Cambridge Neuropsychological Test Automated Battery: Comparing cognitive impairment in schizophrenia and bipolar disorder

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INTRODUCTION

Schizophrenia (SZ) and bipolar disorder (BD) are frequently occurring and impairing disorders that affect around 1% of the population.

Schizophrenia (SZ) is a psychotic disorder with usual onset in adolescence or early adulthood. (Tsuang, 2004).

SZ is associated with pervasive cognitive impairment. Many investigators have argued that this impairment represents a core feature of the disorder, which reflects both genetic risk and influences functional outcomes. (Green, 1998)

Cognitive impairment in schizophrenia is considered a core feature of the disorder. It is reliably present in the majority of patients, independent of positive symptoms such as delusions and hallucinations, and a major cause of poor social and vocational outcome. It is trait-like and present throughout the course of the illness. Thus, impairment is largely stable over intervals ranging for months to years. (Heaton et. al., 2001)

The most pronounced deficits are observed in information processing speed and verbal and visual memory, while the smallest deficits are observed in attention and motor processing speed. (Rajji, Ismail and Mulsant, 2009)

On the other side bipolar disorder (BD) is characterized by episodic pathological mood alterations that can be manic, depressive or mixed (American Psychiatric Association, 1994)

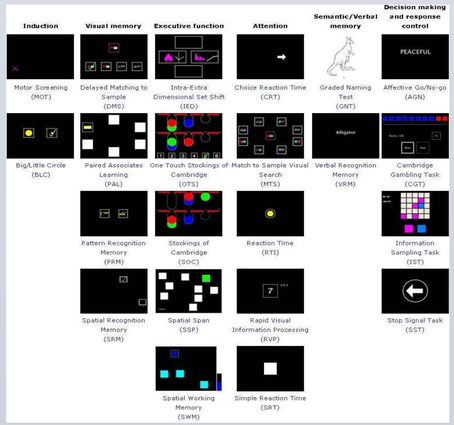
Bipolar disorder also presents with cognitive deficits that are similar to but less severe, than those reported in schizophrenia.

Studies demonstrate impairments in visuospatial memory, verbal learning, executive functions, and sustained attention among remitted patients with BD. (Thompson et. al., 2005)

Comparing bipolar disorder to schizophrenia is a relevant point since both disorders show considerable overlaps in many aspects.

Over the last decade, the Cambridge Neuropsychological Test Automated Battery (CANTAB) has been utilized in cognitive studies mostly of schizophrenia but also of bipolar disorder.

The aim of this study is to compare cognitive impairment between patients with schizophrenia, bipolar disorder and healthy controls using CANTAB test battery.



MATERIALS AND METHODS

The use of a computerized battery presents some methodological and practical advantages over traditional neuropsychological tests. The main advantage of CANTAB is the standardization of administration. The rigorous experimental heritage of the CANTAB and the wide range of data already collected have allowed effects to be related to particular components of cognitive function and to potential underlying neural substrates.

Sample

Patients and controls were assessed at the Psychiatric Clinic, Clinical Center, University of Sarajevo, Bosnia and Herzegovina. The study included patients with diagnosis of schizophrenia or bipolar disorder according to the Diagnostic and Statistical Manual of Mental Disorders IV (DSM-IV) and healthy control subjects, recruited from students and personnel from other (non-psychiatry) departments of the clinic, with neither a diagnosis of psychiatric disorder nor a family history of BD and SZ. The study was approved by the respective local ethic committees in Bosnia and Herzegovina and in Germany. Written informed consent was obtained from all participants. The cohort comprised of 105 SZ patients, 46 BD patients; and 48 controls.

Table 1: Demographic characteristics: Age and sex distribution in patients with bipolar disorder (BD) and schizophrenia (SZ), and in controls. F = females, M = males.

	SZ	BD	Controls
Age	41.24 (11.25)	43.63 (10.37)	38.96 (12.63)
F:M ratio	68:37	32:14	24:24
N total	105	46	48

Participants were compared on CANTAB test battery that included: Simple reaction time (SRT), Choice reaction time (CRT), Stop signal task (SST), Cambridge gambling task (CGT), Information sampling test (IST), Stocking of Cambridge (SOC) and Intra/Extradimensional set shift (IED) tests.

According to CANTAB test description by functions SRT and CRT tests are measuring attention, SST test measure responses, CGT and IST tests are measuring decision making and SOC and IED tests are measuring executive function, working memory and planning.

CANTAB

RESULTS

SRT - Simple Reaction Time

SRT outcome measures cover latency (response speed), correct responses and errors of commission (impulsivity), inaccurate performance of task steps) and omission (failure to complete task steps).

In our study we found statistically significant difference between schizophrenia patients and control participants in latency, commission trials and omission errors and between SZ and BD patients there is statistically significant differences in latency which show us that BD patients respond faster than SZ patients and also that they show less impulsivity and it is less likely that they failure at task.

And there are statistically significant difference between BD patients and controls in latency, commission trials and omission errors which shows us that BD patients are doing significantly worse than controls but they are slightly better than SZ patients.

CRT - Choice reaction time

CRT outcome measures assess correct and incorrect responses, errors of commission and omission (late and early responses), and latency (response speed). Choice reaction time is also use as a measure of span of attention.

We found statistically significant differences between SZ and healthy controls on all variables and also there are statistically significant differences between SZ and BD patients on three sub tests that are focusing onto latency or response speed which means that SZ patients are significantly slower than BD patients.

But there were statistically significant differences between BD and controls on five sub tests and we expected some differences because attention was highlighted as vulnerability marker for BD.

SST - Stop signal task

SST outcome measures cover direction errors, proportion of successful stops, reaction time on Go trials, and stop signal reaction time (SSRT).

In our study there are statistically significant differences between SZ and controls on sub test that are measuring SST direction errors which can be explained with deficit in attention present in SZ patients and not just inhibitory deficits because there were no any statistically significant difference on other sub test that are measuring correct RT on GO trials. Also there are statistically significant difference comparing BD patients and controls on sub test that are measuring SST direction errors which can be explained with deficit in attention present in BD patients.

Comparing SZ and BD patients there are no any statistically significant differences, so there are no any differences in attention.

CGT - Cambridge gambling task

In the CGT six outcome measures cover risk taking, quality of decision-making, deliberation time, risk adjustment, delay aversion and overall proportion bet.

BD and SZ are associated with impairments of decision making and behavioral control in everyday circumstances. We found statistically significant differences between SZ and controls on all variables, which suggest us that SZ patients are expressing more cognitive impairment and problems in decision making process.

On the other side we found statistically significant differences between BD and controls on few variables and this can suggest us that BD patients are having cognitive impairment and problems with decision making but still they are slightly better than SZ patients on this task. But we didn't find any statistically significant differences between SZ and BD patients which means that there is no big differences between this two groups in decision making process tasks.

IST - Information Sampling Test

The IST outcome measures include errors, latency (speed of response), total correct trials, mean number of boxes opened per trial and probability of the participant's decision being correct based on the available evidence at the time of the decision. This test is a designed to measure pre-decision processing, where the subject gathers and evaluates information prior to making a decision.

Our research results we didn't find any statistically significant differences between BD or SZ patients and controls as well as between BD and SZ patients.

SOC - Stocking of Cambridge

SOC - Outcome measures include the number and percentage of correct trials and latency (speed of participant's response).

In our case we found statistically significant differences on one variable (Problems solved in minimum moves 5 moves) between BD and controls and between SZ and controls.

But this test is connected with frontal lobe dysfunction, and we were not able to investigate that part in case of our patients. Also we didn't have data of episodes in which our patients were before this research, so this can influence on our results.

IED - Intra/Extradimensional Set Shift

IED - Outcome measures assess the number of errors made, the number of trials completed and the number of stages completed. We found statistically significant differences between SZ and controls on majority measured variables, but on the other side there were less variables on which we observed statistically significant differences between BD and controls.

CONCLUSION

Majority of our results are in the line with previous research and overall we can conclude that we found more cognitive impairments in SZ patients compared with controls, but we also did not find any statistically significant difference between BD patients and SZ patients.

There is a possibility that we obtained this results because of the specific sociocultural background of our participants, as they are from post-war country in transition. So it will be interesting to see results of similar research with a sample from another country. But it is important to mention that this is the first research study of this kind, using CANTAB test, done in Bosnia and Herzegovina and this research can be a good starting point for future research.

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