

# Cognitive insight and clinical insight in schizophrenia

methodological, neurocognitive and psychopathological  
aspects and comparison to bipolar disorder

John Abel Eng

Psychosis Research Section, Division of Psychiatry

Oslo University Hospital, Ullevål

and

Institute of Psychiatry, Faculty of Medicine

University of Oslo

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# List of papers

## Paper I

Halldóra Jónsdóttir, John A. Engh, Svein Friis, Astrid Birkenæs, Petter A. Ringen, Anja Vaskinn, Kjetil Sundet, Stein Opjordsmoen, Ole A. Andreassen. Measurement of Insight in Patients With Bipolar Disorder. *Are Self-Rated Scales Developed for Patients With Schizophrenia Applicable?* J Nerv Ment Dis 2008; 196:333-335.

## Paper II

John A. Engh, Svein Friis, Astrid B. Birkenaes, Halldóra Jónsdóttir, Petter A. Ringen, Torleif Ruud, Kjetil S Sundet, Stein Opjordsmoen, Ole A. Andreassen. Measuring Cognitive Insight in Schizophrenia and Bipolar Disorder: A Comparative Study. BMC Psychiatry 2007, 7:71.

## Paper III

John A. Engh, Svein Friis, Astrid B. Birkenaes, Halldóra Jónsdóttir, Ole Klungsøyr, Petter A. Ringen, Carmen Simonsen, Anja Vaskinn, Stein Opjordsmoen, Ole A. Andreassen. Delusions Are Associated With Poor Cognitive Insight in Schizophrenia Schizophr Bull. 2009 Jan 27 [Epub ahead of print].

## Paper IV

John A. Engh, Kjetil Sundet, Carmen Simonsen, Anja Vaskinn, Trine V. Lagerberg, Stein Opjordsmoen, Svein Friis, Ole A. Andreassen. Verbal Learning Contributes to Cognitive Insight Independently of Affective and Psychotic Symptoms. Submitted.

## Summary of study

Poor *clinical insight* (i.e. insight of illness) is considered a characteristic feature of schizophrenia. It is central for determining the presence of mental disorder and its prognosis, as well as for prescribing appropriate treatment and management. Patients with schizophrenia and other psychotic disorders suffer markedly from distorted beliefs. Yet, insight of illness does not specifically address the patient's capacity to evaluate these disruptions. Evaluation of own anomalous beliefs and recognition of incorrect conclusions can be conceptualized as *cognitive insight* and assessed with Beck Cognitive Insight Scale (BCIS).

Lack of clinical insight may also be a major problem in psychotic disorders other than schizophrenia. Studies comparing levels of insight across diagnostic groups have not found substantial differences between patients with bipolar disorder and schizophrenia. Notably, the insight questionnaires used in these studies were not validated for patients with bipolar disorders. This also applies to the scale measuring clinical insight in this study, the Birchwood Insight Scale (IS). The first part of this thesis focuses on methodological issues regarding these questionnaires. In study I acceptable psychometric properties were found for the IS when applied to patients with schizophrenia and bipolar I disorder. However, for patients with bipolar II disorder the scale seemed to work poorly. Findings in the original BCIS study (Beck et al., 2004) suggested that the scale was able to differentiate between depressive patients with and without psychosis. We found that the psychometric properties were acceptable for the bipolar disorder group as well as the schizophrenia group. The scores of healthy controls, however, cannot be compared to patient scores without excluding items referring to psychotic experiences. Furthermore, the two BCIS subscales, self-reflectiveness and self-certainty, showed low or moderate correlation for all the three groups, indicating that they represent two different dimensions of cognitive insight. High scores on self-reflectiveness and low scores on self-certainty were considered as normal.

In the second part of the thesis the relationships between cognitive insight and clinical characteristics were explored. An association was found between self-certainty and delusions, in line with findings in the few previous studies. Furthermore, we explored the relationship between cognitive insight and different constellations of psychotic symptoms (delusions and/or hallucinations). Delusions irrespective of the presence or absence of hallucinations were associated with low self-reflectiveness and high self-certainty, reflecting low cognitive



insight. In contrast, a subgroup of patients with solitary hallucinations showed high cognitive insight, which is quite interesting for understanding hallucinations but needs replication.

The relationship between cognitive insight and neurocognition was also studied within the framework of this thesis. Consistent with a study on patients with first episode psychosis we found that low self-certainty is associated with high IQ and verbal learning. Verbal learning made a specific contribution in explaining self-certainty also when potential confounders were taken into account.

Taken together, the present thesis suggests that both clinical and cognitive insight could be measured with self-report questionnaires in schizophrenia and bipolar I disorder. Further, it suggests that hallucinations are related to better cognitive insight, and delusions with worse cognitive insight, and that low cognitive insight is associated with high IQ and low verbal learning. This indicates that cognitive insight is an important concept in understanding the psychopathology of psychotic symptoms.

## Abbreviations

ANOVA	Univariate analysis of variance
BCIS	Beck Cognitive Insight Scale
CBT	Cognitive behavioral therapy
CI	Confidence interval
CITC	Corrected item total correlation
D-KEFS	Delis Kaplan Executive Functioning Scale
DSM-IV	Diagnostic and Statistic Manual of Mental Disorders, 4 <sup>th</sup> edition
fMRI	Functional magnetic resonance imaging
GAF	Global Assessment of Functioning
ICC	Intra class correlation
IDS-C	Inventory of Depressive Symptoms - Clinician rated
IS	Insight Scale (Birchwood)
ITAQ	The Insight scale and Treatment Attitudes Questionnaire
MANOVA	Multivariate analysis of variance
PANSS	Positive and Negative Syndrome Scale
PSE	Present State Exam
SAI	Schedule to Assess Insight
SCID-I	Structured Clinical Interview for DSM-IV-TR-axis I disorders
SD	Standard deviation
SE	Standard error
SMA	Supplementary motor area
SPSS	Statistical Package for the Social Sciences
SUMD	Scale to assess Unawareness of Mental Disorder
TOP	Thematically Organized Psychosis Study
U-600	Ullevål 600 study (part of TOP)
WAIS	Wechsler Adult Intelligence Scale
WASI	Wechsler Abbreviated Scale of Intelligence
WMS-II	Wechsler Memory Scale
YMRS-C	Young Mania Rating Scale - Clinician rated

# 1 Introduction

## 1.1 Unresolved issues in insight

Insight of illness is an important aspect in diagnostics and treatment of patients with psychosis. Focus has primarily been on lack of insight in patients with schizophrenia, yet, poor insight seems to be a major problem also in patients with other psychotic illnesses, as well as bipolar disorder. Insight of illness is considered a multidimensional concept distributed on a continuum. A delineation by Anthony David (1990) is widely used: “Insight of illness in psychosis encompasses the patient’s awareness of symptoms as abnormal, attributing symptoms to a mental disorder and recognizing the need for treatment...”. Aaron T. Beck later labeled insight of illness as *clinical insight*. In addition to attenuated insight of illness, patients with psychosis often have reduced capacity to reflect rationally on their anomalous experiences and to recognize when their conclusions are incorrect. Beck termed such insight *cognitive insight*.

As cognitive insight addresses the patient’s own interpretation of psychotic experiences and appraises the possibility of being mistaken, it differs conceptually from clinical insight. Cognitive insight in patients with psychosis encompasses decision-making processes and builds on the principles of cognitive theory and Cognitive Behavioral Therapy (CBT). Patients with schizophrenia with some awareness of the possibility of being mistaken seem to improve more after CBT aimed at psychotic symptoms than patients without this “chink of insight” (Garety et al., 2000). Consistent with this finding middle-aged and older patients with schizophrenia receiving (cognitive behavioral) social skills training improved their cognitive insight more than patients receiving “treatment as usual” (Granholtm et al., 2005). More research, however, is needed to answer whether cognitive insight can predict treatment response in patients with schizophrenia.

Cognitive insight is assessed with Beck Cognitive Insight Scale (BCIS). The question of applicability of the scale to different clinical populations is pertinent. Beck and colleagues found that the questionnaire could distinguish between depressed patients with and without psychosis (Beck et al., 2004). Further, the scale was found to have acceptable psychometric properties for middle-aged and old patients with schizophrenia (Pedrelli et al., 2004). Though, the applicability of the scale for other psychotic disorders is not known. Can the BCIS be applied to patients with bipolar I disorder? How is the applicability of the self-report in non-clinical populations? As cognitive insight entails appraisal of the psychotic

experience, its relationship to central features of psychosis, delusions and hallucinations, as well as neurocognition, should be explored.

## **1.2 Schizophrenia**

Although there is no pathognomonic sign or symptom of schizophrenia, a cluster of symptoms occur frequently in the disorder. Symptoms in schizophrenia are commonly divided into positive and negative, which respectively are based on the occurrence of productive or deficit signs of the disturbance (Crow, 1981). The positive symptom dimension (i.e. psychosis), encompasses delusions and hallucinations, whereas the negative symptom dimension comprises affect flattening, poverty of speech, lack of motivation and social withdrawal. A third category, disorganized symptoms, consists of symptoms related to disorganization of speech and behavior (Liddle, 1987b). Negative symptoms are more stable than positive symptoms and are the least likely to improve over the course of the illness (Addington and Addington, 1991). The current diagnostic systems of mental disorders, based on the work by Emil Kraepelin (Kraepelin, 1919) and Kurt Schneider (Schneider, 1959), rely on clinical descriptions of such presented symptoms and elimination of the most probable differentials such as drug abuse, neurological conditions, or metabolic illness (First and Tasman, 2004). According to the DSM-IV classification of diagnoses continuous signs of the disorder must persist for at least 6 months and there must be a manifest social or occupational decline.

A hallucination is a perception when in fact nothing exists in the perceptual field, in other words, a perception without an object. Hallucinations can be divided into various types according to modality, timing with respect to sleep, their occasional precipitation by a sensory stimulus and their content. The auditory modality of hallucinations is most common in schizophrenia. The mean lifetime prevalence of hallucinations is approximately 60 % among patients with the disorder (Slade and Bentall, 1988).

Delusions can be delineated as (DSM-IV): “A false personal belief based on incorrect inference about external reality and firmly sustained in spite of what almost everyone else believes and in spite of what constitutes incontrovertible and obvious proof or evidence to the contrary. The belief is not one ordinarily accepted by other members of the person’s culture or sub-culture. When a false belief involves an extreme value judgment, it is regarded as a

delusion only when the judgment is so extreme as to defy credibility". Delusions occur at some stage of the condition in more than 90% of the patients. In a meta analysis positive symptoms, negative symptoms and disorganized symptoms were all weakly to moderately associated with insight of illness (Mintz et al., 2003). Moreover, there is an association between intact insight of illness and depression. Suicidal ideation seems to increase with improvement in insight (Schwartz and Petersen, 1999; Schwartz, 2000) but no consistent association has been found between insight of illness and suicidal behaviour or suicide (Amador et al., 1996). Empirical studies suggest that insight of illness predicts time to symptomatic resolution (van Os et al., 1996) and also predicts improvement in psychosocial functioning (Schwartz et al., 1997).

Cognitive impairment in patients with schizophrenia has been reported since the illness was first described by Bleuler. Neurocognition is moderately to severely impaired in patients with schizophrenia (Keefe et al., 2006). The severity of impairments is greatest in the domains of memory, attention, working memory, problem solving, processing speed and social cognition (Sadock et al., 2009). Impairments in cognitive functioning is associated with negative and disorganized dimensions (Liddle, 1987a; Liddle and Morris, 1991; O'Leary et al., 2000), but not associated with psychotic symptoms (i.e. delusions and hallucinations) (Bilder et al., 1985; Cuesta and Peralta, 1995; O'Leary et al., 2000).

Schizophrenia has a high heritability (approx. 80 %) and is on a group level associated with demonstrable alterations in brain structure such as subtle decrease in gray matter volume, enlargements of ventricles and focal alterations of white matter (Vita et al., 2006; Glahn et al., 2008). Neurochemical imaging studies have consistently demonstrated that schizophrenia, in its acute state, is associated with an increase in dopamine synthesis and in certain brain areas release, as well as increased resting-state synaptic dopamine concentrations (Guillin et al., 2007). These changes in dopamine transmission are related to the clinical manifestations of delusions and hallucinations (van Os and Kapur, 2009). Pharmacological agents which block the dopamine systems are effective in treatment of psychotic symptoms, but less effective on negative symptoms and cognitive impairment (Kapur et al., 2006).

The likelihood that individuals develop schizophrenia during their lifetime is 0.4 - 1.0 % with an average of 0.7 (van Os and Kapur, 2009) with an incidence and prevalence depending on strict or wide criteria. Age of onset varies widely across large parts of early

adulthood, peaking in males during late adolescence to early adulthood and in females in their mid to late twenties.

Decline of psychosocial functioning is one of the defining characteristics of schizophrenia. Individuals with schizophrenia face major difficulties in a variety of aspects of everyday life. Their problems in holding a job, initiating or staying in partnerships and difficulties keeping friends reflect fundamental problems with social interaction. Most of the reduction in social functioning occurs during the early illness stages of schizophrenia (McGorry et al., 1996). The course of illness shows, on the one hand, extensive inter-individual differences, and on the other hand, a large degree of intra-individual stability in the case of remission after the first episode of psychosis.

### **1.3 Bipolar disorder**

The cardinal symptoms of bipolar disorder are discrete periods of abnormal mood and activation that define depressive, manic or hypomanic episodes. The DSM-IV definition is based on the identification of individual mood episodes occurring over time. Individuals who experience the combination of major depressive episodes and mania are diagnosed with bipolar I disorder, and individuals who experience the combination of major depressive episodes and hypomania are diagnosed with bipolar II disorder. A hypomanic episode is not severe enough to cause marked impairment in social and occupational functioning, or to necessitate hospitalization, and psychotic symptoms do not occur. In mania, however, such impairment occurs, potentially combined with hospitalization and psychotic symptoms. In accordance with the definition the key differentiating feature between a manic and a hypomanic episode is the impact of symptoms on social or occupational functioning, as well as the duration. Research on the structure of manic episodes indicates that they appear with similar presentations if and when they reoccur (Goodwin, 2007).

Results from a recent survey estimates that the life-time prevalence is 1.0 % for bipolar I disorder and 1.1 % for bipolar II disorder (Merikangas et al., 2007). The mean age at onset varies with the definition applied (definition of onset), ranging from the appearance of first symptoms before the age of 20 to the first hospitalization in the age interval 25-30 years. A recent study found that mean age at onset defined as the start of the first affective episode was 23 years (Larsson et al., 2009).

Several studies have shown that insight is impaired in bipolar disorder, and specifically in the manic phase (Michalakeas et al., 1994; Ghaemi et al., 1995; Swanson, Jr. et al., 1995; Peralta and Cuesta, 1998). The results in a small meta-analysis by Ghaemi and Rosenquist suggested that insight of illness in mania could be a state phenomenon.

## **1.4 Clinical insight in psychosis**

### **1.4.1 General aspects**

Thoughts and ideas of an individual suffering from a psychotic disorder may seem incoherent and lacking in rationality. Despite the efforts of family members and clinicians explaining that the patient has a mental disorder and consequently is in need of treatment patients frequently appear indifferent or unaware of the illness. Such lack of a consensual perspective may impose frustration among next to kin and professionals. Yet, for the person being diagnosed who may also be certain that he/she does not suffer from a serious mental illness the issue may inflict great distress. Lack of insight of illness with its profound effect on the therapeutic relationship is frequently observed in schizophrenia and other psychotic illnesses such as bipolar disorder.

*Insight* has acquired a number of meanings and the usage is broad. Consequentially, it is important to clarify the terminology used in relation to insight. The definition in the Advanced Oxford English Dictionary is: “understanding, power of seeing into something with the mind or a (often sudden) perception or glimpse”. The general usage of *insight of illness* in the health care system, and this also applies to patients with psychosis, refers to a state of mind or mental act in which the patient is aware of being ill. Obviously, insight of illness is complex, and by some theorists described as kaleidoscopic in nature. To date no universally used definition of insight of illness has been delineated. Markova and Berrios postulated that insight of illness is a composite construct (i.e. comprising not only the phenomenon of insight, but also constructions by the patient, the clinician, and the interactive process itself) which also contributes to the shaping of the final contract (Markova and Berrios, 1995). In keeping with this is the notion that the construct insight of illness represents a phenomenon which consider something being presented or assessed (epistemological viewpoint) rather than something that is actually happening (ontological viewpoint). The usage of insight of illness in this dissertation will be confined to the former

construct. It is beyond the scope of the thesis to further review the theoretical background of clinical insight.

The observed lack of recognition of being ill has been given many names, such as poor insight, insightlessness, unawareness of illness, clinical insight, attitude towards illness, sealing over, defensive denial etc. Such terms often imply particular positions regarding the etiology of deficits or explanation of insight within a particular school of thought or therapeutic tradition (e.g. denial as defense in psychodynamic psychiatry). The next subsection addresses different perspectives of clinical insight. The terms insight of illness and clinical insight are considered to be synonymous and will be used interchangeably in the text throughout the thesis. Clinical insight will be distinguished from cognitive insight.

#### 1.4.2 Historical and current perspectives

The notion that insanity equals the presence of delusions persisted until the first part of the 18th century (Berrios, 1994). “Lack of insight” was, on the other hand, used synonymously with insanity. Until the eighteenth century the view on insanity was a reflection of what has been called the ontological definition of disease – being mad and losing one’s reason was a sort of permanent state that affected the entire person. “Partial insanity”, however, as viewed by theorists in the early nineteenth century could indicate a state of mind being “intermittent” and also “incomplete”. A deeper shift in the view of disease had made such a change in view possible. The French physician Philippe Pinel (1745 -1826), who was instrumental in the development of a more humane approach to the care of psychiatric patients, claimed that patients could be affected in some parts of their psyche, but not in other parts. These perspectives opened up for the later view: “an insanity that was aware of itself”.

The German psychiatrist Emil Kraepelin (1855-1926) distinguished between manic-depressive psychosis and the disorder designated dementia praecox (Kraepelin, 1919), which later was renamed schizophrenia. The nosology was based on symptom patterns and the long-term course of illness. Kraepelin categorized dementia praecox within the group of endogenous dementias and believed that the illness had a deteriorating course in which mental function continuously declined. In contrast to patients with dementia praecox he believed that patients suffering from manic-depressive psychosis experienced an intermittent course of illness with relatively symptom-free intervals between acute episodes. Dementia praecox was later relabeled *schizophrenia* (Bleuler, 1950) by the Swiss psychiatrist Eugen



Bleuler (1857-1939). He proposed the name to denote the lack of integration of different psychic functions' (Gr. *skhizo*: to split, *phren*: mind). This was based on descriptions of patients who partially worked out their ideas and subsequently connected fragments of ideas in an illogical way. Bleuler considered schizophrenia as a group of psychotic diseases (*group of schizophrenias*) with variable course and prognosis, which at times were chronic, at times marked by intermittent attacks. Yet, he explicitly noted that the course of illness did not permit a full "restitutio ad integrum". Bleuler made substantial contributions to the description of patients with psychosis and characterized insight in these patients as a phenomenon encompassing both inter and intraindividual differences: "We find all nuances from almost complete insight to complete misinterpretations of all situations- not only in different patients, but sometimes in the very same patient, occasionally changing from one moment to the next". His description of autism (i.e. in the sense of a symptom in schizophrenia) is fundamental to the concept of clinical insight. Autistic thought content is considered incorrigible and assumes complete reality value for the patients, while actual reality value is minimized or reduced to zero. Bleuler explains, "The patient with schizophrenia is convinced that others believe him to be mentally healthy although daily he hears the very opposite from us. The patient does comprehend the sense of our words, can reproduce them, but immediately afterwards he substitutes his own meaning for that of ours because what we in reality have been telling him could not be brought into logic contact with his ideas. Depending on the circumstances the patient will displace or falsify reality" (Bleuler, 1950). Thus, Bleuler postulated the existence of two parallel pathways of thinking in the patient with schizophrenia which he labeled "double registration".

The German psychiatrist and philosopher Karl Jaspers (1883-1969) introduced the "biographical method" in the examination of patients with mental illness (i.e. providing information on how the patients themselves felt about the symptoms as well as notes on the people concerned), which is fundamental to modern psychiatric practice. He observed that transient insight may occur in acute psychosis. According to Jaspers, insight was not lasting or complete. It was rather a relative phenomenon which should be expressed in relation to clinical features and remission. Nevertheless, he observed that patients who recovered from manic psychosis or alcoholic hallucinations were capable of looking back on their experiences with complete insight. Patients with schizophrenia, on the other hand, did not exhibit such overall insight and were unable to talk freely about their experiences, becoming overtly affected when told to do so (Jaspers, 1963). The patients' ability to judge what was

happening to them and why this occurs played a central role in Jasper's concept of insight. In keeping with this he conveyed the problem of "pseudo-insight" describing patients who essentially repeat what the therapist has said without a deeper understanding of their illness. Aubrey Lewis, an Australian physician and early researcher in psychiatric epidemiology, published the paper "The psychopathology of insight" in 1934 (Lewis, 1934). The paper had a profound impact on the issue of insight of illness at the time. He defined insight as: *"The correct attitude to morbid change in oneself, and moreover, the realization that the illness is mental"*.

According to Lewis, insight of illness could be modular with the self as both object and subject. He also gave an early hint at the later elaborated notion of symptom attribution (defined by A. David in 1990). Lewis describes the struggle and the pain in individuals gaining insight and rejected the "all-or-nothing approach" which up to then had been widely clinically applied. He described insight in terms of both awareness of self-change and the judgment of such change. Pointing out that insight was judged by non-affected individuals and at the same time it was with a "disordered mind the patient contemplates his state or individual symptoms" Lewis insinuated the necessity of studying the whole psychopathology of the patient. At the time of Lewis' publication gestalt therapists had a very different view on insight of illness, being concerned with the nature of insight in the sense of an intuitive understanding comparable with how a solution to a problem suddenly comes to mind. Psychodynamic approaches have mostly been applied to patients struggling with neurotic conflicts, pointing out the role of the unconscious defense in poor insight.

During the last two decades several theorists have emphasized that insight of illness encompasses a complex concept representing a continuum of thinking and emotions affected by internal and external factors. Markova and Berrios postulated that the individual's self-knowledge and self-deception is essential to insight of illness (Markova and Berrios, 1992b). As insight is restricted to illness it is viewed as a subcategory of self-knowledge. The patient acquires such self-knowledge when the relationship between personal characteristics (e.g. personality attributes) and the mental illness is recognized. Hence, knowledge of the facts regarding the illness does not suffice to obtain insight proper, but is rather considered a prerequisite. Markova and Berrios suggested that the patient may not wish to gain proper insight because it could be too threatening to the self, bringing us to the question of self-deception. Self-deception is a failure of acquiring self-knowledge and there are different views as to whether it represents a conscious or unconscious process. Such self-deception

entails a paradoxical state of holding such knowledge and yet lacking the knowledge at the same time. Patients with psychosis are out of touch with reality. Thus, it is incompatible for such individuals to possess self-knowledge. To take this one step further and explore the role of denial in terms of self-deception Moore et al. (1999) examined insight of illness, depression and self-deception (operationalized as the tendency to give self-reports that are subjectively honest, but positively biased) in schizophrenia (Moore et al., 1999). Patients with lack of insight showed relatively low depressive symptomatology and relatively high self-deception. The findings suggest that the presence of depressive symptomatology in schizophrenia is related to the level of insight, and possibly partly contingent on the absence of self-deception as a denial defense.

### 1.4.3 Definition and assessment

After Lewis' much cited paper from 1934 there were a number of attempts on assessment of insight. However, these authors were facing fundamental methodological problems. Definitions of insight of illness were either absent or overly simplistic, and in most instances no systematized measure was used. In 1990, Anthony David exerted a multidimensional definition, proposing that insight of illness is comprised of three overlapping dimensions: The recognition that one has a mental disorder, compliance with treatment and the ability to relabel unusual mental events, such as delusions and hallucinations, as pathological (David, 1990). This definition has also received critique, mainly because it fails to assess insight of illness as a whole (Markova and Berrios, 1992b). Nevertheless, it is by far the most used delineation of the construct and has to a large degree formed the basis for empirical research in the field over the past twenty years. An overview of the assessment of clinical insight will be presented (although not exhaustive) employing five modified categories of clinical instruments suggested by Amador and associates (Amador et al., 1991).

*Case reports* based on in depth interviews regarding the patients' beliefs about their illness were frequently used in the early literature on the topic. These were essentially subjective descriptions of the individuals' psychotic experiences, describing whether or not the patients believed they were mentally ill. Restrictions were neither put on the patients' responses nor on the investigators regarding categories of answers. This method has encouraged the generation of hypotheses as the investigator observes the patient and speaks to him/her,

therein opening up for new clinical descriptions. The lack of objectivity is a clear disadvantage to this method.

*Structured psychiatric interviews* without standardized rating was introduced at a time when rather simplistic and imprecise definitions of poor insight were applied, for example: “verbal recognition by the patient of existing psychological difficulties” (Eskey, 1958). Scores were not adjusted to standardized rating. The patients would for instance be rated as having full, partial or no insight. In general these methods have been criticized for the lack of validity and difficulty in measuring finer gradations of insight.

*Structured psychiatric interviews with standardized rating* represent the group of instruments presently most used. The first insight measure to be widely applied was “The Insight Scale and Treatment Attitudes Questionnaire” (ITAQ; McEvoy et al., 1981). Insight was assessed along two dimensions, the patient’s failure to acknowledge illness and the need for treatment. The patients were rated as having ‘good insight’, ‘partial insight’ or ‘no insight’. The main criticism of this scale has been that it failed to account for patients’ perception of specific symptoms of the disorder, such as cognitive processes, emotions and behavior (Markova and Berrios, 1992a). The attempt to measure insight along several dimensions was taken a step further with the Scale to assess Unawareness of Mental Disorder (SUMD; Amador et al., 1993), which essentially builds on the definition by David. The scale uses a semi-structured interview and the insight scores are rated in reference to predetermined categories of answers. The scale was developed to assess current and retrospective awareness of having a mental disorder, the effects of medication, and the awareness and attributions for the specific signs and symptoms of the disorder, as well as the consequences of exhibiting these symptoms. The SUMD with its extensive composition of 72 items has been frequently used to assess the relationship between insight of illness and psychopathology. The Schedule to Assess Insight (SAI) measures awareness and acknowledgement of the illness, the need for treatment and also includes the assessment of attributions (e.g. the patient’s capacity to describe the psychotic symptoms as morbid) (David, 1990). The expanded version also encompasses the awareness of specific signs and symptoms. The insight item of the Positive and Negative Syndrome Scale (PANSS) has been widely used in insight research. The measure incorporates aspects from the three dimensions of insight into one – obviously a strength and a limitation. The extended usage is beneficial enabling comparison of results across studies.

*The systematized scoring of free responses* is a further category of insight assessment which encompasses a systematic interpretation of data. Patients' responses are categorized, making comparisons between studies easier. The Present State Exam (PSE) which is used for rating signs and symptoms has a single insight item (Wing, 1974). The answer to the question: "Do you think there is anything the matter with you?" is rated after being compared with categories of insight composed when the investigation is completed.

*Self-reports* are questionnaires comprised by several items which are rated by the patient in a multiple choice order. In Soskis' and Bowers' self-report from 1969 patients indicated dichotomously whether the statements in the questionnaire could be applied to themselves or not (Soskis and Bowers, 1969). The first self-report to be extensively used in the insight of illness assessment was Birchwood Insight Scale (IS), which is based on three dimensions: Insight of illness, relabeling of symptoms and treatment needs. The 8 items of the inventory are scored on a four point Likert scale. The IS is one of the two self-reports used in the current work. The Beck Cognitive Insight Scale (BCIS) which addresses self-appraisal of unusual experiences and beliefs is also employed in the studies of this thesis. An advantage of self-reports is avoidance of potential rater bias such as the tendency to rate patients with low intelligence or poor communication skills as having poor insight (Marks et al., 2000). Patient response bias that could result from the presence of an examiner is also reduced.

#### 1.4.4 Neurocognitive model

A number of theoretical models have exerted to explain insight of illness. On the one end of a theoretical spectrum poor clinical insight has been considered a psychological defense mechanism and on the other extreme it has been thought to reflect a neurocognitive deficit. During the last two decades there has been increasing focus on poor insight of illness in schizophrenia as possibly resulting from neurocognitive impairments. It has been suggested that due to deficits in neurocognition, particularly impeded executive functions, individuals with schizophrenia may fail to recognize their symptoms and will not attribute them to the illness (Morgan and David, 2004). Hence, information processing failure may prevent individuals from comprehending their state in its totality and represent a source of poor insight. A body of literature has emerged on the relationship between insight of illness and neurocognition. In a meta-analysis small, although significant, positive relationships were found between insight of illness and all the assessed neurocognitive domains, and also

between insight of illness and general intellectual functioning in schizophrenia (Aleman et al., 2006). The much used dimensions of clinical insight labeled “illness awareness” and “insight in treatment needs” seem to be relatively weakly connected to neurocognition compared to the individuals capacity to relabel symptoms as pathological (Morgan and David, 2004). A suggested explanation is the possible association of the former two factors with social and cultural variation. Weiler and associates investigated insight of illness and symptom change in a longitudinal study and found that the relationship was relatively strong in schizophrenia patients with high symptom load. Patients with severe psychopathology showed fairly persistent lack of insight and the authors suggested that neurocognitive impairment and insight deficit could be related in subgroups of severely ill patients (Weiler et al., 2000). This notion has later gained some support, but further research, both cross-sectional studies determining mediating factors and longitudinal studies are needed to acquire in depth knowledge on the relationship.

The neuropsychological model has suggested poor insight in schizophrenia to be related to frontal lobe dysfunction. Findings in structural neuroimaging studies have shown reduced middle and superior frontal lobe volume in schizophrenia patients with poor insight of illness, and, thus, providing support for this model (Flashman et al., 2001) Theoretically, neuroanatomically based models have been outlined in neurological disorders, which may have relevance to schizophrenia. Unawareness of illness in patients with acquired brain lesions secondary to cerebral insults, as well as in patients with neurodegenerative disorders represent indirect clues for the understanding of the neural basis of unawareness of illness in schizophrenia (Amador et al., 1991). Anosognosia is a disorder in which the patient, affected by a brain dysfunction, does not recognize the presence or appreciate the severity of deficits in sensory, perceptual, motor, affective or cognitive functioning (Heilman et al., 1998). However, the previously postulated close association between global cognitive deficit and anosognosia (McGlynn and Schacter, 1989) does not seem to be supported by more recent data (Starkstein et al., 1992; Coslett, 2005). Cognitive dysfunction may rather be a predisposing factor or may lead to greater severity of anosognosia following stroke (Marcel et al., 2004; Vuilleumier, 2004).

Empirical studies have consistently shown lesions in the right cerebral hemisphere in patients with anosognosia (Starkstein et al., 1992; Pia et al., 2004; Coslett, 2005; Karnath et al., 2005). Further, there seems to be an association between anosognosia for motor impairment and lesions of the fronto-parietal or fronto-parietal-temporal areas.

## 1.5 Cognitive insight in schizophrenia

The founder of Cognitive Behavior Therapy (CBT), Aaron T. Beck, applied cognitive models of psychosis in explaining patients' own evaluation of erroneous or unusual experiences. This perspective was termed *cognitive insight* and is assessed with the Beck Cognitive Insight Scale (BCIS), which is a key measure in the present work. In the following section, the background, assessment, method and previous use will be presented.

### 1.5.1 A cognitive model of positive symptoms

In the last two to three decades a consensus has developed that psychosis may occur in individuals with a vulnerable predisposition and that its onset often follows specific life events (Read et al., 2005; Hardy et al., 2005), adverse environments (Bebbington and Kuipers, 1994), illicit drug use (van Os and Kapur, 2009) or periods of isolation. Genetic factors may represent such vulnerability. Schizophrenia, the best characterized psychotic disorder in terms of genetics, shows large heritability (estimates of 0.8) and is considered a complex genetic disorder where environmental factors add to the disease risk (van Os and Kapur, 2009). Different stress-vulnerability models have been applied to explain the development of psychotic disorders. Cognitive models of psychosis attempt to link the steps between phenomenological experiences and such neurobiological, psychological and social predispositions. These models could be connecting theory, therapeutic approaches applied in clinical settings and also research on psychotherapy. Garety and colleagues found that patients with schizophrenia who confirmed the possibility of being mistaken and received Cognitive Behavioral Therapy (CBT) had better outcomes than patients who did not approve and received CBT (Garety et al., 2000). These researchers developed a cognitive model comprising factors that contribute in the shaping and maintenance of psychotic symptoms. The model builds on work by other researchers (Hemsley, 1993; Morrison et al., 2000; Chadwick and Birchwood, 1994; Bentall et al., 1994) and entails concepts essential to cognitive therapy such as disruptions in automatic cognitive processes and maladaptive conscious appraisals (Garety et al., 2001).

A number of potential empirical factors contribute to the formation and maintenance of the psychotic appraisal. Four factors, however, were particularly relevant as background

when Beck and associates developed the scale measuring reasoning and evaluation impairments in psychotic patients.

### *1. Reasoning bias in patients with schizophrenia*

Reasoning biases which seem to contribute to formation of psychotic symptoms and thus are relevant to cognitive insight are ‘jumping to conclusions’ information gathering bias, externalizing attribution style and poor social understanding. The “jumping to conclusions” bias described by Garety, Helmsley and Wessely (Garety et al., 1991) may limit the amount of data to support an explanation, and seems to play a role in the early stage of delusional development in which a patient is considering whether or not to accept or reject a thought with a delusional content (Fine et al., 2007). Patients with persecutory delusions seem to excessively attribute hypothetical positive events to internal causes showing an exaggerated self-serving attributional bias when making inferences about hypothetical positive and negative events (Kaney and Bentall, 1989a; Candido and Romney, 1990). The attribution bias may yield a tendency to find external explanations for own idiosyncrasies. Limited capacity to read and understand the intentions of others is assumed to play a further role in the formation of delusions.

### *2. Adverse social environments and psychosis*

Empirical findings suggest that adverse environments are interlinked with high symptom load. Aversive social environment, such as living with families where high level of expressed emotion is the dominant communicational style is a well established predictor of relapse in schizophrenia (Bebbington and Kuipers, 1994). A recent study reported that supportive social environments are associated with reduced positive symptoms and that family support relates to reduced number of hospital admissions up to 3 years after first episode psychosis (Norman et al., 2005). It is increasingly recognized that trauma and other aversive events precedes the onset of psychosis (Read et al., 2005; Hardy et al., 2005).



### *3. Affective states and positive symptoms*

Schizophrenia often occurs concomitantly with other psychiatric disorders and emotional states. Patients with schizophrenia are at increased risk of developing depression relative to the already high lifetime prevalence of depression in the general population. In a review by Siris and Bench it was found that schizophrenia patients were prone to elevated rates of depression, with a modal frequency of about 25% (Siris and Bench, 2003). The prevalence of anxiety disorders is also increased in schizophrenia. Approximately 25% of schizophrenia patients suffer from panic attacks and 15% meet the criteria of a panic disorder (Buckley et al., 2009). Birchwood and colleagues reported that depression nearly always is part of the first-episode prodrome that recedes with the positive symptoms (Birchwood, 2003). In a longitudinal study of patients with schizophrenia spectrum disorder approximately one-third of the patients had clinical levels of depression within a 7.5 years follow-up period (Sands and Harrow, 1999). The depressive symptomatology is also accompanied by low levels of self-esteem (Freeman et al., 1998). Moreover, 25 % of patients with schizophrenia have a diagnosis of obsessive compulsive disorder (Berman et al., 1995) and 40-50 % have a dual diagnosis of comorbid substance abuse (Scott et al., 1998; Buckley et al., 2009). This comorbidity adversely affects outcome and may also reflect on processes underlying the development of schizophrenia (Buckley et al., 2009).

The causality, however, between the positive symptoms and the appraisals of self and others is uncertain. Though, empirical findings may imply that depression contributes to later development of delusions in individuals with preexisting aberrant experiences (Krabbendam et al., 2005). Furthermore, patients with psychotic illness tend to manage stressful events differently than control subjects, reacting with less positive affect and more negative affect to subjective appraisal of stress in daily life (Myin-Germeys et al., 2001).

### *4. Self-appraisal and psychosis*

Early adverse experiences are postulated by Garety et al. (Garety et al., 2001) to create an enduring cognitive vulnerability characterized by negative schematic models of the self and others (Smith et al., 2006). Individuals with schizophrenia have a negative self-image in the sense of poor self-esteem (Kinderman and Bentall, 1996). In addition, the content of their psychotic symptoms may affect their self-perception. Two studies have shown that negative evaluative beliefs about the self were independently and significantly associated with

symptoms of psychosis. The results, however, diverged in the sense that one group found an independent association with overall positive symptoms (Barrowclough et al., 2003) and the other an association solely for persecutory delusions (Smith et al., 2006). A possible explanation is that there might be an independent and direct role for negative evaluative self beliefs in the development of psychotic symptoms. On the other hand, the cross-sectional design of these studies offers an alternative explanation. The negative evaluative beliefs may be secondary to the psychotic experience. Furthermore, patients with psychosis exhibit safety behavior, which is a common form of acting on persecutory delusions (Freeman and Garety, 2003; Freeman et al., 2007). These behaviors are likely to prevent the processing of disconfirmatory evidence and will therefore contribute to delusion persistence. Moreover, Barrowclough et al. (2003) found that occurrence of positive symptoms (i.e. delusions and hallucinations) was associated with negative evaluations of the self and others. In keeping with this finding patients with negatively loaded delusions and hallucinations seem to exhibit negative self-concepts (Close and Garety, 1998). Psychotic beliefs may be more firmly held if they are consistent with firmly held distorted beliefs present in the first place about the self (“I am bad”), others (“you are hostile”) and the world (e.g. “the world is a dangerous”) (Garety et al., 2001).

### 1.5.2 Designation and assessment

The clinical concept of insight has been widely applied to determine the patients’ awareness concerning symptoms and illness, as well as awareness of treatment needs. A number of scales have been developed to assess insight of illness, and their usefulness has been demonstrated especially in diagnostics and pharmacological treatment. Though, the operationalized insight of illness does not essentially address the patient’s capacity to evaluate own psychotic experiences. Observations of psychotic patients in clinical settings point to limitations in their understanding of their own aberrant beliefs, experiences and disruptive cognitions.

Beck emphasized that the cognitive problem in patients with psychosis resides not only in their consistent distortions of their experience, but also in their difficulty in distancing themselves from these distortions and receiving corrective feedback (Beck and Warman, 2004). Drawing on the empirical factors which seem to contribute to formation and maintenance of the psychotic appraisal (reasoning bias, environmental factors, emotional

processes and self-evaluation of aberrant experiences) Beck and colleagues devised the Beck Cognitive Insight Scale (BCIS), a self-report addressing impairments in reasoning and evaluation in psychotic patients (Beck et al., 2004). The questionnaire measures patients' reflection on unusual experiences, capacity to correct erroneous beliefs and own certainty about mistaken judgments. The BCIS comprises 15 statements and forms the two subscales, self-reflectiveness and self-certainty (For details see appendix fig. 1).

## **1.6 Previous research and knowledge required**

Clinical insight is mostly assessed in reference to the definition by Anthony David encompassing awareness of illness, attribution of symptoms to illness and need for treatment. Studies comparing levels of insight in bipolar disorders and schizophrenia have found no substantial difference between the two, neither during psychotic episodes (Amador et al., 1994; Pini et al., 2001) nor in remission (Yen et al., 2002). However, few measures of insight have been validated for patients with mood disorders. The self-report Birchwood Insight Scale (IS) forming three subscales compatible with David's delineation of insight of illness (illness, symptoms, treatment) has only been validated for a mixed sample of patients with psychosis. Findings in the original article by Birchwood and associates (1994) suggested that one common factor could be extracted from the eight items of the questionnaire. High internal consistency (Chronbach's alpha: 0.75) for the items of the scale and a moderate to high correlation between the subscales and the total score (corrected-item-total-correlation: 0.37 - 0.56) further underscored that one common factor should be used. Although, the psychometric properties of the IS have not previously been examined for different diagnostic groups with psychotic disorders. Feasibility of the subscales, as well as total score, and utility of the scale for schizophrenia, bipolar I and bipolar II disorder was addressed in study I of the thesis.

The introduction of the Beck Cognitive Insight Scale (BCIS) provided an opportunity to explore cognitive insight in diagnostic subgroups of patients. Beck and associates explored the psychometric properties of the BCIS and found acceptable internal consistency (Alpha self-reflectiveness: 0.68; Alpha self-certainty: 0.60) for patients with schizophrenia, schizoaffective disorder and major depression (Beck et al., 2004). The authors found that self-certainty differentiated between major depressive patients with and without psychosis.

Pedrelli and colleagues investigated the psychometric properties in a sample of middle-aged and older patients with schizophrenia and schizoaffective disorder (Pedrelli et al., 2004). Acceptable internal consistency was found for self-reflectiveness (Alpha: 0.70), but not for self-certainty (Alpha: 0.50), and the findings were thereby somewhat inconclusive. Warman et al. investigated cognitive insight in 37 long-term outpatients with schizophrenia or schizoaffective disorder, in addition to 60 healthy controls (Warman et al., 2007). They found that the control subjects had better cognitive insight than psychotic patients regardless of psychotic status. Individuals with active delusions showed higher self-certainty relative to both healthy controls and individuals with psychotic disorders without delusions. Surprisingly, individuals with psychotic disorder without active delusions had impaired self-reflectiveness relative to both healthy controls and individuals with active delusions. However, the difference was due to a very low mean score in the group with psychosis, but no delusions. This group was small (13 patients), fairly old (mean age 50 years), came from a Veteran Administration setting, and had a skewed distribution of gender (11 of the 12 who reported gender were men) and ethnicity (5 Caucasian, 7 African, and 1 other). Thus, subscale scores and the psychometric properties of the BCIS should be assessed in a larger and more representative sample of patients with schizophrenia. As for the IS further research is needed on the applicability of the questionnaire for different subgroups of individuals. This could include studies on the utility of the scale in groups of patients with and without psychosis and among patients along a psychosis continuum. Study II in the dissertation is concerned with the utility of the BCIS for patients with schizophrenia and bipolar disorder, as well as the applicability for healthy controls.

The BCIS is primarily devised for individuals with psychosis with anomalous thinking and experiences. Thus, the relationship to delusions and hallucinations are of particular interest and should draw the attention of the researcher. Bora et al. investigated the relationship between cognitive insight and psychotic symptoms in a sample of patients with schizophrenia (Bora et al., 2007). Patients with current psychotic symptoms (defined as a score of four or higher on the PANSS delusions or PANSS hallucinations items) obtained a significantly lower self-reflectiveness score and a higher self-certainty score than patients without these symptoms. Concordantly, the authors found a significant negative correlation between positive symptoms and self-reflectiveness, as well as a significant positive correlation between positive symptoms and self-certainty. In regards to methodology, positive symptoms in this study were measured by the PANSS positive subscale. However,

studies investigating the factorial structure of the scale have found that the 7 items forming this subscale could represent more than one factor or dimension (White et al., 1997; Lindenmayer et al., 2004). Furthermore, the relationships between cognitive insight, delusions and hallucinations were not addressed in the study. In the Warman-study the relationship between cognitive insight and delusions was investigated in a small sample of patients with schizophrenia (Warman et al., 2007). Thus, there is a need to investigate the relationship between cognitive insight and psychotic symptoms. In study III of the thesis we approached the subject matter by investigating how different constellations of delusions and/or hallucinations relate to cognitive insight in a sample of patients with schizophrenia.

Cognitive insight and neurocognition appear to have a conceptual overlap. In order to gain more knowledge about the nature of cognitive insight it seems important to explore the relationship to intellectual functioning, both general intellectual abilities and neurocognitive domains. To our knowledge there are only two reports on the relationship between neurocognition and cognitive insight. In the first study, a significant relationship between self-certainty and verbal learning and memory was found in 51 patients with first episode psychosis (Lepage et al., 2008). After a modest enlargement of the patient sample the strength of this relationship was somewhat attenuated, whereas the relationship between self-reflectiveness and verbal learning and memory was strengthened (Buchy et al., 2009b). However, this study did not control for important confounders. In addition to delusions depression is a potential confounder in the relationship between cognitive insight and neurocognition. In a study investigating cognitive insight and depression a significant positive relationship between self-reflectiveness and depression was found (Beck et al., 2004), but others did not report similar relationships (Pedrelli et al., 2004; Warman et al., 2007). Thus, there is a need for study of the relationship between cognitive insight and neurocognition taking potential confounders into account – an approach pursued in the fourth study of the dissertation.

## 1. 7 Aims of the study

### **Main aims of this thesis:**

The overall aim was to investigate methodological, neurocognitive and psychopathological aspects of cognitive insight in schizophrenia. Emphasis was also put on methodology in clinical insight, the relation between clinical and cognitive insight and comparison to bipolar disorder.

### **The thesis had the following subaims:**

#### *Paper I:*

1. To investigate the psychometric properties of the Birchwood Insight Scale (IS) in patient with schizophrenia, bipolar I and bipolar II disorder.
2. To study the level of clinical insight in patients with these disorders

#### *Paper II:*

1. To examine the subscale scores, internal consistency, as well as intercorrelation for the subscales of the Beck Cognitive Insight Scale (BCIS) in schizophrenia, bipolar disorder and normal controls.
2. To explore the relationship between the BCIS and both affective symptom scores and clinical insight for the two diagnostic groups.
3. To compare mean scores for patients and controls.

#### *Paper III:*

1. To investigate the relationship between delusions and hallucinations, occurring solitarily or concurrently, and cognitive insight in patients with schizophrenia.

#### *Paper IV:*

1. To investigate the association between cognitive insight and neurocognitive function in schizophrenia.
2. To explore if neurocognition adds to explained variance in cognitive insight after contributions by potential confounders have been accounted for.

## **2 Material and methods**

### **2.1 Ethical aspects**

The study was approved by the Regional Committee for Medical Research Ethics and the Norwegian Data Inspectorate. Participants received oral and written information about the study. Specific information was given about the interviews, testing, physical examination and other investigations in the TOP study not included in this thesis, such as blood sampling. The invitees were informed about procedures for use, storage and erasure of data.

All participants gave written informed consent. Though, the consent to participate could at any given time be retracted without negative consequence for further counseling and treatment in mental health care. The collected data could be made available to the participant, and, also, data would be erased upon the subject's request. Data was used and stored without the subject's name, social security number or other means of identification. Only authorized health care personal associated with the study had access to the list of participants.

### **2.2 Study design and recruitment of patients**

The present study is part of the TOP study (Thematic Organized Psychoses Research) - a translational study on schizophrenia and bipolar disorders, which is a joint collaboration between University of Oslo and the university hospitals in Oslo. The health care system in Norway is catchment area based and publicly funded, and patients are referred from primary care. The inclusion area of the study covers essentially the total population of the city of Oslo, approximately 550 000 inhabitants. The present study is a naturalistic, cross-sectional study.

The patients were recruited from out-patient and in-patient psychiatric units at psychiatric hospitals in Oslo, Norway, from October 2002 through July 2007. Patients were included mainly from outpatient clinics, but also from intermediate and long term treatment units. Inclusion of patients admitted to acute treatment units was awaited until they were stabilized and able to consent and participate in interviews and assessments. Eligible for the study were patients who met the following inclusion criteria: Age between 18 and 65, understand and speak a Scandinavian language, IQ score of above 70, no history of severe

head trauma, fulfill the DSM-IV criteria for schizophrenia spectrum disorder (schizophrenia, schizoaffective disorder and schizophreniform disorder) or bipolar disorders (bipolar I disorder, bipolar II disorder and bipolar disorder not otherwise specified), and willing and able to give informed consent. The patients were invited to participate in the study by the clinician responsible for treatment. Thorough information about the study in general, entailed procedures and clinical assessments was given by the research fellows who were all trained clinicians (MDs or psychologists).

## **2.3 Subjects**

### **2.3.1 Samples**

The patients were continuously recruited to the studies in this thesis through the general TOP recruitment protocol. The different insight measures were implemented in different time periods without any additional selection criteria. Study I used the Birchwood Insight Scale, and patients were recruited until november 2005. The BCIS was introduced in March 2005 and was used in the samples of study II-IV.

Due to different research questions, different diagnostic groups were used in different studies (table 1). Study I and II have a sample consisting of patients with schizophrenia, schizoaffective disorder and schizophreniform disorder (categorized as schizophrenia in this thesis), as well as samples with bipolar disorders. The same sample of patients with schizophrenia was used in study II and III, while study I and IV built on a sample of schizophrenia included at a different time period. As shown in table 1 the samples of patients with bipolar I and II disorders were used in study I, whereas another sample of patients with bipolar disorders recruited at a later time period was used in study II



Table 1. Substudies of the thesis

Study	Inclusion period	Schizophrenia	Bipolar Disorder	Controls
Study I	May 2003 - Nov. 2005	n=101	n=94	
Study II	March 2005 - July 200	n=143	n=92	n=64
Study III				
Study IV	March 2005 - July 2007	n= 102		

As shown in table 2 the three samples consisting of patients with schizophrenia were largely similar regarding demographic and clinical characteristics. The mean illness duration, defined as the time since the first contact with a specialized health care unit due to psychosis, was under four years (3.6 – 3.9). Mean symptom scores on the Global Assessment of Functioning Scale (GAF, for further details see 2.4.2, p. 34-35) reflected a severity of symptoms bordering what is observed in psychosis.

The three samples of patients with bipolar disorders in paper I and II (table 2) were essentially similar in respect to demography and benchmarks clinical characteristics. The mean GAF was somewhat lower in study I than in study II. Mean GAF scores as well as mean PANSS positive and negative subscale scores yield low to moderate symptom levels.

Table 2. Demographic and clinical characteristics of the subsamples

		Study I			Study II			Study III	Study IV
Samples		Sch. n=101	BD I n= 57	BD II n= 37	Sch. n=143	BD n=92	Contr. n=64	Sch. n=143	Sch. n=102
Male (%)		61 (60)	24 (42)	13 (35)	83 (58)	40 (44)	25 (39)	83 (58)	60 (59)
Age (y)		33 (10)	40 (12)	37 (10)	33 (10)	37 (11)	33 (12)	33 (10)	33 (10)
GAF	sympt	42 (11)	56 (11)	55 (8)	43 (11)	61 (12)		43 (11)	40 (11)
	funct				44 (11)	63 (14)		44 (11)	41 (10)
PANSS pos		15 (6)	9 (2)	10 (2)	15 (6)	10 (4)		15 (6)	15 (6)
PANSS neg		16 (8)	10 (4)	11 (3)	14 (6)	9 (3)		14 (6)	15 (6)

Sch., schizophrenia; BD, bipolar disorder; BD I, bipolar I disorder; BD II, bipolar II disorder; Contr., control subjects. Male, percentage in parenthesis, other variables mean with standard deviation presented in parenthesis. GAF, Global Assessment of Functioning; GAFs, Global Assessment of Functioning, symptom; GAFf, Global Assessment of Functioning, function; PANSS, Positive and Negative Syndrome Scale, positive and negative subscale scores.

### *Paper I*

The patient sample was included in the period from May 2003 through November 2005. One-hundred-and-one patients diagnosed with schizophrenia (schizophrenia, n=76; schizophreniform disorder, n = 4; schizoaffective disorder, n = 21), 57 patients with bipolar I disorder and 37 with bipolar II disorders participated in the study.

### *Papers II and III*

Paper II and III are based on samples of patients included between March 2005 and July 2007. A patient sample consisting of 143 patients with schizophrenia (schizophrenia, n=107; schizophreniform disorder, n = 10; schizoaffective disorder, n = 26) was used in both studies, whereas a sample of 92 patients with bipolar disorders (bipolar I disorder, n = 45; bipolar II disorder, n = 43; bipolar disorder not otherwise specified, n = 4) in addition to a control group of 64 healthy subjects took part in study II. Twenty-seven of the individuals who participated in the control group were randomly selected from statistical records from the same catchment area as the patients. The remaining 37 persons were a mixed group of volunteering

professionals. These two control samples attained similar scores and internal consistency on the BCIS, and hence, in this thesis the control group is referred to as one group.

#### *Paper IV*

The sample in paper IV consisted of 102 patients with schizophrenia (schizophrenia, n=81; schizophreniform disorder, n=8; schizoaffective disorder, n=13). They were recruited from March 2005 through July 2007. Since the paper addressed the relationship between cognitive insight and neurocognition patients without both BCIS assessments and neuropsychological test scores were excluded.

### 2.3.2 Study samples compared to reference group

In order to evaluate the representativity of the schizophrenia samples in study I-IV participants were compared with patients clinically diagnosed with psychotic disorders and severe affective disorders registered in a health care survey at Ullevål University Hospital, Department of Psychiatry. Nine-hundred-and-sixty-six patients were registered from May 2003 through April 2005 and compared to study participants with schizophrenia on central demographic and clinical variables (see table 3).

Table 3. Central characteristics of subjects in health care survey (n=966) and patients with schizophrenia in study I-IV (n=101/143)

	Health care survey	Schizophrenia (Study I-IV)
Male	52 %	58-60 %
Age (y)	39 (13)	33 (10)
GAFs	40 (13)	40-43 (11-12)
GAFf	40 (13)	41- 44 (10-11)

Male, percentage. Other variables mean with standard deviation in parenthesis. GAFs, Global Assessment of Functioning symptom; GAFf, Global Assessment of Functioning, functioning.

## 2.4 Measurement

### 2.4.1 Diagnosis

Diagnosis was established using the Structured Clinical Interview for DSM-IV-TR-axis I disorders (SCID-I, Spitzer et al., 1992). All interviewers finished a training course in SCID assessment based on the training program at University of California Los Angeles (UCLA) (Ventura et al., 1998) and participated in diagnostic evaluation meetings on regular basis led by a clinically experienced professor in psychiatry. Mean overall kappa for SCID diagnoses assessed by the UCLA was 0.77 (95 % CI: 0.60–0.94).

### 2.4.2 General assessments

History of mental illness, present symptoms, life style and pharmacological treatment were obtained from interview with the patient. Additional information was collected from treatment records and clinical staff. Severity of symptoms was assessed by the Positive and Negative Syndrome Scale (PANSS, Kay et al., 1987) and the Young Mania Rating Scale - Clinician rated (YMRS-C, Young et al., 1978). In the TOP study depression was assessed partly with the Inventory of Depressive Symptoms - Clinician rated (IDS-C, Rush et al., 1996), partly with CDSS (Calgary Depression Scale for Schizophrenia, Addington et al., 1990), but only the former scores were used in the current work, resulting in a discrepancy between the number of patients with IDS-C scores and the number of patients with other symptom scores (PANSS, YMRS-C). The PANSS was utilized to assess severity of positive symptoms. A score of four or higher was defined as having delusions or hallucinations. Concerning assessment of delusions the PANSS P1 definition was followed as described by the rating manual: “Beliefs which are unfounded, unrealistic, and idiosyncratic”. Hallucinations were measured in accordance with the PANSS P3 rating criteria: “Verbal report or behavior indicating perceptions which are not generated by external stimuli. These may occur in the auditory, visual, olfactory, or somatic realms”. The severity of symptoms is not assessed by involvement of specific sensory modalities, but is rated according to the number of (one or more than one) hallucination modalities and their impact on behavior. All interviewers participated in inter rater reliability testing which entailed rating of patient videos. An intraclass correlation (ICC 1.1, Shrout and Fleiss, 1979) of 0.73 was obtained for

the PANSS positive subscale. Psychosocial functioning was measured by the Global Assessment of Functioning Scale (GAF, Pedersen et al., 2007), and the scores were split into scales of symptoms (GAFs) and function (GAFf) to improve psychometric properties. The inter-rater reliability of the investigators was good for GAFs and GAFf with an intra class correlation (ICC 1.1, Shrout and Fleiss, 1979) of 0.86 and 0.85 respectively.

### 2.4.3 Assessment of clinical insight

The Birchwood Insight Scale (IS, Birchwood et al., 1994 ) was used in the assessment of clinical insight (for details on the scale see appendix fig. 1). This self-report inventory consists of 8 statements originally representing 3 subscales (awareness of illness, relabeling of symptoms and need for treatment). Due to low internal consistency for the subscales (study I) the usage of the scale in this thesis is restricted to the total score (see discussion, 4.2.1, p. 46). The total score has a range of 0 to 12, with a score of 9 or more indicating good insight. The original 3-point Likert scale (agree - unsure - disagree) was transformed to a 5-point scale (agree very much - agree - unsure - disagree - disagree very much). The statements of the 8 items were translated from English into Norwegian (Halldora Jonsdottir) and the procedure was reversed under blinded conditions back into English. The author of the scale had no objections to the translation and the modifications of the scale.

### 2.4.4 Assessment of cognitive insight

The Beck Cognitive Insight Scale (BCIS, Beck et al., 2004) is a self-report consisting of 15 statements rated on a 4-point Likert scale (0 = do not agree at all to 3 = agree completely, for details regarding the scale see appendix fig.2). Based on factor analyses Beck and coworkers divided the 15 items into 2 subscales. The first component consisted of 9 items measuring objectivity, reflectiveness and openness to feedback and was labeled *self-reflectiveness*. Under the umbrella of decision-making and resistance to feedback, 6 items were united in a second component of the scale, given the label *self-certainty*. Overall cognitive insight was defined by Beck and associates as the difference between self-reflectiveness and self-certainty and labeled *composite index*. High scores on self-reflectiveness (and composite index) and low scores on self-certainty are considered as normal. The questionnaire was administered without a time limit. With approval from the authors the inventory was

translated from English into Norwegian (John A. Engh) and the procedure was reversed under blinded conditions back into English. The authors of the scale had no objections to the translation. Scores on self-reflectiveness and self-certainty were applied in paper II-IV, whereas the composite index was used in paper II and III. For validation purposes the BCIS was applied to control subjects in addition to patients with schizophrenia in paper II. As the questionnaire initially was devised for individuals with psychotic symptoms the subscale self-reflectiveness was split into two components when applied to healthy controls, *component I*, consisting of pathological experiences and, *component II*, comprising the remaining items.

#### 2.4.5 Neurocognitive assessments

Neurocognitive assessment was carried out by psychologists with training in standardized neuropsychological testing. A battery of neuropsychological tests was administered. In paper IV test results were used from five cognitive domains found to be sensitive to dysfunction in schizophrenia. In addition, current general intellectual abilities were assessed. The domains were verbal learning, processing speed, attention, verbal fluency and inhibition. Full scale IQ was also assessed.

*Verbal learning* was assessed with Logical Memory from the Wechsler Memory Scale (WMS-III). This test requires recollection of two short stories (Wechsler, 2007b). A total score for the number of items immediately recalled from both stories was used to measure verbal learning.

*Processing speed* was assessed with Digit Symbol Test from WAIS-III (Wechsler, 2003). The test is comprised by numbers paired with symbols, and the task is to fill in blank spaces with correct symbols within the time limit of 90 seconds.

*Attention* was assessed with Digit Span from Wechsler Adult Intelligence Scale (WAIS-III). Both the forward and the backward version were presented for the patients. The former test requires the participant to repeat a number of digits in the same order as presented, and the latter version entails repetition of a number of digits in the backward order of presentation. The total score (summation of digits repeated forwards and backwards) was used.

*Verbal fluency* was operationalized with Verbal Fluency Letter Test from the Delis Kaplan Executive Functioning Scale (D-KEFS; Delis, 2005). The subtest consists of three trials,

requiring production of words beginning with the letters 'F', 'A', and 'S'. The number of words generated in each of the trials was used as measures of verbal fluency.

*Inhibition* was assessed with the Color-Word Interference Test from D-KEFS. The test consists of four trials. In the first two trials the subject is required to name the colored ink patches and to read the printed color names displayed on separate cards as rapidly as possible. In the two subsequent trials the cards presented consist of written names of colors printed in colored ink that is incongruent with the color name itself. The time taken to name the color of the ink was included as the measure of inhibition (third trial D-KEFS).

*Full scale IQ:* Wechsler Abbreviated Scale of Intelligence (WASI) was used to assess full scale IQ (Wechsler, 2007a). The following subtests were used: Vocabulary, Similarities, Block Design, and Matrix Reasoning.

Scaled scores from published norms with defined mean scores and defined standard deviations (SD) were used for all neurocognitive test performance (subtests neurocognitive domains: mean=10, SD=3; WASI: mean=100, SD=15).

## **2.5 Statistical analysis**

Statistical analyses were carried out using the software Statistical Package for the Social Sciences (SPSS) version 13.0, 14.0 and 16.0 for Windows.

### *Paper I*

Reliability analyses of the Birchwood Insight Scale (IS) were performed by calculating the internal consistency (method of Cronbach's alpha) for the 3 subscales and the total score in patients with schizophrenia, bipolar I and bipolar II disorder. Bivariate correlations between the subscales were calculated using Pearson correlation tests.

### *Paper II*

Student t-tests for independent samples were used for examining statistical differences between the schizophrenia and the bipolar group on clinical variables (GAF, PANSS, IDS-C). A univariate analysis of variance (ANOVA) and post-hoc tests were employed when comparing the three groups (schizophrenia group, bipolar group and healthy controls) on age, gender distribution and BCIS subscale scores. The internal consistency for the two subscales was calculated as Cronbach's alpha, as well as the average correlation between each item and the remaining items within the subscale (corrected-item-total-correlation, CITC). Additionally, the subscale intercorrelation was estimated for each of the three groups. The correlation between the BCIS subscales and the PANSS insight item (G12) was calculated using Pearson correlation test.

### *Paper III*

A grouping variable based on the presence of four combinations of delusions and/or hallucinations (no delusions and no hallucinations (-D/-H), delusions and no hallucinations (+D/-H), delusions and hallucinations (+D/+H), and no delusions and hallucinations (-D/+H)) was computed. To test the main effect of this grouping variable on cognitive insight a multivariate analysis of variance (MANOVA) was employed with self-reflectiveness and self-certainty representing the multivariate outcome. As covariates, we used the grouping variable as well as the potential confounders gender, age, illness duration, and antipsychotic medication. Non significant covariates were removed. Cognitive insight was also analyzed univariately by analysis of variance (ANOVA) with the composite index as outcome. Similar tests as in the MANOVA were performed. Non linearity and interactions were assessed. Two null hypotheses were tested: Each group was no different from the average of the remaining 3 groups, and the 2 groups with delusions were no different from the 2 groups without delusions (similar for hallucinations). These hypotheses were tested using linear contrasts with Bonferroni correction for multiple testing.



#### *Paper IV*

Pearson correlation tests were used for investigating the relationship between BCIS subscales scores and neurocognitive test performance. A linear regression model was employed with the BCIS subscales self-reflectiveness and self-certainty representing the outcome - cognitive insight. To search for unique contributions in explained variance in self-reflectiveness and self-certainty potential confounders were statistically controlled. Selection of variables in the regression model was based on Pearson correlation tests between scores on the BCIS subscales and variables with assumed clinical importance. The independent variables in the regression model did not intercorrelate significantly, except for the relationships attention - full scale IQ ( $r=0.52$ ,  $p<0.001$ ) and insight of illness - depression ( $r=0.31$ ,  $p=0.002$ ). The independent variables were entered one at a time in the sequential regression analysis except for full scale IQ and verbal learning. To calculate the unique contribution by neurocognitive measures these independent variables were entered together in a final block (stepwise analysis). The model was examined for non-linear relationships between the independent and the dependant variables.

### 3 Results

#### PAPER I

The Birchwood Insight Scale (IS) forms three subscales compatible with the frequently used factors of insight of illness (i.e. awareness of illness, attribution of symptoms to illness and need for treatment). In this study the psychometric properties of the scale and levels of insight were examined in samples of patients with schizophrenia and bipolar I and bipolar II disorder. Except for “need for treatment” the IS subscales showed poor to marginal internal consistency, indicating that the usage of the instrument should be restricted to the total score. Nonetheless, we found that the IS total score works well for patients with schizophrenia and also for patients with the diagnosis of bipolar I disorder. However, for patients with bipolar II disorder the scale seems to work poorly. For validation purposes the relationship between the IS total score and the PANSS insight item was investigated. A moderate to high correlation was found for patients with schizophrenia ( $r=-0.54$ ,  $p<0.01$ ) as well as for patients with bipolar disorders ( $r=-0.49$ ,  $p<0.01$ ), indicating acceptable to good validity for both diagnostic groups. For patients with bipolar II disorder, however, a low to moderate correlation was found ( $r=-0.27$ ), indicating poor validity of the scale for this diagnostic group. The cut off score on the Birchwood Insight Scale (total) was set to 9 by the authors. In this study the mean IS total scores were similar in the groups with schizophrenia and bipolar I disorder, 8.2 and 8.5 respectively, reflecting a general attenuated clinical insight in the groups. Sixty-two % of the patients with schizophrenia and 56 % of the patients with bipolar I disorder had attenuated insight when applying the cut off defined by Birchwood and colleagues.

#### PAPER II

The internal consistency for the two subscales of the Beck Cognitive Insight Scale (BCIS), self-reflectiveness and self-certainty, was acceptable for the clinical groups of patients with schizophrenia and bipolar disorder, and also for healthy controls . The internal consistency was somewhat higher for self-reflectiveness than for self-certainty. However, the subscale of self-reflectiveness had items which were conceived differently among control subjects than among the patients. These items (3, 5, 6 and 15) contained statements which could be

interpreted as referring to psychotic experiences, and, therefore, were difficult to answer by control subjects. Thus, self-reflectiveness was split into component I, referring to pathological experiences, and component II comprising the remaining items. The mean score for component I was significantly lower for the controls than for both the schizophrenia and the bipolar group. The mean score for component II, however, was similar for the three groups. The scores of the control subjects cannot be compared to patient scores without excluding these items referring to psychotic experiences. Furthermore, the two subscales self-reflectiveness and self-certainty showed low or moderate intercorrelation for the patient groups (schizophrenia:  $r=-0.13$ ; bipolar disorders:  $r=-0.21$ ,  $p<0.05$ ).

### PAPER III

The relationships between delusions and hallucinations, occurring solitarily or concurrently, and cognitive insight as measured by the BCIS were investigated in patients with schizophrenia. A grouping variable was computed based on four combinations of the presence of delusions and/or hallucinations. A multivariate model (MANOVA) with both self-reflectiveness and self-certainty as outcomes was employed. The potential confounders gender, age, illness duration and antipsychotic medication were non-significant. The grouping variable was the only significant covariate ( $p = 0.0297$ ). Additionally, the group of patients with no delusions but with hallucinations (-D/+H) was the only group which was significantly different from the rest ( $p = 0.0076$ ). A univariate model (ANOVA) with composite index as outcome was also utilized. The same independent variables were entered in the model, and in the same way as in the multivariate model the grouping variable was the only significant covariate ( $p = 0.0034$ ). Two groups (-D/+H) and (+D/-H) were significantly different from the rest in the univariate model ( $p = 0.0018$  and  $p = 0.0124$  respectively). Both the multivariate and the univariate model showed that the two groups with delusions were significantly different from the groups without delusions (MANOVA: (-D/-H and -D/+H) vs (+D/-H and +D/+H):  $p = 0.0011$ ; ANOVA: (-D/-H and -D/+H) vs (+D/-H and +D/+H):  $p < 0.001$ ).

## PAPER IV

The study investigated the relationship between cognitive insight and neurocognition in a sample of patients diagnosed with schizophrenia. Pearson correlation tests were used for examining the relationship between BCIS subscales scores and neurocognitive test performance. A linear regression model was employed to calculate the explained variance in self-reflectiveness and self-certainty. Potential confounders were accounted for. In the present study we found significant negative correlations between self-certainty and both verbal learning and IQ. Though, only verbal learning added uniquely to the explained variance in self-certainty after contributions by insight of illness, depression and delusions had been taken into account. The contribution in explained variance of self-certainty was essentially unaltered before and after controlling for the clinical features. No association was found between self-reflectiveness and neurocognition.

## 4 Discussion

### 4.1 General methodology

#### 4.1.1 Representativity

In Norway, patients with psychotic disorders are treated in government funded specialized out and inpatients units within the catchment area based health care system. Thus, diagnostic distribution and treatment is not likely to be strongly biased for socioeconomic factors. The current study is part of a multisite study with participants from outpatient clinics, as well as intermediate and long-term treatment units. As the subjects were recruited from different parts of the treatment chain within specialized psychiatric care and inclusion proceeded over an extended period of time, patients exhibited diverse constellations of symptoms and symptom severity. Interviews were not carried out in destabilized psychotic patients and few subjects were recruited from acute treatment units. Inclusion of these patients took place after stabilization, presuming that they were able and willing to consent.

In studies of patients with psychotic disorders the question often emerges whether there is a selection bias in respect to symptomatology, so also in the current work. Few patients participated in this study with acute exacerbation and selection of patients with mild and moderate severity of symptoms cannot be ruled out. However, the research fellows involved in the current study had contact on a weekly basis with the clinicians in the psychiatric units giving thorough information to personnel and patients about the study, and, therein, seeking to reduce speculations concerning the content and aims of the research protocol. In addition, a high degree of researcher availability intended to prevent general skepticism towards the study and to facilitate recruitment of patients with a broad range in symptoms and functioning.

All patients gave informed consent before participating in the study. Due to legal restrictions set by the Personal Data Filing System Act we were not allowed to register the patients declining to participate. In the absence of such a registry the exact proportion of invited patients actually participating in the study cannot be assessed. Nonetheless, a part of the patients have declined after being invited and informed. A rough estimate of the percentage of patients who actively declined could be 10-15 % of all invited patients. Further concerns relevant to the subject of representativity are that a proportion of patients has not

been asked to participate due to extensive symptomatology, in particular acute psychotic symptoms, or because their capacity to consent was regarded as compromised. It is beyond the scope of this thesis, however, to address the complex issue of consent to participate in research at length. Although, a brief discussion of the relationship between the capacity to give informed consent and insight of illness is pertinent. The decision-making capacity, a term increasingly central to medical law and ethics, seems to be related to the capacity to consent in patients with psychosis (Carpenter, Jr. et al., 2000). Thus, generally, patients with impairments in decision-making capacity are less likely to participate in clinical studies. Such decision making capacity does not seem to be associated with psychopathology, but rather associated to insight of illness (Owen et al., 2009) and neurocognition (Carpenter, Jr. et al., 2000). These empirical findings seem to correspond with the clinical observations that a part of the patients with psychosis withdraw from both recommended diagnostics, treatment and, also, participation in clinical research. Patients with excessive symptom severity or compromised capacity to consent are mainly encountered in acute treatment units where they seem to make up a large proportion of patients with psychotic disorders, perhaps half or even more of the hospitalized patients. However, this multisite study with consistent patient inclusion over many years permits to recruit patients who were destabilized at one time in other stages of the illness. An estimated proportion of patients not being invited due to illness severity and consent issues is another 10-15 % of the patients with psychosis. Hence, a possible proportion of patients prevented from inclusion due to active decline, high symptom severity and compromised capacity to consent could be in the magnitude of 20-30 % of the patients with psychotic disorders. The number of participants in the studies of the thesis has been further restricted due to organizational reasons. Implementation of the insight measures was after the main study had been initiated, but, notably, the selection criteria remained the same.

The representativity of the schizophrenia samples in the current work was further investigated by comparing them with a reference group consisting of patients with schizophrenia and bipolar disorders receiving treatment in any psychiatric department within the Ullevål University Hospital. The level of global symptoms was similar in the samples of patients with schizophrenia and the reference group. In addition, a recent study comparing a mixed sample of patients with schizophrenia and bipolar disorder with this reference group found no significant differences on key demographic variables (Ringen et al., 2008). In conclusions, there is probably no systematic bias in the studies of the thesis, and the findings

can be generalized to patients with schizophrenia receiving treatment under ‘real life conditions’.

#### 4.1.2 Reliability of general assessments

Axis I diagnoses (DSM-IV) were established using the Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders (SCID-I). All interviewers participated in diagnostic evaluation meetings on regular basis and also completed a training course in SCID assessment. Reliability for the actual diagnostic interviews was assessed using a stratified random sample consisting of cases from each of the clinical raters involved. Vignettes rated by 2 experts blind to the study ratings demonstrated a high overall agreement for the diagnostic categories. Global Assessment of Functioning (GAF) Scale was used to measure global symptoms and psychosocial functioning. We found high inter rater reliability of both GAF and PANSS scores. The latter is of particular importance since the grouping variable in study 3 was built on the PANSS scores.

## 4.2 Main results

### 4.2.1 Psychometric properties of a clinical insight measure

Interview based instruments have been widely used in psychosis research, but during the last two decades the usage of self-reports has become more frequent. The scales applied in the current work, as well as most other self-rating scales, have a simple form, are easy to complete and are less time-consuming than rater-based scales. Self-reports may provide a better control for confounding variables conceivably inherent in the patient-examiner interaction (Young et al., 2003). Young et al. compared the interview based and self-report method in the assessment of clinical insight and postulated that the attendance of a rater may add many complexities to the process of self-reflection due to exacerbated cognitive problems (Young et al., 2003). The authors argue that this could be consistent with previous research showing that self-generated problem solving techniques (“scaffolding technique”) were robust and stable over time when compared to methods involving more direct participation by a researcher (Young and Freyslinger, 1995). In two studies comparing researcher rated insight measures and self-reports, significant correlations were found in

insight scores only when the self-reports were administered first (Jovanovski et al., 2007; Young et al., 2003). The authors offered the explanation that the presence of an active examiner aggravates cognitive problems as well as social skill deficits and that data are more reliable when the individual makes the initial decision regarding own beliefs without the social influence. Notably, these studies used the extensive rater based scale SUMD to assess insight. Whether these findings can be generalized to studies using an insight measure being part of a scale measuring symptom severity, such as the PANSS, is uncertain.

In the studies of this thesis we used the Birchwood Insight Scale (IS) consisting of 8 statements rated by the patient on a Likert scale. These items form three subscales compatible with the frequently used factors of *insight of illness* (i.e. awareness of illness, attribution of symptoms to illness and need for treatment). In the original study by Birchwood and associates reliability and validity was explored in a mixed psychiatric sample of 133 patients (Birchwood et al., 1994). The authors found that the 8 items of the self-rating scale could be accounted for by a common factor, therein obtaining acceptable construct validity. Cronbach's alpha was high to very high for the total scale, indicating good internal consistency for the scale on the whole. However, in order to gain knowledge about the utility of the IS for patients diagnosed with different psychotic disorders, we investigated its psychometric properties when applied to patients with bipolar I and II disorder, as well as schizophrenia in study I of this thesis. In bipolar I disorder and schizophrenia poor to modest internal consistency was found for the subscales "relabelling of symptoms" and "awareness of illness", whereas the internal consistency was even lower in the bipolar II group. For all diagnostic groups Cronbach's alpha was somewhat higher for the subscale "need for treatment" than for the other two subscales. Each of the IS subscales, however, consists of only 2-4 statements, and as Cronbach's alpha is a function of the number of items within the confined factor or subscale (Cortina, 1993), a somewhat deflated internal consistency would be expected. Moreover, the poor internal consistency of the IS subscales implies poor validity. This taken together with findings from the original study by Birchwood, showing high internal consistency for the total score, leads to the conclusion that the scale measures one dimension, and, subsequently, the usage of the IS should be restricted to the total score. Birchwood and colleagues also found an association between an interview based insight measure (Present State Exam, PSE, see introduction, 1.4.3, p. 18) and the IS total score. Consistent with this finding we found a moderate to high correlation between PANSS insight



measure and the total score of the IS for schizophrenia ( $r = -0.54, p < 0.01$ ) and bipolar I disorder ( $r = -0.49, p < 0.01$ ), indicating acceptable validity of the IS for both groups.

#### 4.2.2 Psychometric properties of the cognitive insight measure

##### *Applicability in schizophrenia and bipolar disorders*

Cognitive insight has recently been delineated and operationalized. In order to gain knowledge on the applicability of the cognitive insight measure, Beck Cognitive Insight Scale (BCIS), it is essential to investigate the psychometric properties of the scale. Beck and associates conducted a principal component analysis of the 15 items of the scale to determine if they constituted one or several factors. A two component solution displayed the simplest structure with all but one item loading saliently on one component as opposed to the other component. However, the principal component analysis does not provide enough evidence to conclude that these items are distributed in two factors (Cortina, 1993). To estimate the unidimensionality of the items we built on these potential factors and calculated their internal consistency (Cronbach's alpha), as well as the intercorrelation between the potential factors. Thus, the intercorrelation was used as a confirmatory analysis of dimensionality and the internal consistency indicated the strength of the factors for patients with schizophrenia and bipolar disorders. We found that self-reflectiveness and self-certainty were weakly or moderately intercorrelated in the two groups suggesting that they represent different dimensions (schizophrenia:  $r = -0.13$ ; bipolar disorders:  $r = -0.21, p > 0.05$ ). Alpha was essentially the same for the groups (schizophrenia: self-reflectiveness alpha = 0.72, self-certainty alpha = 0.63; bipolar disorder: self-reflectiveness alpha = 0.73, self-certainty alpha = 0.61; controls: self-reflectiveness alpha = 0.73, self-certainty alpha = 0.63). In general, the level of acceptable internal consistency is dependent on the decision being made with the scale. The finer the distinction that needs to be made, the better the reliability must be. In addition, a test used for individual judgment should be more reliable than one used for group decisions or research purposes (Streiner, 2003). There are two possible justifications for the distinction between usage for groups and individuals. First, the research will draw conclusions from a mean score averaged across many individuals, and the sample size will serve to reduce the error of measurement in comparison to group differences. Second, rarely will decisions related to research findings be made on the basis of a single study. Instead inferences are usually made on a series of replicated studies (Streiner, 2003). Although, there

are no rigid rules regarding the level of acceptable reliability, statisticians have given certain recommendations varying between 0.60 and 0.70. Nunnally recommended a minimum reliability of 0.70 when the scale is used in research, and 0.90 when the scale is used clinically (Nunnally, 1978). Similarly, Weiner and Stewart considered reliability coefficients in the range of 0.60 - 0.70 as acceptable for tests used in research where no decisions will be made that directly affect individuals (Weiner and Stewart, 1984).

The relationship between measures of cognitive and clinical insight has been studied in previous studies, as well as in study II of the thesis. A moderate correlation was found between the two, indicating that the BCIS represent a dimension different from insight of illness. However, to what degree the scale measures overconfidence in own beliefs and a person's capacity to evaluate own beliefs, is uncertain.

As the BCIS has rather recently been devised, there is, to our knowledge, no other instrument used in the assessment of cognitive insight to which it can be compared. This limits the possibilities for estimation of its validity. In study III we hypothesized that intact cognitive insight might reflect awareness of the voices' origin in patients with schizophrenia. However, on average patients with schizophrenia have relatively poor cognitive skills which in turn are likely to affect cognitive insight. Thus, whether cognitive insight (or the possible awareness of voices origin) should be considered a behavioral outcome of cognitive deficits in schizophrenia is undecided. Whether such an epiphenomenon is present could be examined by comparing delusional and non-delusional patients with schizophrenia or investigating attributional bias in patients with other diagnosis than schizophrenia (e.g. delusional disorder) (Menon et al., 2006).

In conclusions, building on the principal component analysis conducted in the original work by Beck and colleagues, suggesting the existence of two factors within the BCIS, the estimated internal consistency further indicates unidimensionality within each of the two subscales.

### *Applicability for non-psychotic subjects*

The similar scores on self-reflectiveness and self-certainty attained by the control subjects and the clinical groups were unexpected. However, among healthy controls the omission of items was higher for the self-reflectiveness subscale (14 %) than for self-certainty (3 %), indicating that the former subscale contained items which were conceived differently among

the control subjects than among the patients, which is understandable due to lack of psychotic experiences in this group. A closer investigation of scoring profiles disclosed a significantly lower score for controls than for the patient groups on a component of the self-reflectiveness subscale consisting of 4 items referring to psychotic experiences. This implies that comparison of scores between control subjects and patients should be carried out only for items of the scale without referral to psychosis. Although, presuming that the BCIS-ratings of the controls are compared with patients without psychotic symptoms, all items in subscale self-reflectiveness might be applicable for means of investigating relations between cognitive insight and other domains such as psychopathology. The two components within self-reflectiveness were fairly strongly correlated for all groups, and consequently, there was no clear indication that they constitute two separate dimensions.

#### 4.2.3 Cognitive insight – different, yet complementary to clinical insight

Clinicians frequently observe that patients with schizophrenia are able to detect the erroneous nature of beliefs held by others, but not when occurring within themselves. The ability to distance themselves from these distorted beliefs also seems to be impaired in these patients. Such self-evaluation and reflection upon own beliefs are not necessarily addressed by the concept insight of illness, which primarily focuses on aspects of clinical phenomenology essential for diagnosis and treatment. Cognitive insight is rooted in models for psychosis developed within the framework of cognitive psychology. These cognitive models have in particular been concerned with formation of delusions. Emphasis is put on the interplay between aberrant beliefs, (mis)interpretations and current experiences. These models also point out the significance of specific erroneous inferences in respect to frequency, degree of conviction and relative incorrigibility.

In keeping with cognitive theory Beck and Warman postulated a close interaction between delusions, information-processing and the capacity to view own interpretations objectively. In the clinical setting a patient suffering from delusions could accept the professionals' explanation of symptoms and convey agreement, though, this may or may not reflect a change in the underlying belief system. Misinterpretations are common also in individuals with non-psychotic disorders, such as patients with depression or panic disorder. Despite difficulty accessing previous experiences these patients often retain their capacity to reflect upon them and to recognize that their interpretations might have been wrong (Beck,

1985). In patients with psychosis, however, this capacity is frequently impaired. The designators of cognitive insight suggest that the patients' relative inability to distance themselves can be broken down to impairment of objectivity about cognitive distortions, loss of ability to put the distortions into perspective and resistance to corrective feedback from others, in addition to overconfidence in own interpretations and conclusions.

The relationship between insight of illness and cognitive insight has been investigated in a study by Pedrelli et al (2004). In a sample of middle aged and older patients with schizophrenia a significant positive association was found between self-reflectiveness and clinical insight as measured by Birchwood Insight Scale (total score), whereas no association was found between self-certainty and clinical insight (Pedrelli et al., 2004). Investigating a small subsample of patients Beck and associates found a strong negative association between self-reflectiveness and insight into delusions using the SUMD (Beck et al., 2004) (for details on SUMD see introduction, 1.4.3, p.18). In study II of the thesis the relationship between cognitive and clinical insight was assessed using Beck Cognitive Insight Scale (BCIS) and the rater based PANSS insight item. Self-reflectiveness was associated with high insight of illness and self-certainty was associated with poor insight of illness. Thus, the finding in the current study regarding self-reflectiveness and insight of illness is congruent with the finding in the study by Pedrelli et al., but the finding concerning self-certainty and insight of illness is inconsistent with their finding. It is important to note, however, that the levels of self-reflectiveness and self-certainty scores in the Pedrelli-study differ from the scores in the studies of the thesis. In the former study the mean scores were 12.5 (SD=5.8) and 7.2 (SD=3.1) respectively, where as in study II the scores were 14.5 (SD=4.8) and 8.2 (SD=3.4). The question then arises if these discrepancies are related to dissimilarities between the samples of the two studies. Sixty-nine % of the patients in the Pedrelli-study were male and the mean age was 53 years (SD=8, range: 40-77), where as in the current work 58-60 % of the patients with schizophrenia were male, and the mean age was 33 years (SD=10). Obviously, there is a large difference in mean age between the samples. The effect of age on cognitive insight, however, is uncertain. In study IV of this dissertation we found no association between self-reflectiveness and age ( $r=-0.09$ ) or between self-certainty and age ( $r=0.06$ ). To our knowledge the Warman-study is the only additional study which has investigated this relationship. In a small sample of patients with schizophrenia and schizoaffective disorder exhibiting current delusions and a mean age of 48.1 (SD=6.0), no association was found between self-reflectiveness ( $M=13.5$ ,  $SE=0.7$ , standard deviation not

presented) or self-certainty ( $M=8.6$ ,  $SD=2.9$ ) on the one hand and age on the other hand. The low statistical power in the study, however, increases the risk of running a type II error. In both the Pedrelli and in the Warman-study patients had relatively high mean age, in addition to low scores on self-reflectiveness and high scores on self-certainty. However, no conclusion on the relationship between age and cognitive insight can be drawn.

On the whole, the findings of the current study suggest that self-reflectiveness and self-certainty represent two distinct dimensions of cognitive insight which are only weakly to moderately related to insight of illness.

Table 4. BCIS subscale scores in previous studies and study II of the current work

Study		Self-reflectiveness	Self- certainty	Composite index
Beck et al.	Sch., n = 32	13.0 (5.0)	7.9 (3.8)	5.0 (5.8)
	SA dis., n = 43	13.3 (4.7)	6.5 (3.4)	6.6 (5.8)
Pedrelli et al., n =164		12.5 (5.8)	7.2 (3.1)	5.2 (5.8)
Warman et al., n = 49		11.7 (2.9)	6.8 (2.7)	4.9 (4.1)
Bora et al., n = 138		15.3 (4.4)	10.8 (3.1)	4.5 (6.0)
Engh et al. (study II), n = 143		14.5 (4.8)	8.2 (3.4)	6.3 (6.2) <sup>1</sup>

Sch., schizophrenia; SA, schizoaffective disorder. <sup>1</sup>Composite index is not applied in study II, but is presented in the thesis for means of comparison

#### 4.2.4 Delusions associated with poor cognitive insight

The close integration of delusions in the hallucinatory process has been shown in several studies (Hustig and Hafner, 1990; Liddle, 1987b). Most patients with schizophrenia have delusional explanations for their voices which have either developed over time or the hallucinations have been incorporated into pre-existing delusional ideas. It has been proposed that auditory verbal hallucinations arise from a problem with monitoring one's own thoughts (or inner speech) so that they are misidentified as external "voices". Hallucinating patients

with schizophrenia have been found to misattribute the source of self-generated speech to an external source to a larger degree than non hallucinating patients with the same diagnosis (Baker and Morrison, 1998; Morrison and Haddock, 1997). At the same time empirical findings suggest that the externalizing bias in patients with hallucinations is similar to the externalizing bias in patients with delusions (Young et al., 1987; Bentall, 1990). A study with experimental design showed that schizophrenia patients with delusions, but no hallucinations tended to attribute distorted voices in the same manner as patients with both hallucinations and delusions (Johns et al., 2001). In another experimental study where schizophrenia patients determined the source of self-generated speech (“self” or “others”), it was found that patients with delusions, either alone or in the combination with hallucinations, were very likely to present with speech misattribution. Patients’ identification of source as “other” was positively correlated with severity of delusions. The findings in these experimental studies indicate that the propensity to misattribute the source of hallucinations is related to the occurrence of delusions.

Cognitive insight is assessed with Beck Cognitive Insight Scale (BCIS) encompassing the two subscales self-reflectiveness and self-certainty. Self-reflectiveness entails the patients’ capacity and willingness to observe their mental productions and to consider alternative explanations, where as self-certainty addresses (over)confidence in own beliefs. Overall cognitive insight was assessed by the composite index and defined as the difference between the scores of self-reflectiveness and self-certainty. Calculation of the index score was based on the hypothesis that patients’ level of overconfidence about their beliefs would lessen the capacity to be self-reflective (Pedrelli et al., 2004). Possibly, this could represent a valuable tool for studying underlying factors related to delusions. Several studies have shown an excessively external attribution for negative events in deluded patients with schizophrenia or delusional disorder (Kinderman and Bentall, 1997; Bentall et al., 1991; Kaney and Bentall, 1989b), and the externalizing bias seems to be related to delusion’s formation. In study III of the thesis the hypothesis was put forward that overall cognitive insight could reflect the attribution of voices in patients with schizophrenia. High overall cognitive insight could yield the internalizing of the auditory hallucinations, whereas low cognitive insight could reflect an externalizing bias of voice hearing, each representing extremities on a continuum. Hence, cognitive insight might represent a link between delusions and hallucinations in patients with schizophrenia. However, on average patients with schizophrenia have poor cognitive skills which in turn are likely to affect cognitive insight (or the possible awareness of voices

origin). In study IV an association was found between cognitive insight and IQ and verbal learning (for further details see 4.2.6, p.56-57). Thus, whether cognitive insight should be considered a behavioral outcome of cognitive deficits in schizophrenia or a separate dimension is undecided.

We studied the relationships between cognitive insight and both delusions and hallucinations in subgroups of patients with different constellations of psychotic symptoms. Thus, the relationships between delusions and hallucinations, occurring solitarily or concurrently, and cognitive insight were investigated. We found that delusions irrespective of the presence or absence of hallucinations were associated with low self-reflectiveness and high self-certainty, reflecting low cognitive insight. The present results of low self-reflectiveness and high self-certainty in patients with delusions were expected because subjective certainty of judgment and not listening to counterarguments are implicit in the concept of delusions, and also in line with several but not all previous reports. Beck et al. reported a significant negative correlation between scores on PANSS delusions and self-reflectiveness, which is consistent with our findings (Beck et al., 2004). The authors also found a tendency toward a negative association between overall cognitive insight and both delusions and hallucinations. Our findings on the relationship between delusions and self-certainty are in accordance with the findings of Warman et al. (Warman et al., 2007), but the findings regarding delusions and self-reflectiveness are inconsistent. The questionable representativity of the patient sample and low sample size in the Warman-study indicates that the results should be interpreted with caution, as the authors discussed. Buchy et al. studied cognitive insight and delusions in a sample of 13 delusional and 53 non-delusional patients with first episode psychosis (Buchy et al., 2009b). In this recent study the authors found that participants with delusions exhibited higher self-reflectiveness, but similar self-certainty compared to participants without delusions. Buchy and associates suggest that the capacity to refrain from overconfidence may interact with delusions differently across the various phases of psychosis. The marked self-certainty in first-episode psychosis patients could then reflect the minimal feedback acquired regarding the false nature of their beliefs. All things considered, the findings in the current work is consistent with previous studies showing an association between delusions and overconfidence in own beliefs. Though, further studies are required on the topic of cognitive insight and formation of psychotic symptoms.

Findings from a recent study investigating first-episode-psychosis patients with structural MRI suggest an association between high self-certainty and low bilateral

hippocampal volumes (Buchy et al., 2009a), though, the relation to other cortical areas were not explored in the study. The involvement of the frontal lobes has also been postulated to be involved in self-evaluation. However, there is growing interest in the possible role of neural systems underlying the appraisal of the self and others. In an fMRI study investigating self-evaluation in healthy subjects, an activation was found in the dorsal and ventral medial prefrontal cortex and posterior cingulate gyrus (Johnson et al., 2002). The latter area appears to mediate an interaction between memory retrieval and emotion (Maddock, 1999). On the whole, further studies are required on self-appraisal, the formation of psychotic symptoms and neurobiological correlates.

#### 4.2.5 Solitary hallucinations possibly associated with high cognitive insight

In study III of the thesis the patient group with no delusions, but current hallucinations (-D/+H) was associated with high self-reflectiveness and low self-certainty, reflecting high cognitive insight, a finding that has not been reported earlier. It was anticipated that this group would have better cognitive insight than the remaining patients, but that these patients would be more cognitively insightful than the patients with neither delusions nor hallucinations (-D/-H) was surprising. However, this group consisted of only 15 individuals and due to the low statistical power a type I error cannot be ruled out.

Possibly, solitary hallucinations co-occurring with open-mindedness and high cognitive insight cannot be entirely explained by lack of delusional ideation. In general, hallucinations create increased ambiguity and incoherence that make delusional misinterpretations more likely. The most cognitively insightful and grounded individuals, however, might overcome the challenge of incorporating hallucinatory sensations into a reality-based interpretation of the world. Hence, (-D/+H) patients on average would be expected to be more insightful than (-D/-H) patients who have not had the challenge of incorporating hallucinated sensations into a reality-based interpretation of the world. In conclusion, the concurrence of hallucinations and no delusions is possibly associated with high overall cognitive insight.

Clinical characteristics and outcome have been explored in a small sample of patients with chronic auditory hallucinations and a sudden onset. Poor response to treatment with atypical antipsychotics was found (Mauri et al., 2006; Mauri et al., 2008). The authors suggest applying the diagnosis “Hallucinatory Disorder” and point out that further research



on this patient group could be conducted with less interfering effect of the other symptoms that characterize the clinical picture of schizophrenia. Thus, the investigation would be more closely connected to the hallucinatory phenomenon (Mauri et al., 2006). Efforts have also been made to characterize neurobiological correlates associated with hallucinations. White matter changes have been found in schizophrenia patients hearing voices (Hubl et al., 2004). These regions of alterations constitute the most important connections between language – related frontal and temporal regions. The aberrant connections may lead to abnormal activation in regions that normally process external acoustical and language stimuli (Hubl et al., 2004). In an fMRI study investigating schizophrenia patients with auditory hallucinations the pattern of neural activity was remarkably similar to what had been previously found in healthy volunteers imagining another person talking to them (auditory verbal imagery) (Shergill et al., 2000a). A paucity in the activation of a region in the frontal cerebral cortex (supplementary motor area, SMA) was found during auditory hallucinations. SMA is implicated in the deliberate generation of inner speech (Curtis et al., 1998; Shergill et al., 2000b). Shergill and coworkers speculated that patients' lack of awareness that inner speech has been generated, considered to be a critical deficit underlying auditory hallucinations, might be related to the altered cortical activation. A finding in another neuroimaging study indicated that the anterior cingulate cortex play a potential role in the formation of psychotic symptoms. Disturbances in the anterior cingulate cortex function seemed related to a specific alteration in the monitoring of own performance (Carter et al., 2001). The authors infer that this disturbance could be considered as a potential mechanism for psychotic symptoms in which putatively self-generated actions are attributed to an external agent, e.g., inner speech is mistaken for an external voice. Hence, in view of the possible attributional bias related to voice hearing it could be beneficial to investigate cortical activation in combination with cognitive insight in patients with solitary hallucinations.

#### 4.2.6 Verbal memory is related to cognitive insight

Cognitive insight and neurocognition appears to have a conceptual overlap, but whether this can be supported by empirical data has been scarcely investigated. In study II and III of the thesis we found that insight of illness and delusions correlated moderately with cognitive insight. In study IV these clinical features were considered to have potential confounding effect in the relationship between cognitive insight and neurocognition. Reports on the

relationship between depression and cognitive insight, however, have been somewhat inconsistent. A significant positive relationship has been found (Beck et al., 2004), but other authors did not report similar relationships (Pedrelli et al., 2004; Warman et al., 2007). Additionally, illness duration could confound the relationship between cognitive insight and neurocognition in schizophrenia.

We found no association between self-reflectiveness and neurocognitive test performance in the fourth study of the thesis. Self-certainty, on the other hand, showed a significant negative correlation with both verbal learning and IQ. The common denominator of the items in Self-certainty is “confidence in own beliefs”. As flexibility of thought and use of corrective feedback are essential to general intellectual abilities a negative association between self-certainty and IQ was anticipated. A significant negative correlation was found between the two; yet, IQ did not contribute uniquely to self-certainty when controlling for insight of illness, depression and delusions. Verbal learning, on the other hand, made a specific contribution in explaining self-certainty independently of potential confounders. Hence, our data suggests that the role of verbal learning impairments on “confidence in own beliefs” is not confounded by insight of illness, depression or delusions. Interestingly, in a study by Brebion and colleagues depression seemed to be the main predictor of verbal memory (Brebion et al., 2001). This finding taken together with the significant negative correlation between depression and self-certainty found in study IV of the dissertation further underscores the association of verbal learning to self-certainty. The contribution by verbal learning is almost unaltered before and after controlling for the clinical features. The findings in study IV may lead to some speculations about the relationship between verbal learning and self-certainty. Possibly, a level of immediate learning is needed to evaluate own aberrant ideas and to apply self-correction strategies. Individuals with impairments in verbal learning may have difficulties with the continuous comparison and adjustment between acquired learned material and held beliefs, and, thus, alternative explanations may not be sufficiently facilitated causing enhanced restricted bias towards oneself.

The relationship between cognitive insight and neurocognition was studied in 60 patients with first episode psychosis (Lepage et al., 2008; Buchy et al., 2009a), and verbal learning and memory was positively associated with self-reflectiveness and negatively associated with self-certainty. Hence, our findings are in line with the previously found negative association between self-certainty and verbal learning and memory, but inconsistent with the finding regarding self-reflectiveness and verbal learning and memory. Further, we

found that cognitive insight scores were not associated with duration of illness. Thus, a comparison of the two studies should not be restricted by the difference in mean illness duration. However, the sample size of the Buchy-study indicates rather limited statistical power and inferences cannot be drawn. To our knowledge the study IV of the thesis is the first report on cognitive insight and neurocognition taking other clinical characteristics into account, and these findings need replication.

### **4.3 Strengths and limitations of the study**

The studies of this thesis have several strengths. The naturalistic and cross-sectional study design with sustained multisite recruitment of outpatients and inpatients from acute, intermediate and long-term treatment units over a long period of time facilitated inclusion of patients with broad psychopathology. The inclusion criteria were fairly wide, and patients in the study were well-characterized and the clinical data had high reliability. Overall, the samples of the study consisted of ethnically homogenous, relatively young patients with an even gender distribution and low mean illness duration. Therein, the frequently encountered methodological issues of chronicity and institutionalization in patients participating in clinical research were minimized.

In the study we found high overall agreement for the diagnostic categories. The inter-rater reliability was high for both PANSS and GAF scores. Further, the psychometric properties of the clinical instruments used in both the assessment of clinical and cognitive insight were tested in the first part of the current work, allowing clarification of methodological strengths and weaknesses at an early stage of the research. In the somewhat explorative approach of study III and IV, addressing relationships between cognitive insight and clinical dimensions, one could then make use of, on the one hand, clinical measures with established reliability such as the PANSS, on the other hand, draw on more recently developed measures characterized through own research. The assessment of patients on various clinical features pivotal to schizophrenia enabled us to make use of a model of the cognitive insight-neurocognition relationship taking potential confounding factors into account.

There are also several limitations in the current work. The relationship between measures of clinical and cognitive insight has been examined in previous studies, as well as

in study II of the thesis. A moderate correlation was found between the two, indicating that the BCIS represent a dimension different from insight of illness. Though, as there is no golden standard or even no other instrument to apply for means of comparison the validity of the BCIS cannot be estimated. In study III we hypothesized that intact cognitive insight might reflect awareness of the voices' origin in patients with schizophrenia. Patients with solitary hallucinations might represent a subgroup of patients with better insight of illness and less negative symptoms. Due to low statistical power neurocognitive performance could not be further investigated in this subgroup. Outcome measures such as employment, education or social adjustment have not been assessed in the group of patients with solitary hallucinations or in any of the other three clinical subgroups in study III. The relationship between cognitive insight and neurocognition addressed in study IV was not investigated in a healthy control group, thus, it is difficult to make inferences on the specificity of the findings. The relationship between personality traits and cognitive insight has not been approached in the thesis.

#### **4.4 Implications**

As cognitive insight has been operationalized quite recently the research in this field is not conclusive. Nonetheless, cognitive insight seems to be a dimension complimentary to the clinically established insight of illness. Clinical insight has especially demonstrated its usefulness in the evaluation of patients' adherence to treatment. However, after three to four decades of research its diagnostic use and also the relationship to central features in schizophrenia are still uncertain.

The studies of this dissertation suggest the feasibility of cognitive insight in the evaluation of psychotic beliefs and experiences in patients with schizophrenia and bipolar I disorder. The initial work of endorsing the psychometric properties of the cognitive insight measure (BCIS) has been followed by exploring the relationship between cognitive insight and clinical characteristics in schizophrenia. Hence, the studies in this thesis contribute to a methodological and also a phenomenological basis for the utility of cognitive insight in clinical settings. The findings are suggestive of a moderate association between cognitive insight and central characteristics in schizophrenia such as delusions, verbal learning and insight of illness. Previous research in patients with delusions has indicated that the "possibility of being mistaken" about their delusional beliefs could be predictive of

improvement in Cognitive Behavioral Therapy (Garety et al., 1997). At a conceptual level the “possibility of being mistaken” reflects mental flexibility as part of cognitive insight. In a treatment intervention study patients with schizophrenia who received “treatment as usual” plus (cognitive behavioral) social skills training showed greater cognitive insight after treatment than the patients in the “treatment as usual” group (Granholtm et al., 2005). The authors inferred that cognitive insight is a possible mediator of positive symptom outcome in cognitive behavioral therapy. Taken together with our findings the group of schizophrenia patients exhibiting no current delusions and the group with solitary hallucinations might be relatively apt to improve their course of illness.

Cognitive insight seems to contribute to our understanding of reasoning and decision-making in patients with psychotic symptoms. We found that the evaluation of both delusions and hallucinations is essential when appraising reasoning style. Delusions are interlinked with poor cognitive insight, whereas the occurrence of solitary hallucinations is possibly associated with high cognitive insight. In the absence of longitudinal data, however, patients’ potential to improve their cognitive insight is not known. Nonetheless, our findings suggest that a detailed description of both current delusions and hallucinations is useful when seeking to understand aberrant beliefs, experiences and cognitions. In patients with auditory hallucinations the level of cognitive insight may indicate whether the voices are externally attributed, but more research involving cognitive insight and also the externalizing bias – cognitive insight relationship is clearly needed. Moreover, impairments in verbal learning seem to be connected with poor reasoning style, but, again, more studies are required before drawing conclusions.

## **4.5 Future research**

Patients may become depressed if considering themselves as mentally ill or psychotic. This clinical observation is underscored by empirical findings showing that improvement of clinical insight in patients with psychosis coincide with increased depression. Nonetheless, we found that cognitive insight was not associated with depression. Treatment approaches targeting the reasoning style may lead to an increased understanding of the psychotic experience, while possibly decreasing the depression. The underlying mechanisms for these relationships should be studied in future research. In the current work we found that the measure of clinical insight (Birchwood Insight Scale) could not be applied in the assessment

of different insight dimensions. Thus, the relationship between these dimensions and self-reflectiveness and self-certainty has not been sufficiently investigated in the studies of this thesis. It has been suggested that relabelling of symptoms may be more universal or hard-wired than the other dimensions of clinical insight, and, thus, perhaps related to self-monitoring (David and Kircher, 2003). The relations between clinical insight, cognitive insight and self-monitoring need to be addressed in future investigations.

The contributions of reasoning styles have been extensively studied in the formation and retention of delusions. However, the frequent co-occurrence of delusions and hallucinations has facilitated theories of common pathways in the symptom formation. Investigating attributional bias in patients hearing voices could be one way of addressing such a possible interlink. We have suggested that cognitive insight taking the individual's reflection upon own unusual experiences and judgment, as well as overconfidence in beliefs into account could be a fruitful approach in acquiring further knowledge on the formation of psychotic symptoms. However, an important next step would be to clarify the relations between cognitive insight, self-monitoring and approaches of attributional bias. The role of these features in the formation of hallucinations and delusions could be further explored using neuroimaging techniques.

Patients with solitary hallucinations showed high clinical insight and few negative symptoms, however these clinical characteristics were not significantly different from the other 3 groups with different constellations of psychotic symptoms. Insight of illness and psychopathology, in addition to neurocognitive performance in patients with hallucinations and/or delusions should be addressed in future studies, preferably in a large sample of patients with schizophrenia.

We found that high self-certainty is associated with poor verbal learning. The neural correlates of cognitive insight have to our knowledge been explored in one neuroimaging study, suggesting that cognitive insight is related to cortical changes in areas essential for memory. The authors found that low self-certainty is related to diminished bilateral hippocampal volumes (Buchy et al., 2009a) - a finding which seems consistent with the results in our study, but this research also needs replication.

Whether cognitive insight represents a "trait" or "state" phenomenon is not known. Longitudinal studies could contribute to gain knowledge about how and to what degree cognitive insight changes with current symptom load, or is stable over time. Implementation of functional outcome measures, as well as assessments of psychopathology in future long-

term treatment studies could represent important steps to clarify whether cognitive insight can predict improvement in psychotic symptoms.

## 5 Conclusions

- Acceptable psychometric properties were obtained for the sum score of Birchwood Insight Scale - a self-report used in the assessment of clinical insight - when applied to patients with schizophrenia and bipolar I disorder. For patients with bipolar II disorder the scale seemed to work poorly.
- The level of insight was similar in patients with schizophrenia and bipolar disorder.
- Beck Cognitive Insight Scale (BCIS) - a self-report measuring cognitive insight – showed acceptable psychometric properties for patients with schizophrenia and bipolar disorders. The level of cognitive insight was similar in the two patient groups. Healthy controls cannot be compared to patient scores without excluding items referring to psychotic experiences. The BCIS subscales, self-reflectiveness and self-certainty, showed low or moderate intercorrelation for patients with schizophrenia and bipolar disorders, as well as control subjects, indicating that they represent two different dimensions of cognitive insight.
- Delusions irrespective of the presence or absence of hallucinations were associated with low self-reflectiveness and high self-certainty, reflecting low cognitive insight.
- A subgroup of patients with schizophrenia exhibiting solitary hallucinations seemed to have high cognitive insight.
- Low self-certainty was associated with high IQ and verbal learning in schizophrenia. Verbal learning made a specific contribution in explaining self-certainty also when potential confounders were taken into account.



## 6 Errata

Under *Summary of study, page 7, last paragraph*, it is written “..low cognitive insight is associated with high IQ and low verbal learning”. The word high should be replaced with low. The correct wording is: “..low cognitive insight is associated with low IQ and low verbal learning”.

In paper 3 under *Material and Methods, Participants, page 2, paragraph 1*, it is written: “From May 2003 through July 2007, the present study was conducted in outpatient and inpatient psychiatric units at 4 University Hospitals in Oslo..”. The period of patient recruitment is incorrect and should be replaced by the period March 2005 through July 2007.

Oslo, January 2011  
John A. Engh

## 7 References

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## Appendix

Figure 1. Birchwood Insight Scale (IS)

	<b>Agree very much</b>	<b>Agree</b>	<b>Unsure</b>	<b>Disagree</b>	<b>Disagree very much</b>
1. Some of the symptoms were made by my mind					
2. I am mentally well					
3. I do not need medication					
4. My stay in hospital was necessary					
5. The doctor is right in prescribing medication for me					
6. I do not need to be seen by a doctor or psychiatrist					
7. If someone said I had a nervous or mental illness then they would be right					
8. None of the unusual things I experienced are due to an illness					

Figure 2. Beck Cognitive Insight Scale (BCIS)

	Do not agree at all	Agree slightly	Agree a lot	Agree completely
<p><b>Self-reflectiveness</b></p> <p>1. At times I have misunderstood other people’s attitudes towards me</p> <p>3. Other people may be more objective about the cause of my unpleasant experiences than I am.</p> <p>4. I have jumped to conclusions too fast.</p> <p>5. Some of my experiences that seemed very real may have been due to my imagination.</p> <p>6. Some of the ideas that I was certain were true turned out to be false.</p> <p>8. Even though I feel strongly that I was right I could be wrong.</p> <p>12. If somebody points out that my beliefs are wrong I am willing to consider it.</p> <p>14. There is often more than one possible explanation for why people act the way they do</p> <p>15. My unusual experiences may be due to me being extremely upset or stressed.</p>				
<p><b>Self-certainty</b></p> <p>2. My interpretations of my experiences are definitely right.</p> <p>7. If something feels right, it means that it is right.</p> <p>9. I know better than anyone else what my problems are.</p> <p>10. When people disagree with me, they are generally wrong.</p> <p>11. I cannot trust other people’s opinion about my experiences.</p> <p>13. I can trust my own judgement at all times.</p>				













## Measuring cognitive insight in schizophrenia and bipolar disorder: a comparative study

John A Engh<sup>\*1,2</sup>, Svein Friis<sup>1,2</sup>, Astrid B Birkenaes<sup>1,2</sup>, Halldóra Jónsdóttir<sup>1,2</sup>, Petter A Ringen<sup>1,2</sup>, Torleif Ruud<sup>4</sup>, Kjetil S Sundet<sup>3</sup>, Stein Opjordsmoen<sup>1,2</sup> and Ole A Andreassen<sup>1,2</sup>

Address: <sup>1</sup>Division of Psychiatry, Ullevål University Hospital, Oslo, Norway, <sup>2</sup>Institute of Psychiatry, University of Oslo, Norway, <sup>3</sup>Institute of Psychology, University of Oslo, Oslo, Norway and <sup>4</sup>Akershus University Hospital and University of Oslo, Oslo, Norway

Email: John A Engh\* - john.ENGH@medisin.uio.no; Svein Friis - svein.friis@medisin.uio.no; Astrid B Birkenaes - a.b.birkenaes@medisin.uio.no; Halldóra Jónsdóttir - halldora.jonsdottir@medisin.uio.no; Petter A Ringen - p.a.ringen@medisin.uio.no; Torleif Ruud - torleif.ruud@sintef.no; Kjetil S Sundet - k.s.sundet@psykologi.uio.no; Stein Opjordsmoen - o.s.e.ilner@medisin.uio.no;

Ole A Andreassen - o.a.andreassen@medisin.uio.no

\* Corresponding author

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### Abstract

**Background:** Beck Cognitive Insight Scale (BCIS) has been designed for assessment of self-reflection on patients' anomalous experiences and interpretations of own beliefs. The scale has been developed and validated for patients with schizophrenia. We wanted to study the utility of the scale for patients with bipolar disorder. The relationship between the BCIS as a measure of cognitive insight and established methods for assessment of insight of illness was explored in both diagnostic groups.

**Methods:** The BCIS self-report inventory was administered to patients with schizophrenia (n = 143), bipolar disorder (n = 92) and controls (n = 64). The 15 items of the inventory form two subscales, *self-reflectiveness* and *self-certainty*.

**Results:** The internal consistency of the subscales was good for the patient groups and the controls. The mean subscale scores were not significantly different for the three groups. Four items in subscale *self-reflectiveness* referring to psychotic experiences gave, however, different results in the control subjects. *Self-certainty* and scores on insight item PANSS correlated significantly in the schizophrenia, but not in the bipolar group.

**Conclusion:** BCIS with its two subscales seems applicable for patients with bipolar disorder as well as for patients with schizophrenia. The self-report inventory can also be applied to control subjects if the items referring to psychotic experiences are omitted. In schizophrenia high scores on *self-certainty* is possibly associated with poor insight of illness. For the bipolar group the subscales are largely independent of traditional insight measures.

### Background

Insight of illness is an important aspect in diagnostics and

treatment of patients with severe mental disorders. Focus has primarily been on awareness of illness and treatment

needs based on the widely used definition by Anthony David [1]. Aaron T. Beck labeled this *clinical insight* [2]. In addition to attenuated clinical insight, patients with psychosis often have reduced capacity to reflect rationally on their anomalous experiences and to recognize that their conclusions are incorrect [2]. Beck termed such insight *cognitive insight*. He summarized the relevant components of this concept as "impairment of objectivity about the cognitive distortions, loss of ability to put these into perspective, resistance to corrective information from others and overconfidence in conclusions [2]."

To measure cognitive insight, he developed the Beck Cognitive Insight Scale (BCIS), a 15 item self-report instrument with two subscales, self-reflectiveness and self-certainty (Beck 2004). Acceptable levels of internal consistency (alpha self-reflectiveness 0.68, alpha self-certainty 0.60) were found for a mixed sample of patients with schizophrenia, schizoaffective disorder and major depression [2]. For middle-aged and older patients with schizophrenia and schizoaffective disorder, acceptable internal consistency was later confirmed for self-reflectiveness (alpha 0.70), but not for self-certainty (alpha 0.50) [3].

The introduction of the BCIS has provided an opportunity to explore cognitive insight among patients with schizophrenia. Beck and colleagues recruited 150 inpatients, 75 diagnosed with schizophrenia and schizoaffective disorder and 75 with major depressive disorder. Twenty-one per cent in the latter group had psychotic depression. The authors [2] showed that the subscale self-certainty differentiated between major depressive patients with and without psychosis. However, the BCIS has not yet been validated for patients with bipolar I and bipolar II disorder, in whom lack of insight may also be a major clinical problem. We have earlier demonstrated that a self-report questionnaire assessing insight of illness with good psychometric properties for patients with schizophrenia may not necessarily function as well for patients with bipolar disorders [4]. It is therefore important to study the psychometric qualities of the BCIS also for this patient group. Self-reflectiveness and self-certainty comprise items that seem to be rather general in content. Possibly, the two subscales cover a spectrum from normality to pathology. Warman *et al.* [5] have recently published an article which points out that the factor loadings and internal consistencies of the BCIS were similar for healthy controls and the two groups of inpatients in Beck's original paper. We intended to replicate the investigation of the subscales' utility for normal controls.

The aims of the present study were: 1) to examine the subscale scores, internal consistency and intercorrelation of the BCIS' subscales for the schizophrenia group, the bipolar group and for normal controls, 2) to explore the rela-

tionship between the BCIS and affective symptom scores, and established scales for assessment of insight for the two diagnostic groups, and 3) to compare mean scores for patients and controls.

## Methods

The subjects participated in a large ongoing study on schizophrenia and bipolar disorders (TOP Study, Thematic Organized Psychoses Research) and were recruited from out-patient and in-patient psychiatric units at four University Hospitals in Oslo, Norway, from March, 2005 through July, 2007. The health care system is catchment area based and the patients are referred from primary care. The patients were invited to participate in the study by the clinician responsible for their treatment.

All participants gave written informed consent, and the study was approved by the Regional Committee for Medical Research Ethics and the Norwegian Data Inspectorate.

## Participants

The inclusion criteria were as follows: age 18 to 65 years, able to understand and speak a Scandinavian language, meeting the DSM-IV criteria for schizophrenia, schizoaffective, schizophreniform or bipolar disorder, no history of severe head trauma, IQ score of above 70 and willing and able to give informed consent. A total of 235 patients met the criteria. The schizophrenia group consisted of 143 patients with the DSM-IV diagnoses schizophrenia ( $n = 107$ ), schizophreniform disorder ( $n = 10$ ), and schizoaffective disorder ( $n = 26$ ). Ninety-two patients were included in the bipolar group, diagnosed with either bipolar I disorder ( $n = 45$ ), bipolar II disorder ( $n = 43$ ) or bipolar NOS ( $n = 4$ ). Sixty-four healthy subjects took part in the control group. Twenty-seven of these individuals were randomly selected from statistical records from the same catchment area as the patients. The remaining 37 persons were a mixed group of volunteering professionals. Detailed analyses of the subscale scores and intra class correlation showed similar results in the two control samples, and hence we refer only to one control group in this article.

Diagnosis was established using the Structured Clinical Interview for DSM-IV-TR-axis I disorders (SCID-I) [6]. All interviewers finished a training course in SCID assessment based on the training program at UCLA [7] and participated in diagnostic evaluation meetings on regular basis led by a clinically experienced professor in psychiatry (S.O.). Mean overall kappa for SCID diagnoses assessed by the UCLA was 0.77 (95 % CI: 0.60–0.94).

**Measures**

*General assessments*

History of mental illness, present symptoms, life style, and pharmacological treatment were obtained from interview with the patient, with additional information collected from treatment records and clinical staff. Severity of symptoms was assessed by the Positive and Negative Syndrome Scale PANSS (PANSS) [8], the Young Mania Rating Scale-Clinician rated (YMRS-C) [9] and the Inventory of Depressive Symptoms-Clinician rated (IDS-C) [10]. The assessment of depression was conducted partly with the Inventory of Depressive Symptoms-Clinician rated (IDS-C), partly with CDSS (Calgary Depression Scale), but only the former scores are utilized in the study. Hence, there is a discrepancy between the number of patients with IDS scores and the number of patients with other symptom scores (PANSS, YMRS). Psychosocial functioning was measured by the Global Assessment of Functioning Scale (GAF) [11,12], and the scores were split into scales of symptoms (GAF-S) and function (GAF-F) to improve psychometric properties. The inter-rater reliability of the

investigators was good for the GAF with an intra class correlation, ICC 1.1, of 0.86 [13].

*Assessment of cognitive insight and insight of illness*

The BCIS is a self-report inventory consisting of 15 statements rated on a 4-point Likert scale (0 = do not agree at all to 3 = agree completely). Based on factor analyses Beck and coworkers divided the 15 items into 2 subscales (Figure 1). The first component consisted of 9 items measuring objectivity, reflectiveness and openness to feedback and given the label *self-reflectiveness*. Under the umbrella of decision-making and resistance to feedback, 6 items were united in a second component of the scale, labeled *self-certainty*. High scores on the subscale self-reflectiveness and low scores on subscale self-certainty is considered as normal. With approval from the authors the inventory was translated from English into Norwegian and the procedure was reversed under blinded conditions back into English. The questionnaire was administered without a time limit.

	Do not agree at all	Agree slightly	Agree a lot	Agree completely
<p><b>Self-reflectiveness</b></p> <p>1. At times I have misunderstood other people's attitudes towards me</p> <p>3. Other people may be more objective about the cause of my unpleasant experiences than I am.</p> <p>4. I have jumped to conclusions too fast.</p> <p>5. Some of my experiences that seemed very real may have been due to my imagination.</p> <p>6. Some of the ideas that I was certain were true turned out to be false.</p> <p>8. Even though I feel strongly that I was right I could be wrong.</p> <p>12. If somebody points out that my beliefs are wrong I am willing to consider it.</p> <p>14. There is often more than one possible explanation for why people act the way they do</p> <p>15. My unusual experiences may be due to me being extremely upset or stressed.</p>				
<p><b>Self-certainty</b></p> <p>2. My interpretations of my experiences are definitively right.</p> <p>7. If something feels right, it means that it is right.</p> <p>9. I know better than anyone else what my problems are</p> <p>10. When people disagree with me, they are generally wrong.</p> <p>11. I cannot trust other people's opinion about my experiences.</p> <p>13. I can trust my own judgment at all times.</p>				

**Figure 1**  
BCIS subscales.

Insight of illness was assessed for both diagnostic groups by the PANSS insight item (G12) [14]. A score of three or higher was defined as poor insight of illness.

**Patient characteristics**

Table 1 gives an overview of demographic and clinical characteristics for the two patient groups. The proportion of men in the schizophrenia group was significantly larger than in the control group. Subjects in the schizophrenia group were significantly younger than the bipolar patients. Additionally, the subjects in the schizophrenia group had significantly higher scores on symptom measures (PANSS delusions, PANSS hallucinations, PANSS pos., PANSS neg., PANSS total) and also larger variability than in the bipolar group. Sixty-four of the patients in the schizophrenia sample (44.8 per cent) obtained scores above cut off (4 or higher) on items PANSS delusions and/or PANSS hallucinations, where as only 4 patients in the bipolar sample (4.3 per cent) attained scores above cut off. Similarly GAF-S and GAF-F were significantly lower in the schizophrenia group than in the bipolar group, with mean scores in the schizophrenia group reflecting a symptom level bordering psychosis. The variance for both GAF-measures was lower in the schizophrenia group. The mean score on G12 was significantly higher in the schizophrenia group than in the bipolar group, pointing toward poorer insight of illness in the former group. Fifty per cent of the patients in the schizophrenia group and 14 per cent of the bipolar patients obtained G12 scores reflecting poor insight of illness.

**Statistics**

For the statistical analysis we used SPSS version 13. Student-t-test was utilized for examining statistical significance between the two patient groups on clinical variables. ANOVA and post-hoc tests were used when

comparing all three groups on age and gender distribution, in addition to comparison of BCIS scores.

Few patients had missing data on the BCIS. The missing items were scattered on the various items in both subscales. On the average there were 1.5 total missing registrations per item for each of the patient groups. For the controls there was a clear difference between the subscales, as 14.3 % had omitted self-reflectiveness items, but only 3.1 % had left out self-certainty items. For PANSS total and YMRS total score there were 2 and 1 missing registrations respectively in the schizophrenia sample and 1 and 4 in the bipolar sample.

The internal consistency for the two subscales was calculated as Cronbach's alpha for the two diagnostic groups and for the controls. We followed the recommendations by Nunally that a satisfactory alpha equals or is higher than 0.70 [14].

The average correlation between each item and the remaining items within the subscale (corrected item total correlation, CITC) was also calculated. Furthermore, we computed the subscale intercorrelation for the different diagnostic groups. Finally, self-reflectiveness and self-certainty of the BCIS were correlated with scores on the G12 using the Pearson correlation test.

**Results**

**Psychometric properties and scale scores of the BCIS**

As shown in Table 2 alpha for self-reflectiveness was the same for all groups. Alpha for self-certainty, displayed in Table 3, was somewhat lower, but equally consistent across groups.

We found no significant difference in mean scores for self-reflectiveness or self-certainty in any of the groups. Addi-

**Table 1: Demographic and clinical variables**

	Schizophrenia (1) n = 143	Bipolar disorder (2) n = 92	Controls (3) n = 64	1 vs. 2	1 vs. 3	2 vs. 3
Male	83 (58.0)	40 (43.5)	25 (39.1)	n.s.	<0.05	n.s.
Age	32.5 (9.5)	37.2 (11.4)	33.7 (11.7)	<0.05	n.s.	n.s.
GAF-S	42.8 (11.4)	61.2 (12.1)		<0.001		
GAF-F	43.8 (10.9)	61.6 (14.3)		<0.001		
PANSS delusions	3.0 (1.7)	1.4 (0.9)		<0.001		
PANSS hallucinations	2.6 (1.7)	1.2 (0.8)		<0.001		
PANSS pos	14.7 (5.9)	9.1 (2.9)		<0.001		
PANSS neg	14.4 (5.5)	10.1 (3.7)		<0.001		
PANSS total	58.3 (16.6)	43.6 (10.9)		<0.001		
IDS-C total	17.0 (12.5)	15.8 (12.6)		n.s.		
PANSS insight	2.6 (1.5)	1.5 (1.0)		<0.001		

Male, per cent in parenthesis; for other variables, standard deviation in parenthesis; GAF-S, Global Assessment of Functioning – Symptom scale; Global Assessment of Functioning – Function scale; PANSS, Positive and Negative Syndrome Scale, delusions item, hallucinations item, positive symptoms subscale, negative symptoms subscale, total score; IDS-C, Inventory of Depressive Symptoms Scale-Clinician and PANSS insight item.



**Table 2: Internal consistency**

	Schizophrenia n = 143		Bipolar disorder n = 92		Controls n = 64	
	Cronbach's alpha	CITC	Cronbach's alpha	CITC	Cronbach's alpha	CITC
<b>Self-reflectiveness</b>	0.72	0.39	0.73	0.40	0.73	0.41
<b>Self-certainty</b>	0.63	0.36	0.61	0.35	0.63	0.38

CITC, Corrected Item Total Correlation

tionally, both subscales showed similar variance in all groups.

**BCIS subscales divided according to content**

The similar subscale scores attained in all groups was unexpected. An obvious question would be if the statements in the various items were understood differently by the groups. The high percentage of self-reflectiveness items omitted by the controls indicated that the subscale contained items which were conceived differently among these subjects than among the patients. We found that item 3, 5, 6 and 15 were left out to a large degree and that these items consisted of statements which could be interpreted as referring to psychotic experiences and, therefore difficult to answer by the control subjects. Self-reflectiveness was split into *component I*, consisting of these pathological experiences, and *component II* comprising the remaining items. As shown in Table 4 the mean score for component I was significantly lower for the controls than for both the schizophrenia and the bipolar group. The correlations between the mean scores of the two components were 0.55, 0.40 and 0.52 for the schizophrenia group, the bipolar group and controls respectively, indicating moderate to strong relationships.

**Relationship between scores on BCIS and psychopathology**

There was no significant association between self-reflectiveness and YMRS total score or between self-reflectiveness and IDS total score in schizophrenia. For Self-certainty, however, we found a significant relationship to YMRS total score in this group. We did not find a significant association between any of the BCIS subscales and

these measures of affective symptoms in the bipolar group. The relationship between the BCIS subscales and PANSS positive in the bipolar group was also nonsignificant.

Sixteen of the subjects diagnosed with bipolar disorder reported one or more previous psychotic episodes. These subjects attained scores on component I and II which were similar to the scores in the group of remaining subjects in the bipolar sample.

We wanted to investigate if there was a difference in self-reflectiveness and self-certainty scores between inpatients and outpatients. In a subsample of 78 schizophrenia patients no difference was found on self-reflectiveness or self-certainty scores. There were very few hospitalized bipolar patients and hence the comparison was unfeasible.

**Comparing BCIS and measures of insight**

As displayed in Table 5 and 6 the correlation between self-reflectiveness and self-certainty was low for the schizophrenia group and significant for the bipolar group.

We calculated the correlation between self-reflectiveness, self-certainty and G12 score and found a highly significant positive correlation between self-certainty and G12 for schizophrenia.

**Discussion**

The main finding was that the psychometric properties of both subscales of the BCIS were acceptable for the schizophrenia and for the bipolar group. The scores of the con-

**Table 3: Subscale scores**

	Schizophrenia (1)			Bipolar disorder (2)			Controls (3)			I vs. 2	I vs. 3	2 vs. 3
	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.			
<b>Self-reflectiveness</b>	143	14.5	4.8	92	14.7	4.7	64	13.4	4.3	n.s.	n.s.	n.s.
<b>Self-certainty</b>	143	8.2	3.4	92	7.4	3.0	64	8.0	2.7	n.s.	n.s.	n.s.

S.D., standard deviation.

**Table 4: Self-reflectiveness divided in two components.**

	Schizophrenia (1)			Bipolar disorder (2)			Controls (3)			I vs 2	I vs 3	2 vs 3
	N	Mean pr item	SD	N	Mean pr item	SD	N	Mean pr item	SD	p	p	p
<b>Component I</b>	143	1.34	0.72	92	1.19	0.72	64	0.86	0.64	n.s.	<0.001	<0.05
<b>Component II</b>	143	1.83	0.52	92	1.99	0.55	64	1.98	0.48	n.s.	n.s.	n.s.

Component I, items referring to psychotic experiences; Component II, remaining items.

trols, however, can not be compared to patient scores without excluding items referring to psychotic experiences. Furthermore, the two subscales self-reflectiveness and self-certainty showed low or moderate correlation for the three groups, indicating that they represent two different dimensions of cognitive insight.

Internal consistency for each subscale of the BCIS was consistent across groups, somewhat higher for self-reflectiveness than for self-certainty. Previous findings for the schizophrenia group [2,3] were thereby replicated. These findings are also in line with the results by Warman *et al.* [5] which point out that the factor loadings and internal consistencies of the BCIS were similar for healthy controls and the two groups of inpatients in Beck's original paper. To our knowledge the psychometric properties of the BCIS have not previously been published for a bipolar sample.

The psychometric properties of the BCIS were similar for normal controls to what we found in schizophrenia and bipolar disorder. However, the self-reflectiveness scores in the two patient groups were actually higher than in the control group, although not statistically significant. Similar findings concerning scores on subscale self-reflectiveness was found in a recent study by Warman *et al.* [5] comparing scores of undergraduate students with patients diagnosed with schizophrenia or schizoaffective disorder. In this study the controls scored non-significantly lower on self-reflectiveness and significantly lower on self-certainty than subjects in the schizophrenia group. Similarly, in a study by Eric Granholm (personal communication) middle aged and older controls obtained self-reflectiveness and self-certainty scores that were lower than the patient scores in the Beck study.

**Table 5: Correlation coefficients between scores of cognitive insight and insight of illness for schizophrenia.**

	Self-reflectiveness	Self-certainty
<b>Self-certainty</b>	-0.13	
<b>PANSS insight</b>	-0.21*	0.38**

\*p < 0.05; \*\*p < 0.01.

We wanted to investigate if different scoring profiles were present in the three groups. Comparing scores across these groups on component I which includes "unusual experiences" disclosed a significantly lower score for controls than both patient groups. This discrepancy indicates that the control subjects interpret the statements of these particular items rather differently from the patients, which is understandable due to lack of psychotic experiences in this group. Control subjects and patients seem to have a different reference point for 4 out of the 9 items in self-reflectiveness. This implies that comparison of scores between control subjects and patients should be carried out only for component II. On the other hand, the two components within self-reflectiveness were fairly strongly correlated for all groups, and consequently, there was no clear indication that they constitute two separate dimensions. Provided that the scores of the controls are not compared with patients whose interpretation of items involving "unusual experiences" are likely to be different, all items in subscale self-reflectiveness might be applicable for controls for means of investigating relations between cognitive insight and other domains such as psychopathology.

We also investigated the scores on each of these components in our bipolar sample and found that the patients with and without previous psychotic episodes did not come out differently. This could be considered as additional support to the applicability of the scale in bipolar samples.

Self-reflectiveness and self-certainty were weakly or moderately intercorrelated in the groups suggesting that they represent different dimensions. Self-certainty showed a highly significant positive correlation with G12 scores in

**Table 6: Correlation coefficients between scores of cognitive insight and insight of illness for bipolar disorder.**

	Self-reflectiveness	Self-certainty
<b>Self-certainty</b>	-0.21*	
<b>PANSS insight</b>	-0.03	0.15

\*p < 0.05

the schizophrenia group, indicating that mental inflexibility is possibly associated with poor clinical insight of illness. For self-reflectiveness a significant negative correlation was found for this group, suggesting that the capacity to reflect on anomalous experiences is linked to insight of illness. Further exploration of self-certainty could expand our knowledge of cognitive processes involved in insight of illness in general, and in particular comprehending patients' lack of insight related to treatment need. The relationship between poor mental flexibility and both symptoms and cognition are not known, and investigating these associations could represent important topics for future studies.

### Conclusion

The Beck Cognitive Insight Scale (BCIS) with its two subscales self-reflectiveness and self-certainty seems applicable for patients with schizophrenia and bipolar disorders. The BCIS can also be applied to control subjects, but in the case of comparison between controls and other clinical samples the four items referring to psychotic experiences should not be used. Our findings indicate that self-reflectiveness and self-certainty represent independent domains. In schizophrenia high self-certainty and low self-reflectiveness seem to be associated with poor insight of illness.

### Competing interests

The author(s) declare that they have no competing interests.

### Authors' contributions

JAE, HJ, ABB and PAR recruited patients to the study and carried out the clinical testing. SF, SO, KSS, TR and OAA participated in the design and coordination of the study. Statistical analyses were conducted by JAE, SF and OAA. All authors participated in the writing and all authors read and approved the final manuscript.

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# Verbal learning contributes to cognitive insight in schizophrenia independently of affective and psychotic symptoms

John A. Engh<sup>a,\*</sup>, Kjetil Sundet<sup>b</sup>, Carmen Simonsen<sup>a</sup>, Anja Vaskinn<sup>c</sup>, Trine V. Lagerberg<sup>a</sup>,  
Stein Opjordsmoen<sup>a,d</sup>, Svein Friis<sup>a,d</sup> and Ole A. Andreassen<sup>a,d</sup>

<sup>a</sup> Dept. of Psychiatry, Oslo University Hospital, Ullevål, Oslo, Norway

<sup>b</sup> Institute of Psychology, University of Oslo, Norway

<sup>c</sup> Clinic for Mental Health, Oslo University Hospital, Aker, Oslo, Norway

<sup>d</sup> Institute of Psychiatry, University of Oslo, Norway

Corresponding Author:

\* John A. Engh, Section of Psychosis Research, Building 49, Department of Psychiatry, Oslo University Hospital, Ullevål, 0407 Oslo, Norway. Tel: + 4722118441; Fax: + 47 22 11 78 48

E-mail: [john.engh@medisin.uio.no](mailto:john.engh@medisin.uio.no)

## 1. Introduction

Insight of illness encompasses the patient's awareness of symptoms as abnormal, attributing symptoms as well as social consequences to a mental disorder and recognizing the need for treatment (Amador et al., 1993;David, 1990). The clinical concept of insight is considered a multidimensional concept (Vaz et al., 2002) distributed on a continuum (Cooke et al., 2005) which has been valuable for determining the presence of mental illness and its prognosis, as well as prescribing appropriate treatment and management (Mintz et al., 2003). However, patients with psychosis might not only suffer from distorted beliefs and experiences, but are also relatively unable to reflect on them rationally and use corrective feedback (Beck et al., 2004). Patients' capacity and willingness to observe their mental productions and to consider alternative explanations and their confidence in their beliefs has been designated *cognitive insight* (Beck et al., 2004). Cognitive insight can be measured with a reliable self-report, the Beck Cognitive Insight Scale. It has two components, *self-reflectiveness* measuring objectivity and reflectiveness and openness to feedback and *self-certainty* measuring mental flexibility or confidence in own beliefs. Weak to moderate associations have been found between these two subscales and Birchwood's measure of insight in schizophrenia (Engh et al., 2007;Pedrelli et al., 2004;Beck et al., 2004), indicating that cognitive and clinical insight represent different domains.

Neurocognitive dysfunction is a key characteristic of schizophrenia (Heinrichs and Zakzanis, 1998;Keefe et al., 2006). To our knowledge there are only two reports on the relationship between neurocognition and cognitive insight. In the first study, a significant relationship between self-certainty and verbal learning and memory was found in 51 patients with first episode psychosis (Lepage et al., 2008). After a modest enlargement of the patient sample the strength of this relationship was somewhat attenuated, whereas the relationship between self-

reflectiveness and verbal learning and memory was strengthened (Buchy et al., 2009a). However, this study did not control for important confounders. In the present study we investigated the relationship between cognitive insight and neurocognition in a larger sample of patients with schizophrenia taking potential confounders into account. There is a body of literature on the relationship between neurocognition and positive symptoms in schizophrenia, and a recent review showed no reliable association between the two (Dominguez et al., 2009). Few studies have, however, examined the specific relationships between neurocognition and delusions and hallucinations. Investigating the relationship between each of these positive symptoms and cognitive insight in schizophrenia the occurrence of delusions seems to be associated with low self-reflectiveness and high self-certainty in schizophrenia (Engh et al., 2009) (Buchy et al., 2009b). Hallucinations were not associated with either of the two cognitive insight dimensions (Engh et al., 2009). Yet, there are other potential confounders in the relationship between cognitive insight and neurocognition. One of these is depression. In a study investigating cognitive insight and depression, a significant positive relationship between self-reflectiveness and depression was found (Beck et al., 2004), but others did not report similar relationships (Pedrelli et al., 2004; Warman et al., 2007). In addition, illness duration could confound the relationship between cognitive insight and neurocognition in schizophrenia.

Based on the conceptual content of cognitive insight and the suggestions from the previous studies, we hypothesized that confidence in own beliefs would be associated with poor verbal learning. Hence, the aim of the current study was to address the following questions: 1. Is there an association between cognitive insight and neurocognitive function in schizophrenia?

2. Can neurocognition add to explained variance in cognitive insight after contributions by potential confounders such as affective and psychotic symptoms have been accounted for?

## **2. Materials and Methods**

### *2.1 Participants*

One hundred and two patients (schizophrenia, n=81; schizophreniform disorder, n=8; schizoaffective disorder, n=13) participating in a large ongoing study on schizophrenia and bipolar disorders, the Thematic Organized Psychoses Research (TOP) Study, were included in the study. They were recruited from February, 2005 through May, 2007 in outpatient and inpatient psychiatric units at four University Hospitals in Oslo. These hospitals provide treatment for patients referred from primary care. The psychiatric units in Norway are catchment area based and publicly funded. Inclusion criteria were: age 18 - 65 years, understand and speak a Scandinavian language, no history of severe head trauma, obtain an IQ >70 and meeting DSM-IV criteria for schizophrenia, schizoaffective or schizophreniform disorder.

Table 1 gives an overview of demographic and clinical characteristics. Close to 60 % of the subjects in the study are males and more than two thirds are Caucasian. Their mean age is slightly above thirty years, and the mean level of education equivalent to high-school completion. One-third of the patients (33 %) had used illicit drugs during the past 6 months. The mean illness duration, defined as the time since the first contact with a specialized public health care unit due to psychosis, was 3.6 years for all patients. Scores on Global Assessment of Functioning symptoms (GAFs) and Positive and Negative Syndrome Scale (PANSS)

reflected a severity of symptoms bordering on psychosis (see Measures). Ninety-seven % of the patients in the study were using antipsychotic medication.

All participants gave written informed consent, and the study was approved by the Regional Committee for Medical Research Ethics and the Norwegian Data Inspectorate.

Table 1

## **2.2 Measures**

### *2.2.1 General Assessments*

Diagnosis was established using the Structured Clinical Interview for DSM-IV-TR-axis I disorders (SCID-I) (Spitzer et al., 1992). All interviewers completed a training course in SCID assessment based on the training program at the University of California Los Angeles (Ventura et al., 1998) and were also supervised on a regular basis by an experienced researcher in the field of diagnostics in severe mental disorders (S.O.). Global symptoms and psychosocial functioning were measured by the Global Assessment of Functioning Scale (GAF) (Endicott et al., 1976), and the scores were split into scales of symptoms (GAF-s) and function (GAF-f) to improve psychometric properties (Pedersen et al., 2007). Severity of symptoms was assessed with the Positive and Negative Syndrome Scale (PANSS) (Kay et al., 1987). The PANSS delusions (item P1), PANSS hallucinations (item P3) and PANSS depression (item G6) were utilized to assess delusions, hallucinations and depression, respectively. In addition, the subscales PANSS negative and PANSS positive were used. The reliability was satisfactory for diagnosis (SCID-I), GAF and PANSS (For details see (Eng et

al., 2009)).

### *2.2.2 Assessment of cognitive insight*

The BCIS is a self-report consisting of 15 statements forming two subscales, self-reflectiveness and self-certainty. High scores on self-reflectiveness and low scores on self-certainty is considered as normal. The questionnaire was administered without a time limit. Psychometric properties of both BCIS subscales were found acceptable for patients with schizophrenia (For details see (Beck et al., 2004;Engh et al., 2007)).

### *2.2.3 Assessment of clinical insight*

Insight of illness was assessed using the Birchwood Insight Scale (IS), a self-report comprising 8 items. The total score has a range of 0 to 12, with a score of 9 or more indicating good insight. Previous studies have shown acceptable psychometric properties for the inventory (Birchwood et al., 1994;Jonsdottir et al., 2008). The reported correlation between IS total score and PANSS insight has been moderate to high ( $r=-0.54$ ,  $p<0.01$ ) (Jonsdottir et al., 2008).

### *2.2.4 Neuropsychological tests*

A battery of neuropsychological tests covering five neuropsychological functions often compromised in schizophrenia was administered by trained psychologists. In addition, current general intellectual abilities were assessed (For details see (Simonsen et al., 2008)).

*Verbal learning* was assessed with Logical Memory from the Wechsler Memory Scale (WMS-III). This test requires recollection of two short stories (Wechsler, 2007b). A total

score for the number of items immediately recalled from both stories was used to measure verbal learning.

*Processing* speed was assessed with Digit Symbol Test from WAIS-III (Wechsler, 2003).

The test is comprised by numbers paired with symbols, and the task is to fill in blank spaces with correct symbols within the time limit of 90 seconds.

*Attention* was assessed with Digit Span from Wechsler Adult Intelligence Scale (WAIS-III).

Both the forward and the backward version were presented for the patients. The former test requires the participant to repeat a number of digits in the same order as presented, and the latter version entails repetition of a number of digits in the backward order of presentation. The total score (summation of digits repeated forwards and backwards) was used.

*Verbal fluency* was operationalized with Verbal Fluency Letter Test from the Delis Kaplan Executive Functioning Scale (D-KEFS) (Delis, 2005). The subtest consists of three trials, requiring production of words beginning with the letters 'F', 'A', and 'S'. The number of words generated in each of the trials was used as measures of verbal fluency.

*Inhibition* was assessed with the Color-Word Interference Test from D-KEFS. The test consists of four trials. In the first two trials the subject is required to name the colored ink patches and to read the printed color names displayed on separate cards as rapidly as possible. In the two subsequent trials the cards presented consist of written names of colors printed in colored ink that is incongruent with the color name itself. The time taken to name the color of the ink was included as the measure of inhibition (third trial D-KEFS).

*Full scale IQ:* Wechsler Abbreviated Scale of Intelligence (WASI) was used to assess full scale IQ (Wechsler, 2007a). The following subtests were used: Vocabulary, Similarities, Block Design, and Matrix Reasoning.

Scaled scores from published norms with defined mean scores and defined standard deviations (SD) were used for all neurocognitive test performance (Subtests neurocognitive domains: mean=10, SD=3; WASI: mean=100, SD=15).

### **2.3 Statistics**

For the statistical analysis we used Statistical Package for the Social Sciences (SPSS) version 16.0. Pearson correlation tests were used for calculating correlations between BCIS subscales scores and neurocognitive test performance. Multiple regression analyses were employed to examine the relationships between independent variables and cognitive insight. Selection of variables in the regression model was based on correlation tests conducted in the present study between the BCIS subscales and variables with assumed clinical importance. The BCIS subscales self-reflectiveness and self-certainty were used to represent the outcome - cognitive insight. A linear regression model was employed to search for unique contributions in explained variance in self-reflectiveness and self-certainty after potential confounders had been statistically eliminated. The independent variables in the regression model did not intercorrelate significantly, except for the relationships attention - full scale IQ ( $r=0.52$ ,  $p<0.001$ ) and insight of illness - depression ( $r=0.31$ ,  $p=0.002$ ). The independent variables were entered one at a time in the sequential regression analysis except for full scale IQ and verbal learning. To calculate the unique contribution by neurocognitive measures these independent variables were entered together in a final block (stepwise analysis). The model was examined for non-linear relationships between the independent and the dependant variables.



Few patients had missing data in the study. On an average there were 1.0 and 0.8 total missing registrations per item on the instruments BCIS and IS respectively. The neurocognitive assessments were complete except for 5 missing registrations on the subtest Logical Memory.

### **3. Results**

#### **3.1 Cognitive insight and neurocognitive test performance**

The scores on self-reflectiveness, self-certainty and the neuropsychological subtests are shown in table 2. The group performs within the lower-normal range compared to published norms. Processing speed was the most impaired cognitive domain, whereas verbal fluency and full scale IQ were the two least affected functions. No significant correlations were found between self-reflectiveness and any of the neurocognitive subtests. Self-certainty showed a significant negative correlation with both verbal learning and full scale IQ (table 3).

Table 2

Table 3

## **3.2 Explained variance in cognitive insight**

### *3.2.1 Self-reflectiveness*

Insight of illness and delusions were the only independent variables which correlated significantly with self-reflectiveness. In the regression analysis both variables contributed significantly to explain the variance in self-reflectiveness. Insight of illness explained 12.4 % of the variability, whereas additional 3.0 % were explained by delusions.

### *3.2.2 Self-certainty*

Verbal learning significantly added to explained variance of self-certainty after contributions by insight of illness, depression and delusions had been controlled for. Insight of illness, delusions and verbal learning explained 9.5, 5.0 and 4.6 % of the variance respectively (table 4).

Table 4

## **4. Discussion**

The main findings of the present study in schizophrenia were significant relationships between self-certainty and both verbal learning and IQ indicating that the higher the IQ or verbal learning score, the better the cognitive insight as measured by reduced self-certainty. Verbal learning significantly added to the explained variance in self-certainty after contributions by insight of illness, depression and delusions had been taken into account. We found no association between self-reflectiveness and neurocognition.

The neurocognitive performance of the patients in the present study was consistent with scores in a recent meta-analysis (Dickinson et al., 2007). Processing speed was the most impaired cognitive domain, whereas verbal fluency and full scale IQ were the two least affected functions. The relationship between neurocognition and cognitive insight was studied in patients with first episode psychosis by Buchy and associates (Lepage et al., 2008; Buchy et al., 2009a), who found that verbal learning and memory were positively associated with self-reflectiveness and negatively associated with self-certainty. Hence, the findings in the present study are in line with the previously found negative association between self-certainty and verbal learning and memory, but in contrast to the finding regarding self-reflectiveness and verbal learning and memory. Yet, to our knowledge, our study is the first to report on cognitive insight and neurocognition taking other clinical characteristics into account.

Self-certainty measures “confidence in own beliefs”. As flexibility of thought and use of corrective feedback are essential to general intellectual abilities, a negative association between self-certainty and IQ was anticipated. In the present study we found a significant negative correlation between the two, yet, IQ did not contribute uniquely to self-certainty. Verbal learning, on the other hand, made a specific contribution in explaining self-certainty independently of potential confounders. Hence, our data suggests that the role of verbal learning impairments on confidence in own beliefs is not confounded by insight of illness, depression or delusions. Interestingly, in a study by Brebion and colleagues depression seemed to be the main predictor of verbal memory (Brebion et al., 2001). This finding taken together with the significant negative correlation between depression and self-certainty found in the present study further underscores the association of verbal learning to self-certainty.

The contribution by verbal learning is almost unaltered before and after controlling for the clinical features. Hence, the current findings may lead to some speculations about the relationship between verbal learning and self-certainty. Possibly, a level of immediate learning is needed to evaluate own aberrant ideas and to apply self-correction strategies. Individuals with impairments in verbal learning may have difficulties with the continuous comparison and adjustment between acquired learned material and held beliefs, and, thus, alternative explanations may not be sufficiently facilitated causing enhanced restricted bias towards oneself.

Our study has limitations due to cross-sectional design. Future longitudinal studies with assessment of cognitive insight, delusions and memory performance, in addition to reasoning style could shed further light on the role of cognitive insight in formation of delusions and clarify whether self-reflectiveness and self-certainty essentially are state or trait phenomena.

In conclusion, we found that high self-certainty - a dimension of cognitive insight - is associated with poor verbal learning and low IQ in schizophrenia. Verbal learning seems to make a unique contribution in explaining the variability in self-certainty, also when taking potential confounders such as depression and positive symptoms into account.

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**Contributors**

JAE, AV and TVL recruited patients to the study and carried out the clinical testing. JAE, KS, CS, SO, SF and OA participated in the design and coordination of the study. Statistical analyses were conducted by JAE, KS, and SF. All authors participated in the writing and all authors read and approved of the final manuscript.

**Conflict of Interest**

The authors declare that they have no conflicts of interests.

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## Tables

**Table 1. Demographic and clinical characteristics**

	Mean (SD)
Male, %	58.8
Ethnicity, % Caucasian	73.5
Illicit drugs last 6 months, %	33.3
Age (y)	32.6 (9.9)
Illness duration (y)	3.6 (5.7)
Education (y)	12.0 (2.3)
GAFs	40.4 (10.5)
GAFf	41.0 (10.3)
PANSS delusions	3.3 (1.7)
PANSS hallucinations	2.9 (1.6)
PANSS positive sum	5.5 (5.4)
PANSS negative sum	15.2 (6.4)
PANSS depression	3.0 (1.5)
Birchwood Insight Scale total	7.3 (2.5)

N=102 for all variables except for illness duration, n=99. Mean with standard deviation (SD) presented. For male, ethnicity and illicit drugs last 6 months per cent of patients are presented. Global Assessment of Functioning was used to assess global level of symptoms and global level of functioning (GAF-s and GAF-f). Positive and Negative Syndrome Scale (PANSS) was utilized to measure level of delusions, hallucinations and depression. PANSS positive and negative subscale scores were also presented.

**Table 2. Cognitive insight and neurocognitive test performance**

	Mean (SD)	Rang (min – max)
Self-reflectiveness	13.9 (4.8)	4-25
Self-certainty	8.4 (2.9)	3-17
Verbal learning	8.1 (2.6)	1-16
Processing speed	6.5 (2.2)	3-13
Attention	7.8 (1.8)	4-12
Verbal fluency	9.1 (3.6)	1-19
Inhibition	6.9 (3.7)	1-14
Full scale IQ	98.5 (14.5)	71-130

N=97 for verbal learning, for all other variables n=102. Neuropsychological tests used: Verbal learning: Logical Memory, subtest from Wechsler Memory Scale (WMS-III). Processing speed: Digit Symbol Test from Wechsler Adult Intelligence Scale (WAIS-III). Attention: Digit Span from WAIS-III. Verbal fluency: Verbal Fluency Letter Test from the Delis Kaplan Executive Functioning Scale (D-KEFS). Inhibition: Color-Word Interference Test from D-KEFS. Full scale IQ: Wechsler Abbreviated Scale of Intelligence (WASI). Scaled scores from published norms with defined mean and standard deviation (SD) used (neuropsychological tests: mean=10, SD=3. WASI: mean=100, SD=15

**Table 3. Correlation coefficients between cognitive insight and demographic variables, clinical characteristics and neurocognitive test performance**

	Self-reflectiveness		Self-certainty	
	r	p	r	p
Gender	-0.06	0.57	-0.09	0.39
Age	-0.09	0.36	0.06	0.55
Illness duration	0.07	0.50	0.05	0.63
Clinical insight	0.36	<b>&lt;0.001</b>	-0.32	<b>0.001</b>
Depression	0.04	0.70	-0.21	<b>0.031</b>
Delusions	-0.26	<b>0.009</b>	0.28	<b>0.005</b>
Hallucinations	-0.04	0.70	0.07	0.46
Verbal learning	-0.06	0.58	-0.28	<b>0.006</b>
Processing speed	-0.03	0.73	-0.06	0.57
Attention	0.16	0.12	-0.12	0.24
Verbal fluency	-0.11	0.27	-0.02	0.81
Inhibition	0.08	0.44	-0.12	0.24
Full scale IQ	0.09	0.38	-0.21	<b>0.035</b>

N=97 for verbal learning, for all other variables n=102. Pearson correlation test used. Clinical insight assessed with Birchwood Insight Scale. Depression and delusions assessed with Positive and Negative Syndrome Scale (PANSS depression, PANSS delusions, PANSS hallucinations). Neuropsychological tests used: Verbal learning: Logical Memory, subtest from Wechsler Memory Scale (WMS-III). Processing speed: Digit Symbol Test from from Wechsler Adult Intelligence Scale (WAIS-III). Attention: Digit Span from WAIS-III. Verbal fluency: Verbal Fluency Letter Test from the Delis Kaplan Executive Functioning Scale (D-KEFS). Inhibition: Color-Word Interference Test from D-KEFS. Full scale IQ: Wechsler Abbreviated Scale of Intelligence (WASI). Scaled scores from published norms with defined mean and standard deviation (SD) used (neuropsychological tests: mean=10, SD=3. WASI: mean=100, SD=15).

