



Original Article

The effect of exercise combined with a cognitive-enhancement group training program on cognition and depression in the community-dwelling elderly

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Abstract. [Purpose] In this study, we investigated the effects of combining exercise with a cognitive-enhancement group program on cognition and depression in a group of community-dwelling elderly people. [Subjects and Methods] The study's subjects consisted of 30 community-dwelling elderly people of both genders, whose average age was 78 years. They participated in a program of physical exercise combined with a cognitive-enhancement group training program. This consisted of sessions lasting 60 minutes that took place once a week over 3 months. To assess the participants' levels of cognition and depression, we conducted batteries of tests using, respectively, the Korean versions of the Consortium to Establish a Registry for Alzheimer's Disease assessment packet (CERAD-K) and the Geriatric Depression Scale-Short Form (GDS-SF). [Results] The Verbal Fluency test, Word List Memory test, Modified Boston Naming test, Mini Mental Status Examination (Korean Version) (MMSE-KC), Constructional Praxis task and Constructional Recall task showed significant improvement, but improvement in the Word List Recall and Word List Recognition tests did not achieve significant levels. Meanwhile, the symptoms of depression were shown to decrease significantly. [Conclusion] Physical exercise combined with a cognitive-enhancement group training program was effective in improving some of the components of cognition, as well as alleviating depression. This program should be used for the prevention of dementia in community-dwelling elderly, through the intervention should be complemented in order to improve more of the components of cognition.

Key words: CERAD-K, Dementia, Exercise combined with a cognitive-enhancement group training program

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INTRODUCTION

Advances in medical technology have prolonged the average human lifespan, leading to an aging society with a dramatically increasing incidence and prevalence of senescent diseases, such as dementia, stroke, osteoporosis, and diabetes mellitus. In particular, dementia is a neuropsychiatric disorder that results in sustained degenerative cognitive function, functional disorders, behavior problems, personality changes, and more^{1,2)}. Because dementia cannot be treated, prevention is more essential.

Baker et al.³⁾ reported that cognitive intervention decreased the risk of cognition impairment and delayed declines in cognitive function for the elderly. Many studies have reported that programs integrating physical exercise with cognition enhancement have been effective against dementia⁴⁻⁷⁾.

Although group program is practical and effective for the elderly living in the community⁸⁾, there is a lack of the study on

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exercise combined with a cognitive-enhancement group program. Thus, in this study, we investigated the effects of exercise combined with a cognitive-enhancement group training program on cognition in the elderly. Also, because impairment of cognitive function is associated with depression, and depression is a critical factor contributing to the deterioration of quality of life⁹⁾, in this study we also investigated this combined program's effect on depression in its participants.

SUBJECTS AND METHODS

The subjects of the study were 30 community-dwelling elderly people of both genders over the age of 70 years who were healthy and able to walk independently. All the participants read and signed documents giving their informed consent to participate in the experiment, in accordance with the ethical principles of the Declaration of Helsinki. The group of participants consisted of 14 men (46.7% of the group total) and 16 women (53.3%). The participants' average age was 78.26 ± 3.15 years and their average number of years of education was 5.20 ± 3.52 .

The cognitive intervention program consisted of physical exercise combined with a cognitive-enhancement group training program. It was implemented once a week, for a total of 12 sessions over 3 months in the Y community health center. Each session was 60 minutes long, and was comprised of taking the first 10 minutes for checking attendance and doing simple cognitive exercise to prevent dementia, then 40 minutes of physical exercise combined with the cognitive-enhancement group training program, and in the final 10 minutes, making closing comments and announcements. The cognitive-enhancement consisted of performing memory-oriented cognitive tasks, combined with mild physical exercise. At each session, a therapist presented the day's task. The participants deliberated over how to solve the task, and then they performed a physical group exercise to express their solution. For example, the therapist would ask, "What is the sum of the digits in today's date?" After determining the answer, the participants would then toss a ball the specific number times that equaled the answer. In another example, while listening to music, they would move their bodies whenever they heard specific words.

To measure the cognition and depression, we conducted the assessment one day prior to first intervention and one day after last intervention. The Korean version of the test battery from the Consortium to Establish a Registry for Alzheimer's Disease (CERAD-K) was conducted to measure the cognitive level. CERAD-K is a standardized assessment for the early diagnosis of dementia. It is easy to implement and takes about 30 to 40 minutes. It is composed of 8 neuropsychological subtests—the Verbal Fluency test; the Modified Boston Naming test; the Korean version of the Mini-Mental State Examination (MMSE-KC); the Word List Memory test; the Constructional Praxis task; the Word List Delayed Recall test; the Word List Recognition test; and the Constructional Recall test.

To measure depressive symptoms, we implemented the Korean version of the Geriatric Depression Scale-Short Form (GDS-SF). The original version of the GDS was developed by Yesavage et al.⁹⁾ and its short form, the GDS-SF, was developed by Sheikh and Yesavage.¹⁰⁾ The short form is composed of 15 items, each worth one point, for a total score ranging from 0 to 15 points. The higher the score, the more severe the patient's depressive condition.

We conducted the statistical analysis using SPSS 19.0. We analyzed gender with frequency analysis, age and years of education with descriptive statistics. We analyzed the CERAD-K and GDS-K results with a paired t-test and set the significant statistical level at 0.05.

RESULTS

Regarding the scores for the CERAD-K tests, we found improvement at the significant level of 0.05 in the Verbal Fluency test and the Word List Memory test. For the Modified Boston Naming test, MMSE-KC, Constructional Praxis, and Constructional Recall tasks, we found significant improvement at the level of 0.01. However, we did not find significant improvement in the Word List Recall and Word List Recognition tests. The result of the GDS-K showed significant improvement at the level of 0.01 (Table 1).

DISCUSSION

With regard to the effects of exercise combined with a cognitive-enhancement group training program, the results of the CERAD-K for cognition levels indicated that a significant improvement occurred in the Verbal Fluency test, Word List Memory test, but not in the Word List Recall and Word List Recognition tests. Results showing no significant improvement in the Word List Recall test with a significant improvement in the Word List Memory test are the same as those of earlier studies examining the effect of exercise intervention on normal elderly subjects. Kim et al.¹¹⁾ reported that dance exercise over 6 months was effective only for improving verbal fluency, delayed recall, and word recognition. Shin et al.¹²⁾ reported that exercise intervention over 4 months had an effect on attention, delayed memory and verbal fluency, but had no effect on immediate recall.

Our study showed a significant improvement in Verbal Fluency test results. Our study used music, which is consistent with a study by Baker et al.³⁾ that reported exercise with music led to improvement in verbal fluency. In addition, since we provided intervention to all the group members at the same time, we were able to give the member time to talk to each other, which would also have a positive effect on verbal fluency.

Table 1. The comparison of cognitive functions and depression between before and after treatment (unit: score)

Variable	Before treatment	After treatment	
	Mean ± SD	Mean ± SD	
CERAD-K	Verbal Fluency test	11.3 ± 3.43	12.77 ± 3.74*
	Modified Boston Naming test	10.07 ± 2.59	11.73 ± 2.86**
	MMSE-KC	24.30 ± 3.06	26.07 ± 3.06**
	Word List memory	16.07 ± 4.23	17.73 ± 4.68*
	Constructional Praxis	9.03 ± 2.01	10.17 ± 1.26**
	Word List Recall	4.97 ± 1.73	5.53 ± 2.06
	Word List Recognition	8.40 ± 1.65	9.07 ± 1.72
	Constructional Recall	4.83 ± 1.86	6.3 ± 2.85**
GDS-K	5.17 ± 3.42	3.20 ± 2.27**	

* $p < 0.05$, ** $p < 0.01$. CERAD-K: Consortium to Establish a Registry for the Alzheimer's disease-Korean version; MMSE-KC: Mini Mental State Examination-Korean version of CERAD Assessment Packet; GDS-K: Geriatric Depression Scale Korean Version.

The skills for the Constructional Praxis and Recall tasks require short-term memory and visuospatial function. In the first test, the subject is shown a group of simple figures, which he or she is required to copy. In the second test, 5 minutes after the first, the subject is required to draw as many of the figures as possible from memory¹³). The exercises in our intervention included many tasks involving short-term memory, where the subjects were shown actions that they then imitated either immediately or a short time thereafter. This would have a positive effect on the skills required for the Constructional Praxis and Recall tasks.

Depression tends to increase with age and, as noted earlier, it is a critical risk factor for cognitive decline and the onset of dementia. Thus, there are a number of studies about depression in the elderly. In our program, we found that our interventions led to a significant decrease in the participants' symptoms of depression. This is consistent with the findings of a study by Ji et al.¹⁴) They reported that an integrated program of hand exercises, memory training, and music therapy decreased symptoms of depression in elderly people.

Despite many efforts to prevent dementia, the perfect prevention program has not yet been found. Yoon et al.¹⁵) reported that an integrated program was more effective on cognition, motor skills, social interaction and so on than one single therapy. The intervention in our study, consisting of exercise combined with cognitive-enhancement group training program, was effective in improving cognition and reducing depression. However, it was not effective for every component of cognition. We cannot control other variables which can impact this result because the participants of this study were elderly living in the community. In the future, our intervention program will need to be complimented these limitation.

Conflict of interest

None.

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