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Original Research Article

The design and effectiveness of educational package based on increased activity and cognitive, emotional and neuro-muscular activity in activities of daily living in the elderly with mild cognitive impairment

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ABSTRACT

Dementia is a progressive disorder with severe cognitive decline, behavioral problems, and lack of movement in daily life activities. Simultaneous resistance training and active participation in mental, physical, and emotional activities can delay the onset of dementia in the elderly. In explaining brain-compatible teaching methods, the combination of cognitive learning effects, physical activity, and the role of emotion in learning should be considered. The aim of this study was to evaluate the effectiveness of the training package based on increased cognitive, emotional and neuromuscular activity in the daily activities of the elderly with mild cognitive impairment. In this research study with pre-test and post-test design and control group, 30 elderly people with mild cognitive impairment residing in Kahrizak elderly sanatorium were selected by simple sampling and randomly divided into two experimental groups. The participant's mini mental state examination questionnaire, depression, and social isolation were implemented. Rehabilitation program was conducted in 18 sessions over 8 weeks and 2-3 weeks. Data were analyzed with analysis of covariance model. The experimental group received cognitive rehabilitation intervention and compared with the control group based on the mental state examination scores [F=24, 30, P≤0, 01] significantly better cognitive function; depression ratings [F=17, 67, P≤0, 01] lower depression rates and based on Barthel's scores [F=29, 78, P≤0, 01], they performed better on a daily basis. The results showed that response-based intervention based on enhanced cognitive, emotional, and neuro-muscular activity was effective in improving the cognitive function, reducing depression, and improving the daily activities. Therefore, it is recommended that elderly caregivers use the training program designed in this study to improve the daily functioning of the elderly. In future studies, by examining the neural and infrastructural mechanisms of interventions, educational programs is generalized to the elderly.

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Graphical Abstract

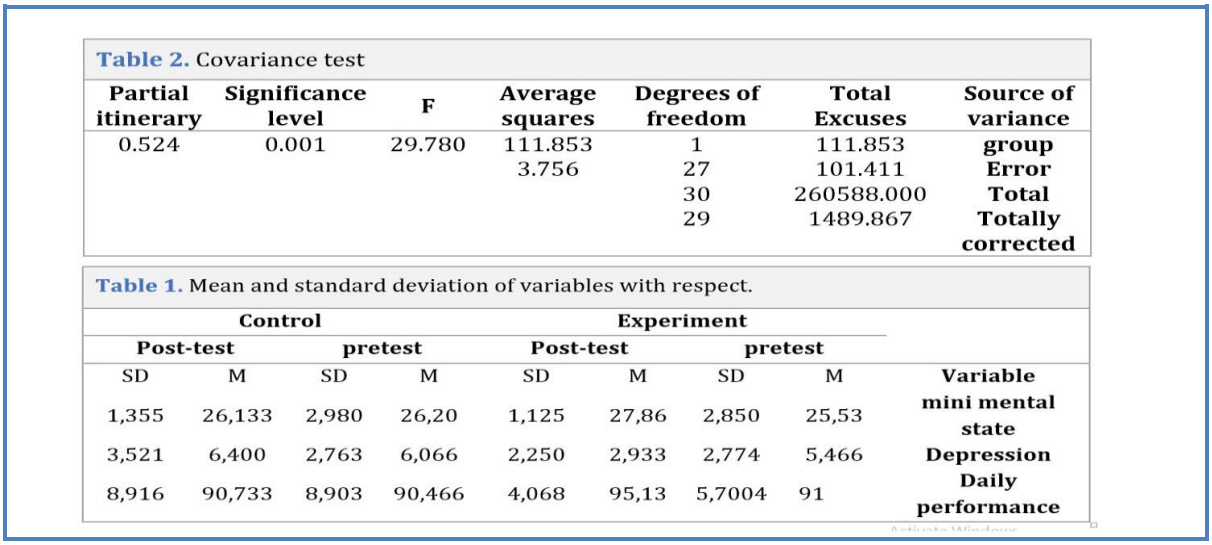

Table 2. Covariance test

Partial itinerary	Significance level	F	Average squares	Degrees of freedom	Total Excuses	Source of variance
0.524	0.001	29.780	111.853	1	111.853	group
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Table 1. Mean and standard deviation of variables with respect.

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1,355	26,133	2,980	26,20	1,125	27,86	2,850	25,53	mini mental state
3,521	6,400	2,763	6,066	2,250	2,933	2,774	5,466	Depression
8,916	90,733	8,903	90,466	4,068	95,13	5,7004	91	Daily performance

Introduction

Dementia is a progressive disorder that is associated with severe cognitive impairment, lack of movement, and behavioral problems resulting from reduced daily life activities and is one of the leading causes of disability and dependence among the elderly. According to the World Health Organization (WHO), the number of people with dementia is currently estimated at 47 million, and is projected to increase to 75 million by 2030 and almost triple by 2050 [1-2]. Mild cognitive impairment is an early stage in the normal course of dementia, and more than 50% of people with it subsequently develop dementia [3]. The early stages of Alzheimer's are memory deficits, often characterized by impaired executive function. Executive functions are used for a variety of cognitive processes, including planning, working memory, attention, inhibition, and self-regulation, which are controlled by the hippocampus and the frontal lobe area in the brain [4, 5]. These age-related changes in brain structure play a major role in reducing the cognitive functions such as processing speed and memory [6, 7]. In contrast, the increased hippocampal volume after one year of aerobic exercise intervention was associated with improved memory [8].

Currently, there are various hypotheses aimed at explaining the age-related changes in brain activation and cognition. Harold's model predicts that there is a decrease in hemispheric asymmetry in the frontal lobe in the elderly during memory tasks [9, 10]. In the theory of aging scaffolding and cognition, it is assumed that increasing the brain activity with age, especially in the frontal lobe, is a compensatory mechanism that results in reorganization of the brain in response to reduced age-related function in neural structures [11, 12]. To date, none of these hypotheses satisfactorily explain the age-related changes in brain function; however all of these hypotheses emphasize the important role of the frontal lobe in age-related functional changes in the brain.

On the other hand, dementia and mild cognitive impairment are associated with increased risk of depression, impaired social functioning, anxiety, stress, and poor quality of life related to mental health [13]. The prevalence of depression in the elderly is 9.4%,

and in nursing homes it reaches 14-42%, at least 40% of whom develop dementia within 3 years and 70% within 7 years. Elderly people with dementia and depression have an impact on social participation, effective collaboration in physical and psychological rehabilitation programs, and the day-to-day capabilities of this group. [14-15]. Emotional disorders and stressful events can affect the cognitive function including, the attention and memory, and it is a fact that delays in delays in higher processing and higher brain function can affect many cognitive aspects. Depressed people are more likely to show memory deficits in tasks that require more difficult processing [16, 17, and 18].

On the other hand, muscle mass and muscle strength, which are capable of producing the muscle strength and power, gradually decrease due to the decreased levels of muscle fibers and the motor units. Therefore, the decreased muscle strength in the legs is associated with the reduced mobility and increased risk of death in the elderly, and they need adequate muscle strength to live an independent and healthy life. Exercise strengthens muscle strength and leads to positive changes in cognitive function, especially in executive functions and brain activation patterns. In addition, changes in brain activation patterns are associated with improvements in cognitive function, indicating the important role of physical interventions in maintaining brain cognition and health [19-24]. The "neuro trophic hypothesis" claims that in response to physical exercise [eg, resistance training], chemical neurotransmitters are released that stimulate functional/structural stimulation of the brain, which at best facilitates the improvement of cognitive functions [25, 26]. It was reported that, the dynamic muscle strength [measured by a maximum of one repetition in different resistance exercises] improved cognitive function and cognitive function after 6 months of resistance training [27]. In another study, older adults with cognitive impairment performed resistance training twice a week for 26 weeks, and their cognitive function improved [28].

In order to explain the brain-compatible training methods for improving the daily functioning, treating depression and improving cognitive function in the elderly with cognitive impairment, the effects of cognitive rehabilitation methods, physical activity, and the role of emotion in learning should be considered [29-31].

Some studies showed that rich social networks, mental stimulation activities and physical exercise, and active participation in mental, physical, and social activities can delay the onset of dementia in the elderly [33, 32]. The training program can improve verbal memory [eg, delay in free call], language processing [e.g., class dominance] and limit complaints in the daily activities of instrumental memory in the elderly with mild disorders [34]. Therefore, by examining the effects of cognitive, physical and emotional dimensions, an educational package was designed to reduce the depression of the elderly with mild cognitive impairment in the elderly to examine: Does increasing cognitive, emotional, and neuromuscular activity reduce the depression of the elderly with mild cognitive impairment?

Method

The present research study is quasi-experimental and was performed as a pre-test-post-test with the control group. The present statistical population is that all 65-year-old men and women with mild cognitive impairment living in Kahrizak nursing home for the elderly and disabled in Tehran in 1397, which is about 300 people .Since the minimum sample in the experimental research is 15 people, the number

of samples in this study was considered to be 30 elderly people with mild cognitive impairment who were selected by regular random sampling method in two experimental groups [15 people] and control group [15] People were placed.

The method of selecting the elderly with mild cognitive impairment is as follows: First, after visiting Kahrizak nursing home, among the elderly living in four different wards [75 people each], according to the file and the expert's diagnosis, as well as the pre-test. [MMSE Cognitive Scale] Used as a mild cognitive impairment tool in this study, their mild cognitive impairment was diagnosed, individuals were selected. The criteria for entry were: lack of major physical, sensory or emotional disability and acute physical illness, and the criteria for output were: suffering from psychiatric illness, other neurological diseases, participation in other psychological intervention programs, and obvious impairment in verbal comprehension and expression. This research is approved by the National Ethics Committee in Biomedical Research with the number IR.IAU.QOM.REC.1398.012. The ethical considerations considered in this study included confidentiality of information, obtaining written consent from the elderly [clients] in order to be interested in participating in the research and freedom to participate in the research.

After randomized placement of individuals in the experimental and control groups from both group, the pre-test of the Mini Mental State Exam, Depression, and Social Isolation Survey Questionnaire was take. Also the experimental group [18 sessions of one hour, eight weeks and two to three times a week] trained according to the training package program and the control group did not receive any intervention at that time. In the post-test phase, a Mini Mental State Exam, depression, and Barter Daily Evaluation Questionnaire were administered to the two groups and the data were prepared for statistical analysis.

Mini Mental State Exam [MMSE]: The questionnaire to assess cognitive functions such as orientation, language, attention, concentration, calculation, recall and perception is concerned. Fvlstyn and colleagues, in a study, at four weeks, the credibility test with assessing the validity of the test-retest patients with dementia, 0.99 reported. In Iran, the reliability of this test was calculated using Pearson correlation coefficient and the results showed a retest of 0.73. The results showed that the scale mini mental state examination, according to the cut-off score of 18 with a sensitivity of 95% and specificity of 97% of the patients with dementia distinguish from normal individuals [20]. Geriatric Depression Scale [GDS]: This test is suitable for the diagnosis of depressive symptoms in the elderly, which has internal and external stability in the clinical diagnosis of depression. Its reliability is 0.85 with retest method [21]. In one study, its reliability was 0.85 with a one-week retest [22].

Barter Daily Performance Questionnaire: The Bartel Questionnaire contains 11 items. xIf you get a zero score from the "mobility" item, the "wheelchair user" will be considered as an alternative item. In this questionnaire, a score between 0 and 15 is assigned to each item related to individual conditions and the nature of the item. To the items "Moving from the chair to the wheel and vice versa", "Mobility" 15 points each, to the items "Going up and down the stairs", "Using the toilet", "Stool control", "Urine control", "Eating"and"dressing up" are given a maximum of 10 points each. The first option for each question is for incompetence and the fifth option is for complete independence. In general, this tool determines the ability of the individual in different

dimensions of daily performance on a scale of 0-100, which higher scores indicate a better situation. Scores of 0-20 are considered as complete dependence, scores of 21-60 are considered as dependent dependence, scores of 61-90 are considered as moderate dependence, scores of 91-99 are considered as partial dependence and score of 100 is considered as complete independence. Training protocol includes the following:

1. Warming phase [the training time is about ten minutes].

2. 2-Cognitive tasks: It was an integrated movement through the implementation of dual homework exercises and in the form of cognitive exercises.

These exercises were presented to enhance executive functions through distance retrieval exercises, selective attention, continuous attention assignments, time orientation, and verbal comprehension in each session. Exercises included answering general information questions, contrasting and synonymous words, words with multiple meanings, naming the days of the week in reverse, meanings of proverbs, names of animals and places, names of girls and boys, and so on. Exercises included answering general information questions, contrasting and synonymous words, words with multiple meanings, naming the days of the week in reverse, meanings of proverbs, names of animals and places, names of girls and boys, and so on. These exercises are performed simultaneously with the tasks of standing on a narrow support surface with open and closed eyes, walking on a narrow support surface, walking around obstacles and back and forth, sitting and getting up, standing and walking, and holding. Having a book on your head, hitting the ball while standing, throwing the ball into the basket while standing, walking and hitting the ball, walking on both sides, and at the end of each session the seniors performed 10 minutes of relaxation exercises.3-Emotional interventions through continuous individual sessions and performing awareness skills exercises [emotion identification exercises, empathy exercises, motivation training exercises, impulsivity coping exercises] Adaptation skills exercises [practicing useful and useless methods, organizing your week, practicing Purposeful planning, practice of thinking and depression, practice of challenging negative thoughts] and practice of acceptance skills [practice of seeing the positive aspects, practice of happiness and satisfaction] were held [26].

In this study, the initial differences of the subjects were analyzed using covariance analysis test.

Findings

The mean age in the experimental group was 75.73 and in the control group was 75.6 and the average participants in the two groups were not statistically significant. The percentage of participants in the study is 50% men and 50% women. Participants in the study ranged from illiterate to doctoral, with most elementary school graduates. The average length of hospitalization of the elderly in the study was 5.6 years in the experimental group and the average in the control group was 5.2 years. The mean and standard deviation of the tests for brief examination of mental state, depression, daily activities in both pre-test and post-test situations were reported in Table 1 according to the experimental and control groups. The results show that post-test of the experimental group, the examination tests the mini mental state, depression, daily activities compared to the pre-increase that represents the impact of closed training on cognitive function, depression of the elderly with impaired Cognitive mild.

Table 1. Mean and standard deviation of variables with respect.

Control				Experiment				
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SD	M	SD	M	SD	M	SD	M	Variable
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8,916	90,733	8,903	90,466	4,068	95,13	5,7004	91,066	**Daily performance**

Assigned to investigate the effects of experimental variables mini mental state examination, depression, daily activities of analysis of covariance was used. Assuming the normal variables, using the Kolmogorov-Smirnov test was performed to evaluate the fit of the data with the normal curve shows the scores of the normal curve is not much difference. Assumption of homogeneity of variances was investigated using Levine test and the findings showed that the value of F score in the variable of mild cognitive impairment [F=0.427, P≤0.05], depression [F=1.207, P≤0.05], daily performance [[F=1.301, P≤0.05] and the same assumption of variance is true for the two experimental and control groups. The assumption that the regression lines are parallel is also assumed.

Table 2. Covariance test

Partial itinerary	Significance level	F	Average squares	Degrees of freedom	Total Excuses	Source of variance
0.524	0.001	29.780	111.853	1	111.853	**group**
			3.756	27	101.411	**Error**
				30	260588.000	**Total**
				29	1489.867	**Totally corrected**

As seen in the Table 2, the sum of the squares and the mean squares of the groups is equal to 111.853 and F=29.780, which at the level of P ≤ 0.05 is significant .In other words, there was a significant difference between the groups after adjusting the pre-test scores, and training based on increased cognitive, emotional and neuromuscular activity had a significant effect on improving the daily performance of the elderly [MCI].The partial itea square [effect size] for the effect of the independent variable on the dependent variable is 0.524, indicating that 52% of the changes in the dependent variable are explained by the independent variable.This means that training based on increased cognitive, emotional and neuromuscular activity has been able to affect 52% of the daily performance of the elderly [MCI].

Discusssion

The aim of this study was to assess the effectiveness of the training package based on increased cognitive, emotional and neuromuscular activity in improving cognitive

function, reducing depression and improving the daily activities of the elderly with mild cognitive impairment. Analysis of covariance after 18 sessions of training package based on increased cognitive, emotional and neuromuscular activity showed that there was a significant difference between the average of brief examinations of mental state, depression, daily activities in the experimental and control group. There is a test, and training based on increased cognitive, emotional, and neuromuscular activity has had a significant effect on improving the daily functioning of the elderly with mild cognitive impairment. The findings are in line with the research of Atalahi et al. found that improving the level of education by cognitive training programs with the elderly helps in mental stimulation and memory to improve cognitive disorders among these people [40]. A comparative study of depressed people with non-depressed individuals suggests that there are dysfunctions and deficiencies in the psychomotor and cognitive functions of depressed people in overt long-term memory actions and short-term memory. Cognitive-behavioral interventions also help reduce depression in the elderly by engaging in fun tasks, helping to evoke emotion, and fighting annoying thoughts [41, 42]. Age-related muscle changes can also lead to reduced cognitive function [43]. Shabani, Fatemeh, Ismaili, Ali, Salman, and Zahra found that acute resistance training [moderate and mild intensity] could improve working memory of elderly men and women [44]. Fabian et al., In a study entitled "Functional/Structural Changes in Response to Resistance Exercises, Leads to Cognitive Advances," found that based on the analysis, resistance exercises caused significant changes in brain function, especially in the frontal lobe which has been associated with executive functions [45].

Considering the similarity of the results of this study with previous similar studies, it can be said that the training package is based on increased cognitive, emotional and neuromuscular activity using mental and cognitive exercises, increasing patients' level of awareness and insight, and increasing adaptability. Emotional, empowerment, and patient independence have a significant effect on improving cognitive function, reducing depression, and improving performance in the daily activities of patients with mild cognitive impairment.

Conclusion

The results showed that the cognitive rehabilitation intervention based on the increased cognitive, emotional, and neuromuscular activity was effective in improving cognitive function, reducing depression, and improving the daily activities of the elderly with mild cognitive impairment. Regular involvement in resistance, cognitive, and emotional exercises throughout life seems to be essential to ensure the physical and cognitive health of the elderly and preventing dementia. Therefore, it is recommended that the elderly caregivers use the training program designed in this study to improve the daily functioning of the elderly.

Also, in future studies, by examining the neural and infrastructural mechanisms of interventions, if the research findings are confirmed, educational programs can be generalized to the elderly with dementia. One of the limitations of this study is the inability to use this method for patients with severe Alzheimer's disease. Also, this study only emphasized the improvement of some cognitive, emotional and neuromuscular functions and therefore its generalization to other cognitive, emotional and neuromuscular functions is not correct. This study was

performed on the elderly with mild cognitive impairment living in the Kahrizak nursing home for the elderly and the disabled in Tehran, so it is not allowed to generalize the results to the elderly in other parts of the country.

Another limitation of this study is the small number of samples because it may not be statistically significant on the effect of experimental applications on low-volume samples. Therefore, on the 1st and 2nd of this month, the training package should be designed as software that includes the combined effect of the variables of this research, and more people should be treated with this package. Cognitive rehabilitation interventions will also be used in the coming years to improve other problems of the elderly, including disorders such as anxiety and obsessive-compulsive disorder caused by the problems of this age group and the problems of their caregivers. Another suggestion is that cognitive rehabilitation interventions be implemented for other elderly people in larger groups and longer intervention intervals to ensure the effectiveness of these interventions. It is also recommended that this method be compared with other cognitive rehabilitation methods to provide evidence of its effectiveness. Finally, qualitative or mixed designs will be used in future research.

Moral consideration

This research has been approved by the National Ethics Committee in Biomedical Research with the number IR.IAU.QOM.REC.1398.012 and also the ethical considerations considered in this research are: The authors of this article have acted according to the ethical protocols of Helsinki studies and The information of the patients participating in this study remains completely anonymous, and after the study, all this information will remain secure. Also, all participants in this study have filled out the consent form for participating in this study and all the study objectives for the participants have been fully described.

Conflict of Interest

Authors declare that they have no conflict of interest.

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