Objective

To evaluate the Test of Everyday Cognitive Ability (TECA) as a measure of real-world cognitive functioning in multiple sclerosis (MS).

Background

MS is one of the most common neurological disorders affecting approximately 400,000 individuals in the United States. Among the variable symptoms affecting MS patients, cognitive impairment is experienced by more than 50%. Despite the fact that cognitive measures have been established to detect cognitive deficits, there are a lack of measures that can assess the real-world experience of cognitive impairment in MS.

The Activities of Daily Living (ADL) has been previously employed in aging and dementia studies to evaluate the real-world experience of impaired patients. Those previous trials in evaluating real-world experience have been confined by both their mild degree of difficulty and their small number of tasks. This has limited their application in MS populations.

TECA, the response to these shortcomings, is a robust battery consisting of 10 items of sufficient difficulty to reflect a range of performance in MS populations. By presenting subjects with common situations and props such as a grocery shelf with food items, coin currency, and prescription bottles, the TECA places cognitive tasks, such as processing speed, visual scanning, and working memory, in the context of everyday situations (Figure 1).

Figure 1. The TECA’s tasks involves a group of props, including a simulated grocery shelf

Methods

The TECA was administered to 177 MS participants with 129 experiencing mild cognitive impairment (defined by SDMT performance of 1 SD below norms) and a group of 49 healthy control participants (Table 1). Additional cognitive measures were also administered (Table 2) as part of a cognitive battery.

Each of the ten test items has a defined time limit. The completion time is combined with the accuracy of an individual’s response (no error, mild error, major error) to produce a score for each item. Examples of mild response errors are explicitly stated within the TECA’s instructions to provide consistent scoring among testers. The scores of each task were transformed to z-scores using the normative data of the control group at baseline. Composite scores were created by averaging z-scores across all ten items.

Sample Characteristics: The MS participants were diagnosed with relapsing remitting (76%), primary progressive (20%) or secondary progressive (4%) disease and ranged from minimal to severe neurologic disability (Expanded Disability Status Scale (EDSS) median score of 3.0, range of 0.0 to 8.0).

Additionally, the sample consisted of native English speakers (excluding those who learned English after 12 years of age) which is reflected in the relatively high WRAT reading scaled scores.

Table 1: Sample Demographics

<table>
<thead>
<tr>
<th>Measure</th>
<th>Mean Normative z Score</th>
<th>Impairment</th>
<th>Correlation to TECA Performance (r)</th>
<th>Sample Size (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDMT</td>
<td>-0.84 ± 1.09</td>
<td>Mildly Impaired</td>
<td>0.54*</td>
<td>224</td>
</tr>
<tr>
<td>BVMT-R Total Trials</td>
<td>-0.55 ± 1.42</td>
<td>Low average</td>
<td>0.35*</td>
<td>209</td>
</tr>
<tr>
<td>SRT Total Trials</td>
<td>-0.72 ± 1.43</td>
<td>Low average</td>
<td>-0.31*</td>
<td>155</td>
</tr>
<tr>
<td>PASAT (2 second)</td>
<td>-0.98 ± 1.02</td>
<td>Mildly Impaired</td>
<td>-0.32*</td>
<td>146</td>
</tr>
</tbody>
</table>

Predictors of TECA Performance: A higher EDSS score predicted a poorer TECA score (r=0.25, p=0.002, n=153). TECA performance is positively correlated to other cognitive measures (Table 2). Neither age nor education predicted TECA score (Age, r=-0.27, p<0.001, n=225; Education, r=0.16, p=0.015, n=225).

Conclusion

- The TECA is a reliable, valid measure of cognitive impairment in daily functioning in MS.
- The TECA presents a quantifiable method of measuring real-world functioning in individuals with MS.
- Further development of the measure is underway to enhance its sensitivity to real-world deficits.

References