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Original Article

The effects of an occupation-centered cognitive rehabilitation program on elderly individuals with mild cognitive impairment

Keum-Sook Kim[1)], Young-Seok Cho[1)*]

[1)] *Department of Occupational Therapy, Hyejeon College: 18-23 Daehak-gil, Namjang-ri, Hongseong-eup, Hongseong-gun, Chungcheongnam-do, Republic of Korea*

Abstract. [Purpose] This study investigated the effects of an occupation-centered cognitive rehabilitation program on the cognitive function, electroencephalogram amplitude, and daily activity performance of patients with mild cognitive impairment living in a local community. [Subjects and Methods] The subjects were 6 patients (all female; age: 72.5 ± 6.6 years) with mild cognitive impairment. The patients took part in 10 60-minute sessions, over 10 weeks. [Results] The cognitive function scale scores increased, but the increase was not statistically significant. Daily activity performance improved significantly as evidenced by the Instrumental activities of daily living score in Korean Activity Card Sort. Additionally, electroencephalogram SensoriMotorRhythm wave amplitude increased significantly. [Conclusion] The effects of the occupation-centered cognitive rehabilitation program helped increase concentration and daily activity performance.

Key words: Occupation-centered cognitive rehabilitation program, Electroencephalogram amplitude, Instrumental activities of daily living

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INTRODUCTION

Elderly individuals with cognitive impairment show low cognitive function and problems with activities of daily living (ADL) because of overall damage to their cerebral cortex[1)]. Mild cognitive impairment is associated with functional impairment and decreased quality of lifes[2)]. Additionally, studies have suggested associations between physical function and cognitive function[3)]. Elderly individuals with mild cognitive impairment typically have issues with memory and initiative, attention and comprehension, and depression, and mild-to-moderate impairment in ADL[4)]. Cognitive training has been shown to have an effect on memory, mood, and analogs of ADL for elderly individuals with mild cognitive impairment[5)]. The purpose of cognitive rehabilitation is to decrease functional impairment and increase social participation and engagement in ADL[6)]. Therefore, if cognitive ability improves, ADL are likely to improve.

Occupation-centered performance consists of the dynamic relationships among occupations, roles, life circumstances, jobs, and leisure activities[7)]. Occupation-centered performance affects self-care, productivity, and leisure[8)]. Occupation-centered cognitive rehabilitation programs (OCCRPs) aim to improve cognitive ability with respect to the tasks, activities, and roles that define the person as an individual[9)]. Therefore, we expected that an OCCRP would improve cognitive abilities.

Electroencephalography (EEG) is widely used for diagnosing dementia[10)]. EEG captures electrical changes that appear during the signal transition process among general nerves and has the advantages of non-invasiveness and ease of use for monitoring brain functions. Thought and behavior are controlled by the cortex, according to the activity of many neurons whose activities can be identified via EEG. Among kinds of cognition, there is attention. The attention (AT) index was defined as the ratio of the theta wave to the SensoriMotorRhythm (SMR) wave. Therefore, we used the SMR wave of EEGs

*Corresponding author. Young-Seok Cho (E-mail: cys@hj.ac.kr; otdoctor@naver.com)

to assess the attentional component of cognition. This study investigated the effect of OCCRP on cognition and functioning in ADL in adults with mild cognitive impairment, using Mini-Mental State Examination for Dementia Screening (MMSE-DS), EEG, and the Korean Activity Card Sort (K-ACS).

SUBJECTS AND METHODS

This study was conducted on 6 elderly individuals (6 female; age range, 72.5 ± 6.6 years) with mild cognitive impairment with the ability to participate in occupational activities. The participants visited H University and participated in a 60-minute OCCRPs once per week, for 10 sessions, if need to relax for 60 minutes, have a 10-minute break. The purpose of the study was explained to the participants before they agreed to take part, and consent to participate was obtained in accordance with the principles of the Declaration of Helsinki.

This study used an occupation-centered cognitive rehabilitation program that included handicrafts and traditional treatment that involved reminiscence based on Park and Jung's clinical casebook of occupational therapy for elderly with dementia[11]. The program consisted of activities that require fine motor skills including making a picture frame, a necklace, or a bracelet.

The cognitive ability of participants was assessed by an experienced occupational therapist, using the MMSE-DS. The ability to engage in tasks of daily living was assessed via Lee et al.'s modified version of the Korean-Activity Card Sort (K-ACS)[10]. The K-ACS has 80 items divided among four categories: instrumental activities of daily living (IADL), low-intensity physical activity, high-intensity physical activity, and social activity[12]. IADL includes activities such as leisure and work.

For the EEG measurement, the time constant was 0.3 seconds, the sensitivity was 10 μV, and the highest frequency was 60 Hz. Brain waves were categorized following convention into theta waves (4–7 Hz), alpha waves (8–13 Hz), SMR waves (12–15 Hz), low beta waves (14–20 Hz), and high beta waves (21–30 Hz)[13]. The AT index was calculated by dividing the theta wave by the SMR wave. We confirmed the AT index.

All statistical analyses were performed using SPSS 20.0 software (SPSS Inc., Chicago, IL, USA). Descriptive statistics are presented as means ± standard deviation. Paired t-tests were used to compare the measures of cognitive function, IADL, and EEG waves. The significance level was set at $p<0.05$.

RESULTS

The cognitive function scale suggested increased functioning after OCCRP, but the increase was not statistically significant ($p>0.05$). IADL of patients increased, as evidenced by K-ACS scores, which increased from 64.4 ± 17.7% to 77.6 ± 23.6% ($p<0.05$). SMR wave amplitude increased significantly from 0.38 ± 0.009 μV to 0.43 ± 0.012 μV ($p<0.05$) (Table 1).

DISCUSSION

This study investigated the effect of an OCCRP on cognitive function, IADL, and electroencephalogram amplitude. Previous studies have reported that occupation-centered programs have a positive effect on cognitive function and ADL related to physical function[14]. Additionally, IADL and specific cognitive abilities using EEG are investigated in this study. Brainwave examination by EGG is a noninvasive method that displays functional changes in the cerebrum and provides various useful data within a short time[15]. The OCCRP affected IADL, and among cognitive abilities, an impact was noted on concentration. The activities of OCCRP, which uses a lot of patients' hands such as making a picture frame, a necklace, or a bracelet stimulated their brain, which in turn strengthened their brain function and improved their cognitive abilities, it improvement in cognitive ability improved the IADL ability.

Table 1. The differences between Pre-test values and Post-test values (unit: μV)

		Pre-test	Post-test
		(Mean ± SD)	(Mean ± SD)
MMSE-DS		24 ± 3.0	25 ± 3.4
	IADL	64 ± 17.7	77 ± 23.5*
K-ACS	Low-intensity physical activity	68 ± 15.7	85 ± 19.6
	Social activity	69 ± 8.6	84 ± 13.9
EEG		0.03 ± 0.009	0.043 ± 0.027*

Values are shown as the mean ± SD. *$p<0.05$. MMSE-DS: mini-mental state examination for dementia screening; K-ACS: Korean activity card sort; EEG: electroencephalography.

The AT index determines the concentration level as it is the ratio of theta waves that show a sleepy state. This study suggests that OCCRP is a suitable intervention by which to improve concentration and instrumental abilities of daily living in patients with mild cognitive impairment. The results of previous studies support the results of this study. A limitation of this study is that there were only six participants, which makes it difficult to generalize the findings to a wider population. As such, further studies with larger sample sizes are needed to determine the effectiveness of OCCRPs in elderly individuals with mild cognitive impairment.

Conflict of interest

None.

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