Recent Neurobiological Insights into the Concept of Insight in Psychosis

Starlin Vijay Mythri, Y Sanjay[1]

ABSTRACT

The concept of insight in psychosis has been an interesting area in clinical psychiatry for well over a century with a surge in research interest over the past 25 years. Moreover, the past 5 years have been particularly fruitful in deciphering its neurobiological underpinnings. This article presents the development of the concept of insight in psychosis and reviews the current neurobiological research findings in this area.

Key words: *Cortical midline structures, insight, neurobiology, psychosis*

INTRODUCTION

Lack of insight in psychosis can be conceptualized in the following ways – phenomenologically, it is a set of attitudes strongly linked to the psychopathology (e.g., as an aspect of delusion); psychosocially, it involves cognitive appraisal biases, denial, or expression of culturally shared narratives; neuropsychiatrically, it is a result of neurophysiological deficits. Insight in psychosis has been a subject of much neuroscientific research in the past 25 years. Increased interest into the concept of insight in psychosis is considered to be due to its association with the overall prognosis,[1] functional outcomes,[2,3] compliance with treatment,[4,5] consent for procedures including involuntary treatments,[6,7] psychopathology,[8,9] and the severity of illness. Since the 1850s, alienists (erstwhile, asylum medical officers) like Arnold Pick,[10] tried to discuss and understand the issue of patient's judgment of his mental illness and attitudes toward it. We have come a long way from those initial thoughts in the discussion of the subject. Today there is recognition of the relationship of phenomenology, psychology, and neurophysiology to the concept of insight in psychosis.[11] In this article, we want to review the development of the concept and the recent neuroscience research findings.

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EARLY 20TH CENTURY DISCUSSION ON INSIGHT IN PSYCHOSIS

Jaspers in his monumental work, General Psychopathology,[12] defines insight as the "... an objectively correct estimate of the severity of illness (and)... objectively correct judgment of its particular type." He opined that in psychosis there

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Asha Bipolar Clinic, Asha Hospital, Road no.14, Banjara Hills, Hyderabad, Telangana, [1]Professor, Department of Psychiatry, Katuri Medical College and Hospital, Eudulapalem, Guntur - 522019, Andhra Pradesh, India

Address for correspondence: Dr. Starlin Vijay Mythri
402B, Saincher Palace Apartment, East Marredpally, Secunderabad, Hyderabad - 500 026, Telangana, India. E-mail: starlinvijay@yahoo.co.in

is no lasting or complete insight. He describes various reactions and attitudes of persons with acute psychosis – at onset, during the illness and at recovery – and attitudes of those with chronic psychosis. In the English-speaking countries, Lewis' article on insight[13] brought the concept onto the discussion. He defined insight as "a correct attitude to morbid change in oneself" but opined that the application of the words – correct, morbid, and change – require cautious use and discussion. It was thought that the intelligence, culture, and educational background of the person suffering from the illness play an important role. Even though the early discussions acknowledged the complexity of the concept, in the WHO international pilot study of schizophrenia[14,15] the concept of insight was measured as a categorical present or absent item.

TURNING POINT IN INSIGHT RESEARCH

The formulation of insight as a multidimensional construct during the 1990s was the reason for the renewed research interest in this area. David[8] described Insight as having three dimensions: (i) Awareness of mental illness, (ii) relabeling the change as pathological and (iii) compliance with treatment. Later Amador and David[16] suggested the following five dimensions:

- Awareness of mental illness
- Awareness of the social consequences of mental illness
- Awareness of symptoms of mental disorder
- Attribution of symptoms to a mental disorder, and
- Awareness of the effects of medication.

The important aspect of these multidimensional models was the separation of the concept of attribution from the concept of awareness. This was derived from the new insights obtained from the "attribution theory" and "theory of mind" concepts from the social and developmental psychology, respectively.

The multidimensional models paved the way for construction of sophisticated insight measurement tools. Earlier as pointed out, insight was being measured as a categorical present or absent item with instruments like Present State Examination, Positive and Negative Syndrome Scale, Hamilton Depression Rating Scale and schedule for affective disorders and schizophrenia. The new semi-structured interview and self-report measurement instruments are based on the multidimensional models and avoid various clinician and researcher biases. Scale for Assessment of Unawareness of Mental Disorder, Scale for Assessment of Insight-Extended and Beck Cognitive Insight Scale (BCIS) are few commonly used instruments which are based on the multidimensional models of insight in psychosis.

INSIGHTS FROM METACOGNITION RESEARCH

Over the last decade, the concept of metacognition was being considered as an essential aspect in the discussion of insight. Metacognition is the ability of human mind to reflect upon itself or its mental events (i.e., thoughts, beliefs, desires, etc.). Augustine around 397 AD in his 10th book of Confessions, 16th section[17] ponders, "When, therefore, I remember memory, then memory is present to itself by itself, but when I remember forgetfulness then both memory and forgetfulness are present together – the memory by which I remember the forgetfulness which I remember." Here Augustine is reflecting on his mental events – memory and thoughts in this case – that is he's discussing the concepts of metacognition and metamemory.

Regarding self-reflection, Jaspers[18] says, "I am not only conscious in the sense of having certain inner experiences, but I am turned back on myself – reflected back – in the consciousness of self. In the course of this reflection, I not only come to know myself, but I also influence myself." Here Jaspers discusses our metacognitive ability to influence our beliefs and judgments, an aspect called strategic metacognition. According to Saxe and Offen,[19] there are two aspects of metacognition. One is called "attributive metacognition" which is the ability to be aware of one's thoughts and desires, i.e., mental events and the other is called "strategic metacognition" which is the ability to monitor and control on-going mental events.

Neuroscience research in metacognition of insight was helped by the construction of the BCIS.[20] Beck *et al*. proposed a distinction between cognitive insight and clinical insight. According to them, clinical insight is about the person's awareness and acceptance of the illness whereas cognitive insight is about his attributive metacognitive ability, especially flexibility and confidence towards their beliefs, judgments, and experiences. Cognitive insight and clinical insight might be correlated to each other to some extent wherein the presence of cognitive insight might increase the chance of improvement in the clinical insight. BCIS[20] has helped understand this concept of cognitive insight in a better way. There are two factors in BCIS, namely self-certainty and self-reflectiveness. Self-certainty refers to the confidence in one's judgments, and attributions and self-reflectiveness refers to an understanding of one's fallibility and acceptance of correction. Research with this scale has shown a correlation between reduced cognitive insight on at least one subscale of BCIS and increased severity of delusions.[21] However, some studies did not show such a correlation. Future research with this instrument might bring out more

useful insights into the nature of insight, especially the attribution component.

GOING BEYOND "THE ANOSOGNOSIA MODEL" OF INSIGHT

Initially anosognosia, a condition associated with frontal and parietal damage wherein the person is unaware of his deficit, was proposed as a model similar to the lack of insight in schizophrenia.[8,22] Even though later many investigators rejected this idea based on empirical research,[23] the research to find neurophysiological deficits in insight persisted. Currently, it is thought that there are definite executive function deficits in people suffering with lack of insight in schizophrenia. This association was observed when comprehensive insight scales based on the multidimensional model of insight and sensitive neurological tests like Wisconsin Card Sorting Test were used. It was also found that insight was not associated with global cognitive ability. These findings were confirmed by many studies and recent meta-analyses and reviews[24,25] in schizophrenia. In first episode psychosis, the correlation between verbal memory and insight[26] was observed. However, this accounts only for a small portion of the variance in insight.[27]

FUNCTIONAL NEUROIMAGING AND NEUROSCIENCE OF SELF

Functional magnetic resonance imaging (MRI) studies have contributed towards a new understanding of the neurophysiology of insight. Although sample size in studies was small and effects of duration of illness and antipsychotic medication use on the brain changes were not studied, last 5 years of research has brought out certain replicable findings. We will discuss the following promising and replicated findings.

Cortical midline structures and self-reflection

Studies have delineated a neuroanatomical system called cortical midline structures (CMS) which are seemingly associated with the self-reflection or metacognitive ability[28,29] which distinguishes the self from the others. This encompasses medial prefrontal cortex (Brodmann areas of 9, 10, and 11) and anterior and posterior cingulate cortex. Dorso-lateral prefrontal cortex is also thought to be important in exerting cognitive control even on the medial prefrontal cortex and related CMS areas and thereby self-evaluative metacognition. van der Meer *et al*.[27] and Bedford *et al*.[21,28,30] have shown that the anterior portion of the CMS was often functional when self-appraisal was contrasted with other-appraisal. There are suggestions that within the anterior CMS, ventral medial prefrontal cortex (vMPFC) is more associated with information relevant to self than dorsal medial prefrontal cortex (dMPFC),[27] whereas others have suggested that dMPFC is more important.[28] What all this evidence means is that people with schizophrenia, when compared with controls, showed reduced activation of anterior CMS whenever they considered themselves as opposed to a famous "other" (in Bedford *et al*. study, Tony Blair) suggesting that CMS deficits in schizophrenia might lead to abnormal self-appraisal, i.e., problems in distinguishing self from others.

Shift in cortical midline structures activity

Unlike above-mentioned researchers, Shad and Keshavan[31] and Holt *et al*.[32] showed an anterior to posterior shift in the CMS activity in people with schizophrenia during self-reflection tasks. In persons with schizophrenia, during self-reflection and even in social-reflection tasks there was increased posterior CMS activation, i.e., mid/posterior cingulated cortex along with precuneus and reduced anterior CMS activation, i.e., anterior cingulate cortex and vMPFC. There were also functional connectivity changes between posterior and anterior cingulate cortex.

Distinct neural correlates for the dimensions of insight

Shad and Keshavan[31] also suggested the differential neurophysiological basis for symptom unawareness and symptom misattribution. Symptom unawareness had more widespread brain activation in multiple gray (particularly CMS) and white matter areas suggesting that it may be a funciton of a more complex brain network compared to symptom misattribution which has more localized prefrontal cortex and basal ganglia activation suggesting that it may be mediated by specific brain regions. Apart from CMS, activation of inferior parietal lobule (which is known to have "mirror neurons") was also associated with unawareness of symptoms. However, symptom awareness and attribution have to be seen as related phenomena, with symptom attribution requiring a basic level of symptom awareness.

Differential cortical midline structures activity in schizophrenia and bipolar disorder with a history of psychotic symptoms

Similar to people suffering from schizophrenia, those with bipolar disorder showed less activation of posterior CMS during other-reflection compared to healthy controls. A positive correlation between posterior CMS activation and cognitive insight was observed in people with schizophrenia while those with bipolar disorder did not show such a correlation.[33] This interesting difference between schizophrenia and bipolar disorder has to be further studied.

Even though these findings have to be further replicated and refined, they have opened up new doors into the neuroscientific understanding of self. Research in these lines may help us understand the normal metacognitive abilities of our minds.

CONCLUSION

Development of the concept of insight in psychosis has progressed from categorical understandings to multidimensional models which inspired the on-going neuroscience research. The neuroscience research on the concept also helped unravel workings of self-reflection in the brain. Functional MRI findings, especially with regards to CMS, over the past 5 years have been exciting, and they help us to conceptualize and redirect research focus in a better way. It is clearly evident that phenomenological and psychosocial mediated processes exist along with neurophysiological processes and the complete understanding requires integration of all these related findings.

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