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Metacognition amidst narratives of self and illness in schizophrenia: associations with neurocognition, symptoms, insight and quality of life

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Objective: Impairments in laboratory tasks of metacognition appear to be associated with symptoms, functioning, and neurocognition in schizophrenia. We sought to replicate these results in a study of metacognition within personal narratives of self and illness.
Method: Narratives of 61 men with schizophrenia were rated using the Metacognition Assessment Scale and correlated with concurrent assessment of symptoms, quality of life, neurocognition and insight.
Results: Controlling for age and education, understanding of one's own mind was linked with better neurocognition across multiple domains, and lesser emotional withdrawal. Greater understanding of other's mind was linked with better verbal memory and less emotional withdrawal. Greater metacognition in the context of purposeful problem solving was associated with better verbal memory, insight and social function, and less emotional withdrawal and paranoia.
Conclusion: Deficits in metacognition within the narratives of persons with schizophrenia are linked with symptoms, quality of life, neurocognition and poorer awareness of illness.

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Key words: schizophrenia; metacognition; theory of mind; neurocognition; insight; psychosocial function; symptoms

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Introduction

It has been widely observed that persons with schizophrenia experience grave difficulties thinking about their own thinking and thinking about the thinking of others. Bleuler (1) for instance, described under the label of 'autism', an inability to fully appraise the meanings embedded in speech and behaviour. Freud (2) observed that persons with schizophrenia are profoundly unaware of their own affects and thoughts as well as the affects and thoughts of others. Since then a wealth of self-report and case studies have confirmed the recalcitrance of these deficits in schizophrenia and highlighted their profound impact on the recovery process (3, 4).

Recently, Frith (5) has suggested that deficits in the abilities to think about thinking, often labeled metacognition (6), may be a fundamental aspect of schizophrenia that underlies many of the traditional signs and symptoms of the disorder. Accordingly, researchers have begun to examine the correlates of metacognition in schizophrenia. Often this has involved examining performance on 'theory of mind tasks'. Theory of mind refers to the ability to form a representation of the consciousness of another and make inferences about their motives and internal states. This research has found that greater impairments in theory of mind tasks are linked with negative symptoms (7), acute persecutory delusions (8) as well as deficits in verbal and visual memory and flexibility in abstract

thought (9). Langdon et al. (10) have also reported links between measures of mentalizing and negative symptoms and visual memory span but not with positive symptoms. Others have linked poorer theory of mind performance with poorer autobiographical memory (11) and poorer community function independent of neurocognition (12). As summarized by Garety and Freeman (13), research on theory of mind tasks confirms that persons with schizophrenia perform more poorly than others without schizophrenia on theory of mind tasks and that difficulties with this task predict the presence of greater levels of negative symptoms and disorganized speech.

From another angle, other research has examined whether participants with schizophrenia can distinguish their own actions or thoughts from those of another source. Studies of such tasks, referred to as source monitoring tasks, suggest that persons in schizophrenia have difficulties distinguishing thoughts they imaged saying from thoughts they were asked to imagine that others said (14). Source monitoring errors have been linked with positive symptoms (15) and inversely correlated with negative symptoms (16). Frank et al. (17) have reported that failure to recognize when an image's movement mimicked one's own hand movement was related to persecutory delusions. Others suggest that participant's difficulties distinguishing one's own touch from that of another was also linked to positive symptoms (18).

In general, while this line of research offers a promising framework within which to conceptualize deficits of schizophrenia, it has tended to employ a limited way of assessing metacognition. Typically, a participant is asked to imagine something or to perform a behaviour in a laboratory, and then perform a metacognitive act. In other words, metacognitive ability is inferred from a situation with an explicit task and specified metacognitive judgment. Thus, less clear from this literature is what might be linked with metacognition in different kinds of situations, including those which do not call for specific judgments about analogue situations. Would the same correlates be in evidence, for example, in a test of metacognition wherein participants were asked to think about their own lives?

To address this question we have measured metacognition in narratives of self and illness in persons with schizophrenia using an adaptation of the Metacognition Assessment Scale (MAS; 19) a method developed for assessing metacognition in psychotherapy transcripts. The MAS assesses metacognitive abilities in the domains of understanding one's own mind, understanding the mind of the other, and mastery in the ability to think purposefully regarding a particular problem or source of distress. The MAS thus allows not only for an assessment of metacognition within spoken narratives but also conceptualizes and assesses metacognition across semi-independent dimensions. While we have discussed metacognitive deficits as a singular phenomenon, as others often do (20–22), Nichols and Stich (23) have suggested that metacognition be conceptualized according to a modular theory in which lack of first and third person awareness proceed from different sources and are linked with different outcomes. Casacchia et al. (24) have further described how awareness of one's intentions could be uniquely linked to hallucinations while a different aspect of metacognition, awareness of one's purposes might be linked with behavioural disturbances. Thus, by using the differing subscales of the MAS we may also be able to detect different patterns of associations with different aspects of first and third person awareness in an exploratory manner.

The narratives we have analyzed using the MAS reflect behaviour samples in which participants were invited to reflect on their life story, on their illness and about others who populate their stories (25). We judged them as appropriate for us to rate with the MAS because they are in transcript form and because they pose a situation where metacognition is elicited in an open ended manner. Put another way, our methods present participants with an opportunity to think about their own thinking, the thinking of others and the problems they are presented, without posing direct problems to be solved. We reasoned that this method would allow us to explore the correlates of metacognition in the context of self-reflection without a detailed problem explicitly posed. Given that there may be gender differences in the construction of life stories we began with a sample of males only. Finally to study the links of neurocognition and metacognition we selected five domains previously linked with metacognition or awareness of illness: verbal and visual memory, processing speed, executive function and premorbid intelligence (26–28).

Aims of the study

In the following study, we sought primarily to determine whether metacognition within a narrative would be correlated with (a) neurocognition; (b) positive, negative and depressive symptoms; and (c) quality of life. We secondarily sought to examine whether metacognition was linked to awareness of illness, hypothesizing that poorer metacognition would naturally impede an appraisal of one's psychiatric condition.

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Material and methods

Participants

Participants were 61 adult men with DSM-IV diagnoses of schizophrenia ($n = 40$) or schizoaffective disorder ($n = 21$) enrolled in a larger study seeking to develop a cognitive behavioural therapy targeting working function in schizophrenia. All were initially recruited from the outpatient Psychiatry Service of a VA Medical Center and were in a postacute phase of illness as defined by having no hospitalizations or changes in medication or housing in the month prior to entering the study. Excluded from the study were participants with mental retardation or active substance abuse. The mean age and education of the sample was 47.7 (SD = 6.8) and 12.2 (SD = 1.4) years, respectively. Participants had, on average, 9.9 lifetime psychiatric hospitalizations (SD = 7.0) with the first occurring at age 24.2 (SD = 6.1).

Instruments

Hopkins Verbal Learning Test (HVLT). The HVLT is an auditory verbal memory test designed to measure recall, recognition memory and learning potential (29). In this test the experimenter verbally presents a list of 12 words, each belonging to one of three semantic categories. After each trial the participant is asked to repeat as many words from the list as they can remember. In this study we employed the total correct score for all three trials.

Wisconsin Card Sorting Test (WCST). The WCST asks participants to sort cards that vary according to shape, color and number of objects depicted (30). Subjects are told to match cards to 'key' cards but not told the matching principle which changes after 10 correct responses. This study utilized one score: the total number of categories correct, a score which can range from '0' to '6' and is an accepted indicator of participant's ability to grasp, hold and shift set when necessary.

Visual Reproduction Subtest (VRT). The VRT is a subtest of Weschler Memory Scales (WMS) III that asks participants to reproduce four drawings after a brief period of visual exposure (31). The VRT is thought to be closely associated with visual spatial problem solving (32). For the purposes of this study, we examined immediate recall after the first set of stimuli.

Digit Symbol Subtest (DSS). The DSS is a timed subtest of the Wechseler Adult Intelligence Scale (WAIS) III that assesses participants' visuomotor processing speed (32, 33). Participants are presented with a key in which symbols are paired to single digit numbers and then asked to copy those symbols as appropriate underneath several rows of random single digit numbers.

The Vocabulary subtest (VS). The VS is a subtest of the WAIS III that assesses participants' knowledge of vocabulary by presenting words for participants to define in increasing order of difficulty (33). This subtest has been widely used to assess premorbid intellectual function (32).

Positive and Negative Syndrome Scale (PANSS). The PANSS is a 30-item rating scale completed by clinically trained research staff at the conclusion of chart review and semi-structured interview (34). Individual items are rated on a '1' to '7' scale with higher scores reflecting greater psychopathology. Previous assessment of inter-rater reliability for this study using the intraclass correlation found good to excellent intraclass correlations on all scale scores and most items (35). For this study, we a priori selected six items based on previous findings. Three were traditional forms of positive symptoms: hallucinations, delusions, and suspiciousness. Three were traditional forms of negative symptoms: blunted affect, emotional withdrawal and disturbance of volition and one was a general symptom: depression.

Scale to Assess Unawareness of Mental Illness (abbreviated) (SUMD). The SUMD is a rating scale completed by clinically trained staff following a semi-structured interview and chart review (36). For the purposes of this study a total score was obtained by summing the three central items of the SUMD: (a) awareness of mental disorder; (b) awareness of the consequences of mental disorder; and (c) awareness of the effects of medication. Each of these items is rated on a five point scale with '1' indicating good awareness and '5' indicating severe unawareness. Thus higher scores were reflective of poorer awareness. Inter-rater reliability for this study was found to be in the excellent range with an intraclass correlation of 0.89. Information regarding the validity of the SUMD have been presented elsewhere (36, 37).

Quality of Life Scale (QOL). The QOL is a 21-item scale completed by clinically trained research staff following a semi-structured interview and chart review (38). While initially intended as a scale to assess the deficit syndrome, it has been widely used a general measure of psychosocial function because of its potential to detect strengths and weaknesses

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in interpersonal, work, and community function (37, 39). For the purposes of this study, we used the total score, which is the arithmetic sum of four factor scores: 'interpersonal relations', which measures the frequency of recent social contacts, 'intrapsychic foundations', which measures qualitative aspects of interpersonal relationships, 'instrumental role', which taps vocational function, and 'common objects and activities', which assesses community involvement in terms of participation in activities and possession of common objects. A total of 21 items are rated on a '0' to '6' scale with higher scores reflecting better psychosocial function. Inter-rater reliability was assessed among three raters. An intraclass correlation of 0.94 was found for three raters which is consistent with values we found elsewhere (37).

Indiana Psychiatric Illness Interview (IPII). The IPII is the semi-structured interview developed to assess illness narratives (25). A research assistant conducted the interview and it typically lasted between 30 and 60 min. Of note there is no time limit to this interview although our experience with over 100 of such interviews is that persons with severe mental illness generally complete these procedures within this time frame. Responses can be recorded verbatim in written or typed form during the interview, or audio taped and later transcribed. The interview is divided conceptually into four sections. First, rapport is established and the participant is asked to tell the story of their lives in as much detail as they can. Second, the participant is asked if they think they have a mental illness and how they understand it. This is followed up with the participant being asked to say more about their experience of mental illness including what has and has not been affected by their condition in terms of interpersonal and psychological life. Here life changes related to mental illness may be expressed in a desirable or undesirable direction. In the third section, the participant is asked whether and, if so, how their condition 'controls' their life and how they 'control' their condition. Fourth, the participant is asked what he or she expects to stay the same and what will be different or improve into the future again in terms of interpersonal and psychological function.

This measure differs from other psychiatric interviews in that it does not introduce content. If the participant does not mention hallucinations, the IPII interviewer does not inquire about hallucinations. The interviewer may ask for clarification when confused and may query non-directively, using language consistent with the participant's words. The tone of the interview is directed to be conversational, not interrogatory. Questions are not posed for the participant to solve. The interviewer's task is to elicit enough information to understand the story the participant is telling, not to confirm or refute. The IPII thus results in a narrative of self and illness that can be analyzed in terms of form and quality rather than content.

The Metacognition Assessment Scale. The MAS is a rating scale that assesses metacognitive abilities as manifest in an individual's verbalizations (19). It was created in Italian and translated into English. It was originally designed to detect changes in the ability of persons with severe personality disorders to think about their own thinking within psychotherapy transcripts (40). The MAS focuses on metacognitive functions and not on metacognitive contents (i.e. ideas and beliefs linked to a particular mental phenomenon: beliefs about beliefs). It conceptualizes metacognition as the set of abilities that allow us to understand mental phenomena and work them out in order to tackle tasks and master mental states that are a source of distress (41).

The MAS asks the rater to indicate whether the participant has successfully used or failed to use a function. The items of the MAS are divided into three distinct scales: 'understanding of one's own mind' or the comprehension of one's own mental states; 'understanding of other's minds', or the comprehension of other individuals' mental states and 'mastery' or the ability to work through one's representations and mental states, with a view to implementing effective action strategies, in order to accomplish cognitive tasks or cope with problematic mental states. In this study, the full presence of a function was accorded a score of '1' and the partial presence of a function was awarded a score of '0.5'. Items of each scale were summed to provide a total score for each scale. Because we were rating responses to general questions and not psychotherapy sessions in which client's are challenged to consider their own thinking, we did not attempt to rate the failure to perform a metacognitive act when called for. Inter-rater reliability was assessed with two blind raters for 12 transcripts. Good overall reliability was found with an intraclass correlation for the total score of 0.89 and individual scales ranging from 0.83 (understanding the mind of the other's) to 0.89 (understanding one's own mind).

Procedures

Following informed written consent, diagnoses were determined using the Structured Clinical

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Interview for DSM IV (SCID) (42). The SCID was conducted by a clinical psychologist. Next participants were given the WCST, HVLT, DSS, VRT, VS, PANSS, QOL, SUMD and IPII as part of a baseline assessment for a study of Cognitive Behaviour Therapy and work outcome. The IPII interview was audiotaped and later transcribed with identifying information removed. Ratings of the transcripts were made blind to participant identity, test performance, symptom level and ratings of quality of life. Raters were not present during the IPII interviews, nor did they transcribe the audiotapes of the interviews.

Results

Mean and standard deviations for MAS scores for understanding one's own mind were 4.50 (1.64) with a minimum of 0 and a maximum of 8.5. Mean and SD for MAS scores for understanding other's mind were 2.27 (1.49) with a minimum of 0 and a maximum of 6.0. Mean and SD for MAS scores for mastery were 2.57 (1.90) with a minimum of 0 and a maximum of 6.5. Means and SD on measures of neurocognitive, symptoms, insight and function are presented in Table 1. As presented in Table 2, MAS scales were significantly inter-related, sharing between 16 and 35% of the variance between one another. Metacognition scores did not differ between participants with schizophrenia and schizoaffective disorder, thus the sample was collapsed across diagnoses in subsequent analyses.

To determine associations among variables, MAS scales were converted to Z-scores and partial correlations controlling for age and education were obtained with neurocognition raw scores, symptom, insight and quality of life scores. Given the large number of planned correlations, we chose to use two-tailed tests of significance despite unidirectional hypotheses and reduced the level of significance to 0.025. An alpha of less than 0.05 was determined a priori only to represent evidence of a trend. These partial correlations are presented in Table 3. Given the multiple correlations between neurocognition and understanding of one's own mind, a stepwise multiple regression was conducted in which the neurocognitive scores linked with understanding of one's own mind were entered as predictors of that score. This resulted in a significant predictor equation $F(4,56) = 4.73$, $P < 0.01$) in which both vocabulary (partial $R^2 = 0.15$) and digit symbol (partial $R^2 = 0.10$) scores uniquely contributed, and accounted for a quarter of the variance cumulatively (total $R^2 = 0.25$).

In order to rule out the possibility that the association between mastery and awareness of illness was the result of mastery's link with verbal memory, a partial correlation between mastery and insight was obtained controlling for HVLT. This

Table 1. Mean symptom, insight, Quality of Life and Neurocognitive Scores

Measure	Mean ± SD
PANSS items	
Hallucinations	2.63 ± 1.6
Delusions	3.62 ± 1.4
Suspiciousness	3.65 ± 1.5
Blunted affect	3.37 ± 1.0
Emotional withdrawal	2.54 ± 1.1
Disturbance of volition	2.60 ± 1.2
Depressed mood	3.56 ± 1.6
SUMD Total Score	6.86 ± 2.7
QOLS Total Score	47.8 ± 12.3
WMS Visual Reproduction Scale score	6.87 ± 4.3
WAIS Vocabulary Scale score	7.75 ± 3.1
Digit Symbol Substitution Scale score	5.69 ± 2.7
HVLT Total recall T score	31.3 ± 10
WCST total categories correct	3.35 ± 2.2

Table 2. Inter-correlations among metacognition subscales

	Metacognition scales		
	Understanding one's own mind	Understanding other's minds	Mastery
Understanding one's own mind	xx		
Understanding other's mind	0.56**	xx	
Mastery	0.59**	0.39**	xx

**$P < 0.01$.

Table 3. Partial correlations of metacognition with neurocognition, Quality of Life and Symptoms, controlling for age and education

	Metacognition scales		
	Understanding one's own mind	Understanding other's mind	Mastery
Neurocognitive measures			
Vocabulary subtest	0.38**	0.02	0.15
Digit symbol substitution	0.33*	0.14	0.21
Hopkins verbal memory	0.38**	0.33*	0.32*
Wisconsin card sort	0.03	−0.16	0.06
Visual reproduction	0.34**	0.23	0.11
Symptom and outcome measures			
Scale to assess awareness			
Of mental disorder	0.26***	0.18	0.35**
Quality of Life total	0.12	−0.05	0.30*
PANSS positive symptoms			
Hallucinations	−0.26***	−0.03	−0.16
Delusions	−0.07	0.05	−0.14
Suspiciousness	0.04	0.05	−0.36**
Negative symptoms			
Blunted affect	−0.04	0.05	−0.05
Emotional withdrawal	−0.38**	−0.43**	−0.31*
Disturbance of volition	−0.04	0.10	0.02
General symptoms			
Depressed mood	0.30*	0.15	0.08

*$P < 0.025$; **$P < 0.01$; ***$P < 0.05$.

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resulted in a continued significant relationship between mastery and insight ($r = 0.33$, $P < 0.01$). In that partial correlation the HVLT score was found to uniquely account for 12% of the variance ($r = 0.37$, $P < 0.01$; total $R^2 = 0.22$). When a correlation was obtained between mastery and quality of life, controlling for HVLT, the observed association was no longer significant ($r = 0.24$, $P = 0.07$).

Discussion

The current study examined three aspects of metacognition as they occurred spontaneously in the telling of the narrative of life, illness and abilities by persons with schizophrenia: understanding one's own mind, understanding of other's minds and mastery. Consistent with previous studies of performance on theory of mind and source monitoring tasks, performances on three indices were related to neurocognition, symptoms, and quality of life in the predicted directions.

Regarding neurocognition, verbal memory was linked to understanding one's own mind, understanding of other's mind and mastery. Three other forms of neurocognition, visual memory, processing speed, and premorbid intellectual function were linked exclusively to awareness of one's own mind. When entered into a regression, the vocabulary and digit symbol scores predicted a quarter of the variance in understanding of one's own mind. This may suggest that this facet of metacognition may be influenced by possible risk factors for schizophrenia such as premorbid intellectual function (43) as well as cognitive impairments that are more markers of the disease progress such as processing speed. The finding that verbal memory was linked with all three domains may suggest that these deficits also interfere with the ability to hold onto a mental representation of mental or emotional states as objects for contemplation. As has been speculated elsewhere, perhaps with greater difficulty encoding verbal material, there may come greater disruption in the ability to maintain the larger cognitive structures needed to make meaning of daily experience and to frame a personal sense of self (44).

Regarding symptoms, emotional withdrawal, a negative symptom was linked to all three domains of metacognition. Depression was linked to understanding one's own mind, suspiciousness was linked to mastery, and hallucinations were linked to understanding one's own mind at the level of a trend. The link between understanding one's mind and depressed mood may suggest that with greater awareness of one's own thoughts as objects of reflection comes greater pain. This would be consistent with the observation that many with schizophrenia despair when they experience an 'awakening' or become more cognizant after exposure to second generation anti-psychotic medication (45). This overall pattern of results may also contribute to the debate among theorists (20, 21, 23) regarding whether damage to first person awareness is meaningfully independent from damage to metacognition in the third person. The observed relationship between understanding one's own mind and hallucinations, although modest and at the trend level, is consistent with the supposition of Casacchia et al. (24) that hallucinations should be uniquely linked with awareness of one's own intentions.

Regarding quality of life and insight, both were linked to mastery. While previous literature has linked neurocognition and awareness of illness in schizophrenia (37, 46), when verbal memory was controlled for statistically, mastery continued to be significantly related to insight, accounting together for more than a fifth of the variance. This may suggest that the deficits in the ability to reflect on one's own thinking within the context of active problem solving may relate to impairments in neurocognition and insight. Perris and Skagerlind (47) have noted that metacognition represents a major target for cognitive therapies of schizophrenia. With replication this finding may suggest that it is metacognition with regards to purposeful problem solving which is most closely linked with difficulties accurately conceptualizing one's own illness. In the case of quality of life, when verbal memory was controlled for mastery was no longer significantly correlated at the 0.05 level.

Surprisingly, understanding other's mind was linked with the fewest number of variables and with no variable uniquely. This may suggest that this domain is the one least connected to core features of schizophrenia. It may also be that the narrative tasks that ask persons about themselves do not naturally draw out abilities to think about the thoughts and affects of others as objects of reflection. Future studies that more directly invite stories about others in the context of one's narrative are planned to investigate this possibility. It is also possible that this is an artifact of participant's age and/or need for rehabilitation. Perhaps with age and continuous dysfunction comes general resignation regarding the other. If this is so, different associations might be found in younger and/or less disabled persons with schizophrenia.

Of note, there are several limitations to this study. Participants were male, mostly middle aged and generally many years had passed since the

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onset of their illness. Additionally all were in some form of active treatment and yet disabled to the extent that they sought rehabilitation. Replication is, therefore, needed with more diverse groups including women, and persons in an earlier phase of illness and those refusing treatment. We would interested to know, for instance, whether persons who have just become ill or are on the cusp of becoming ill struggle to understand themselves and others in a similar manner. The narratives were also elicited here in a dialogue with an interviewer, in a particular social context, as well. Replication with interviewers in other sites and non-clinical settings is also essential, as research on metacognition in which there is perhaps even less elicitation of metacognition. Importantly, given the correlational nature of the study no conclusions regarding causality can be drawn. It may be that the associations observed here, for instance, are the result of other processes not assessed. Finally, since multiple correlations were performed, the chances of spurious findings are inflated, even though more conservative alphas and two-tailed tests were employed.

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