



Henry A. Nasrallah, MD
Editor-in-Chief

Impaired mental proprioception in schizophrenia

Psychiatrists recognize that schizophrenia is a disorder in which the highest mental functions, such as thought, language, emotions, conation, and cognition, are drastically disrupted. However, the most serious impairment in schizophrenia is a global malfunction in self-integration and personal identity that includes a deficit in self-recognition.

This distorted sense of self leads persons with schizophrenia to fail to recognize what is or is not part of their own mind, which can produce clinical symptoms of schizophrenia, including bizarre delusions, hallucinations, thought disorder, social deficits, and information processing.¹

Just as intact *physical* proprioception enables a healthy person to be continuously aware of where his body and its parts are located in space, allowing sensory-motor integration, *mental* proprioception enables one to be fully aware of his identity and self-boundaries, and that his thoughts and actions are generated from within his own sphere of consciousness, not from an external source. In schizophrenia, the coherent sense of self is shattered and fragmented, a frightening experience patients describe after emerging from psychosis.² A person affected by schizophrenia feels lost, as if his “self no longer belong[s]” to him. He feels

alienated from his “real self” and refers to himself in the third person. He feels “disconnected, disintegrated, and diminished,” with a sense of “emptiness, a painful void of existence,” of being disembodied with no clear demarcation between self and others.²

Not surprisingly, false beliefs (delusions) and perceptual aberrations (hallucinations) emerge from a fragmented sense of self. Patients fail to recognize that their actions, thoughts, or feelings are initiated from within the self, leading to delusions of passivity and being controlled by an outside force. One’s impulses are misperceived as being imposed by an alien. One’s thoughts, fantasies, and memories become external hallucinations instead of internal recollections. It is not surprising that depersonalization and derealization are common in schizophrenia and in the prodrome stage. Phencyclidine and ketamine, which can produce schizophrenia-like psychoses, are known to trigger dissociative phenomena and a loss of a coherent sense of self.

What causes the disintegration of the mind (self) in schizophrenia? The leading neurobiologic explanation is well-documented white matter pathology.³ Numerous studies have demonstrated that the myelinated axons and fibers that connect various brain regions are abnormal in patients with schizophrenia. The evidence for the breakdown of white matter—and, consequently, brain connectedness and integration—

Myelin pathology in schizophrenia leads to brain disconnectivity and a shattered sense of self

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includes several lines of evidence, such as: a) *in vivo* neuroimaging studies using diffusion tensor imaging (DTI) that show abnormal water mobility in the myelin; b) genetic aberrations in myelin genes; c) postmortem evidence of reduced oligodendrocytes, the glial cells that manufacture myelin; and d) biochemical markers such as the calcium-binding protein S100B, which is released by compromised glial cells.³

Therefore, it is reasonable to think that the disruption of the sense of self and its proprioception may be due to the extensive disconnectivity of brain regions caused by myelin pathology.⁴ However, grey matter abnormality also may play a role in loss of mental proprioceptive functions, which causes a failure to properly recognize one's self. The inferior parietal cortex, which controls body image, concept of self, sensory integration, and executive function, has been reported to be structurally impaired in patients with schizophrenia.⁵ Damage to the parietal cortex can alter awareness in healthy persons that they are initiating a voluntary action as they do it.⁶ Furthermore, refractory auditory hallucinations can be suppressed with repetitive transcranial magnetic stimulation (rTMS) or with transcranial direct current stimulation (tDCS) over the left parietotemporal area.⁷

More than 25 years ago, I published a hypothesis⁸ postulating that the delusions of passivity and external control may be caused by an abnormality in the corpus callosum—the largest white matter bundle in the brain, comprised of approximately 200 million myelinated fibers connecting homologous regions in the left and right cerebral hemispheres. I proposed that failed inter-hemispheric connectivity across the corpus callosum would disrupt the unified sense of self that integrates the 2 hemispheres, each of which has its own

sphere of consciousness, producing hallucinations and delusions of alien control. The discovery of multiple white matter abnormalities over the past decade and acceptance of disconnectivity in schizophrenia confirms the model I proposed in 1985 as a possible mechanism for schizophrenia.⁹

Finally, it is interesting that DSM-IV-TR does not contain any reference to self disorder or fragmentation in schizophrenia, and diagnostic criteria do not include any reference to loss of self-identity in schizophrenia despite the extensive literature. The term “self” does not even appear in the index. Perhaps now is an opportune time to incorporate this new knowledge in DSM-5 and even consider a new name for schizophrenia. How about “self-proprioreception disorder”?

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