

The effects of computer-assisted cognitive rehabilitation on Alzheimer's dementia patients memories

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Abstract. [Purpose] The purpose of the present study was to conduct Computer-Assisted Cognitive Rehabilitation (COMCOG) to examine the effects of COMCOG on Alzheimer's dementia patients' memories. [Subjects] Thirty-five patients diagnosed with Alzheimer's dementia received COMCOG for 30 minutes per day, five days per week for four weeks. [Methods] Before and after the COMCOG intervention, subjects' cognitive functions were evaluated using the Cognitive Assessment Reference Diagnosis System (CARDS) and Mini-Mental State Examination-Korea (MMSE-K) test. [Results] According to the results of the evaluation, among the CARDS scores of the subjects who received COMCOG, the scores of the delayed 10-word list, delayed 10-object list, recognition 10-object, and recent memory significantly increased while the scores of recognition 10-word significantly decreased after intervention compared to before intervention. In addition, among the MMSE-K items, the orientation, registration, and recall showed significant increases. [Conclusion] Based on these results, delay in the progress of memory deterioration can be expected when COMCOG is conducted for Alzheimer's dementia patients who show declines in cognitive functions.

Key words: Alzheimer's, Computer-Assisted Cognitive Rehabilitation, Memory

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INTRODUCTION

In the case of Alzheimer's dementia, cognitive disorders such as disorders in attention, start, plans, organization, problem solving ability, reasoning power, calculation ability, and memory appear before vascular dementia symptoms, such as motor or behavior disorders¹⁾. Alzheimer's dementia patients' characteristics are impairment of the explicit memory necessary to obtain and maintain new information and decline in memory which inhibits subjects ability to perform daily living activities^{2, 3)}.

Cognitive rehabilitation intervention methods for dementia patients generally implemented at clinics include Computer-Assisted Cognitive Rehabilitation (COMCOG), memory rehabilitation, cognitive stimulation, and psychological therapy²⁾. Among them, COMCOG is currently used at clinics widely, and has the advantages of being easily

adjusted to individual patients' cognitive levels and accurate results and immediate feedback for judging the performance of patients²⁾.

In a study that conducted COMCOG for Alzheimer's dementia patients, delay in the progress of cognitive function disorders was identified⁴⁾. In another study, it was reported that after conducting COMCOG for Alzheimer's dementia patients for four weeks, the number of errors in task performance decreased⁵⁾. However, studies that have conducted COMCOG for Alzheimer's dementia patients and examined its memory improvement effects have been are in South Korea. The purpose of the present study was to conduct COMCOG for Alzheimer's dementia patients' to examine its effects on memory and to provide basic data for the effects of COMCOG on Alzheimer's dementia patients at clinics.

SUBJECTS AND METHODS

The present study was conducted with 35 in patients diagnosed with Alzheimer's dementia. Criteria for selection of subjects for the present study were: a Clinical Dementia Rating (CDR) in the range of 0.5–2, a Mini-Mental State Examination-Korea (MMSE-K) score of 23 points or lower, and no history of neurological disease. Participants who met the inclusion criteria and agreed to participate in the study

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Table 1. Pre- and post- intervention values of the CARDS and MMSE-K (N=35)

	pre	post
CARDS		
Delayed 10-word list	10.28 ± 14.64 ^a	23.71 ± 21.15***
Delayed 10-object list	2.00 ± 5.31	22.00 ± 19.37***
Recognition of 10 words	34.00 ± 33.97	14.00 ± 22.90**
Recognition of 10 objects	34.57 ± 19.30	52.00 ± 24.22***
Recent memory	36.85 ± 28.59	49.42 ± 26.22**
MMSE-K		
Orientation	4.71 ± 1.58	5.48 ± 2.68*
Registration	2.48 ± 0.91	2.68 ± 0.79*
Recall	1.00 ± 1.69	1.62 ± 2.01*
Language	6.97 ± 1.52	7.00 ± 1.59
Attention and calculation	1.45 ± 1.55	1.85 ± 1.68

^aMean±SD, *p<0.05, **p<0.01, ***p<0.001, CARDS: Cognitive assessment reference diagnosis system; MMSE-K: Mini-mental state examination-Korea

received a general explanation of the procedures, and gave their written informed consent. All procedures were reviewed and approved by the Institutional Ethics Committee of Cheongju University.

The tester provided education before the intervention so that the subjects could learn to use computers and manipulate the mouse by themselves. The COMCOG program consists of items such as simple recognition memory, simple spatial memory, sequential recall memory, language recall memory, combined recall memory, language categorization memory, and language integration memory, and is intended to improve memories. This program was conducted for 30 minutes per day, five times per week for four weeks.

The Cognitive Assessment Reference Diagnosis System (CARDS) is a cognitive test tool that includes individual tests consisting of seven memory test items and five non-memory test items. The five memory test items consist of recognition of 10 words, delayed 10-word list, recent memory, delayed 10-object list, and recognition of 10 objects. In the present study, to measure memories, memory-related tests of five items were conducted. The test-retest reliability and inter-rater reliability were very high at 0.74–0.99²⁾.

MMSE-K is the Korean version of a standardized cognitive evaluation tool and is a dementia screening tool used to evaluate elderly persons' cognitive disorders and whether they have dementia. It consists of a total of 12 questions with a maximum possible score of 30 points: 24 points or higher indicates a normal state, 20–23 points indicates suspected dementia, and 19 points or lower indicates dementia. The inter-rater reliability of this test tool is very high at 0.99⁵⁾.

In the present study, data were analyzed using SPSS 18.0 and the paired t-test was conducted to test average differences in memories between before and after intervention. Significance was accepted for values of p<0.05.

RESULTS

Thirty-five subjects participated in the present study, 14 males and 21 females. The subjects' ages were distributed as follows: 60–69 years 5 (14.3%), 70–79 years 18 (51.4%),

80–89 years 11 (31.4%), 90 years or older 1 (2.9%). The number of subjects with CDR class 0.5 was 7 (20%), with class 1 was 17 (48.6%), and with class 2 was 11 (31.4%). The subjects' dementia duration was 20.94±9.66 months and their average MMSE-K score was 16.63±4.35 points.

After conducting COMCOG, among CARDS items, the scores of recognition of 10-words decreased significantly (p<0.01), while the scores of all the other variables increased significantly (p<0.01).

Among MMSE-K items, orientation, registration, and recall showed significant increases (p<0.05) (Table 1).

DISCUSSION

In the present study, after conducting COMCOG, Alzheimer's dementia patients' CARDS scores of the delayed 10-word list, the delayed 10-object list, recognition of 10 objects, and recent memory items significantly increased. These results are consistent with the results of previous studies in which Alzheimer's dementia patients' memories were improved through COMCOG⁶⁾.

However, in the present study, the scores of recognition of 10 words, that is understanding the meanings of words, significantly decreased after intervention unlike the other items and it is our assumption that the characteristics of Alzheimer's dementia are reflected in this result. These results are similar to the results of previous studies indicating that in the results of cognitive rehabilitation intervention, Alzheimer's dementia patients' scores in the recognition of 10 words item were shown to be lower than those of the general elderly persons or groups with other kinds of dementia, as Alzheimer's dementia patients' ability to distinguish between words and to accurately understand the meanings of words is impaired⁷⁾.

In the results of the present study, the scores of the delayed 10-word list item were increased by the intervention while the scores of the recognition of 10 words decreased. A likely reason for this is the characteristics of the evaluation. Recognition of 10 words requires an understanding of the relevant words to re-recognize the words, whereas in the

delayed 10-word list only recall of words that were heard even if the words may not be properly understood⁸⁾.

Based on the results of previous studies of the characteristics of Alzheimer's dementia patients, it is thought that the effects of COMCOG on Alzheimer's dementia patients' recognition of 10 words ability is lower than those on other kinds of memories.

In a study conducted by Cipriani et al., it was reported that when COMCOG was conducted to 10 Alzheimer's dementia patients, their MMSE scores significantly increased⁶⁾.

The results of the present study are similar and among the MMSE-K items, the memory item showed a significant increase. These results provide evidence that COMCOG is effective at improving memories of Alzheimer's dementia patients. Based on these results, when in the deterioration of memories can be expected COMCOG is conducted for Alzheimer's dementia patients showing declines in cognitive functions.

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