Psychiatry Research 210 (2013) 375–380

Contents lists available at ScienceDirect

Psychiatry Research

journal homepage: www.elsevier.com/locate/psychres

A snapshot of cognitive functioning: Deriving a tool for the efficient assessment of cognition in schizophrenia and other chronic psychiatric disorders in a real-world inpatient setting

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ARTICLE INFO

Article history:
Received 11 November 2012
Received in revised form
24 May 2013
Accepted 8 July 2013

Keywords:
Schizophrenia
Cognitive assessment
Cognitive functioning
Psychiatric disorders
Inpatient

ABSTRACT

Previous research has led to the development of short batteries of tests that efficiently measure the cognitive functioning of individuals with schizophrenia. To attempt to replicate previous findings, we applied an empirical test selection strategy to archival cognitive test data of two non-overlapping inpatient samples of individuals with schizophrenia or schizoaffective disorder (total $N=110$). We then extended previous findings by applying the empirical test selection strategy to the archival data of two non-overlapping inpatient samples of individuals with various psychiatric disorders (total $N=149$). For each sample, tests were selected by examining the relationships between individual test scores and averaged test scores representing global cognitive functioning while taking into account test administration times. Across patient samples, digit symbol coding tasks, verbal fluency tasks, and tests with a processing speed component (Trail Making Test Part A and Stroop) emerged as efficient and effective indicators of overall cognitive functioning. A brief cognitive assessment tool incorporating coding, fluency, and processing speed tasks would provide a valid and clinically useful snapshot of a patient's level of cognitive functioning if more comprehensive testing cannot be completed.

1. Introduction

Cognitive deficits are an important part of the presentation of schizophrenia (e.g., Keefe and Fenton, 2007; Bora et al., 2010). There is thus a need to assess cognitive functioning in individuals with schizophrenia, so that appropriate interventions can be provided (e.g., Silverstein and Wilkniss, 2004; McGurk et al., 2007). Brief cognitive assessment tools have recently been developed for use with individuals with schizophrenia (e.g., Hurford et al., 2011). However, given their novelty, further evaluation of these tools is warranted, particularly for individuals with schizophrenia in real-world inpatient settings. It would also be valuable to evaluate whether these assessment tools can be applied to all individuals at real-world inpatient settings (i.e., individuals with various chronic psychiatric disorders).

Cognitive deficits are evident across psychiatric disorders (Millan et al., 2012), and a large body of research has specifically examined the nature of the cognitive deficits in schizophrenia. For example, cognitive dysfunction in schizophrenia has been shown to be on average 0.5–2 standard deviations below that of healthy individuals (e.g., Heinrichs and Zakzanis, 1998; Keefe et al., 2006). Moreover, cognitive deficits persist despite the management of the positive and negative symptoms of schizophrenia (Krabbendam and Aleman, 2003; Hill et al., 2010). This research has highlighted the importance of assessing cognitive functioning in schizophrenia.

The traditional approach to assessment of cognitive functioning has involved the administration of a large set of tests that tap key cognitive domains (for schizophrenia, see e.g., Green et al., 2004). Such test batteries can take between 1 and 3 h and involve multiple test sessions. In clinical settings, some patients may not be motivated to complete long test batteries and symptoms of psychiatric disorders may fluctuate in such a way that only a short period is available during which testing can be done. Rather than omit cognitive testing as part of an assessment, brief cognitive assessment tools can be used.

Currently, there are several short test batteries that take between 15 and 35 min to administer, and these batteries have been shown to correlate between 0.56 and 0.77 with large comprehensive batteries of tests in either outpatient or mixed inpatient and outpatient samples of individuals with schizophrenia (the Repeatable Battery for the Assessment of Neuropsychological Status [RBANS]; Gold et al., 1999; the Brief Assessment of

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0165-1781/$ - see front matter © 2013 Elsevier Ireland Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.psychres.2013.07.006

Cognition in Schizophrenia [BACS]; Keefe et al., 2004; the Brief Cognitive Assessment [BCA]; Velligan et al., 2004; the Audio Recorded Cognitive Screen [ARCS]; Loughland et al., 2010). Recently, Hurford et al. (2011) developed the Brief Cognitive Assessment Tool for Schizophrenia (B-CATS), which takes about 10–11 min to administer. Hurford et al. (2011) had three separate samples (Sample 1=outpatients with first-episode schizophrenia, Sample 2=inpatients with schizophrenia, Sample 3=inpatients and outpatients with schizophrenia) and each sample was administered a different set of cognitive tests (Sample 1=30 tests, Sample 2=12 tests, Sample 3=10 tests). Across the samples, the three individual tests that explained the most variance in overall test performance accounting for differences in administration time for each test were: Trail Making Test Part B, Digit Symbol Substitution, and Category Fluency (animals, fruits, vegetables). These tests formed the B-CATS. Hurford et al. (2011) reported significant corrected correlations (corrected for part-whole correlations) of 0.82 and 0.73 between the B-CATS and the full set of cognitive tests administered to Samples 1 and 2, respectively.

To our knowledge, none of the existing brief cognitive assessment batteries have been examined with pure samples of inpatients with schizophrenia, or samples of inpatients with various chronic psychiatric disorders. Given the B-CATS has the shortest administration time of all the existing brief cognitive assessment batteries, it would be valuable to replicate the findings of Hurford et al. (2011) with pure inpatient samples with schizophrenia, as well as inpatient samples with chronic psychiatric disorders. More specifically, it would be important to examine whether the tests included in the B-CATS emerge as the most efficient tests for explaining overall cognitive performance for these inpatient groups in real-world inpatient settings.

Our study thus had several aims. We aimed to apply the empirical strategy of Hurford et al. (2011) to determine the cognitive tests that most efficiently account for the most variance in overall cognitive test performance in: (a) two non-overlapping inpatient samples of individuals with schizophrenia, and (b) two non-overlapping inpatient samples of individuals with different chronic psychiatric diagnoses. To further compare our results with previous research, we also aimed to report the differences in performance between our patient samples and healthy controls (using published norms) on the cognitive tests that emerge as the most efficient and effective indicators of overall cognitive performance.

Based on the tests of the B-CATS, we predicted that across our two samples of individuals with schizophrenia, Trails B, a coding task, and a fluency task would emerge as the most efficient at explaining the most variance in overall cognitive performance. We did not have a prediction for our two samples of individuals with different psychiatric diagnoses, as no previous studies have applied the Hurford et al.'s (2011) test selection strategy to such samples.

2. Methods

2.1. Participants

We examined neuropsychological test scores from 226 patients who were assessed at Macquarie Hospital, a psychiatric rehabilitation hospital, between 1999 and 2011. Following Hurford et al. (2011), only patients with complete data sets were included in our main analyses. Patient diagnoses were made by psychiatrists using Diagnostic and Statistical Manual of Mental Disorders—Fourth Edition (DSM—IV; American Psychiatric Association, 1994) criteria. As shown in Fig. 1, there were 103 psychiatric patients with mixed diagnoses (MD) who completed one set of tests (MD Sample 1) and 46 patients with MD who completed a second set of tests (MD Sample 2). The remaining patients ($n=77$) had either incomplete data sets or other combinations of tests that were administered. Hence, these individuals were excluded from our main analyses and formed Excluded (EX) Sample 1. No other exclusion criteria were employed. Of the individuals in MD Sample 1, MD Sample 2, and EX Sample 1, there were 70, 40, and 63 individuals who met criteria for schizophrenia or schizoaffective disorder, respectively (see Fig. 1). These subsets of 70, 40, and 63 individuals thus also formed Schizophrenia Spectrum (SS) Sample 1, SS Sample 2, and EX Sample 2, respectively. Table 1 shows demographic and clinical information for the samples.

2.2. Measures

2.2.1. Cognitive tests administered

Individuals in MD Sample 1 and SS Sample 1 were administered several common neuropsychological tests, subtests from the Wechsler Adult Intelligence Scale (3rd edition; WAIS-III), and subtests from the Wechsler Memory Scale (3rd edition; WMS-III). Table 2 shows the specific tests that were administered along with the cognitive domain assessed by each test. Individuals in MD Sample 2 and SS Sample 2 were also administered several common neuropsychological tests, along with all subtests of the RBANS. Table 3 lists the specific tests that were administered together with the cognitive domain assessed by each test.

2.2.2. Administration time of tests

For each test, the length of administration time also needed to be ascertained. Given we examined archival cognitive test data, the time of administration for each test was not collected during testing. To obtain test administration times, we first examined published articles or books (e.g., Ryan et al., 1998; Axelrod, 2001; Keefe

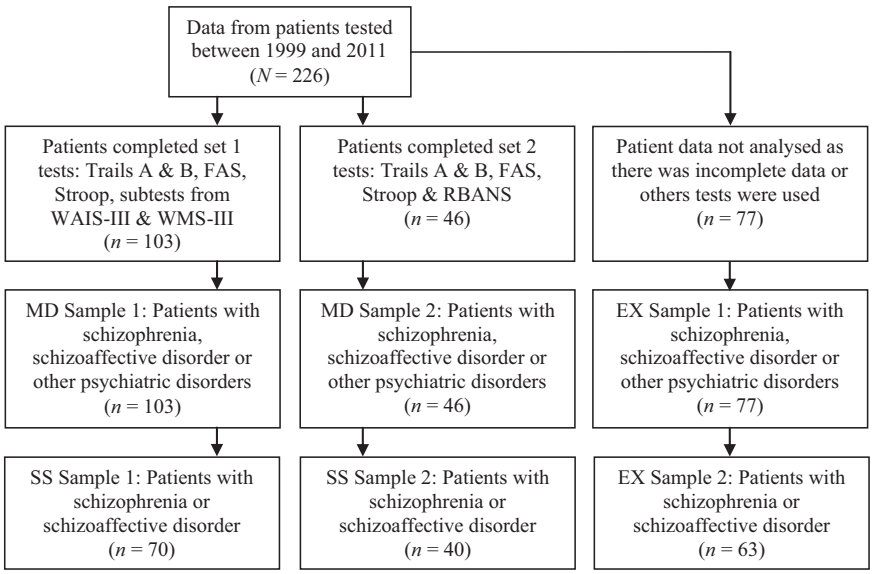

Fig. 1. Flow-diagram showing the division of patient data into groups for analysis. MD, mixed diagnoses; SS, schizophrenia spectrum; EX, excluded.