



## Intrinsic motivation and metacognition as predictors of learning potential in patients with remitted schizophrenia

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### ABSTRACT

**Background:** Previous research has suggested that neurocognitive functioning predicts best the potential of patients with schizophrenia to acquire newly learned material, which, in turn may impact patients' social functioning. Recent studies have also shown that intrinsic motivation and metacognitive abilities play a decisive role in social functioning in schizophrenia. Accordingly, the present study sought to examine the relationship between intelligence, motivation, metacognition, and learning during a cognitive remediation experimental training. We hypothesized that metacognition and intrinsic motivation would have a strong relationship and independently predict learning potential.

**Method:** Thirty-two patients with schizophrenia who fulfilled the criteria of functional remission were recruited. In a pre-training–post experimental design, patients' learning potential was assessed using previously defined cognitive remediation training for WCST. Intrinsic motivation was examined using Intrinsic Motivation Inventory for schizophrenia; mastery, a domain of metacognition, was measured using the Metacognitive Assessment Scale.

**Results:** Metacognition significantly correlated with subdomains of intrinsic motivation. Patients with higher intrinsic motivation and preserved metacognition improved more in the learning paradigm compared to poorly motivated patients and patients with reduced metacognitive abilities. In particular, “mastery” was determined as an independent predictor of learning potential.

**Conclusions:** Motivation and metacognition are important predictors of learning in schizophrenia. Psychological interventions in schizophrenia may therefore consider incorporating techniques to stimulate metacognitive and motivational abilities as well as developing individualized training programs.

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### 1. Introduction

Since Brenner et al. (1992) introduced the Integrated Psychological Therapy (IPT) as a modularized tool to improve cognition in severe psychiatric disorders, psychosocial interventions for schizophrenia have enjoyed a rapidly increasing popularity over the last 20 years. This development can largely be explained by two key findings: one is based on evidence for the limited effects of psychopharmacological treatment on social functioning and residual symptoms in schizophrenia (Swartz et al., 2007), the other is the proven efficacy of cognitive remediation and cognitive behavioral therapy (Wykes et al., 2008, 2011). Despite the developments in new

therapeutic techniques, there are a number of factors that have a direct influence on the efficacy of an intervention, including therapeutic alliance, neurocognition, motivation and metacognition, the individual roles of which still need to be further clarified, and may be independent of the specificity of the intervention (Svensson and Hansson, 1999).

Intervention studies of cognitive behavioral therapy in anxiety disorders and cognitive remediation in post-stroke patients (Hofmann and Smits, 2008; Rohling et al., 2009) have found higher effect sizes from treatment when compared to similar interventions in schizophrenia patients (Wykes et al., 2011). One possible explanation for this is attributed to the neurocognitive impairment in patients with schizophrenia (Wykes and Reeder, 2005), which arguably has a negative impact on the potential to benefit from training and practice (Kurtz et al., 2010), henceforth referred to as “learning potential” (LP; Sternberg and Grigorenko, 2002). Previous definitions of LP in schizophrenia largely focused on its link with

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a person's cognitive capacity, suggesting that LP is a crucial factor in predicting performance after rehabilitation (Fiszdon et al., 2006). LP has typically been measured through repeated administration of specific cognitive tests before and after training of that particular cognitive faculty (Lauchlan and Elliott, 2001). For instance, Kurtz et al. (2010) evaluated LP using the California Verbal Learning Test (CVLT; Delis et al., 2000) and the Wisconsin Card Sorting Task (WCST; Heaton, 1981) with a pre-training-post design. They categorized a sample of schizophrenia patients into non-learners, learners, and high achievers according to the participants' improvement in performance after the CVLT and the WCST though this failed to predict social functioning (Kurtz et al., 2009). Taken together, it is plausible to predict that the LP of a neurocognitive test has the potential to predict treatment outcome of a neurocognitive remediation program as well as work skills training (Sergi et al., 2005). A few studies have shown that LP can have predictive power for treatment outcome in schizophrenia patients beyond patients' performance on neurocognitive measures (Watzke et al., 2009; Rempfer et al., 2011). In addition, studies of LP in educational psychology suggest that motivation and metacognitive abilities should be considered as mediating factors of learning (e.g., Flavell, 1979; McCabe, 2011).

Motivation has been defined as an "internal state, need, or desire that serves to incite, direct, and maintain goal-oriented behaviors which is believed to be implicated in all learned responses and can either foster or hinder future actions" (Kleinginna and Kleinginna, 1981). Motivation has been conceptualized with the "self-determination theory" (SDT), which describes motives along a continuum, with intrinsic motivation (IM) lying at one end and extrinsic motivation (EM) at the other (Deci and Ryan, 1985). IM refers to pursuing an action because it is inherently interesting or enjoyable whereas EM refers to performing an action because it leads to a distinct outcome (Ryan and Deci, 2000).

In general, motivational deficits in schizophrenia have previously been considered as part of a negative symptom syndrome (Barch, 2005). Studies on motivation in schizophrenia have referred to the self-determination theory of motivation (Choi et al., 2010; Nakagami et al., 2008, 2010). For example, a recent study using a standard and a motivational mathematical game reported that schizophrenia patients with higher IM levels learned better than those with lower IM levels (Choi and Medalia, 2010). In addition, Nakagami et al. (2008) found that IM, as measured using a composite index derived from the Quality of Life Scale for Schizophrenia (Heinrichs et al., 1984), mediated the relationship between neurocognition and social functioning. In view of these findings, recent cognitive remediation strategies in schizophrenia have included means to induce IM by educational approaches, computer-based tasks, and virtual reality (Medalia and Thysen, 2008; Park et al., 2011).

Self-regulation refers to the capacity for altering behavior in terms of SDT and also overlaps with features of "metacognition". In particular, "mastery" represents a metacognitive capacity to form integrated narratives built around complex and coherent accounts of how the mental states of both oneself and others change over time, and then to use that kind of mentalistic information for purposeful problem solving. In the case of mental illness, mastery refers to the use of knowledge about oneself and other to effectively deal with subjective distress and interpersonal challenges (Semerari et al., 2003; Lysaker et al., 2005; Brüne et al., 2011). Metacognitive mastery, for instance, concerns one's ability to respond to unexpected conflicts, emergent symptoms or psychosocial setbacks on the basis of their knowledge of themselves and others as beings with unique sets of interrelated thoughts and feelings.

A substantial amount of research has demonstrated that metacognitive deficits are related to the course of illness in schizophrenia,

independent of symptomatology and neurocognition (Roncone et al., 2002; reviewed in Brüne et al., 2011). Metacognitive impairments in schizophrenia are associated with the capacity to monitor one's own thinking and behavior (Koren et al., 2006), to mentalize (Langdon and Coltheart, 2001), and to form complex ideas of one's own life as a narrative spanning a lifetime (Berna et al., 2011). Recently, Lysaker et al. (2010) provided substantial evidence that schizophrenia patients struggle not only with how to cope with symptoms and neurocognitive impairment, but also struggle to interpret and make sense of the challenges that they face. This could profoundly impact on variables such as IM. Although distinct but related, we assert that metacognitive capacities also regulate IM among schizophrenia patients.

The present study therefore sought to explore the influence of metacognition and IM on LP in schizophrenia. Specifically, we hypothesized that individual differences in metacognition and IM would predict a significant amount of the variance to explain LP. To minimize the confounding effects of symptomatology, we decided to study this association in a sample of symptomatically remitted patients with schizophrenia.

## 2. Methods

### 2.1. Participants

Fifty-two clinically stable individuals with schizophrenia were recruited from the Psychosis Unit at Celal Bayar University. The patients met DSM-IV criteria for schizophrenia as determined by medical records and confirmed with the Structured Clinical Interview for DSM-IV – Patient Edition (SCID; First et al., 1996). Only patients meeting the criteria of being in remission according to the Schizophrenia Working Group (Andreasen et al., 2005) were included. Of the thirty-two patients meeting the criteria for remission two patients refused participation. Thus, data from thirty patients (53 percent men) were secured. The patients' mean age was  $32.93 \pm 12.35$  years; the number of years of education was  $11.50 \pm 2.34$ , the mean duration of illness was  $12.07 \pm 10.55$  years, and the number of hospital stays was  $2 \pm 2$ . All patients received second-generation antipsychotic medication. Chlorpromazine equivalent dosages (CPZ) were calculated for all patients in order to control for the medication effects (Rijcken et al., 2003). Accordingly, mean dosages were  $416.25 \pm 220.99$  mg per day. All patients provided written informed consent. The study was approved by the local Institutional Review Board.

### 2.2. Clinical and neuropsychological measures

#### 2.2.1. Clinical rating and remission criteria

The Positive and Negative Syndrome Scale (PANSS; Kay et al., 1987) is a 30-item rating scale that was administered by clinically trained research staff using a chart review and a semi-structured interview. Accordingly, the average total PANSS score of the group was  $57.25 \pm 11.46$  points. Symptomatic remission was assumed if the following items of the Positive and Negative Syndrome Scale (PANSS; Kay et al., 1987) were rated as moderate, mild, minimal or absent (i.e. PANSS score for each item  $\leq 3$ ): delusions (PANSS-P1), unusual thought content (PANSS-G9), hallucinations (PANSS-P3), conceptual disorganization (PANSS-P2), mannerisms (PANSS-G5), blunted affect (PANSS-N1), social withdrawal (PANSS-N4), and lack of spontaneity (PANSS-N5). PANSS ratings were completed by a trained consultant psychiatrist working in the outpatient department.

#### 2.2.2. Estimated general intelligence

Age-corrected indices of the memory quotient (MQ) were calculated over total WMS-WMS-III (Wechsler, 1997). The MQ is

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