Brief Computerized Cognitive Testing in Pediatric-Onset Multiple Sclerosis (MS)

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Objective

To pilot the utility of the computerized CogState Brief Battery for the assessment of cognitive functioning in pediatric-onset MS.

Background

Pediatric-onset MS has an incidence of 0.2 to 0.6 per 100,000 children and requires multicenter collaboration to study. For patients who are this young, it is critical to identify cognitive impairment at its earliest point.

The computerized Cogstate Brief Battery has demonstrated sensitivity in adults and children with other neurologic disorders and is utilized as a cognitive outcome for clinical trials. It has the advantages of a large normative database, absence of practice effects, ease of administration, and culture-free stimuli with data managed through a central server.

Methods

Participants diagnosed with pediatric-onset MS were consecutively recruited during routine outpatient visits at the Lourie Center for Pediatric MS between December 2013 and June 2014.

Participants received neurologic examination and the Symbol Digit Modalities Test (SDMT) was administered. They then completed the Cogstate Brief Battery, which consists of four card games presented on a computer screen requiring yes or no responses. The responses are assigned to specific keys on the keyboard.

The games Detection and Identification measure information processing (simple and choice reaction time), One-Back measures working memory, and One-Card Learning measures visual learning. The representative score for the Detection, Identification and One-Back tasks is speed, and the score for the One-Card Learning task is accuracy.

Results

Fifty (50) participants completed the study. Ages ranged from 10 to 25 years, with a mean of 18.7 ± 3.5 years and a median of 19.1 years. EDSS scores from 0.0 to 4.0 with a median of 1.25. Average disease duration was 4.4 ± 3.2 years.

Mean SDMT z score was -0.37 ± 1.23 (range of -2.76 to 3.54), with thirty percent (30%) or n=15 scoring in the impaired range (one standard deviation or more below the mean).

Measures	Mean	SD	Impairment
SDMT	-0.37	1.23	30%
Cogstate Detection	-0.93	1.62	44%
Cogstate Identification	-0.84	1.34	46%
Cogstate One Card Learning	-0.38	1.01	30%
Cogstate One Back	-0.87	0.99	48%
Cogstate Processing Composite	-0.88	1.24	44%

- All participants' Cogstate data met criteria demonstrating acceptable completion and integrity.

- Seventy-four (74)% of the sample are impaired (one standard deviation or more below the normative mean) on at least one of the four Cogstate measures, with 52% impaired on two or more measures and 44% impaired on the within-subjects composite score representing the three processing tasks (Detection, Identification, One-back).

- Of the 15 participants with impaired SDMT, 13 are also impaired on at least two Cogstate tests (87% agreement), while 25 additional participants are impaired on at least one Cogstate measure, Another 13 are impaired on two or more without impairment on the SDMT.

Impairment Rates for the SDMT and Cogstate Measures (n=50)
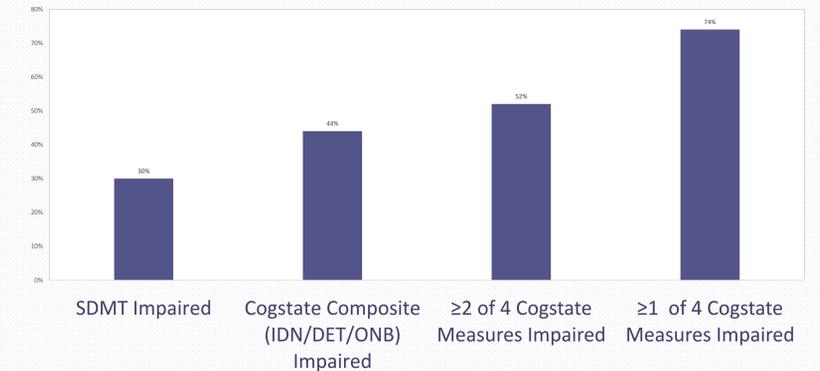
- Correlations between the SDMT and Cogstate measures were significant for the Detection Identification and One Back measures, but not for One Card Learning (r=0.42, 0.43, 0.41 vs. 0.12.

- EDSS was only significantly correlated with One Card Learning (r=-0.32 vs. -0.12, -0.15, -0.25).

Conclusion

- The Cogstate Brief Battery is a practical computerized battery that is sensitive to detecting cognitive involvement in pediatric-onset MS.

- Cogstate may be a useful measure of cognition for collaborative studies to follow participants over time.

References

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