Validation of an automated rule switching test of executive function

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BACKGROUND

The CDR System Rule Switching Test, a measure of executive control/function, has been validated in healthy controls.

The RST showed acceptable test retest reliability and correlated appropriately with the Trail Making Task.

This study was conducted to investigate the task in patients with schizophrenia.

This study was conducted in conjunction with CRI Lifetree, Mount Laurel, NJ, USA

METHODS

30 patients with schizophrenia on stabile medication were studied.

13 females mean age 49 years (range 40 to 59)

17 males mean age 45 years (range 29 to 57)

CDRI were in the range 2 to 4

Each patient attended three sessions on separate days to allow time for patients to recover from cognitive function decline from the 20s to the 90s in healthy individuals

PROCEDURE

On the first study day, the following tests were performed:

- UPSA-B
- CDR System Executive Function Test
- Trail Making Task
- NAB Mazes (from MATRICS)

On the second and third study days, the following tests were repeated:

- CDR System Executive Function Test
- Trail Making Task
- NAB Mazes (from MATRICS)

THE CDR EXECUTIVE FUNCTION TEST

The test involves the presentation of strings of identical digits, eg

PART A

Please decide if the value of the digit is greater or smaller than 5. If the value is greater than 5, press YES, otherwise press NO.

PART B

Please decide if the number of the digit is greater or smaller than 5. If the value is greater than 5, press YES, otherwise press NO.

PART C

Please decide whether or not the value is greater than 5. If the value is greater than 5, press YES, otherwise press NO.

The Trail Making Task Measures Used in Analysis

- Trails A
- Trails B
- Trails A-B
- Trails B-A
- Trails B-A/B
- NAB Mazes Total Score
- NAB Mazes Total Score
- CDR System Executive Function Test

- UPSA-B Total Score, Finances & Communication

RESULTS

Stability Of Test Data Over The 3 Study Days: Test-Retest Reliability & Practice Effects

Comparisons of Patients to Controls

Correlations Between CDR System and the Trails & NABMazes Task

Statistical Properties

Comparisons of Patients to Controls

Correlations with the UPSA-B

DISCUSSION & CONCLUSIONS

All measures showed clear differences between patients and controls, with effect sizes ranging from (1.53 to 1.95).

The CDR System Executive Function test has sound statistical properties and does not show training effects over three test sessions in patients with schizophrenia.

The average completion time for the task was just under 6 minutes, which compared to around 20 minutes for NAB Mazes and 7 minutes for Trails.

This stability plus the relatively low coefficient of variance suggests the test will be sensitive to treatment effects.

The CDR System Executive Function Score correlated appropriately with the Trail Making Task, and also the UPSA-B (r=0.57).

There were no notable or significant correlations between years of education and performance on any measure (largest for Mazes r=−0.18; CDR System Executive Function Score r=0.07).

The NAB Mazes and the Trail Making test show large effect-size improvements due to training which will make these tests unsuitable for repeated admission in clinical trials.

Compared to NAB Mazes and the Trail Making test the CDR System has comparable or better statistical properties.

The strong correlation of the CDR System Executive Function test to the UPSA-B indicates the behavioural relevance of the task for patients with schizophrenia.

This task has now entered clinical trials and data on sensitivity to treatment effects will be presented when available.

The task is currently being validated in bipolar patients and patients with major depressive disorder.