Impact of Cognitive and Social Cognitive Impairment on Functional Outcomes in Patients With Schizophrenia

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Schizophrenia is a severely disabling disease that affects millions of people worldwide. The notion of recovery from schizophrenia has recently become a topic of both research and clinical focus. With the advent of antipsychotic medications in the 1950s, many more patients achieved symptom remission than ever before. However, less than half of all patients have been able to achieve recovery. With so many drugs available to improve the symptoms of schizophrenia, why is the disorder still associated with such severe disability? In the last couple of decades, researchers and clinicians have begun to realize that a hindrance to widespread recovery is that available antipsychotic medications have been effective in treating the positive symptoms (hallucinations and delusions) of schizophrenia but not other features of illness such as cognitive impairment. Dysfunction in cognition and social cognition has a significant impact on patients' functional status, meaning that impaired cognition and social cognition should be treatment targets to improve the likelihood of recovery.

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The World Health Organization (WHO) reports that more than 21 million people worldwide are affected by schizophrenia, which causes substantial disability.[1] Patients experience problems at work, problems living independently, and difficulty developing social connections. Many antipsychotic medications have become available since the 1950s, leading to the question of why the disorder is still associated with such severe disability if so many drugs that improve the symptoms are available. In the last couple of decades, researchers and clinicians have begun to realize that the available medications, which are effective for treating the positive (or psychotic) symptoms of schizophrenia (as their name *antipsychotic* implies), do not address other symptoms such as cognitive impairment. To improve a patient's community functioning, more variables than positive symptoms must be addressed. This article describes the relationships between cognition and functioning.

NOTION OF RECOVERY FROM SCHIZOPHRENIA

The concept of recovery is a relatively recent introduction to the discussion of schizophrenia. For years, the focus was primarily on remission (defined as a reduction in symptoms), but a focus on recovery emerged in the 2000s.[2] Recovery refers to patients being able to function normally at work or school, in the community, and at home.[2] Recovery may occur even if the patient is still experiencing some ongoing symptoms, although they should be controlled.[2] The idea that recovery is possible provides patients with hope, which is vital as they work with clinicians during treatment.

In 1994, Hegarty et al[3] studied the trends of patient recovery by performing a meta-analysis of 320 studies of patients with schizophrenia from 1895 to 1992. Recovery was defined in various ways that indicated symptom remission and the ability to function.[3] Patients were followed from 1 to 40 years, with an average of about 6 years. The rate of improvement that could be considered recovery was about 28% through 1925, which grew to about 35% in the 1930s with the introduction of electroconvulsive therapy. The rate of recovery grew again in the 1960s and 1970s after the development of antipsychotic medications, reaching 48.5%. However, after 1986, the percentage of people with schizophrenia who achieved recovery fell to 36.4%, which is remarkably similar to the levels of recovery from the first half of that century.[3] More recent research suggests that only 1 in 7 patients achieves a "recovery" phase that reflects both normalized social and vocational functioning and symptom remission and lasts ≥2 years.[4] These decreased levels of recovery could be due to changes in the way that symptoms or recovery are defined. While antipsychotic medications are effective in treating psychotic symptoms,[5] cognitive deficits have been recognized as being more associated with functional outcomes than are psychotic symptoms.[6]

OUTCOME DOMAINS

Outcome domains in schizophrenia are only loosely related to each other. The 3 main outcome domains are functional status (or psychosocial functioning), disorder status (or clinical change), and subjective experience.[7,8] Functional status comprises a patient's social and vocational functioning and living situation.[7] Disorder status encompasses both positive symptoms (hallucinations and delusions) and negative symptoms (eg, lack of motivation,

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flat affect), while subjective experience refers to personal well-being factors such as self-esteem, subjective distress, and satisfaction with life.[7] While clinicians may assume that these 3 outcome domains all improve together, it is possible for patients to show improvement in one area and not others.[8] In fact, current antipsychotic treatment for schizophrenia primarily focuses on the positive symptoms while providing less efficacy for functional status, negative symptoms (which may lead to high rates of disability), and subjective experience variables.

Determinants of daily functioning and community success include cognition, social cognition, and motivation. Cognition is the ability to accurately perceive, attend to, and remember information. Social cognition is the ability to identify and interpret social cues (eg, detecting emotion in faces, inferring what other people are thinking or feeling). The patient's motivation to engage in the community is part of the negative symptoms of schizophrenia. While negative symptoms are an important treatment target (as part of the clinical change domain), this article focuses on cognition and social cognition and their relationships to daily functioning in patients with schizophrenia.

COGNITIVE DOMAINS AND FUNCTIONAL OUTCOMES

Although the areas of cognition and social cognition were widely overlooked for decades,[9] cognitive dysfunction is now seen by many as a core feature of schizophrenia.[10] This assertion is supported by the fact that cognitive impairment is present before the onset of clinical symptoms and is not a byproduct of the treatments that patients may be undergoing.[11] Further, cognitive deficits are evidenced in unaffected first-degree relatives of individuals with schizophrenia,[12] and, according to longitudinal studies,[13] impaired cognition remains fairly stable throughout the course of illness. Correlations between cognitive performance and hallucinations and delusions are low.[14]

Research has suggested that cognitive deficits are reliable correlates and predictors of functional outcome or level of disability.[15] As mentioned, functional outcome includes how socially connected you are, how independently you can live, and whether you are able to maintain a job, and psychosocial skill acquisition is an important component of these areas of functioning.[15] One reason that the relationships between cognition and functional outcome tend to be stronger than those between psychotic symptoms and functioning may be that cognitive impairment can influence the extent to which patients can benefit from their psychiatric rehabilitation programs.[16] Effect sizes of the associations between cognition and functional outcome tend to be medium for specific domains but can be larger for summary scores.[15]

Because cognitive impairments have been found to relate to functioning, which is the key element of recovery,[17] it is valuable for clinicians to understand how cognition is assessed in patients with schizophrenia. A variety of assessment tools for different cognitive domains is available.

Clinical Points

- Provide hope for patients with schizophrenia by explaining that recovery is possible and that research is expanding treatment capabilities.
- Identify patients' cognitive impairments using appropriate tests.
- Recognize patients' social process deficits and how they affect functioning.

Assessment Tools

One of the products of the National Institute of Mental Health (NIMH) Measurement and Treatment Research to Improve Cognition in Schizophrenia (MATRICS) initiative was a cognitive battery for use in cognitive enhancement clinical trials for schizophrenia.[18] To develop the battery, Nuechterlein and colleagues[19] reviewed numerous studies and identified 7 distinct domains that could be considered fundamental cognitive deficits in schizophrenia that are relevant for treatment. These 7 cognitive domains are speed of processing, attention/vigilance, working memory, verbal learning and memory, visual learning and memory, reasoning and problem solving, and social cognition. To assess these 7 cognitive domains, a collection of 10 tests was evaluated and selected to comprise the MATRICS Consensus Cognitive Battery (MCCB).[18] Although the battery is primarily used in a clinical trial setting, the testing duration of the entire battery is only 65 minutes, so it could be used in clinical settings with training. Below are a few examples of tests included in the MATRICS battery.

Hopkins Verbal Learning Test—Revised. Verbal learning requires the ability to acquire, store, and retrieve verbal information for more than a few minutes. The Hopkins Verbal Learning Test—Revised is one example of an assessment tool that clinicians may use to test the patient's verbal learning skills. In this test, patients are instructed to hear, but not see, a list of words.[20] They are then asked to repeat as many of the words as they can recall. The list is then repeated to determine if the patient is able to subsequently remember more words. By using this type of assessment tool, clinicians may be able to determine how well a patient might remember material from a rehabilitation program, clinic visit, class, or vocational setting.

Letter-Number Span. Working memory is the ability to briefly remember and manipulate information. The Letter-Number Span (LNS) test focuses primarily on the domain of working memory.[21] The patient hears a list of letters and numbers and is asked to say them in alphanumeric order, eg, K3B4 would be reordered to 34BK. By testing a patient's short-term working memory, clinicians should learn more about their patients' ability to switch attention between different tasks, remember a phone number just received, and maintain social conversation.

Continuous Performance Test—Identical Pairs. The Continuous Performance Test—Identical Pairs is an assessment of attention and vigilance, ie, a patient's ability

to respond to stimuli (and ignore irrelevant stimuli) over an extended period of time.[22] During this test, the patient watches numbers appear on a screen and must press a button when a number is the same as the previous one. This test helps demonstrate the patient's ability to identify relevant information in social interactions or in a discussion with a physician.

SOCIAL COGNITION

When the MCCB was being developed, social cognition was a relatively unexplored domain,[19] but it is now a heavily researched area in the schizophrenia field. Also a core feature of schizophrenia,[23] impaired social cognition is associated with difficulties in processing social information, including identifying emotions and interpreting other people's thoughts and feelings, as well as creating and maintaining social connections.[24] Social cognition has been shown to have correlations with how well someone functions, so patients with schizophrenia may encounter social dysfunction at least in part because they are having trouble processing social information.

Social neuroscientists have discovered that there are brain regions for social processing that are distinct from those for other types of processing.[25] Some regions "come online" when people begin processing social information and "turn off" when processing nonsocial information, which creates a reciprocal balance like a "neural see-saw." By compiling data from a large group of patients with schizophrenia taking multiple types of assessments, researchers have found that social cognition and nonsocial cognition are distinct and partly independent.[26–29]

Systems of Social Processing

Areas of social neuroscience that seem relevant for understanding the brains of individuals with schizophrenia include social cue identification, experience sharing, mentalizing, and emotion regulation.[30] These 4 systems of social processing each have neural structures associated with them.

Social cue identification. Social cue identification is defined as the accurate perception of information conveyed by faces or voices, body movements, and gestures.[31] The vast majority of work in schizophrenia has been focused upon face emotion perception because it is fairly easy to measure and because patients tend to have significant impairment in understanding and identifying emotion in faces. The specific parts of the brain associated with those perceptions are not activated in patients to the same extent as in healthy controls. These brain areas include the amygdala and the fusiform gyrus. The posterior superior temporal sulcus is another area associated with social cue identification but is primarily related to biological motion—being able to tell whether something you see is human or nonhuman.[30]

Experience sharing. Experience sharing happens when simply observing others' behaviors leads to a neural activation corresponding to what would occur if the individual engaged in those behaviors himself or herself. Described as a "gut connection" to other people, experience sharing can also be referred to as an ability to feel other people's pain. This area of social cognition comprises two subsections: motor resonance and affect sharing. Motor resonance describes the ability to compare a stored motor representation of an action with an observation of another person executing the same action. Similarly, affect sharing refers to the ability to empathize with another person in pain, through activation of parts of the brain associated with those emotions. Motor resonance involves the inferior parietal lobe and the premotor cortex, while affect sharing involves the dorsal anterior cingulate cortex and the anterior insula.[30] Findings regarding impairment in these areas among patients with schizophrenia have been inconsistent, and these aspects of social processing may be relatively intact.[32]

Mentalizing. Mentalizing is defined as the ability to understand others' behavior, intentions, and perspectives. Also referred to as "theory of mind,"[25,31] mentalizing can be described as the ability to "stand in someone else's shoes" and infer the mental states of others. The regions of the brain involved in mentalizing are the temporoparietal junction, the temporal pole, the precuneus, and the medial prefrontal cortex.[30] These regions are activated when healthy individuals mentalize, but activation deficits in these areas have been found in individuals with schizophrenia.[33]

Emotion regulation. Emotion regulation is the process by which we influence which emotion is experienced and when and how it is experienced and expressed.[34] One strategy involved in emotion regulation is cognitive reappraisal, in which people see something that might make them feel distressed, anxious, or uncomfortable and they reappraise it in a way that is less negative—for example, imagining a positive outcome to a negative event. The regions associated with emotion regulation are the ventrolateral and dorsolateral prefrontal cortices and the amygdala.[30] Some neuroimaging studies show that emotion regulation is impaired in patients with schizophrenia.[35]

Community Functioning

A meta-analysis by Fett et al[24] found that social cognition explained relatively more variance in community outcome (16%) than nonsocial neurocognition (6%). This difference was largely due to a patient's ability to infer others' mental states, ie, mentalizing or theory of mind. The estimated average correlations between community functioning and each of the neurocognitive and social cognitive domains were strongest for mentalizing, social perception and knowledge, and verbal fluency (Table 1).[24]

Schmidt et al[36] conducted a review of 15 studies of the effects of social cognition on function among patients with schizophrenia. They discovered that neurocognition is directly related to social cognition and that social cognition helps to account for neurocognition's link to community functioning, ie, social cognition acts as a mediator between neurocognition and functional outcomes.[36] Recently, social motivation has also been included in models of functional

Table 1. Correlations Between Neurocognitive (NC) or Social Cognitive (SC) Performance and Community Functioning in Studies of Patients With Nonaffective Psychosis[a]

Cognitive Domain	Estimated Average Correlation in the Population Distribution	*P* Value
Theory of mind/mentalizing (SC)	0.48	<.001
Social perception and knowledge (SC)	0.41	.004
Verbal fluency (NC)	0.32	.004
Emotion perception and processing (SC)	0.31	<.001
Verbal learning and memory (NC)	0.26	<.001
Processing speed (NC)	0.25	<.001
Working memory (NC)	0.22	.01
Visual learning and memory (NC)	0.20	.003
Reasoning and problem solving (NC)	0.19	<.001
Attention and vigilance (NC)	0.16	.01

[a]Data from Fett et al.[24]

outcome.[37] Patients may experience neurocognitive problems early in the course of illness, develop trouble with social cognition, and then develop defeatist attitudes or beliefs. In other words, patients may not expect to be successful at things because they have encountered unsuccessful experiences previously, and they do not expect to enjoy activities and do not expect good outcomes when they engage with the world. This attitude leads to reduced motivation, which is a negative symptom of schizophrenia, which in turn leads to problems in community integration. By using statistical models to study the relationships between both cognition and social cognition and functioning, researchers may be able to develop more effective treatment strategies for patients with schizophrenia.

CONCLUSION

When treating patients diagnosed with schizophrenia, clinicians must not only focus on treating the psychotic symptoms but also address impairments in cognition and social cognition. Recent research has shown that social cognition has a strong relationship with functional outcomes, meaning that, for patients who have social dysfunction, recovery will be harder to achieve. However, assessment tools are being used to gather a better indication of patients' cognitive impairment, which can influence social cognition. As new treatments for both cognition and social cognition deficits become available, clinicians may be able to assist more of their patients with achieving recovery.

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