

Metacognition and social function in schizophrenia: Associations over a period of five months

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Introduction. Deficits in the ability to think about thinking have been widely observed in persons with schizophrenia and linked with concurrent assessments of various forms of function. Less is known though about their links to outcome over time. To address this issue, the current study explores whether Mastery, a domain of metacognition that reflects the ability to use knowledge about one's own mental states and those of others to respond to psychological challenges, is related to the frequency of social contact and persons' capacity for social relatedness.

Methods. Participants were 72 adults with schizophrenia spectrum disorders enrolled in vocational rehabilitation; these patients completed a baseline assessment as well as a follow-up assessment 5 months later. Mastery was assessed using the Metacognitive Assessment Scale and social functioning by the Quality of Life Scale.

Results. Using structural equation modelling, the proposed model demonstrated acceptable fit even when a range of possible confounding variables were entered as covariates.

Conclusions. Results are consistent with the possibility that certain forms of metacognition affect social function among persons with schizophrenia, both concurrently and over time.

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Research was sponsored by the Veterans Affairs Rehabilitation Research and Development Service.

Keywords: Metacognition; Neurocognition; Recovery; Schizophrenia; Social function; Theory of Mind.

INTRODUCTION

Terms such as “Metacognition”, “Theory of Mind”, and “Mentalising” describe a general capacity to think about thinking (Dimaggio & Lysaker, 2010). These terms, originally developed and utilised by scholars from the field of education, and which are now used interchangeably, refer to persons’ abilities to recognise and understand their own mental states, as well as the mental states of others. Individuals with greater aptitude for these abilities may be able to form, revise, and reform ideas about beliefs, feelings, fears, and dreams, thereby developing a detailed picture of their own mental states as well as the wishes and intentions of others. These abilities make it possible for persons to make sense of their dilemmas, find meaning in life, and adapt to a changing environment. In this paper we have selected the term “metacognition” to refer to this general set of semi-independent faculties because of its potential to describe a wide range of internal and socially driven cognitive acts which contain primarily reflexive qualities (e.g., Semerari et al., 2003).

Deficits in metacognition have been recognised for over two decades as a feature of schizophrenia (Frith, 1992). For instance, persons with schizophrenia have difficulty forming ideas about what other people are thinking and feeling on the basis of visual or verbal cues, recognising themselves as the source of some of their own thoughts and actions, and developing a coherent account of their own mental states and personal narrative (Brüne, 2005; Harrington, Siebert, & McClure, 2005; Lafargue & Franck, 2009; Langdon, Coltheart, Ward, & Catts, 2002; Lysaker et al., 2005; Lysaker & Lysaker, 2008; Penn, Corrigan, Bentall, Racenstein, & Newman, 1997; Saavedra, Cubero, & Crawford, 2009; Stratta et al., 2007). These deficits appear to be relatively stable over time and, although correlated with severity of psychopathology, cannot be explained simply as a reflection of symptoms or other features of schizophrenia (Abdel-Hamid et al., 2009; Bora, Yücel, & Pantelis, 2009; Langdon, Coltheart, Ward, & Catts, 2001; Roncone et al., 2002). Deficits in metacognition appear to be trait-like in schizophrenia and to persist over time, though metacognitive capacity varies across different situations depending upon the emotional and cognitive demands present in the moment (Dimaggio, Semerari, Carcione, Nicolò, & Procacci, 2007; Semerari et al., 2003).

Deficits in metacognition are of particular clinical and theoretical interest in schizophrenia, given their potential as a factor responsible for widespread psychosocial dysfunction. In particular, impairments in metacognition have

been suggested to serve as a unique barrier to understanding one's own needs in the wake of schizophrenia, to see others' perspectives, and to plausibly represent and master one's own psychological problems. They may limit persons' abilities to form an image of themselves as functioning within a social context and so be relatively helpless to solve the conflicts and misunderstanding that arise as a result of daily life (Bora, Sehitoglu, Aslier, Atabay & Veznedaroglu, 2007; Lysaker, Buck, Salvatore, Popolo, & Dimaggio, 2009). In support of this hypothesis are studies suggesting that deficits in metacognition are linked with deficits in social and vocational functioning (Bora, Eryavuz, Kayahan, Sungu, & Veznedaroglu, 2006; Brüne, Abdel-Hamid, Lehmkämpfer, & Sonntag, 2007; Horton & Silverstein, 2008; Lysaker, Dimaggio, Carcione, et al., 2010). Other studies have further suggested that deficits in metacognition may also mediate the impact of other clinical phenomena (e.g., neurocognitive deficits) on social and vocational outcome (Bell, Tsang, Greig, & Bryson, 2009; Lysaker, Shea, et al., 2010; McGlade et al., 2008).

In the present study we sought to elaborate on the relationship between metacognition and social functioning. To do this, we selected one facet of metacognition, namely Mastery. Mastery, in the context of metacognition, refers to the ability to utilise knowledge of mental states when responding to psychological challenges (Semerari et al., 2003). It differs from other facets of metacognition in that capacity in this domain reflects active use of metacognitive knowledge. Mastery refers to the ability of an individual to (1) represent psychological distress in terms of problems to solve, passing from the simple representation of mental and social events to being able to actively use knowledge of mental states to change the state of things; (2) use psychological knowledge as a source of information for planning strategies for problem solving, coping with suffering, achieving desires, and social adaptation; and (3) arrive at appropriate strategies for solving tasks with increasing levels of complexity. It differs from coping in that it is not necessarily reflective of efficient problem solving or a preference for a particular approach to difficulties, but instead an adaptive use of metacognitive knowledge to address a variety of problems. For instance some persons might adopt avoidant or active coping strategies with metacognitive knowledge, whereas others might use the same strategies not on the basis of metacognitive knowledge.

As adapted by Lysaker and colleagues (2005) from the rubric proposed by Semerari and colleagues (2003), Mastery in persons with schizophrenia has been operationalised as a dimensional construct along which persons can vary in terms of their capacity to perform increasingly complex metacognitive acts. An example of a higher form of Mastery might involve observing the way one thinks about a problem and forming alternative perspectives about it. In contrast, a lower form of Mastery might involve avoidance

through the use of alcohol, for instance. Evidence that Mastery is linked to functioning in general can be found in previous studies correlating it with quality of life (Lysaker et al., 2005) and the complexity of social scheme (Lysaker, Dimaggio, Daroyanni, et al., 2010).

In order to explore the relationship between Mastery and social function, the present study has examined these constructs as they evolve together over time. One limitation of the literature on metacognition and function to date is that it has generally involved studying the association of certain facets of metacognition with social function using cross-sectional designs. Typically, poor performance on an indicator of metacognition is held up as a correlate of poor function using another measure. As a result, it is unclear whether these relationships persist over time. To study this longitudinal relationship between Mastery and two indices of social function, we used a structural equation model to predict changes in these variables over time. The hypothesised model suggests that Mastery capacity at baseline is related to baseline social function, and that these measures tend to covary over time; higher levels of baseline Mastery predict higher levels of future Mastery, as well as higher levels of quality and frequency of social contact.

METHODS

Participants

Seventy-two adults meeting DSM-IV-TR criteria for schizophrenia ($n = 47$) or schizoaffective disorder ($n = 25$) participated in the present study as part of a larger protocol examining the effects of cognitive behaviour therapy on work outcomes in schizophrenia. Fifty-nine participants (82%) were male and 13 (18%) were female. All participants were in a postacute phase of illness defined as no changes in medication, hospitalisation, or housing within the last 30 days. None of the participants met criteria for substance dependence at the time of testing, and none had a chart diagnosis of mental retardation. Participants were recruited through either a local VA Medical Centre ($n = 47$, 65%) or a Community Mental Health Centre ($n = 25$, 35%). The mean age and level of education in the sample were 46.54 ($SD = 8.96$) and 12.81 ($SD = 2.21$) years, respectively, and the average participant had 6.85 ($SD = 8.08$) psychiatric hospitalisations in his or her lifetime with the first hospitalisation occurring on average at age 27.27 ($SD = 10.84$) years of age. Forty-six of the participants (64%) were African American, 25 (35%) were Caucasian, and one (1%) was Latino. This represents a total of 70% of the original participants from our study on concurrent associations between mastery and social function. The other 30% were lost to follow-up or declined to perform the follow-up assessments.

Instruments

Indiana Psychiatric Illness Interview (IPII; Lysaker, Clements, Plascak-Hallberg, Knipscheer, & Wright, 2002). This is a semistructured interview developed to assess how individuals understand their experience with mental illness. Trained research assistants conducted the interview that typically lasted between 30 and 60 minutes. Responses were audiotaped and later transcribed. The interview is conceptually divided into five sections. First, rapport is established and participants are asked to tell the story of their lives, beginning with their earliest memory. Second, participants are asked if they think they have a mental illness and, if so, what their experiences have been with this mental illness. This is followed by questions about how the participants perceive their condition, and whether or not this condition has affected different facets of their life. Third, participants are asked if and how their condition controls their life and, alternately, how they control their condition. Fourth, they are asked how their condition affects and is affected by others. Finally, participants are asked about what they expect to remain the same regarding their condition, and what will be different for them in the future. The IPII differs from other psychiatric interviews in that only minimal content is introduced for the participant to comment on and thus results in a self-report that can be analysed in terms of the metacognitive capacities that appear spontaneously. In other words, explicit metacognitive tasks are not posed for the participant to solve. Instead, an opportunity for metacognition naturally arises when participants talk in an extended fashion about their life story and thereby allows raters to detect the degree to which complex metacognitive processes are present or absent. Trained and calibrated raters evaluated participants' transcripts using the Metacognition Assessment Scale (MAS; [Semerari et al., 2003](#)), which is described next.

The Metacognition Assessment Scale (MAS; [Semerari et al., 2003](#)). This is a rating scale that assesses metacognitive abilities. It was originally designed to detect growth within psychotherapy transcripts and, in consultation with the authors, has been abbreviated and adapted for the study of IPII transcripts (Lysaker et al., 2005). The MAS differs from other more structured assessments of metacognition in that it focuses on metacognitive functions that arise spontaneously, rather than cued as in a task or referenced in a questionnaire. For the purposes of this study, we were interested in one MAS subscale: Mastery. Scores on the Mastery dimension of the MAS range from 0 to 9, with higher scores representing use of more complex and effective means of using mastery to address psychological problems. For example, when facing a plausible psychological problem, a score of 3 suggests a person can at the most avoid the problem (not talk to a colleague one is angry with), a score of 5 suggests a person can respond with a behavioural strategy

(e.g., buy new clothing to feel better), and a score of 6 suggests a person can respond by changing how they think about the matter (e.g., realizing that having a rather pessimistic view about other's motives may be inaccurate and hamper the process of finding a solution).

Good interrater reliability has been previously reported for the raters in the current study (Lysaker, Shea, et al., 2010). Mastery has been found to be significantly associated with other indices of metacognition; however, these measures are not redundant. Recent evidence indicates that Mastery, in contrast to other aspects of metacognition, is uniquely linked to social function (Lysaker et al., 2005). Mastery has also been found to be related to the use of higher level coping strategies, such as thinking and talking about stressors as well as a greater ability to represent social exchanges in more complex psychological terms (Lysaker, Erickson, Ringer, et al., in press). Evidence of the relative stability of the construct over three administrations has also been found and one preliminary study has also found Mastery to be a unique deficit among persons with schizophrenia relative to others with chronic medical illnesses such as HIV (Lysaker, Erickson, Olesek, et al., in press).

Quality of Life Scale (QOLS; Heinrichs, Hanlon, & Carpenter, 1984). This is a 21-item scale completed by clinically trained research staff following a semistructured interview and a chart review. For the purposes of this study, we were interested in two of the four-factor scores of the QOLS that are most intimately tied to social function. The first, "Interpersonal Relations", measures the frequency of recent social contacts, and assesses contact with friends separately from contact with casual acquaintances. The second, "Intrapsychic Foundations", measures qualitative aspects of interpersonal relationships, such as the presence or absence of empathy for others. High interrater reliability has been found for this scale in previous studies using samples of schizophrenia patients (i.e., Lysaker, Dimaggio, Daroyanni et al., 2010). Evidence of the validity and utility of this scale has been widely reported (Cramer et al., 2000).

Procedure

All procedures were approved by the research review committees of Indiana University and the Roudebush VA Medical Center. Following informed consent, diagnoses were determined using the Structured Clinical Interview for DSM-IV (SCID; Spitzer, Williams, Gibbon, & First, 1994) conducted by a clinical psychologist. Following the SCID, participants were administered the IPII and the QOLS. Trained and calibrated raters assigned each participant a Mastery, Interpersonal Relations, and

Intrapsychic Foundations score based on transcriptions of semistructured interviews and chart reviews. This procedure, assessment, and ratings, was then repeated approximately 24 weeks later (average interval = 23.93 weeks, $SD = 5.11$) to assess change in these measures over time. In between the two assessments, participants were offered a 26 week paid work placement and work counselling services.

Data analysis

Pearson correlation coefficients were calculated to examine the relation between Mastery, the two subscales from the QOLS, and demographics of the participants, including age, education, and lifetime hospitalisations. In a preliminary analysis, scores on each of the three items of interest (Mastery, Interpersonal Relations, and Intrapsychic Foundations) were collapsed across time. Pearson correlations were then conducted on the average scores of these three measures to evaluate the relatively stable relationship between the variables. Bonferroni corrections for multiple correlations were used where applicable. Following the computation of correlations between the variables when collapsed across time, we conducted a path analysis using structural equation modelling software in order to test the proposed theoretical model.

We tested the hypothesised model using AMOS 16.0 (Arbuckle, 2007). First, we evaluated the distributions of the primary variables (Mastery, Interpersonal Relations, and Intrapsychic Foundations) to detect any violations in the assumption of normality. We found that, for all variables, skewness and kurtosis values of the distributions did not exceed the values of -1 or $+1$; we therefore concluded that the distribution of observed variables did not violate the normality assumption for conducting a factor analysis. In our first path analysis, we allowed Mastery and Interpersonal Relations at Time 1 to predict the score on the identical measure at Time 2. Additionally, we hypothesised that Mastery would be a significant predictor of Interpersonal Relations at Time 1 and at Time 2, separately (see Figure 1). In our second path analysis we created an identical model, but replaced Interpersonal Relations scores with scores from the Intrapsychic Foundations measure (see Figure 2). We evaluated the fit of these models using the chi-square statistic (χ^2), the Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), Standardised Root Mean Square Residuals (SRMR), the Akaike Information Criterion (AIC), and the Bayesian Information Criterion (BIC) for both the simple model and the complex model (i.e., the simple model with demographic information added as covariates). The chi-square statistic tests the difference between the observed and theoretical correlation matrix. A small, nonsignificant chi

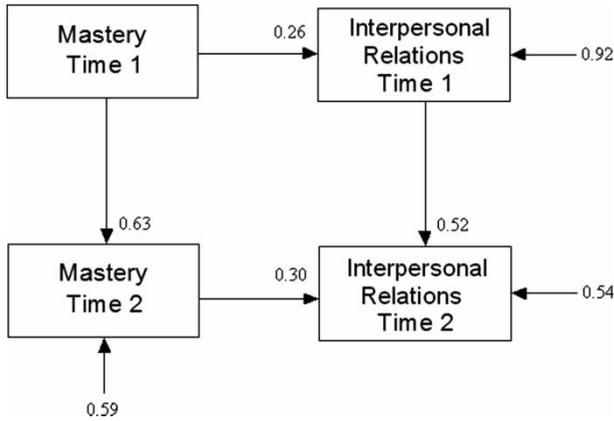


Figure 1. Relationship between Mastery and Interpersonal Relations over time. Covariances between errors for Interpersonal Relations for Time 1 and Time 2 are not depicted.

square is desired, which indicates that the observed correlations are not significantly different from the expected correlations. The range of possible CFI values is from 0 to 1, with larger values indicating a better fit. The RMSEA statistic indicates how well the model would fit the hypothetical population covariance matrix; however, this index may be misleading when there are few degrees of freedom and sample size is relatively small (Rigdon, 1996). We have therefore additionally included the SRMR, which is the average difference between the correlations predicted by the model and the correlations observed. For both the RMSEA and SRMR, small values (i.e., 0.05 or lower) indicate a better fit. The AIC and BIC values may be used to

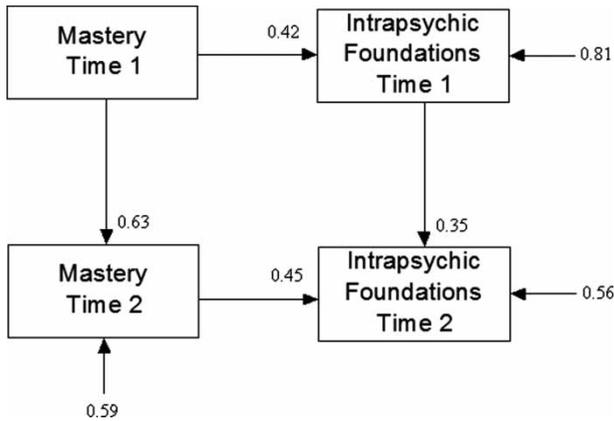


Figure 2. Relationship between Mastery and Intrapyschic Foundations over time. Covariances between errors for Intrapyschic Foundations for Time 1 and Time 2 are not depicted.

determine whether adding covariates (i.e., increasing the complexity of the model) significantly improves model fit; a model associated with smaller AIC and BIC values indicate that the model accounts for the most amount of variance in the data while minimising model complexity (Byrne, 2001).

RESULTS

The correlations, means, and standard deviations of the study measures are presented in Table 1. After applying the Bonferroni correction for the 15 comparisons, the correlations between average Mastery score, average Interpersonal Relations score, and average Intrapsychic Foundations score remained significant at $p < .05$ (r s range from .44 to .59). None of the three dependent variables correlated significantly with any of the demographic variables after accounting for multiple comparisons (r s $< .27$).

The indices of model fit for the two models are presented in Table 2. Both models appear to be a good fit for the observed data, with a nonsignificant chi-square, large (> 0.95) CFI, and small (< 0.06) SRMR index. The RMSEA statistic was large (> 0.10) for both models; however, this may simply be a result of having few degrees of freedom and a relatively small sample size, as RMSEA values are known to be imprecise when these values are not large (Rigdon, 1996). Importantly, all paths between Mastery and the two QOLS subscales were significant ($p < .05$); Mastery scores account for an additional 9% of the variance in Interpersonal Relations after accounting for participants' scores on this variable at the previous time point, and Mastery scores account for an additional 20% of the variance in Intrapsychic Foundations after accounting for participants' prior scores on this same measure.

DISCUSSION

In the current study, we tested, through structural equation modelling, the hypothesis that levels of metacognitive Mastery influence concurrent social function and future metacognitive function, which in turn influences future social function. The model that we tested was based on previous work showing that mastery is linked with various indices of concurrent social functioning. Results supported the model. This is thus consistent with hypotheses that levels of metacognitive function are not only stable over time but that they are linked to function in a systematic manner, at least for persons with chronic schizophrenia. Specifically, it may be that persons with lesser capacities for Mastery consistently struggle in this domain and as a result tend to have fewer enduring social relationships and fewer of the necessary foundations needed for relatedness.

TABLE 1
Relationship between Mastery and Intrapsychic Foundations over time

	<i>Age</i>	<i>Education</i>	<i>Lifetime hospitalisations</i>	<i>Mastery</i>	<i>Interpersonal relations</i>	<i>Intrapsychic foundations</i>
Age	—	-.01	.08	.09	.05	.03
Education		—	.04	.19	.22	.27
Lifetime hospitalisations			—	.25	-.11	-.04
Mastery				—	.44*	.53*
Interpersonal Relations					—	.59*
Intrapsychic Foundations						—
Mean (<i>SD</i>)	46.54 (8.96)	12.81 (2.21)	6.85 (8.08)	3.47 (1.66)	18.94 (7.17)	21.06 (4.74)

*Significant at $p < .05$.

TABLE 2
Goodness of model fit indices

	χ^2	<i>df</i>	<i>p-value</i>	<i>CFI</i>	<i>RMSEA</i>	<i>SRMR</i>	<i>AIC</i>	<i>BIC</i>
Mastery and Interpersonal Relations	1.90	2	.15, <i>ns</i>	0.98	0.11	0.055	19.81	38.02
Mastery and Intrapsychic Foundations	2.11	2	.12, <i>ns</i>	0.98	0.13	0.048	20.22	38.44

CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardised Root Mean Square Residuals; AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion.

Taken as a whole, these results are notably consistent with evolving models suggesting that adaptation to daily life involves not only the passive processing of specific information, but a complex, active and recursive process in which persons' consideration of their own mental states and those of others allows for meaning to be made of the smallest and largest aspects of experience (Damasio, 2000; Dimaggio, Lysaker, Carcione, Nicolò, & Semerari, 2008). The links between metacognition and function are additionally consistent with emerging theoretical (Lysaker & Lysaker, 2008) and first-person accounts of schizophrenia (Chadwick, 2007; Kean, 2009) that stress that persons with schizophrenia are not merely passive recipients of difficult biologically and socially based challenges but must actively interpret and make sense of those challenges in order to forge a meaningful life in the world. Put another way, metacognitive mastery may help persons cope with symptoms and adapt themselves to an ever-changing environment in which they are surrounded by other minds which have covert intentions, complex wishes, and needs that are often at odds with the person's goals. Deprived of these abilities, those persons may be unable to make sense of conflicts, pursue their goals, seek support from others, or form stable affiliative bonds with groups in which they could feel included. Therefore, poor metacognition could pave the way to social alienation (Lysaker, Roe, & Buck, 2010; Roe & Davidson, 2005).

Nevertheless, many questions remain unanswered. For one, although findings are supportive of a general link between these variables, results do not point to the specific processes which link metacognition with social function. We would hypothesise that with a lesser capacity for mastery, relationships are eroded as they become painful, confusing, or irritating for both the person with schizophrenia and those around them. Presumably, the development and sustenance of meaningful relationships involve a number of challenges to which one must respond. Perhaps with limited capacities to use metacognitive knowledge to cope with such challenges, persons are left with only the basic evolutionary strategies noted by Gilbert (2001), such as fight/flight, and respond habitually to difficulties with anxious arousal, heightened vigilance and attention to the threat, all leading to sustained dysfunction. Facing a world that is poorly understood, some may find they can only angrily attack or withdraw. These speculations, however, await future research.

Importantly, there are other limitations to this study. Participants were mostly male and middle aged, and generally many years had passed since the onset of their illness. Additionally, all were in some form of active treatment and were offered rehabilitation services in between baseline and follow-up assessments. Replication is therefore needed with more diverse groups of participants including women, persons in an earlier phase of illness, and those refusing treatment. We would be interested to know, for instance, whether

deficits in metacognition among persons who have just become ill or are on the cusp of becoming ill are also linked in the same manner to different aspects of social function over time. Additionally, we did not evaluate other aspects of metacognition, such as self-reflection and mindreading, as potential influences on social function. We were, therefore, unable to discern whether the observed relationship with social function is unique to Mastery, or if social function is related to other domains of metacognition as well. Further studies will investigate possible correlates of mastery with these other aspects of metacognition and other domains of neurocognition (e.g., poor executive function or poor mental flexibility). Furthermore, we did not consider any of a number of possible factors that might interact with metacognitive capacity, including earlier trauma history as well as the possibility that psychosis itself is traumatic.

CONCLUSION

In conclusion, results are largely consistent with emerging models that deficits in metacognition play a role in the persistence of psychosocial dysfunction in schizophrenia. With replication, there may be implications for treatment. In particular, paralleling the field of the study of treating personality disorders ([Bateman & Fonagy, 2001](#); [Dimaggio et al., 2007](#)), it may be that treatment has to encourage persons to exercise and develop the capacity to plausibly represent psychological and interpersonal problems and to cope with these through the use of metacognitive knowledge about oneself and others. As suggested in a number of preliminary case studies and theoretical analyses, psychotherapy ([Buck & Lysaker, 2009](#); [Lysaker, Buck, & Ringer, 2007](#)) or rehabilitation ([Hasson-Ohayon, Kravetz, Levy, & Roe, 2009](#)) could potentially be tailored or modified to help persons with schizophrenia to develop metacognitive capacity, with an end goal of enhancing outcomes related to daily function.

Manuscript received 23 April 2010

Revised manuscript received 31 August 2010

First published online 10 December 2010

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