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Verbal learning in schizopsychotic outpatients and healthy volunteers as a function of cognitive performance levels

Ulla Karilampi [a,*], Lars Helldin [b], Fredrik Hjärthag [c], Torsten Norlander [c], Trevor Archer [a]

[a] *Department of Psychology, University of Gothenburg, Box 500, S-405 30 Gothenburg, Sweden*
[b] *Department of Psychiatry, NU-Sjukvården, S-461 85 Trollhättan, Sweden*
[c] *Department of Psychology, Karlstad University, S-651 88 Karlstad, Sweden*

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Abstract

OBJECTIVE: The aim was to analyze and compare neurocognitive test profiles related to different levels of verbal learning performance among schizopsychotic patients and healthy volunteers.
METHOD: A single-center patient cohort of 196 participants was compared with an equal-sized volunteer group to form three cognitive subgroups based on the shared verbal learning performance.
RESULTS: 43.9% of the patients had normal learning ability. Despite this, all patients underperformed the volunteers on all subtests with the exception of working memory, and, for those with high learning ability, even verbal facility. All patients also presented equally poor visuomotor processing speed/efficacy.
CONCLUSION: A global neurocognitive retardation of speed-related processing in schizophrenia is suggested.

Keywords: Schizophrenia; Cognition; RAVLT; Verbal learning; Working memory; Visuomotor processing speed; Discriminant analysis

1. Introduction

Neurocognitive impairments have been shown repeatedly to be a prominent feature of schizophrenia. Nevertheless, the issue of whether this is due to generalized neurocognitive impairment or differential deficits in specific neurocognitive processes remains unresolved.

Neurocognitive functioning, a core feature of notions concerning general and specific neurocognitive deficits in the schizophrenic patient, hinges on learning ability. Almost every aspect of behavior and cognition requires learning. Learning goes hand in hand together with memory. Learning may be defined as the acquisition of new information, while memory is the capacity for storing and retrieving this material (Wickens, 2005). A genetic study of cognitive trait components in schizophrenia has shown verbal learning to be linked to the same locus as delayed memory, with semantic clustering linked to the same region (Paunio et al., 2004).

Already at the very first presentation of psychotic symptoms, schizophrenic patients have been found to show significant impairment on tasks of executive function, verbal learning, delayed recall from non-verbal memory, and

* Corresponding author. Tel.: +46 31 7734694; fax: +46 31 7734628.
E-mail address: Ulla.Karilampi@psy.gu.se (U. Karilampi).

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psychomotor speed (Riley et al., 2000). These functions showed significant impairment against a background of generalized, but non-significant, underperformance on all neuropsychological variables. A study of unmedicated schizophrenic patients (Saykin et al., 1991) found them to show generalized impairment relative to controls and a selective deficit in memory and learning compared with other functions. A meta-analysis conducted on 70 studies of memory in schizophrenia showed that the memory impairment is stable, wide ranging, and not substantially affected by potential moderating factors such as severity of psychopathology and duration of illness (Aleman, Hijman, de Haan, & Kahn, 1999).

Even unaffected relatives outside the peak age of risk for schizophrenia, with neither spectrum nor other psychiatric disorders, have deficits in verbal learning and motor speed (Hoff et al., 2005). A meta-analysis of 37 studies comprising 1639 relatives of schizophrenic patients and 1380 control subjects showed the largest difference between relatives and controls to be on verbal recall and executive functioning (Sitskoorn, Aleman, Ebisch, Appels, & Kahn, 2004).

Despite the finding that schizophrenic patients as a group generally perform worse than healthy controls, there is a considerable variation between the patients' performance, suggesting the presence of at least two neurocognitive subgroups: impaired versus unimpaired. Such subdivisions have been based on demographic and/or clinical variables (Brazo et al., 2002; Heaton et al., 2001), preserved and compromised intellect (Weickert et al., 2000), a screening test of attention and auditory perception (Bruder, Wexler, Sage, Gil, & Gorman, 2004), cluster analysis (Abi-Saab, Fiszdon, Bryson, & Bell, 2005; Heinrichs & Awad, 1993; Hill, Ragland, Gur, & Gur, 2002), prototypes from the clinical literature (Kremen, Seidman, Faraone, Toomey, & Tsuang, 2004), and fixed standard deviations from a verbal memory test (McDermid Vaz & Heinrichs, 2002).

A cross-sectional approach would be expected in comparisons of two to even five neurocognitive subgroups of schizophrenic patients to healthy volunteers, yet for some reason, the volunteers are usually treated as a single homogeneous "control group". For example, Horan and Goldstein (2003) based their *Z*-score conversion upon the raw scores of the total study sample, including both schizophrenic and non-psychotic patient control participants, but still divided the schizophrenic patients into four clusters while the non-psychotic patients formed a single "cluster". This kind of approach neglects the issue of "real-life" differences between schizophrenic patients and a control group, as there is a considerable variation even within the performance of controls and healthy volunteers.

The present study assesses neurocognitive performance in schizophrenic patients *relative* to that of healthy volunteers. Thus, a single-center patient cohort was compared with an equal-sized healthy volunteer group to form cognitive subgroups based on the shared verbal learning performance. The subgroups were then analyzed in order to find the best predictors of verbal learning performance. The results were studied also for differences in general neurocognitive performance patterns between schizophrenic patients and healthy volunteers.

2. Method

2.1. Participants

196 schizopsychotic outpatients (116 males, 80 females) between the ages of 19 and 74 years (mean = 46.31, S.D. = 11.76) and 196 healthy volunteers (78 males, 118 females) from 20 to 80 years (mean = 47.81, S.D. = 18.09) participated in this study.

The patients originated from an ongoing epidemiological study of a population of about 670 patients at outpatients settings in Western Sweden with the diagnoses schizophrenia, schizoaffective disorder or delusional disorder according to DSM-IV and ICD-10. Out of the total number, 516 patients were considered to be in a stable phase of the disorder as assessed from the patients' medical records and observations of the psychiatric personnel, personnel from the community psychiatry and relatives. These patients were not presenting co-morbidity of other symptoms, such as dementia, that could influence the result. In total, 284 patients volunteered for the investigation and were presented with an extensive clinical test and interview battery, including study of their medical records. After 20 patients had been excluded due to having other diagnoses than those allowed, 264 patients remained. Of these, 233 had completed at least one of the neurocognitive tests administered. Missing value analysis resulted in a final group of 196 patients with complete results from all neurocognitive testing.

Of the 196 patients included in the present study, 25 individuals (12.8%) were diagnosed with delusional syndrome, 6 (3.1%) with disorganised schizophrenia, 1 (0.5%) with catatonic schizophrenia, 66 (33.7%) with paranoid schizophrenia, 10 (5.1%) with residual schizophrenia, 44 (22.4%) with schizoaffective disorder and finally 44 individuals (22.4%) with undifferentiated schizophrenia, according to their medical records. All but nine patients were on antipsychotic