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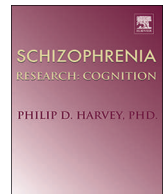


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Review Article

Metacognitive function and fragmentation in schizophrenia: Relationship to cognition, self-experience and developing treatments

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ABSTRACT

Bleuler suggested that fragmentation of thought, emotion and volition were the unifying feature of the disorders he termed schizophrenia. In this paper we review research seeking to measure some of the aspects of fragmentation related to the experience of the self and others described by Bleuler. We focus on work which uses the concept of metacognition to characterize and quantify alterations or decrements in the processes by which fragments or pieces of information are integrated into a coherent sense of self and others. We describe the rationale and support for one method for quantifying metacognition and its potential to study the fragmentation of a person's sense of themselves, others and the relative place of themselves and others in the larger human community. We summarize research using that method which suggests that deficits in metacognition commonly occur in schizophrenia and are related to basic neurobiological indices of brain functioning. We also present findings indicating that the capacity for metacognition in schizophrenia is positively related to a broad range of aspects of psychological and social functioning when measured concurrently and prospectively. Finally, we discuss the evolution and study of one therapy that targets metacognitive capacity, Metacognitive Reflection and Insight Therapy (MERIT) and its potential to treat fragmentation and promote recovery.

1. Schizophrenia as a disorder of fragmentation

When Bleuler (1950) coined the term schizophrenia he was careful to suggest that it referred to a group of disorders which shared one general quality, the fragmentation of previously integrated mental experiences. Influenced by face-to-face interactions with patients, and in collaboration with Jung (1936), Bleuler used constructs such as “splitting” to describe the loss of unity or coherence among mental activities in three primary areas of psychological function: cognition, emotion and volition (Maatz et al., 2015). Bleuler's model accordingly suggests a role for subjective psychological phenomena in the progression of the condition and ultimately its treatment. The subjective experience of fragmentation, according to Bleuler renders life experience confusing and as a result, persons retreat from previous social connections and familiar activities. In other words, after losing a sense

of how thoughts, feelings and desires are meaningfully connected to each other, persons withdraw into a state Bleuler referred to as autism.

Importantly this stands in sharp contrast to Kraepelin et al.'s (1919) earlier model of Dementia Praecox in which there is no role for psychological phenomena or treatments. For Kraepelin, social connections and familiar activities are abandoned after affect and volition wane. The collapse of psychosocial function is regarded as being simply the inevitable result of biological processes. Within Kraepelin's model there is not any particular psychological experience, such as fragmentation that can help us understand behavior or offer anything more than supportive or palliative care. Bleuler's model is also in contrast to contemporary models descended from the Kraepelinian paradigm, which also do not see psychological processes as playing a core role in how the disorder unfolds. For example, dimensional or spectrum models of psychosis (e.g. APA – DSM 5) and models which reduce

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psychosis into biological, cognitive, and genetic components and clusters (Keshavan et al., 2013) generally also ignore whether there are psychological processes whose interaction with biological and social forces, culminates in psychosocial dysfunction. In these models dysfunction is overdetermined by biological and social factors and again the collapse of psychosocial function is unavoidable.

To date, a range of research, including findings from imaging paradigms, supports one aspect of Bleuler's model, namely that many diagnosed with schizophrenia appear to struggle to integrate information (Picard et al., 2008). One barrier, however, to fully exploring schizophrenia as a disorder of fragmentation is that it is difficult to quantify the experience of fragmentation. As proposed by Bleuler fragmentation specifically involves a loss of the sense of how one's ideas, personal striving and emotions are related to one another in a coherent way within the flow of life. Because integration is not a matter of correctly noticing specific things but the ability to ascertain potential relationships among those things, the experience of fragmentation is something fundamentally subjective that cannot be directly detected by assessing the frequency of correct or incorrect identification of stimuli. Instead, since fragmentation involves a failure to integrate discrete experiences persons have of themselves and others within the flow of life, it similarly cannot be comprehensively measured by assessing the kinds of beliefs a person endorses.

We suggest that the dilemma of how to measure fragmentation other than through qualitative and ideographic methods has left the field less able to test some of the core assumption of Bleuler's model and hence also stymied the possibility of that model pointing to treatment possibilities. To respond to this, research has sought to begin quantifying fragmentation in schizophrenia by using the construct of metacognition over the last 15 years. In this paper we will present this work and its implication for moving from theory to treatment. We will first describe the construct of metacognition and one specific approach to its measurement. We then will detail findings of studies of the metacognitive functions of persons diagnosed with schizophrenia as well as correlates of metacognitive function in schizophrenia with alterations in psychophysiological, cognitive, emotional and broader aspects of behavior. Finally, we will discuss the potential meaning of this work for understanding the tasks of rehabilitation and recovery and offer an example of one newly emerging treatment inspired by this work.

2. The construct of metacognition

Metacognition has been an explicit subject of research for roughly four decades, beginning with one of its first formal definitions by Flavell (1979). Examining the use of metacognition in that early work, Moritz and Lysaker (2018) have suggested that the term was initially offered as an umbrella term describing a broad set of processes which enable persons to notice and reflect upon what happens as they perceive and respond to events as they transpire. Indeed, research since then has used the term metacognition to understand how persons plan and monitor their behavior as well as evaluate possible responses to the challenges they face (Tarricone, 2011). The word has also been applied to broad and disparate areas including education (Kuhn and Dean, 2004), memory (Bacon et al., 2001), human development (Main, 1991) and computer science (Cox, 2005). Concerning psychopathology, alterations in metacognitive function have been used to explain the emergence and presence of a range of transdiagnostic processes relating to poorer outcomes including maladaptive responses to worry and sadness (Wells et al., 2009), aberrant cognitions (Moritz et al., 2014), self-appraisal (Silberstein et al., 2018) complex social situations (Ottavi et al., 2014) and interpersonal conflict (Dimaggio et al., 2015).

To sort out the increasing volume of metacognitive research and various approaches to its definition and measurement, particularly regarding mental health, an integrated model of metacognition has been proposed (Lysaker et al., 2018a; Lysaker and Dimaggio, 2014). This model is founded on the assumption that self-conscious awareness and

reflection are responses to the various ways in which the world and the self is disclosed or becomes apparent to us through our ongoing embodied, affective, and cognitive experience, much of which takes place pre-reflectively. Through the lens of the integrated model, metacognition is seen as allowing for a sophisticated synthesis of these responses and is conceptualized as a spectrum of activities that mutually influence one another. These activities range from the awareness of discrete and immediate experiences such as a bodily sensations to the apprehension of a larger more complex sense of self and others composed of multifaceted aspects which can be independent, complementary and contradictory (Lysaker et al., 2018c). Accordingly, what are referred to as bottom-up and top-down processes occur simultaneously as discrete information offers the building blocks whose integration results in larger ideas, which in turn affect the way new discrete information is processed.

The integrative model of metacognition, as studied across disorders and research paradigms, views the construct as a set of processes in which pre-reflective and reflective, embodied, and cognitive experiences are, in the moment, interpreted, and those interpretations are then in turn adjusted (or not) in response to what those experiences disclose. While the term "metacognition" is identified as a cognitive process, it is important to note that the metacognitive model emphasizes the presence of another's subjectivity as essential for metacognitive processes to take place. Thus, our sense of ourselves and others is developed via intersubjectivity, either formed explicitly with and in the company of others or in the context of implied or imagined others who might hear or respond to those thoughts or ideas (Mascolo, 2016; Stern, 1985).

The sense of self enabled by metacognition orients us in a changing world. Metacognition is a key element of human adaptation by allowing for the self to be a subject of reflection and change in its own right. We act on the basis of metacognitive insights and reflect on our lives in the wake of those actions. Metacognition thus keeps us elastic and responsive to a world of complex and evolving contingencies (Lysaker and Klion, 2017). Crucially, metacognitive capacity is dynamic but growth in metacognition need not lead to the development of a clear singular and transparent view of the self. Instead, it may allow persons to more effectively recognize and acknowledge aspects of themselves which seem incomprehensible or opaque. Moreover, growth in metacognitive capacities should enable persons to identify and distinguish different aspects of self and other in a more nuanced manner, which in turn should generate a more differentiated sense of the world. Metacognitive processes thus also allow for increased intimacy. They make it possible for us to see the uniqueness of people beyond the influence of strong feelings of desire and dependence and allow for nuanced and individuated responses to those others.

Importantly, a person's capacity for metacognition is not assessed categorically or dichotomized as present or absent. Instead, metacognition varies along measurable dimensions. Indeed, we would expect natural variation in these capacities in the population, with some evincing better ability to view themselves and the world in an integrative manner. In terms of those who experience disordered integration of reflective knowledge, we would not expect the complete absence of metacognitive capacity and thus, no sense of self whatsoever. Instead, with reduced capacity for metacognition persons may have a sense of themselves and others but that sense is increasingly fragmented and less available to be used to adaptively respond to a complex world. In addition to the level of metacognition being dynamic, its associations with outcome might also change. An association of a particular facet of metacognition with a particular outcome may depend on the relative presence of absence of other aspects of metacognition. For example, reflective knowledge may sometimes lead to relief but at other times also induce pain, particularly when the psychological pain is not yet accompanied by the ability to use the reflective knowledge for one's own benefit.

3. The relationship of metacognition to other forms of cognition

As a construct describing processes which enable persons to have an integrated sense of self and others as a basis of understanding and action, “metacognition” overlaps with other terms which characterize thoughts people have about themselves and others. Metacognition overlaps with neurocognitive functions such as memory, attention and executive function. For example, with a grossly impaired memory it would not be possible to form an integrated sense of oneself. However, metacognition can be distinguished from neurocognition in that it refers to an iterative, reflective activity which pertains directly to how people experience and understand themselves positioned in and responding to the world at a particular moment and in a particular set of contexts. This process involves more than particular recollections and judgments about specific concrete tasks and events. Metacognition thus allows us to answer complex questions like: ‘In general, am I a friendly person?’ Such answers require one to integrate a broad range of information about oneself and the world and is subjective in nature, unlike questions like: ‘What do you see now?’ or ‘What did you have for lunch yesterday?’ Again, metacognition builds upon the foundational neurocognitive acts required to answer the latter questions, but it transcends them in the scope of its concerns and the complexity of its operations.

Metacognition also overlaps with the constructs of social cognition (Deckler et al., 2018) and mentalization (Allen et al., 2008) in that it is concerned with the ideas people form about themselves and others. Metacognition is distinct from social cognition, in that, when operationalized, social cognition is more concerned with the accuracy of how social events are interpreted. For example, intact social cognition might typically be conceptualized as the ability to make an inference about another's emotional state at the moment (e.g. sad) which others agree is correct. In contrast, having greater metacognitive capacities would allow someone to integrate information about the other in a way that is responsive to context as part of a dynamic process rather than making a static assessment.

Metacognition differs from mentalization in both its theoretical basis and its components. Mentalization refers to the formation of ideas about oneself and others. However, mentalization binds reflective abilities to attachment styles. In contrast, the integrative model of metacognition allows that fundamental reflective abilities are not reducible to attachment patterns or basic abilities to respond to affect and distress (Fonagy et al., 2002). From a metacognitive perspective, for example, one could use one's metacognitive capacities to decide how to live with a less healthy attachment style or address a tendency to overrespond to distress. An additional difference between the two constructs is that the integrative model of metacognition distinguishes forming a sense of self and others from the ability to enact this in life as an agent rather than presuming the presence of knowledge as sufficient for its implementation.

4. Measuring metacognition

Echoing concerns about the measurement of the core disturbances that Bleuler links to schizophrenia, measuring the relative integration of information in senses of self and others faces multiple challenges. Unlike a person's ability to attend to, remember, or categorize information, metacognition cannot be measured in terms of correct and incorrect responses. As noted above metacognition involves the integration of information and thus when functioning effectively, metacognitive processes produce an integrated and complex sense of self and others. Importantly, this integrated understanding does not necessarily reflect ideas which are objectively accurate in terms of content. For example, two persons with intact metacognitive capacities could form complex ideas of a third person which differ from one another in terms of content, but which are equally rich, coherent and link many different pieces of information. It is important here to note that with intact

metacognitive capacities these complex ideas would be environmentally informed and adaptive in context and not merely an unrelated stream of guesses about others.

The assessment of metacognitive capacity thus requires an evaluation of the degree of its integration, which ranges from disintegration to synthesis, rather than its correctness. One attempt to measure the degree of integration in sense of self and others, with a particular focus on schizophrenia is the Metacognition Assessment Scale-Abbreviated (MAS-A; Lysaker et al., 2005a). Concretely, this is a rating scale which is used to assess metacognition as it is apparent within personal narratives. The MAS-A was developed in 2004 using several basic characteristics of the original Metacognition Assessment Scale (MAS; Semerari et al., 2003), a scale itself originally designed to assess changes in the frequency of different metacognitive acts across psychotherapy sessions. Like the MAS, the MAS-A distinguishes between metacognitive acts on the basis of their principal concern, namely, the self, others, the interconnection between persons within the larger community (decentration), and the use of metacognitive knowledge to identify and respond to psychosocial challenges and distress (mastery). The MAS-A deviates from the MAS in its conceptualization of metacognitive activities as divisible into a series of levels which range from elemental to more complex, with each gradation indicating an increase in complexity. Further, it assumes that satisfactory function at any given level requires satisfactory function at lower levels such that once a given level is significantly impaired, activities at all higher levels cannot be satisfactorily performed.

5. Metacognition in schizophrenia

5.1. Characteristics in schizophrenia

Comparing the metacognitive capacity of 166 adults diagnosed with schizophrenia to 51 adults who experienced a non-psychiatric prolonged and life-altering medical condition, Lysaker et al. (2014) found the schizophrenia group had far more limited abilities as assessed with the MAS-A than the control group. Specifically, they struggled to form a cohesive sense of {i} one's own shifting emotions and beliefs, {ii} others' emotions {iii} other's perspective and needs and {iv} how to respond to psychosocial challenges other than by completely avoiding them. In this study, the control group had been diagnosed with HIV in part ensuring that both groups faced social and medical adversity and thus any observed difficulties in the schizophrenia were likely not just the result of those adversities. While this study focused on patients who had lived with a diagnosis of schizophrenia, often for decades, similar decrements in metacognitive function have been reported in samples with first episode psychosis (Trauelsen et al., 2016; Vohs et al., 2014). Other research conducted internationally shows evidence of metacognitive deficits among persons diagnosed with schizophrenia, including samples from Australia (Bargenquast and Schweitzer, 2014), Chile (Lysaker et al., 2018b), China (WeiMing et al., 2015), Denmark (Trauelsen et al., 2016), French Canada (Massé and Lecomte, 2015), Germany (Bröcker et al., 2017; Buck et al., 2014; Kukla et al., 2013; Lysaker et al., 2011d; Sneath et al., 2014), Israel (Hasson-Ohayon et al., 2015), Italy (Nicolo et al., 2012; Popolo et al., 2017), the Netherlands (de Jong et al., 2019a). Spain (Inchausti et al., 2017a) Turkey (Tas et al., 2014) and the United Kingdom (McLeod et al., 2014). This work is consistent with older literature suggesting that deficits in source monitoring, or the ability to notice and follow the generation of one's own thoughts, are common among persons with schizophrenia (Keefe et al., 1999).

5.2. Comparisons with other samples

Concerning the relative levels of metacognitive functioning in schizophrenia, multiple studies using the MAS-A suggest that greater levels of fragmentation are experienced by persons diagnosed with

schizophrenia in comparison to people with other psychiatric diagnoses. To date at least three studies have suggested metacognitive deficits are greater in patients with schizophrenia compared to those with bipolar disorder (Lysaker et al., 2018b; Popolo et al., 2017; Tas et al., 2014). Other studies have reported greater metacognitive deficits in schizophrenia relative to others with diagnoses of depression and anxiety disorders (WeiMing et al., 2015), PTSD (Lysaker et al., 2015a), substance use (Inchausti et al., 2017b), and borderline personality disorder (Lysaker et al., 2017) as well as others without any psychiatric condition (de Jong et al., in press; Hasson-Ohayon et al., 2015). Studies of metacognition in first episode depression and chronic depression suggest greater metacognitive dysfunction than community controls but better metacognition than what is commonly found in schizophrenia (Ladegaard et al., 2014; Ladegaard et al., 2016).

5.3. Associations with neurobiological indices

Using refined technologies that have increased our ability to explore biological correlates of higher order cognitive processes in psychotic illness, studies have explored the association of metacognition, as assessed with the MAS-A, with neurobiological function at many different levels of analysis. Neuroimaging technology, such as electroencephalogram (EEG; Leonhardt et al., 2017; Vohs et al., 2016) and magnetic resonance imaging (MRI; Buchy et al., 2015; Francis et al., 2017; Vohs et al., 2015a) have been employed to elucidate neural correlates of metacognitive processes. In terms of EEG, increased gamma activity, which is commonly thought to represent cognitive processing, was linked with a decreased ability to see the world from multiple perspectives, implicating disrupted neural information processing as a substrate of metacognition (Vohs et al., 2015a). Another EEG study demonstrated that the inability of neural networks in psychosis to respond normally to auditory stimulation was also associated with metacognitive processing (Leonhardt et al., 2017).

Additionally, studies utilizing MRI have examined both structural and functional neural correlates of metacognition. One preliminary investigation found positive correlations between increased medial prefrontal cortex and ventral striatum gray matter density and higher metacognition in an early phase psychosis sample (Vohs et al., 2016). Another study with persons at clinical high risk for psychosis demonstrated an association between metacognition and cortical thickness in inferior and middle frontal gyri, the superior temporal cortex and the insula (Buchy et al., 2015). In terms of functional MRI, a recent study in persons with early phase psychosis reported that higher metacognitive capacity was associated with stronger functional connectivity between the medial prefrontal cortex, precuneus and posterior cingulate cortical structures (Francis et al., 2017). Overall this work is consistent with other imaging work linking frontal function with both self-reflectivity and psychosocial behavior including a recent study which found that increased activation of rostralateral prefrontal cortex during a self-reflection task was associated with higher levels of social activity in schizophrenia (Pinkham et al., 2018). Finally, exploring the link of peptide hormones which affect social function, a recent investigation found that altered oxytocin levels are indeed linked with metacognitive deficits (Aydin et al., 2018).

5.4. Associations with cognitive disorganization

Formal thought disorder, manifested by disorganized speech has demonstrated moderate associations with reduced metacognitive capacity in schizophrenia, as assessed with the MAS-A (Hamm et al., 2012; Lysaker et al., 2005b; Minor and Lysaker, 2014). Cognitive disorganization, a concept related to thought disorder has also been shown to moderate the links between neurocognition and metacognition (Minor and Lysaker, 2014; Minor et al., 2015), with results suggesting that the relationship of neurocognitive and metacognitive capacity is weakened when cognitive disorganization is present. Disorganized

speech at the level of the deep semantic structures which allow for coherence within a speech sample, has also been linked with metacognitive capacity (Minor et al., 2018). Using factor analysis to disentangle the constructs of metacognition and social cognition Lysaker and colleagues (2013) demonstrated that each construct had a unique relationship with cognitive disorganization. The distinctiveness of both metacognition and cognitive disorganization has also been demonstrated by a recent network analysis that identified cognitive disorganization and self-reflectivity as the most central nodes in a network of social cognition, neurocognition, symptom and metacognitive indices (Hasson-Ohayon et al., 2018). This is consistent with earlier research finding that disorganization in schizophrenia may be related to deficits in source monitoring (Harvey and Serper, 1990).

5.5. Associations with psychological functions

In terms of psychological functions metacognition has also been related to important behaviors requiring an awareness of self and others in schizophrenia. Lesser capacities for metacognition have been linked with a lesser awareness of illness, or poor insight, in both early and later phases of illness (Lysaker et al., 2011b; Nicolo et al., 2012; Vohs et al., 2015b). This finding contributed to the development of an integrated model of insight (Vohs et al., 2015b) which suggests that metacognitive deficits are a proximal cause of poor insight when they interfere with the capacity to form complex ideas about changes in thoughts, emotions and behaviors resulting from mental illness as well as the historical events surrounding those changes. Supporting this model is a recent latent class analysis of 324 adults with schizophrenia that revealed three classes of patients with poor insight and differing symptom profiles, who had poorer metacognitive capacity as assessed with the MAS-A, than a fourth group with good insight (Lysaker et al., 2018d). In terms of reasoning about larger issues, better metacognition has also been linked with greater abilities to make accurate judgements based on probabilistic reasoning (Buck et al., 2012). In terms of more general forms of psychological functioning, poorer metacognition has been linked to lower levels of subjective recovery (Kukla et al., 2014), and predicts concurrent and future levels of intrinsic motivation (Luther et al., 2016a; Luther et al., 2016b). Research has suggested that greater levels of metacognitive capacity may positively influence social cognitive abilities to recognize and relate to others' emotional states (Bonfils et al., 2019; James et al., 2018a). Greater levels of metacognitive capacity also may moderate the relationship between emotional awareness and self-esteem among participants with schizophrenia (Bonfils et al., 2016).

5.6. Associations with psychosocial function and negative symptoms

Concerning behavior and functioning, metacognition, as assessed with the MAS-A, has also been found, concurrently and prospectively to predict work functioning (Lysaker et al., 2010), physical activity (Snethen et al., 2014), response to rehabilitation work experience (de Jong et al., 2014) and social behavior (Lysaker et al., 2011c) independent of general levels of psychopathology or neuropsychological functioning. Cross-sectional research across diverse international settings using the MAS-A has also found that lower levels of metacognitive capacity were associated with more severe levels of negative symptoms (Lysaker et al., 2005a; Lysaker et al., 2018b; MacBeth et al., 2016; Nicolo et al., 2012; Popolo et al., 2017; Trauelsen et al., 2016; Vohs et al., 2014; WeiMing et al., 2015). A cluster-analytic study of 163 adults with prolonged schizophrenia found that a group identified as experiencing anhedonia without depressed mood had poorer metacognitive capacities than another group without anhedonia or a group with both anhedonia and depressed mood (Buck et al., 2014). A recent latent class analysis of 334 adults with schizophrenia similarly found impairments in social function were generally tied to lower levels of metacognitive capacities regardless of the accompanying symptom

profile (Gagen et al., *In press*). More compelling studies have found that greater metacognitive deficits predict more severe negative symptoms 6 to 36 months in the future after controlling for initial levels of negative symptoms (Austin et al., *In press*; Hamm et al., 2012; Lysaker et al., 2015c; McLeod et al., 2014). Of note, a recent meta-analysis (Arnon-Ribenfeld et al., 2017) has concluded that there are significant associations between metacognitive deficits and both symptomatic and functional outcome measurements among persons with schizophrenia. This is consistent with research finding that reduced awareness of cognitive deficits, a construct that overlaps with metacognition, predicts poorer function (Gould et al., 2013) including at least one study which found the inability to appraise one's own performance on an executive functioning task was a strong predictor of poor psychosocial functioning (Gould et al., 2015).

6. The development of an individualized treatment for metacognitive deficits in schizophrenia: Metacognitive Reflection and Insight Therapy (MERIT)

6.1. Treating metacognition to address fragmentation

In tandem with the research described above, interest in the potential for treatments to improve metacognitive capacity in schizophrenia has naturally grown. Specifically, if the loss of metacognitive capacity is one element of the fragmentation which lies near the foundation of schizophrenia, then a psychosocial treatment that addresses these deficits might well represent a substantial advance in our understanding of how to treat proximal and malleable causes of impairment.

6.2. Defining metacognitively oriented psychotherapy

The first formal efforts to develop a metacognitively oriented psychotherapy targeting fragmentation in schizophrenia sought to document improvements in metacognitive capacity and tie those with developments in the ability to form a coherent sense of psychological challenges as well as the emergence of a richer sense of self and personal agency (Lysaker and Lysaker, 2005; Lysaker and Lysaker, 2001), as well as one's reaction to those challenges and so become a platform for the emergence of sense of agency (Lysaker et al., 2005b). Using the MAS-A and other instruments to assess metacognition, self-experience and related content within sessions spanning two and a half years, early evidence was found suggesting that metacognition improved in a non-linear fashion over time in psychotherapy, with gains often followed by losses ultimately leading to the patient becoming better able to think about his "abilities and disabilities, and his connections with others" (Lysaker et al., 2005b; p. 412). This finding was subsequently replicated in a second case study suggesting that growth in metacognition as assessed with the MAS-A could be differentially observed in sense of self, awareness of others, and mastery or the ability to respond challenges on the basis of a nuanced sense of self and others (Lysaker et al., 2007a). In this study, growth in metacognitive capacity was also shown to predict reductions in delusions. Of note, in both case studies, patients at the outset of treatment had significant levels of symptomatology and psychosocial dysfunction despite active pharmacological interventions.

On the basis of these and other case studies it was suggested that treatment addressing metacognition should possess at least two general qualities. First, such interventions need to be integrative (Lysaker et al., 2007b). If the integration of experience is a principal goal, one cannot afford to limit the experiences that might be examined in psychotherapy by the use of single theory or approach. For example, while the basics of one theory may well capture the struggles of one patient to think about him or herself, that theory may be dramatically less applicable to a different patient. Second, a formal assessment method is needed to quantitatively measure metacognitive capacity so that interventions can be offered appropriate for that capacity. In regard to

this second condition, it was suggested that the MAS-A scales might not only offer a way to assess outcome but also a way to guide targeted interventions on the basis of assessment of metacognitive capacity (Lysaker et al., 2011a). In other words, the MAS-A could provide a means for assessing in the moment what kinds of interventions a patient might be able to understand and what kinds of intervention might go beyond their metacognitive capacity and consequently surpass their ability to make use of or understand that intervention.

6.3. Operationalizing metacognitively oriented psychotherapy

Following these observations and continuing empirical research on metacognition, a multidisciplinary group including psychologists, psychiatrists, psychoanalysts and nurse practitioners developed a set of measurable processes or elements that should be present in each psychotherapy session in order to promote metacognitive capacity (Lysaker and Klion, 2017). These processes were intended to be consistent with the common factors of psychotherapy and usable by therapists from different theoretical orientations (e.g., cognitive behavioral, psychodynamic, rehabilitative and humanistic), who could creatively weave them into their practice to respond to patients with heterogeneous needs.

This multidisciplinary group settled on eight elements divided into three classes: content, process and superordinate (Lysaker and Klion, 2017). There are four content elements which require: explicit attention to {i} the development of a joint understanding of patients' agendas, {ii} the development of a therapeutic dialogue, {iii} exploration of patients' narratives, and {iv} recognizing psychological challenges. There are two process elements which require: {v} reflection on the interpersonal and psychological processes within the session that support joint reflection on patients' lives and experiences, and {vi} attention to the effects of all of these processes on what is happening in patients' minds and bodies. Finally, there are two superordinate elements, which require that therapist interventions {vii} match patients' capacity for thinking about themselves and others and {viii} promote patients' capacity for mastery or the ability to use metacognitive knowledge to actively and effectively respond to psychosocial challenges (Lysaker and Klion, 2017).

6.4. Metacognitive Reflection and Insight Therapy (MERIT)

This form of therapy, later dubbed Metacognitive Reflection and Insight Therapy (MERIT) by Dutch researchers (Lysaker and Klion, 2017), shares several things in common with widely utilized approaches including cognitive behavioral therapies, such as an emphasis on the alliance and the patient's experience of their own thoughts and feelings. However, it sought to move beyond these shared components in its holistic consideration of how embodied and pre-reflective experience is integrated alongside more effortful forms of cognition to enable a personal understanding of one's own life circumstance and challenges (Lysaker and Hasson-Ohayon, 2018). MERIT also rejects the notion that one fixed curriculum, recurrent singular techniques or set of formal exercises can facilitate the development of a richer account of experience. Instead, like many humanistic and contemporary psychodynamic treatments, it relies on joint reflection in an intersubjective context. In contrast to humanistic and psychodynamic treatments, however, MERIT holds that joint reflection requires that the kinds of meaning that persons can make of experience is affected or limited by their abilities to integrate information (Lysaker et al., 2018c). Along with treatment models aligned with certain phenomenological accounts of psychosis (Fuchs and Röhrlich, 2017), MERIT is similarly interested in self-experience. However, unlike those models, it holds that the fragmentation of experience in psychosis ranges from disruptions in embodied experience to higher-order, effortful reflection. MERIT also assumes that the fragmentation of experience can in part be resolved through compassionate joint reflective processes which transpire within

the therapeutic relationship (Lysaker et al., In Press).

Finally, MERIT assumes that the growth of metacognitive capacity only occurs through a person's participation in the world and not from disembodied reflection at a distance of one's life. Specifically, an iterative process is naturally assumed to take place as patients experience a sense of self that is becoming more available, interacts with a growing sense of how to respond to life challenges. This is consistent with findings suggesting that greater participation in basic psychosocial activities is related to a greater capacity for accurate self-appraisal as judged by others (Gould et al., 2013).

6.5. Evidence supporting MERIT

Two randomized, controlled trials, lasting eight and six months respectively, have demonstrated an acceptance rate for MERIT of over two thirds of patients with prolonged and first episode schizophrenia, with participation in MERIT also leading to meaningful metacognitive or clinical gains (de Jong et al., 2019a; Vohs et al., 2018). Similar rates of improvement and participation in treatment were also reported in an open trial of a 12 week version of MERIT (de Jong et al., 2016a) and 1–2 years of metacognitively focused, individual psychotherapies offered to 11 persons with schizophrenia that conformed to the elements of MERIT and lasted between 11 and 26 months (Bargenquast and Schweitzer, 2014). Of note, a three year follow-up of participants in the latter, open trial revealed persistent gains in metacognition and function (Schweitzer et al., 2017).

From a different vantage point, qualitative studies have offered preliminary evidence of the usefulness of MERIT. In two studies comparing patients who had received MERIT vs. more supportive therapy experiences, patients who received MERIT were more likely to describe how the treatment (i) helped them develop a deeper sense of personal agency and (ii) enabled them to use their unique, personal history to make sense of their challenges and emotional pain (Lysaker et al., 2015b; de Jong et al., 2019b). Finally, detailed case studies of patients in real-life, clinical settings have illustrated how MERIT can be applied to patients with widely varying and often quite complex clinical presentations. These include studies of patients who initially suffered from mixtures of severe levels of negative symptoms, substance misuse, disorganization, emotional distress and lack of insight whose metacognition and function were observed to improve (Arnon-Ribinfeld et al., 2018; de Jong et al., 2016b; Dubreucq et al., 2016; Hamm and Firmin, 2016; Hasson-Ohayon et al., 2017; James et al., 2018b; Leonhardt et al., 2018; Leonhardt et al., 2016; Van Donkersgoed et al., 2016). In an effort to synthesize the findings of these diverse case studies, Hamm and Lysaker (2018) have suggested a three-stage process which recurs across these reports: (i) a sense of agency was observed to emerge, (ii) followed by the development of a more coherent sense of self, (iii) followed by action and management of one's own recovery.

7. Summary and future directions

Bleuler suggested that the ongoing fragmentation of thought, emotion and will are the fundamental phenomena which unify the diseases he termed the schizophrenias. In this paper we suggested that to date one impediment to the study of these claims has been the lack of a way to operationalize and assess fragmentation in schizophrenia. Accordingly, we have explored research employing the concepts of *metacognition* to characterize the processes which enables information to be integrated into a sense of self and others and *metacognitive deficits* to describe the process by which sense of self could become fragmented in the manner described by Bleuler. We have offered a description of that rationale for one method of measuring metacognition which allows for the assessment of the experience of self and others as varying from greater degrees of fragmentation to greater degrees of integration. We have summarized evidence from research using that method which suggests that deficits in metacognition occur commonly in

schizophrenia and are related to basic neurobiological indices of brain functioning. We have also further discussed evidence that metacognition is related to concurrent and prospective levels of psychological and social functioning. Finally, we have examined how this work has promoted the evolution and preliminary exploration of one therapy that targets metacognitive capacity, Metacognitive Reflection and Insight Therapy (MERIT).

Importantly, there are limitations to current observations and findings and many questions remain. We have focused on one method and more research is needed, for example, examining the relationship of metacognition to related constructs including social cognition, mentalization and source monitoring. It is also unclear to what extent the observed metacognitive deficits are indeed multidetermined and whether a unidirectional or bidirectional relationship exists between metacognition and alterations in basic brain functions. For example, when metacognitive gains are found in treatments like MERIT, are there concurrent changes in brain functioning or related improvements in neurocognition? Furthermore, this research has relied on the first iteration of the MAS-A using narrative interviews in a laboratory setting. It is likely that future developments will allow for more nuanced assessments of metacognition in a broader range of contexts. The majority of the studies have also been cross sectional with modest sample sizes. Long-term, longitudinal studies are therefore needed that include a broad range of measures related to cognition as a whole, functioning and metacognition with contrasting samples of persons with different forms of mental health and psychological challenges.

Concerning psychological treatments and MERIT in particular, larger randomized controlled trials with larger and broader samples are needed in more diverse clinical settings. It is also unclear to what extent this treatment can be applied to other patient groups. Case reports have suggested MERIT may be useful for adults with Borderline Personality Disorder (Buck et al., 2018; Vohs and Leonhardt, 2016), as well as with considerable histories of trauma (Hillis et al., 2018), though it remains unclear what types of modifications are needed for these and other groups. MERIT also proposes its actions occur through eight different processes, but it remains an empirical question whether the presence of all or only specific elements is sufficient for change. MERIT treatment dosages and personalization of treatment duration also remain open to investigation.

Finally, empirical and theoretical work is needed to evolve more explicit and nuanced models of how effortful and automatic processes, as well as cognitive and embodied experiences come together to allow a sense of self or others to be available in the moment. Self-experience is necessarily a reflection of the ongoing and evolving interaction of multiple facets (Lysaker and Lysaker, 2008). More research is needed to explore the ways in which MERIT may promote this availability and through which pathways persons gain a richer and stable sense of themselves and others whose coherence can withstand contradiction, life adversity and conflict.

Conflict of interest

The authors of the submission: "Metacognitive function and fragmentation in schizophrenia: Relationship to cognition, self-experience and developing treatments" declare that there are no conflicts of interest. All authors report that there are no financial and personal relationships with other people or organizations that could inappropriately influence (bias) their work.

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