Metacognition in Schizophrenia Spectrum Disorders: Methods of Assessment and Associations with Neurocognition, Symptoms, Cognitive Style and Function

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ABSTRACT

Deficits in metacognitive capacity in schizophrenia can be conceptualized as existing along a spectrum from more discrete to more synthetic activities. While each represents an equally important focus of study, synthetic metacognitive activities may be more difficult to measure given they are more a matter of assessing complexity of thought rather than concrete accuracy; and therefore have received less attention. This review summarizes research on synthetic metacognition using a paradigm in which metacognitive capacity is rated within personal narratives. Results across the work reviewed here provides evidence that these deficits are detectable in patients with schizophrenia and that deficits are related to, but not reducible to, symptom severity and poorer neurocognitive function. Independent of symptoms and neurocognition, deficits in synthetic metacognition are related to a range of mental activities including reasoning style, learning potential and insight. These deficits may also play a role in long term outcome via their impact on the ability to function in work settings and to think about and sustain social connections.

Schizophrenia is among the most complex and devastating forms of mental illness. Most models have stressed that the dysfunction found in this condition results from an array of symptoms, neurocognitive deficits, and associated social factors such as trauma, poverty and stigma (e.g., 1-5). More recent work, however, has stressed that deficits in core psychological processes also play a role in outcome. In particular, one set of processes which may mediate or moderate the impact of social and biological factors upon daily life in schizophrenia is metacognition. Though originally used within the educational literature to refer to the ability to think about one's own thinking when learning (6), metacognition has come to take on a range of meanings including broader processes in which information is integrated in more or less effective ways into complex and evolving representations of the self and others (e.g., 7). As noted earlier in this issue (8), metacognition may reflect a spectrum of activities which includes discrete acts, such as noticing errors, memories or specific beliefs about other beliefs and more synthetic kinds of activities involved in integrating and bringing together any number of perceptions into complex ideas about the self and others as unique agents in the world. These discrete and synthetic acts are thought to bi-directionally inform one another as persons evolve ideas of themselves and others in the flow of daily life (9, 10). For example, noticing that one is having a specific emotion or making an error in a specific situation may affect one's larger sense of oneself just as one's larger sense of oneself may affect how one notices errors and emotions in that moment.

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In this paper we will focus on research concerned with the more synthetic elements of metacognition, namely the complexities of self representations within the personal narrative of schizophrenia. This form of metacognition may have unique links with function as it is part of the basis for an evolving, nuanced personal understanding of immediate and long standing challenges of schizophrenia and trials of regular life outside of psychosis. Our goals are first to discuss one set of methods for quantitatively assessing synthetic aspects of metacognition within personal narratives in schizophrenia. We will then summarize research using this method to study the links between metacognition in schizophrenia with (i) deficits in neurocognitive ability and symptoms, (ii) cognitive styles and related elements and iii) functional outcomes such as vocational and social proficiency. A nuanced understanding of these issues could have important implications not merely for models of function, but also for addressing underlying barriers to recovery. A summary of the results of all studies presented along with participant characteristics is presented in Table 1.

ASSESSING SYNTHETIC ASPECTS OF METACOGNITION IN SCHIZOPHRENIA

Many methods have been developed to assess more discrete metacognitive and/or social cognitive abilities. For instance, in a laboratory task participants might be asked to detect whether they have made an error, determine whether movements they were watching on a screen were mimicking their own movements, or recognize whether they know something or not (11-15). These type of assessments, however, are not necessarily useful for assessing synthetic abilities. While they offer a means of observing the accuracy of perceptions, at issue for synthetic functions are the complexity and adaptiveness with which material is integrated into a large representation of oneself and others. For instance, it may be more important that one's idea of oneself is flexible rather than whether it is ultimately correct. Additionally, these tasks are often cued in affectively neutral contexts, whereas synthetic metacognitive acts often occur in emotion-laden contexts in which there may be no explicit cues to make a certain judgement.

To address these limitations we have proposed a method to rate synthetic metacognitive abilities from a spontaneously generated speech sample in which persons discuss their lives and personal understanding of the trials they have faced. That speech sample is obtained through a semi-structured interview called the Indiana Psychiatry Illness Interview (IPII), which elicits a narrative of self and illness and typically lasts between 30 and 60 minutes (16). The IPII differs from other psychiatric interviews in that the interviewer is instructed not to introduce content. For instance, no questions are asked about the presence of symptoms. The interviewer may ask for clarification when confused and query non-directively with the intent of understanding how persons make sense of their lives but not to collect specific historical facts. Thus, there are a number of opportunities in their stories where participants may demonstrate ability to think about their own mental states, the mental states of others, or how certain challenges are best faced.

To quantify metacognitive capacity within IPII narratives, we have used a modified version of the Metacognition Assessment Scale – Abbreviated (MAS-A; 17). The MAS-A contains four scales: "Self-reflectivity," or the comprehension of one's own mental states, "Understanding of others' minds," or the comprehension of other individuals' mental states, "Decentration," which is the ability to see the world as existing with others having independent motives, and "Mastery," which is the ability to use one's mental states to respond to social and psychological dilemmas. It is assumed that the metacognitive capacities assessed by each scale are semi-independent and can vary along a continuum. Higher scores on each of the four MAS-A subscales reflect abilities to perform increasingly complex acts within the domain captured by that scale. For instance, higher scores on Self-reflectivity would suggest a capacity to form more complex representations of oneself while higher scores on Mastery would suggest the capacity to use more complex forms of metacognitive knowledge about oneself and others to respond to psychological and social challenges.

Acceptable levels of interrater reliability and internal consistency have been reported along with evidence of stability of MAS-A assessments across a six month interval (17-19). Evidence that these procedures capture difficulties specific to psychosis includes findings that participants with schizophrenia have lower scores on all of the MAS-A subscales compared to others who also have significant medical and social adversity but not psychosis (20). Concerning its validity, MAS-A scores have been linked with independent assessments of awareness of illness and cognitive insight (17, 21).

ASSOCIATIONS OF METACOGNITION WITH SYMPTOMS AND NEUROCOGNITION

In order to understand the links between metacognition and outcome, one set of studies has examined whether having more severe symptoms and neurocognitive deficits is linked with poorer synthetic metacognitive

Table 1. *Summary of studies of the association performance on the Metacognition Assessment Scale*

Source	Other Instruments	Location	Demographics	Key Findings
Buck KD, Warman DM, Huddy V, Lysaker PH. The relationship of metacognition with jumping to conclusions among persons with schizophrenia spectrum disorders. Psychopathology 2012; 45:271-275	Beads Task, HVLT, WCST	USA	Veteran Sample 37 Men 3 Women 24 Schizophrenia 16 Schizoaffective Post-acute phase of illness	Lower level of mastery correlated with greater propensity to jump to conclusions
Davis LW, Eicher AC, Lysaker PH. Metacognition as a predictor of therapeutic alliance over 26 weeks of psychotherapy in schizophrenia. Schizophr Res 2011; 129: 85-90	HVLT, PANSS, WAIS, WAI-S-C	USA	Veteran/Community Sample 53 Men 10 Women 41 Schizophrenia 22 Schizoaffective Post-acute phase of illness	Higher levels of mastery had better scores of therapeutic alliance
Fridberg DJ, Brenner A, Lysaker PH. Intrusion errors in schizophrenia: Association with self-monitoring, symptoms and executive function. Psychiatry Res 2010; 179, 6-11	CPT-II, HVLT, PANSS, WAIS, WCST	USA	Veteran/Community Sample 68 Men 11 Women 51 Schizophrenia 28 Schizoaffective Post-acute phase of illness	More intrusion errors on a verbal memory test was correlated with lower self-reflectivity, disorganized symptoms, and poorer executive function
Hamm JA, Renard SB, Fogley RL, Leonhardt BL, Dimaggio G, Buck KD, Lysaker PH. Metacognition and Social Cognition in Schizophrenia: Stability and Relationship to Concurrent and Prospective Symptom Assessments. J Clin Psychol 2012; 68:1303-1312	BLERT, PANSS, WCST	USA	Veteran Sample 44 Men 5 Women Schizophrenia Spectrum Post-acute phase of illness	MAS-A total scores are stable over time and correlated with current and prospective positive, negative, and affective symptoms. MAS-A were related to prospective negative symptom scores after controlling for initial levels of negative symptoms.
Luedtke BL, Kukla M, Renard S, Dimaggio G, Buck KD, Lysaker PH. Metacognitive functioning and social cognition as predictors of accuracy of self-appraisals of vocational function in schizophrenia. Schizophr Res 2012;137:260-261	BLERT, PANSS, WBI	USA	Veteran/Community Sample 41 Adults Schizophrenia Spectrum Post-acute phase of illness	Low self-reflectivity correlated with less accurate appraisals of one's own work performance
Lysaker PH, Carcione A, Dimaggio G, Johannesen JK, Nicolò G, Procacci M, Semerari A. Metacognition amidst narratives of self and illness in schizophrenia: Associations with insight, neurocognition, symptom and function. Acta Psychiatr Scand 2005; 112: 64-71	DSS, HVLT, PANSS, QOL, SUMD, VRT, VS, WCST	USA	Veteran Sample 61 Men 40 Schizophrenia 21 Schizoaffective Post-acute phase of illness	Higher scores on domains of MAS-A related to: increased memory, processing speed, premorbid intelligence; lower scores on MAS-A linked with greater emotional withdrawal
Lysaker PH, Dimaggio G, Buck KD, Callaway SS, Salvatore G, Carcione A, Nicolò G, Stanghellini G. Poor insight in schizophrenia: Links between different forms of metacognition with awareness of symptoms, treatment need and consequences of illness. Comprehensive Psychiatry 2011;52:253-260	CPT-II, Hinting Task, HVLT, MAS, SUMD, WAIS, WCST	USA	Veteran/Community Sample 56 Men 9 Women 41 Schizophrenia 24 Schizoaffective Post-acute phase of illness	Self-reflectivity related to awareness of symptoms of psychosis; Awareness of the mind of the other was related awareness of treatment need and performance on the hinting task and mastery were related to awareness of consequence of illness
Lysaker PH, Dimaggio G, Buck KD, Carcione A, Nicolò G. Metacognition within narratives of schizophrenia: Associations with multiple domains of neurocognition. Schizophr Res 2007; 93:278-287	BLERT, PANSS, WAIS-III, WCST, WMS	USA	Veteran/Community Sample 61 Men 8 Women 43 Schizophrenia 26 Schizoaffective Post-acute phase of illness	Higher self-reflectivity was related to better performance on neurocognitive assessments and fewer negative and disorganized symptoms; higher Self-reflectivity coupled with higher levels of Decentration was related to better visual memory
Lysaker PH, Dimaggio G, Carcione A, Procacci M, Buck KD, Davis LW, Nicolo G. Metacognition and Schizophrenia: The capacity for self- reflectivity as a predictor for prospective assessments of work performance over six months. Schizophr Res 2010;122:124-130	WBI, WCST	USA	Veteran/Community Sample 47 Men 9 Women All Schizophrenia or Schizoaffective Post-acute phase of illness	High self-reflectivity correlated with better work performance over six months in vocational rehabilitation

Source	Other Instruments	Location	Demographics	Key Findings
Lysaker PH, Dimaggio G, Daroyanni P, Buck KD, LaRocco VA, Carcione A, Nicolò G. Assessing metacognition in schizophrenia with the Metacognition Assessment Scale: Associations with the Social Cognition and Object Relations Scale. Psychology and Psychotherapy 2010; 83: 303-315	HVLT, PANSS, SCORS, TAT, WCST	USA	Veteran/Community Sample 35 Men 2 Women 21 Schizophrenia 16 Schizoaffective Post-acute phase of illness	Higher levels of mastery linked to a greater understanding of complex psychological forces that affect relationships
Lysaker PH, Erickson MA, Buck B, Buck KD, Olesek K, Grant MLA, Salvatore G, Popolo R, Dimaggio G. Metacognition and social function in schizophrenia: Associations over a period of five months. Cognitive Neuropsychiatry 2011; 16: 241-255	HVLT, MAQ, MSEI, SUMD, WAIS, WCST, WCQ	USA	Veteran/Community Sample 83 Men 15 Women 65 Schizophrenia 33 Schizoaffective Post-acute phase of illness	Mastery predicted concurrent social function; mastery at baseline affected mastery five months later as well as social function five months later.
Lysaker PH, Erickson MA, Ringer J, Buck KD, Semerari A, Carcione A, Dimaggio G. Metacognition in schizophrenia: The relationship of mastery to coping, insight, self-esteem, social anxiety and various facets of neurocognition. Br J Clin Psychology 2011; 50:412-424	HVLT, MAQ, MSEI, SUMD, WAIS, WCST, WCQ, WMS	USA	Veteran/Community Sample 83 Men 15 Women 65 Schizophrenia 33 Schizoaffective Post-acute phase of illness	Higher mastery correlated with coping through thinking and talking about events; intermediate mastery related to higher levels of resignation when facing stressors and more social phobia
Lysaker PH, McCormick BP, Snethen G, Buck KD, Hamm JA, Grant MLA, Nicolò G, Dimaggio G. Metacognition and social function in schizophrenia: Associations of mastery with functional skills competence. Schizophr Res 2011; 131:214-218	PANSS, UPSA, WCST	USA	Veteran/Community Sample 36 Men 4 Women 19 Schizophrenia 21 Schizoaffective Post-acute phase of illness	Mastery was related to poorer performance on the comprehension/ planning subscale of UPSA independent of neurocognition
Lysaker PH, Ringer JM, Buck KD, Grant MLA, Olesek K, Luedtke B, Dimaggio D. Metacognitive and social cognition deficits in patients with significant psychiatric and medical adversity: A comparison between participants with schizophrenia and a sample of participants who are HIV-positive. J Nerv Ment Dis 2012; 200:130-134	BLERT, Hinting Task, HVLT	USA	Veteran/Community Sample 65 Men 23 Schizophrenia 17 Schizoaffective disorder 25 HIV and no psychosis	Participants with schizophrenia had lower levels of Self-reflectivity, awareness of the Other, Decentration, Mastery and performance on the Hinting test than a comparison group diagnosed with HIV but not psychosis.
Lysaker PH, Shea AM, Buck KD, Dimaggio, G, Nicolò G, Procacci M, Salvatore G, Rand KL. Metacognition as a mediator of the effects of impairments in neurocognition on social function in schizophrenia spectrum disorders. Acta Psychiatr Scand 2010; 122: 405-413	HVLT, PANSS, QOL, WAIS, WCST	USA	Veteran/Community Sample 87 Men 15 Women 68 Schizophrenia 34 Schizoaffective Post-acute phase of illness	Mastery mediates the impact of neurocognition upon the quality and quantity of social relationships after controlling for symptoms
Lysaker PH, Warman DM, Dimaggio G, Procacci M, LaRocco V, Clark LK, Dike C, Nicolò G . Metacognition in prolonged schizophrenia: Associations with multiple assessments of executive function. J Nerv Ment Dis 2008; 196: 384-389	BCIS, DKEFS, PANSS	USA	Veteran/Community Sample 49 Men 29 Schizophrenia 20 Schizoaffective Post-acute phase of illness	Self-reflectivity was correlated with mental flexibility; decentration, awareness of other, and mastery were correlated with response inhibition
Nicolò G, Dimaggio G, Popolo R, Procacci M, Hamm J, Buck KD, Pompili E, Buccione I, Lagrotteria B, Lysaker PH. Associations of metacognition with symptoms, insight and neurocognition in schizophrenia in an Italian replication study. J Nerv Ment Dis 2012; 200: 644-647	PANSS, Rey's 15 Word Test, SUMD, WAIS, WCST, WMS	Italy	Community 27 Men 18 Women 32 Schizophrenia 13 Schizoaffective Post-acute phase of illness	Higher scores on domains of MAS-A related to: increased memory, processing speed, premorbid intelligence; lower scores on MAS-A linked with greater emotional withdrawal
Tas C, Brown EC, Esen-Danaci A, Lysaker PH, Brüne, M. Intrinsic motivation and metacognition as predictors of learning potential in patients with remitted schizophrenia. J Psychiatric Res 2012; 46: 1086-1092	IMI, PANSS, WCST, WMS	Turkey	Hospital Sample 16 Men 14 Women 30 Schizophrenia In symptom remission	Greater metacognitive capacity related to higher levels of intrinsic motivation; mastery found to be the best independent predictor of learning potential

function. For instance, symptom ratings and performance on neurocognitive testing was correlated with MAS-A scores among 61 men with schizophrenia in a non-acute phase of illness enrolled in rehabilitation (17). The results revealed that participants with greater capacity for Self-reflectivity had better verbal and visual memory, processing speed and premorbid intelligence. Greater capacities for Knowing the other's mind and Mastery were also related to better verbal memory. Concerning symptoms, greater levels of emotional withdrawal were linked with greater deficits in Self-reflectivity, Awareness of the other and Mastery. This pattern of results was later

replicated in an Italian sample also in a non-acute phase of illness not enrolled in rehabilitation (22).

A second study compared assessments of neurocognition and symptoms among a new sample of 68 adults in a non-acute phase of schizophrenia with three different metacognitive profiles: (i) those who had achieved basic Self-reflectivity and Decentration (n=11), (ii) those with basic Self-reflectivity but without Decentration (n = 25), and (iii) those without both basic Self-reflectivity and Decentration (n = 25; 18). Analyses of variance revealed no between-group differences in demographic information. Basic Self-reflectivity was significantly related to better performance on a number of neurocognitive assessments and fewer negative and disorganized symptoms. Achieving Decentration was related to better visual memory.

To explore the links between synthetic aspects of metacognition and executive function, MAS-A scores were correlated with selected subtests of the Delis Kaplan Executive Function System (DKEFS, 23) including tests of inhibition and set shifting and mental flexibility (21). The sample consisted of 49 participants drawn from the two studies described above if they had completed the DKEFS as part of another study. Results revealed that Self-reflectivity was more closely linked to mental flexibility than the other domains MAS-A subscales. The ability to inhibit a response was more closely linked to Decentration, Awareness of the other's mind and Mastery. This was interpreted as consistent with the possibility that those who are less able to define complex matter in multiple ways, such as thoughts and feelings, may have difficulties in sustaining awareness of internal complexity. Similarly, without an ability to inhibit thoughts about events in the world, some may find it difficult to call to mind the perspectives of others and to detect a range of possible reactions others are having in rapidly evolving situations.

Finally, exploring the links between metacognition and symptoms over time in a group of 49 adults with schizophrenia in a stable phase of illness (19), it was found that the total score of the MAS-A was correlated with concurrent and prospective assessments of positive, negative and disorganization symptoms on the Positive and Negative Symptom Scale (24). In a multiple regression analysis, the MAS-A total score was found to predict prospective ratings of negative symptoms even after covarying for baseline negative symptoms scores. Results were interpreted as suggesting that metacognition may be related to negative symptoms in the moment and a risk factor for their emergence in the future.

ASSOCIATIONS OF METACOGNITION WITH REASONING, AWARENESS AND LEARNING

Exploring the relationship of metacognition to outcome, other studies have examined whether synthetic aspects of metacognition are related to other cognitive phenomenon including reasoning style, learning potential and the general ability to make sense of psychiatric challenges again regardless of clinical status. One of these studies (25) compared assessments of Mastery using the MAS-A with assessments of symptoms, neurocognition, and performance in a probabilistic reasoning task among 40 adults with a schizophrenia spectrum disorder. Partial correlations controlling for memory, executive function and symptoms revealed that lower levels of Mastery were associated with a greater propensity to jump to conclusions or to require less information before rendering a judgment requiring an appraisal of probability. Results were interpreted as suggesting that not being able to use psychological knowledge to solve problems may incline some to give up in the face of uncertainty and accept initial impressions rather than reason more deeply about the issue.

Following these ideas, the relationship of Mastery to coping preference or the tendency to engage in problem solving versus giving up or ignoring the problem was examined (26). Participants were 98 adults with a schizophrenia spectrum disorder in a non-acute phase of illness classified into three groups on the basis of ratings of their MAS-A Mastery score: low Mastery (unable to plausibly represent psychological challenges; n = 33), intermediate Mastery (able to plausibly represent psychological problems but cope primarily through avoidance; n = 52), and high Mastery (able to cope with plausible problems through cognitive means; n = 13). Participants completed assessments of coping preference, anxiety, positive and negative symptoms and neurocognition. Analyses of variance revealed that the high Mastery group had a significantly greater preference for coping with stressors by thinking and talking about them than the intermediate or low Mastery group. The intermediate Mastery group reported higher levels of resignation when facing stressors and more social phobia than the other two groups. Group differences in a coping preference persisted when neurocognition and symptoms were controlled for statistically.

Exploring the relationship of synthetic with more discrete forms of metacognition, another study investigated whether Self-reflectivity was associated with intrusion errors in a verbal memory task (27). Intrusion errors

refer to the free recall of incorrect material during tests of memory and as such represent a false memory that is not detected and corrected. Participants were 68 adults with a schizophrenia spectrum disorder administered the IPII and assessments of symptoms, executive function and verbal memory which recorded the presence of intrusion errors. After controlling for overall verbal memory performance, participants who made intrusion errors were found to have significantly poorer Self-reflectivity, more disorganized symptoms and poorer executive function. The relationship of Self-reflectivity with the presence of intrusion errors persisted after controlling for symptoms and executive functioning. Results were interpreted as suggesting difficulties in self reflection may lead to difficulties distinguishing actual from spurious memories, independent of deficits in executive functioning.

Self-reflectivity has also been linked to the ability to accurately appraise the quality of one's own behavior in a study of 41 adults with a schizophrenia spectrum disorder enrolled in a cognitive therapy and vocational rehabilitation program (28). To estimate accuracy of self-appraisal of work quality, the mean absolute difference of the biweekly supervisor and participant's self-assessment of work quality was calculated in this study for each week a participant worked over a period of six months. Participants were then divided into low, intermediate and high Self-reflectivity based on their MAS-A score. After controlling for symptoms, participants with low Self-reflectivity were found to have less accurate self appraisals of their work performance. Results were interpreted as suggesting that with lower levels of Self-reflectivity persons are less able to perform more discrete metacognitive tasks such as error detection in a work setting.

To investigate the relationship of metacognition with awareness of the symptoms of schizophrenia, treatment need and consequences of illness, the IPII and assessments of social cognition, insight and neurocognition were gathered among 65 adults with a schizophrenia spectrum disorder in a non-acute phase of illness (29). After controlling for neurocognition, regressions revealed that Self-reflectivity was most closely linked to awareness of symptoms of psychosis while Mastery was most closely linked to awareness of treatment and consequence of illness. Interestingly, Mastery and social cognition were found to independently contribute to the prediction of awareness of consequences of illness. Results were interpreted as suggesting that with poorer levels of metacognition, many with schizophrenia may struggle to construct complex, flexible and adaptive accounts of their psychiatric challenges and its implications.

Finally, another study has examined whether assessments of metacognition with the MAS-A was related to learning potential in cognitive remediation experimental training (30). Participants were 32 adults with schizophrenia in a state of symptom remission. Intrinsic motivation and metacognition were assessed prior to the training. Results revealed that greater metacognitive capacity was significantly related to higher levels of intrinsic motivation. Patients with higher intrinsic motivation and preserved metacognition also improved more in the learning paradigm. Of the MAS-A scales, Mastery was found to be the best independent predictor of learning potential. Results are interpreted as suggesting that metacognitive ability may also increase the potential for learning. It is suggested that individuals with lower levels of metacognition may tend to rely on extrinsic motivation and hence struggle in paradigms which rely on intrinsic forms of motivation.

METACOGNITION AND FUNCTIONAL OUTCOMES

Turning to the issue of functional outcome, several studies have also suggested that metacognition may play a role in the ability to successfully function in both social and work settings. Concerning work function, one study has examined whether self-reflectivity predicted work performance measured every other week for six months (31). Participants were 56 adults with schizophrenia enrolled in a vocational rehabilitation program and were divided into three groups on the basis of their Self-reflectivity score on the MAS-A obtained prior to going to work: high (n=13), intermediate (n=21), and low Self-reflectivity (n= 22). A repeated measures analysis of variance comparing assessments of work performance revealed that the high Self-reflectivity group had significantly better work performance overall the entire six months than either of the other two groups. That difference persisted after controlling for executive function as assessed prior to starting work.

To explore how metacognition might be linked to social function independent of neurocognition, assessments of neurocognition, quality and quantity of social relationships, neurocognition and symptoms were administered to 102 adults with a schizophrenia spectrum disorder in a post acute phase of illness (32). A Principal Components Analysis was used to reduce the assessments of neurocognition into a single index and then structural equation modeling techniques were used to test the model that

the capacity for metacognitive mastery mediates the impact of neurocognition upon the quality and quantity of social relationships after controlling for symptoms. Results revealed that an acceptable level of goodness of fit was observed between the model and data. As a follow-up to this study, a second path analysis was conducted to determine whether the cross sectional relationships observed above persisted over time (33). Specifically, two assessments of quality and quantity of social function and metacognition conducted five months apart for 72 of the original 102 participants were examined. In this study a model was specified in which: i) Mastery predicted concurrent social function, and ii) Mastery at baseline affected Mastery five months later; which similarly affected social function five months later. As in the first path analysis, acceptable levels of fit were found for the proposed model. Results of both studies were interpreted as suggesting metacognitive capacity may partially determine the extent to which neurocognitive deficits complicate efforts to relate to others.

Regarding functional competence in terms of community function, another study (34) examined the relationship between metacognition and performance on an assessment of functional skills, the UCSD Performance-Based Skills Assessment Battery (UPSA) (35), a battery that assesses competence with everyday living skills, such as paying one's bills, communication, effectively using transportation, etc. Participants were 45 adults in a post acute phase of schizophrenia who completed the IPII, assessments of neurocognition, symptoms and the UPSA. Correlational analyses revealed that scores on Mastery were correlated with the comprehension/planning subscale of the UPSA after controlling for symptoms and executive function. Results were interpreted as suggesting that decrements in Mastery may make some withdraw from more complex daily tasks such as organizing complex plans for activity, resulting in the atrophy of those functional abilities.

Concerning the relationship of metacognition with schema used to make sense of social interactions, another study compared MAS-A scores with assessments of social schema, symptoms, neurocognition were administered to a sample of 37 adults with schizophrenia in a non-acute phase of illness (36). Social schema was measured using the Social Cognition Object Relations Scale (37) which assesses awareness of interpersonal relationships as a result of complex psychological forces, as well as the recognition that people in relationships have independent needs. Correlational analyses controlling for symptoms and neurocognition revealed that higher levels of Mastery were linked to a greater understanding of the complex psychological forces that affect relationships and the existence of independent needs of individuals in relationships. These findings were interpreted as suggesting that metacognitive abilities may provide the basis for the development of schemata which allow the comprehension of social relationships.

Finally, to examine the link between metacognition and a specific relationship linked to outcome, namely therapeutic alliance with mental health providers, a study (38) has examined the link between Mastery and scores on the Working Alliance Inventory - Short Form (WAI-S, 39). Participants were 63 adults in a non-acute phase of schizophrenia enrolled in cognitive behavior therapy. Participants completed the IPII prior to therapy and then rated their experience of the alliance with their therapist on a monthly basis for six months. Participants were divided into three groups according to their baseline Mastery score: high (n=8), intermediate (n=38), and minimal (n= 17). Comparisons of the WAI-S scores revealed that those with high and intermediate levels of Mastery had better scores of therapeutic alliance than those with low Mastery. These findings were interpreted as suggesting that individuals with lesser capacity for Mastery may struggle both to form a psychological problem which might serve as the basis for treatment and have difficulties repairing ruptures that occur in the therapeutic relationship. It was speculated that this mirrors challenges which occur in other relationships.

CONCLUSIONS

This paper has reviewed research on the links between synthetic forms of metacognition with symptoms, neurocognition, other forms of cognition and psychosocial function. Results provide consistent evidence that these deficits are detectable in patient with schizophrenia and that deficits are related to, but not reducible to, symptom severity and poorer neurocognitive function. Independent of symptoms and neurocognition, deficits in synthetic metacognition, particularly in the areas of Self-reflectivity and Mastery, appear related to a range of cognitive phenomena such as reasoning style, learning potential and insight, and may represent a unique impediment to the recovery of social and vocational function for persons in a non-acute phase of illness.

There were important issues not discussed. In particular, this paper has not dealt with the issue of etiology.

Indeed it is unclear whether these are phenomena that predate the illness and/or whether they can result from a number of different causal influences, including atrophy, loss of cognitive functioning, attachment style or exposure and response to trauma. It was also not discussed how the construct of metacognition converges and diverges with related constructs including social cognition, mentalization and emotional intelligence. There seem to be some areas of overlap, for instance, with all of these constructs being concerned with the detection of emotion and intention, though the construct of metacognition may diverge in its focus on both the development of complex representations of self and others and the use of that to respond to difficulties. We also explored one method for assessing metacognitive activities and it should be noted that there is a range of work focused on autobiographical memory (e.g., 40-42) as well as other methods for rating synthetic metacognitive function (42) that should be considered in future work.

Additionally, there are limitations to the work presented here. Most of the studies discussed, though not all (22, 30), were carried out in one laboratory. Participants also tended to be males in a later stage of illness enrolled in treatment. Replication is needed with broader samples including women, persons in an early stage of treatment and others who reject treatment. Long term longitudinal work is also needed to better understand the relationships suggested above as well as work comparing the metacognitive function of persons with schizophrenia to others with different forms of psychopathology.

Finally, with replication there may be clinical implications that are important to consider. For one, it may be that promoting recovery in schizophrenia may need more than the provision of support, education and skill remediation. Consistent with Hasson-Ohayon (43), it may be that some with schizophrenia need assistance, possibly from a form of psychotherapy, to integrate information and form their own personal and adaptive accounts of themselves and their challenges, ultimately allowing them to take charge of their lives and find a way to have achieve a fully acceptable quality of life. One viable possibility is to use the MAS-A to both develop treatment targets and track progress in evolving treatments.

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