A Computerized Memory Training Protocol for People with Depression and Cognitive Deficit

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Background

Cognitive deficit often accompanies depression in elderly people. This impairment may range from one isolated domain to severe global cognitive deficit (1). We postulate that cognitive training may be considered as an important adjunct modality to be utilized alongside a traditional treatment regimen of medication and psychotherapy (2)

Objective

The goal of this presentation is to describe a unique memory training protocol for depressed, cognitively impaired patients and present first training session data.

Subjects / Methods

34 geriatric (12 male, 22 female), computer-naïve, medically ill patients with mild to moderate depression and concomitant memory problems participated in cognitive training. Their mean age was 77.8±5.4 and mean education was 14.1±3.1. This was their first experience with this protocol. They were initially evaluated by the Mini Mental Status Exam (3).

An original, computerized training protocol has been developed for use with different visual targets; for this trial, the target utilized was flowers. The protocol consists of two parts. The first part is a 40 trial N-back task (3-back task) (4). The patients were required to identify pictures shown for the first time as a new picture and then subsequently recognize these pictures as previously presented. The subjects were asked to monitor the identity of a series of pictures (targets) presented in a sequence. They had to push one of two possible buttons ("yes" or "no") to indicate whether the current stimulus had been presented in the past 3 trials. Approximately 25% of the pictures (targets) were displayed a second time for recognition. The rest of the pictures (non-targets) were presented only one time.

The second part is a learning task. During the learning task, the patients memorized a set of 10 simultaneously-presented pictures (targets). The pictures appeared on the screen for multiple trials. After every trial, the patients selected these targets from among 10 additional, computer-generated non-targets. The trials continued until the patients memorized the maximum number of targets. This point (maximum number of targets) was determined by 3 consecutive trials with unchanged performance. Then the patients were asked to recognize these same targets five minutes later. Performance (correct answers) was defined as the number of memorized objects. For N-back task, errors consisted of the sum of missed targets (target errors) and falsely recognized non-targets (non-target errors). For the learning task, falsely recognized non-targets were defined as the intrusions. Descriptive statistics and Spearman correlations were performed on SPSS 16.

Results

MMSE score ranged from 23 to 30 (28.4±2.2). For the N back task performance was 7.2±2.5 and total errors were 7.9±4.3 (Figure 1).

Figure 1. N-back Task (Working Memory)
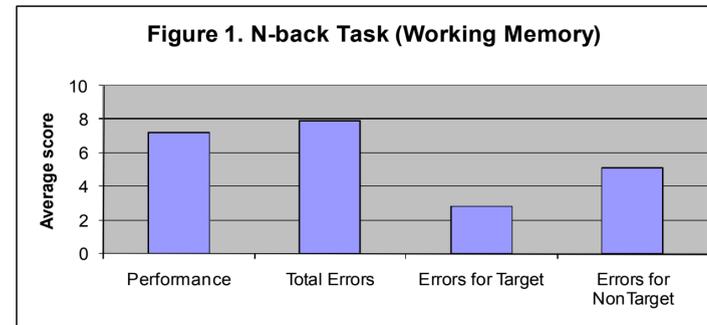
For the learning task, after the first trial, performance was 5.6±2.2 and intrusions were 3.3±2.1 (Figure 2).

Figure 2. Learning Memory
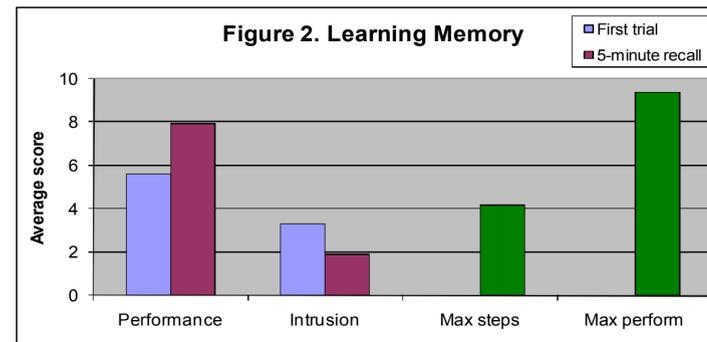
The minimum number of trials to achieve maximum results was 4.2±1.6; maximum performance was 9.4±1.1. Performance on five minute recall decreased to 7.9±2.4 and the number of intrusions were 1.9±2.1.

No significant correlations were seen between performances on the two tasks. Total errors on the N-back task were positively correlated with first trial intrusions on the learning task (r=.426, p<.001) and negatively correlated with five minute recall performance on the learning task (r=-.372, p<.03) (Table 1).

Table 1.Correlation Between Working and Learning Memory Tasks		N-back Errors Total	N-back Errors for Target	N-back Errors for NonTarget
Learning Intrusion trial 1	Correlation	0.426	-0.239	0.437
	Sig. (2-tailed)	**0.012**	0.174	**0.010**
	N	34.000	34.000	34.000
Learning Performance on five minute recall	Correlation	-0.372	0.121	-0.329
	Sig. (2-tailed)	**0.030**	0.496	0.057
	N	34.000	34.000	34.000

Discussion

The present study demonstrated the possibility of cognitive training in elderly, computer naïve, depressed patients with cognitive deficit. Two training modalities were chosen. The first part of the training protocol was based on the data related to working memory deficit in depression (5, 6) and the activation of different cortical regions in the brain during the N-Back task. The second part of the protocol was based on decreased visual-spatial learning capacity in depressed patients (7). We assumed that every training modality involves activation of certain neural networks.

We hypothesize that each of the tasks (the N Back Task and the learning task) activates specific and distinct neural networks because there were no correlations in performance between tasks. This suggestion needs further investigation.

Conclusion

A cognitive memory training protocol was designed as a part of an integrative treatment program for depressed, cognitively impaired, medically ill, elderly people. The training was well tolerated and had a positive impact on the patients' emotional state. Future research needs to be done to evaluate the efficacy of this protocol.

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