Preservation of Learning Abilities in People with Dementia and Depression with Different Levels of Cognitive Impairment

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Background

Data regarding learning potential in people with dementia are very limited (1, 2). Recent findings indicate that improving mitochondrial function has positive affects on the learning capacities in animal models of Alzheimer’s disease (3, 4). It is hypothesized that people with mild to moderate dementia have preserved learning abilities.

Objective

To investigate the learning potential for different targets (flowers, numbers and words) in people with dementia and depression.

Subjects / Methods

The subjects were 32 moderately ill patients (19 women; 13 men) with different levels of dementia with depression (age - 79.32 ± 7.15; education - 13.41 ± 3.43). They ranged in age from 70 to 95 years. After the subjects completed an consent form about the procedures, they were evaluated by using the Mini Mental Status Examination (MMSE) (6), and an original, computerized, continuous visual learning task. Three kinds of visual stimuli were used: flowers, double digit numbers and three letter words. The exclusion criteria for this protocol were poor task comprehension and inability to finish all three types of visual stimuli in one session.

The task is designed to present one type of stimuli (6 targets) on the screen azimuthally for about 200 seconds. The subjects then make a two-choice decision for each stimulus. The subsets view previously presented stimuli and 6 stimuli, and make an observable judgment by pressing one of two keys.

The task has three parts. The first is the continuous visual learning part of the task (or learning curve) that consists of several trials of the same type of stimuli (flowers, numbers and words), until the person reached his or her maximum learning capacity. The second part is a 5 minute break with music. The third part involves recall/recognition of previously memorized targets.

Performance (number of correct answers) and intrusion (number of mistakes) were assessed on every trial and in the 5 minute recall. All analyses were conducted using the Statistical Package for Social Sciences/SPSS 16.0 (SPSS Inc., Chicago, IL). Data analysis included descriptive statistic, Wilcoxon Signed-Rank test, and Spearman correlations. Two-tailed tests were performed for all analyses and p was set to 0.05.

Results

Table 1. Descriptive statistics

<table>
<thead>
<tr>
<th>Targets</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Number of correct answers</th>
<th>Number of mistakes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flowers</td>
<td>5.16</td>
<td>1.17</td>
<td>4.69</td>
<td>1.49</td>
</tr>
<tr>
<td>Numbers</td>
<td>5.00</td>
<td>1.20</td>
<td>4.75</td>
<td>1.50</td>
</tr>
<tr>
<td>Words</td>
<td>4.93</td>
<td>1.20</td>
<td>4.65</td>
<td>1.50</td>
</tr>
</tbody>
</table>

For flowers and words, the positive correlations were demonstrated between correct answers on the first trial, 5 minute recall and maximum memorized targets, and the negative correlations were found between the number of trials to achieve learning capacity and all correct answers (Table 2).

Table 2. Correlations between performances and max. numbers of trials.

<table>
<thead>
<tr>
<th>Targets</th>
<th>Flowers</th>
<th>Numbers</th>
<th>Words</th>
<th>p value</th>
<th>Max numbers of trials (MNT)</th>
<th>p value</th>
<th>5 min recall (SR)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flowers</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>-0.864</td>
<td>0.001</td>
<td>-0.938</td>
<td>0.001</td>
</tr>
<tr>
<td>Numbers</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
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</tbody>
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Discussion

We designed the computerized, continuous visual learning task for different types of visual stimuli: flowers, numbers, and words. The primary objective in designing this task was to develop a measurable, dynamic mechanism that could be used easily for testing and training learning processes in people with mild to moderate dementia. The design of this program was intended for people with physical limitations such as decreased motor speed and visual accuracy. Only two buttons on the keyboard were used for this task. The time for test administration ranged from 5 to 7 minutes.

The preservation of learning capacities in people with dementia was demonstrated to participants, and feedback was provided about all learning patterns.

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References

9. N-Back task to tailor memory training protocols for people with Dementia and Depression based on working memory profile. Poster at the 11

www.postersession.com

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