Relationship Between Psychopathology and Cognitive Functioning in Schizophrenia

Vasilis P. Bozikas, Mary H. Kosmidis, Konstantina Kioperlidou, and Athanasios Karavatos

The purpose of this study was to delineate the relationship between positive, negative, cognitive, depressive, and excitement symptom dimensions of schizophrenia and cognitive functioning. Fifty-eight patients with schizophrenia (DSM-IV criteria) were assessed using the Positive and Negative Syndrome Scale (PANSS) and a battery of neuropsychological tests (executive function/abstraction, verbal and spatial working memory, verbal and nonverbal memory/learning, attention, visuospatial ability, and psychomotor speed). The cognitive symptom dimension correlated with executive functions, attention, verbal memory, and spatial ability. Severity of the negative symptom dimension was related to impairment in the structure of the semantic knowledge system, verbal memory, and auditory attention. In contrast, severity of the positive symptom dimension correlated only with impairment in the structure of the semantic knowledge system, and psychomotor speed. Finally, severity of the depressive and excitement symptom dimension was not associated with cognition. Correlations between symptom dimensions and cognitive measures were at best modest. Severity of cognitive and negative symptoms was mainly correlated with deficits on executive functions, semantic memory, and verbal memory, while positive symptoms only with semantic memory. These correlations were modest, suggesting that psychopathology and cognitive deficits in schizophrenia are caused, at least partially, by distinct pathophysiological processes.

PATIENTS WITH schizophrenia present deficits in multiple domains of cognition: global and selective verbal memory, nonverbal memory, bilateral and unilateral motor performance, visual and auditory attention, general intelligence, spatial ability, executive function, language, and interhemispheric tactile-transfer performance.[1] Generalized cognitive dysfunction has been found in the first episode of the illness,[2,3] with planning and strategy use the most profound of these deficits.[4,5]

The delineation of the relationship between cognitive performance and symptoms of schizophrenia has been pursued extensively. The use of different symptom scales, such as the Scale for the Assessment of Negative Symptoms (SANS), Scale for the Assessment of Positive Symptoms (SAPS), and Positive and Negative Symptom Scale (PANSS), as well as different clusters of symptoms derived from these scales through factor-analysis, may have contributed to the inconsistencies in the reported associations.[6] Moreover, the variety of neuropsychological tests used may contribute further to the variability of findings. However, discovering the putative relationship between psychopathology and cognitive function in schizophrenia may help to elucidate the pathophysiology of the illness.

Many studies have investigated the relationship between positive symptoms and cognitive dysfunction in schizophrenia. More specifically, the severity of positive symptoms of schizophrenia has generally been shown to correlate minimally with executive dysfunction.[6-10] Only a marginal inverse correlation was found between this cluster of symptoms and visuospatial working memory.[11] However, it was suggested that working memory deficits might be associated with positive symptoms, particularly those positive symptoms (i.e., auditory hallucinations, thought insertion) that may derive from deficits in self-monitoring (the inability to identify self-generated mental events).[12] Positive symptoms were associated negatively with attention deficits,[13-15] as measured by Digit Span forward, a subtest of the Wechsler Adult Intelligence Scale–Revised (WAIS-R), but not with performance on the Continuous Performance Test (CPT) (a meta-analysis of six studies reporting measures of CPT and scores for clusters of symptoms based on factor-analysis of the SANS, PANSS, and Brief Psychiatric Rating Scale [BPRS]).[6] Verbal memory,[16,17] but not visual memory,[15] showed significant negative correlations with the positive symptoms of the illness. Memory measures reflecting production of erroneous memory responses (perseverations, false alarms) were positively linked to positive symptoms of schizophrenia.[18]

From the 1st Department of Psychiatry and the Department of Psychology, Aristotle University of Thessaloniki, Giannitsa, Greece.

Address reprint requests to Dr. Vasilis P. Bozikas, 19 Iatrou Magou Str, 58100 Giannitsa, Greece.

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Recent investigators disentangled disorganization symptoms (inappropriate affect and thought disorder) from the original positive dimension. One meta-analysis of 16 studies using the Wisconsin Card Sorting Test (WCST) and scores for clusters of symptoms based on a factor-analysis of the SANS, SAPS, and PANSS reported that disorganization symptoms showed a significant association with perseverations on the WCST.[6] In one study, disorganization symptoms (defined as inappropriate affect, poverty of content of speech, and formal thought disorder) also showed a specific relationship to verbal memory,[17] and in another, disorganization symptoms (defined as bizarre behavior, thought disorder, and inattention) correlated with decreased attention span, motor skills, and sensory-perceptual function.[10] Moritz et al. reported that disorganization symptoms (loosening of associations, tangential speech, inadequate affect, and eccentric behavior) were related to executive functioning and inhibition of inappropriate responses.[19] Finally, Cameron et al.[20] found that disorganization symptoms (difficulty in abstract thinking, conceptual disorganization, disorientation, and poor attention) correlated with impaired visuospatial working memory under distraction, failure of inhibition during a verbal fluency task, perseverative responding on a test of set-shifting ability, and impairment in the ability to judge the veracity of simple declarative statements.

Regarding the relationship of negative symptoms of schizophrenia with cognitive functioning, reports in the literature have been more consistent, suggesting a significant association. Many investigators, albeit not all, have reported a significant relationship between the severity of negative symptoms of schizophrenia and executive dysfunction.[21] In fact, Nieuwenstein et al.[6] concluded that performance on the WCST was negatively correlated with the severity of negative symptoms. Poor performance on the Trail Making Test,[20,22] on Verbal Fluency,[15,17,23] and on Excluded Letter Fluency (number of words generated)[20] was also associated with negative symptoms. On other studies, visuospatial[11,20] and verbal[19] working memory performance were associated significantly with negative symptoms. A significant and inverse relationship was reported between negative symptoms and sustained, auditory or visual, attention,[6,10] as well as motor speed.[10,16] Negative symptoms showed a small but significant correlation with memory impairment in a meta-analysis of 70 studies reporting on measures of long-term memory (free-recall, cued recall, and recognition of verbal and nonverbal material) and short-tem memory.[24]

More recently, the association of severity of depressive symptoms of schizophrenia and cognitive deficits has attracted investigators interest. Depressive symptoms were found to relate significantly to poor selective attention,[25] poor semantic encoding and reduced verbal recall and recognition.[18] Performance on the Trail Making Test Parts A and B, as well as performance on the Finger Tapping Test, showed a significant relationship with this dimension of symptoms.[16]

Several longitudinal studies, both short (about 1 month)[26] and long duration (19 months to 5 years),[27-29] of patients with first episode schizophrenia, some of them including chronic patients[27,28] and other schizophrenia spectrum disorders,[29] have addressed the association between changes in neuropsychological performance and psychopathology. Improvement in negative symptoms, but not in positive and disorganization symptoms, correlated with increased performance in abstraction, attention, spatial memory, language, and spatial abilities,[27] as well as with language skills (verbal fluency) and attention,[26] and both full-scale and verbal IQ.[28] However, Hoff et al.[29] found that a decrease in positive symptoms scores was associated with improvement on executive function, spatial memory, concentration/speed, and global cognition. Significant improvement in symptom ratings in chronic patients with schizophrenia, over a period of 6 months, did not correlate with changes in cognitive functioning, with the exception of motor speed, despite the fact that negative symptoms were inversely associated with IQ, executive functioning, and memory at baseline assessment.[30]

The purpose of the current study was to find the relationship between positive, negative, cognitive impairment, depressive, and excitement symptoms of schizophrenia and cognitive functioning, and to further elucidate the pathophysiology of symptom expression.

METHOD

Patients

Participants were 58 patients with schizophrenia living in the community: 41 men (71%) and 17 women (29%), whose mean age was 37.45 years (SD 10.57; range, 21 to 65). They had a