Elderly Health Journal 2022; 8(1): 36-42.
Shahid Sadoughi University of Medical Sciences, Yazd, Iran
Journal Website : http://ehj.ssu.ac.ir

Original Article

Effectiveness of Cognitive Rehabilitation on Agitation, Apathy and Cognitive Function in Male Elders with Mild Cognitive Impairment

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[DOR: 20.1001.1.24236179.2022.8.1.5.7]
[DOI: 10.18502/ehj.v8i1.9953]

A B S T R A C T

Article history
Received 27 Nov 2021
Accepted 31 May 2022

Citation: Fereidouni Valashejerdi Z, Abolghasemi SH, Khalatbari J, Tarkhan M. Effectiveness of cognitive rehabilitation on agitation, apathy and cognitive function in male elders with mild cognitive impairment. Elderly Health Journal. 2022; 8(1): 36-42.

Introduction: The elders need proper medical and psychiatric care and attention, so choosing a suitable therapeutic approach for their psychological care, especially in those with cognitive impairment, will be effective in improving psychological symptoms and their health. The present study aimed to investigate the effectiveness of cognitive rehabilitation on agitation, apathy and cognitive function.

Methods: This quasi-experimental study carried out among male elders with mild cognitive impairment (MCI) in Kahrizak Charity nursing home in Alborz province in 2020. A sample of 36 male elders with MCI was purposefully selected and randomly assigned to experimental (n = 18) and control (n = 18) groups. Data were collected through Cohen-Mansfield Agitation Inventory; Apathy Evaluation Scale and Montreal Cognitive Assessment-Basic. The intervention group received 8 sessions of 90 minutes, cognitive rehabilitation based on kelly and O'Sullivan's cognitive rehabilitation strategies and techniques.

Results: After controlling the mean scores of the pretest, a significant difference was observed in agitation (96.6 vs 101.9) apathy (30.02 vs 34.10) and cognitive function (19.60 vs 16.80) between experimental and control groups. This means that cognitive rehabilitation reduced agitation and apathy with effect sizes of 0.42 and 0.54 respectively and increased cognitive function with an effect size of 0.65.

Conclusion: Considering the effectiveness of cognitive rehabilitation in reducing agitation, apathy and increasing cognitive function of the participants, cognitive rehabilitation is suggested to improve individual functioning and interpersonal relationships in the elderly with MCI.

Keywords: Cognitive Rehabilitation, Agitation, Apathy, Cognition, Cognitive Impairment, Aging

Introduction

Deaths from Alzheimer's disease (AD) have risen significantly from 2000 to 2015 in the United States, according to death certificates. However, death from the first cause of death (heart disease) has decreased by 11% (1). AD is a neurodegenerative disease associated with profound impairments of memory and cognitive functions; it is also one of the most common causes of dementia, which is especially seen in the elderly (2).

Patients with AD experience different stages in the progression of their disease. These patients develop mild cognitive impairment (MCI) in the first stage of

[DOR: 20.1001.1.24236179.2022.8.1.5.7]

[DOI: 10.18502/ehj.v8i1.9953]

their disease, which is generally common in other dementia patients (3). The annual conversion rate of MCI to AD is reported to be more than 20% and in 30-month follow-ups close to 48% (4). The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR) diagnoses MCI in the pre-dementia stage, and it has been called mild neurological cognitive disorder (5).

The prevalence of MCI varies significantly in different studies. This rate has been reported between 3 to 54% (6). Reliable assessment of the prevalence of cognitive disorders is important. Since cognitive disorders impose a heavy cost on the health system and increase the risk of dementia (7).

MCI was first introduced in a study by Flicker et al., in 1991 (8). Then, in 1995, a study of aging at the Mayo Clinic suggested MCI as an independent diagnosis for classifying people with memory problems who did not have dementia (9). Mayo Clinic criteria for MCI is included complaints of memory problems (preferably confirmed by a caregiver); objective evidence of memory impairment despite maintaining cognitive function; performing activities of daily living; and the absence of dementia (10). Four subgroups of MCI include; Amnestic single domain, Amnestic multiple domain, Non-amnestic single domain and Non-amnestic multiple domain (7, 11).

Emotional, memory, executive functions, language and attention disorders are common problems that patients with MCI suffer from. However, the main problem of these patients is cognitive disorders, the most important reason for their need for more care (12). It also affects many people's behavioral and emotional characteristics. Problems such as mood symptoms (lack of pleasure, agitation, depression, loss of appetite), psychological symptoms (hallucinations, delusions) as well as behaviors such as aggression occur in these patients, among these problems, the prevalence of agitation, apathy and cognitive impairments in patients with MCI increases over time. Whereas, physical aggression with prevalence rate of 6-22% is less common than AD (13).

The purpose of tertiary prevention is using tools or training that can restore some or all of the physical and mental performance of people with disabilities, so that they could more easily be present in society, or even engage in simpler types of tasks. Rehabilitation and some psychological therapies are in this regard to provide the ground for re-activity of patients with chronic diseases to the workplace and society after a complete or relative recovery. One of the components of tertiary prevention programs for people with MCI is cognitive rehabilitation that aims to develop strategies for coping with memory problems. In fact, more studies are needed to develop clinical interventions that can be applied in the real life environment. Non-pharmacological interventions in cognitive rehabilitation in MCI have also shown promising results in preventing or delaying cognitive impairment. Cognitive stimulation also seems to improve and maintain cognitive and social activity (14).

People with MCI may be in the transition phase between aging and AD. The rapid rate of conversion of MCI to AD makes early treatment of the disease an important clinical issue. Evidence suggests that cognitive rehabilitation can possibly slow the progression of MCI to AD (15). Also, improvement and maintenance of cognitive and social activity (14), satisfaction of target function, improvement of cognitive function, mood, self-efficacy and memory in patients with AD (16), improving cognitive function and psychological status (17), improving cognitive function of people with dementia in the early stages of their disease (18) are among the consequences of cognitive rehabilitation in patients with cognitive impairments. The present study aimed to investigate the effectiveness of cognitive rehabilitation on agitation, apathy and cognitive function in elderly men with MCI.

Methods

Study design and participants

The present study was a quasi-experimental with pre-test, post-test design with a control group, and the statistical population included male elders with MCI in Kahrizak Charity nursing home in Alborz province, Iran in 2020. The number of participants in this study was 18 for each group considering 95% confidence level, 0.05 alpha error level, 80% test power, 0.3 effect size and 10% probability of loss. Thirty-six elderly men with MCI were selected by purposeful sampling and randomly assigned to experimental and control groups (each group of 18).

Inclusion criteria were male gender, nursing home resident, age over 65 years, having a diagnosis of mild neurological cognitive disorder based on DSM-5-TR criteria and obtaining a score between 18 and 26 out of 30 in Montreal Cognitive Assessment Basic and ability to read numbers. Exclusion criteria for this study were, depression coinciding with MCI based on patient profile and diagnosis of hospice psychiatrist, difficulty in speech and hearing, and taking antidepressants. Attrition criteria included not attending more than 2 sessions and unwillingness to continue attending the sessions

DSM-5-TR diagnostic criteria including: A) Evidence of modest cognitive decline from a previous level of performance in one or more cognitive domains (attention, executive function). B) The cognitive deficits do not interfere with capacity for independence in everyday activities. C) The cognitive deficits do not occur exclusively in the context of delirium. D) The cognitive deficits are not better explained by another mental disorder (e.g. major depressive disorder, schizophrenia) (5).

Instruments

Cohen-Mansfield Agitation Inventory was designed to investigate the frequency of disturbed behavior manifestations in elderly with cognitive impairment in 1986 to implement research projects in

[DOR: 20.1001.1.24236179.2022.8.1.5.7]

[DOI: 10.18502/ehj.v8i1.9953]

nursing homes. It consists of 29 phrases and 4 components, and includes aggressive behavior, non-aggressive behavior, verbal aggression and hiding behavior. The questionnaire items are rated based on a 7-point Likert scale. Each of the items receives a score of 1 (never), 2 (less than once a week), 3 (twice in a week), 4 (several times in a week), 5 (once or twice a day), 6 (several times in one day) and 7 (several times in one hour). The total score obtains from the sum of 29 points (19, 20). Griffiths et al., (21) reported the criterion validity of the Cohen-Mansfield Agitation Inventory with the Pittsburgh Agitation Scale 0.79, and the Cronbach's alpha coefficient at 0.61. Zare et al., (19) reported the convergent validity of the Cohen-Mansfield Agitation Inventory from 0.43 to 0.90. They also showed that it's reliability by the test – retest was 0.99.

Apathy Evaluation Scale is an 18-item scale designed by Marin et al., (22). Each item is given a score between 1 and 4 (Likert rating) based on the interview with the participants. For each item, scores, 1 for never, 2 for rarely, 3 for somewhat, 4 for very are considered. The items of this scale include four aspects; cognitive, behavioral, emotional, and other. Three items (6, 10 and 11) are scored in reverse. The possible score range of this scale is 18 to 72. The higher score on this scale shows more apathy. Umucu et al., (23) reported the convergent validity of Apathy Evaluation Scale with Neuropsychiatric Inventory-NPI, in elderly at risk of developing AD 0.75 and Alpha Cronbach 0.86.

Montreal Cognitive Assessment-Basic (MOCA-B) was designed by Nasreddin et al., (24) in 2015. MOCA-B is a 10-question inventory, which is included executive function, immediate recall, fluency, orientation, calculation, abstraction, delayed recall, visuoperception, naming and attention. This inventory has a total of 30 points. The minimum score is zero and the maximum score is 30. In this instrument, a score of 26 to 30 without dementia; 18 to 26 MCI ; 11 to 17 mild dementia; 6 to 10 moderate dementia; lower than 6 is considered severe dementia. Saleh et al., (25) reported a discriminant validity of 0.98 and a Cronbach's alpha of 0.91.

In this study, the content validity of Cohen-Mansfield Agitation Inventory, Apathy Evaluation Scale and MOCA-B was evaluated and confirmed by the opinions of nine experts in Psychology. Internal consistency by calculating Cronbach's alpha coefficient on 30 elderly people apart from the samples of this study was 0.80 for Cohen-Mansfield Agitation Inventory, 0.73 for Apathy Evaluation Scale, and 0.75 for MOCA-B.

Procedures and intervention

At first by referring to Kahrizak Charity nursing home in Alborz province, administrative coordination was done. Then, 36 male elders with MCI based on inclusion criteria of the study, was purposefully selected and randomly assigned to experimental (n = 18) and control (n = 18) groups. Participants in the experimental group were required to attend one session each week. During this period, the control group did not receive any intervention. After taking pre-test from both experimental and control groups, the experimental group received 8 weekly 90-minute sessions of cognitive rehabilitation based on Kelly and O'Sullivan's cognitive rehabilitation strategies and techniques (26). Finally, the experimental and control groups were post-tested separately (to prevent the groups from facing each other). After the post-test, according to the provisions of the code of ethics the control group received cognitive rehabilitation (Description of sessions is summarized in table 1).

Data analysis

To analyze the data, the SPSS software was used. Descriptive statistics were applied to describe the findings. To assess data distribution Kolmogorov-Smirnov and Levine's test and multivariate analysis of covariance was done to assess the effectiveness of cognitive rehabilitation.

Ethical considerations

The ethical code of IR.IAU.TON.REC.1399.050 was obtained from the Ethics Committee of Tonekabon Branch of Islamic Azad University for the present study. By providing adequate explanations about the objectives and implementation, written consent was received from the participants and their questions were answered. Participants had the right to leave at every stage of the study. Data were received in accordance with the principle of confidentiality.

Results

The study participants in both experimental and control groups were elderly men ranging in age from 65 to 80 years. The mean age of the participants in the experimental group was 71.3 and the control group was 71.5 years.

The mean score of agitation, apathy and cognitive function in participants before and after intervention is shown in table 2. The results showed that in the experimental group compared to the control group, agitation, apathy and cognitive function in the post-test have changed compared to the pre-test. (Table 2)

The results of multivariate covariance analysis to investigate the effectiveness of cognitive rehabilitation on agitation, apathy and cognitive function of patients with MCI are showed on table 3.

There was a significant difference between the participants in the experimental and control groups in the agitation variable ($F = 22.82$, $p = 0.0001$). After controlling the pre-test scores, there was a significant difference in post-test scores between experimental group (mean = 96.60) and control group (mean = 101.90). This means that cognitive rehabilitation reduced patients' agitation with an effect size of 0.42. In addition, there was a significant difference between the experimental and control groups in the apathy variable ($F = 37.623$, $p = 0.0001$). After controlling the pre-test scores, there was also a significant difference between the experimental group (mean = 30.02) and the control (mean = 34.10) in the post-test scores. This means that cognitive

rehabilitation reduced patients' apathy with an effect size of 0.54. Also there was a significant difference in cognitive function variable (F = 57.53, p = 0.0001). After controlling the pre-test scores, there was a significant difference in post-test scores between the experimental group (mean = 19.60) and the control (mean = 16.80). This means that cognitive rehabilitation increased cognitive function with an effect size of 0.65.

Bonferroni post-hoc test (multiple comparisons) was calculated to investigate the difference between the means of the stages. (Table 4)

Table 1. Summary of cognitive rehabilitation sessions based on strategies and techniques for cognitive rehabilitation kelly and o'sullivan

	Sessions	Contents
1	**Familiarity**	Familiarity with group rules, skills and cognitive rehabilitation exercises
2	**Story recall**	Recalling articles, stories, memories of yourself and others using open-answer questions
3	**Face-name call**	Presenting a person photo, explaining it, creating mnemonics with the agreement of the group members, associating between face-name and mnemonics
4	**Recall numbers**	Presenting numbers in oral and written forms, selecting mnemonics with chunking strategy by agreement of group members, delayed recall
5	**Recall lists/objects**	Visualizing an activity or task explaining its details
6	**Fluency Training**	Training and encouraging group members to participate in naming and describing images
7	**Word associations**	Providing a list of different words to find pair words and their counterpart by group members
8	**Summing up**	Conclusion and post-test

Table 2. Mean and standard deviation of agitation, apathy and cognitive function scores in experimental and control groups in time stages

Variables	Groups	Pre-test		Post-test	
		Mean	SD	Mean	SD
Agitation	Experimental (n = 18)	88.97	36.10	94.93	6.12
	Control (n = 18)	17.10	68.80	17.10	55.80
Apathy	Experimental (n = 18)	32.11	79.10	64.29	2.20
	Control (n = 18)	23.33	38.40	11.34	1.40
Cognitive function	Experimental (n = 18)	23.18	3.20	64.19	26.20
	Control (n = 18)	88.17	65.10	7.16	4.10

Table 3. Summary of the results of multivariate analysis of covariance on the scores of agitation, apathy and cognitive function

	Effects source	df	Mean squares	F	p-value	Effect size
Experimental	Apathy	1	136.418	37.62	0.0001	0.54
	Agitation	1	232.419	22.82	0.0001	0.42
	Cognitive function	1	62.911	57.53	0.0001	0.56

Table 4. Results of bonferroni post-hoc test (multiple comparisons) to investigate the difference between the means of the stages

Variables	Groups	Mean	i-j	Standard error	p-value
Agitation	Experimental	96.60	-4.067	0.66	0.0001
	Control	101.90			
Apathy	Experimental	30.02	-5.308	1.11	0.0001
	Control	34.10			
Cognitive function	Experimental	19.60	2.762	0.36	0.0001
	Control	16.80			

[DOR: 20.1001.1.24236179.2022.8.1.5.7]
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Discussion

The present study aimed to investigate the effectiveness of cognitive rehabilitation on agitation, apathy and cognitive function.

The results of this study indicate the effectiveness of cognitive rehabilitation on agitation. No study was found on the effectiveness of cognitive rehabilitation on agitation in patients with MCI. In limited studies on cognitive rehabilitation of patients with traumatic brain injury (TBI), the results showed the effectiveness of cognitive rehabilitation on agitation. For example in the study of Corrigan & Mysiw (27) eighteen patients with TBI were assessed during cognitive rehabilitation for both the extent of agitation and level of cognitive functioning, agitation decreased as cognitive function improved. In explaining the effectiveness of cognitive rehabilitation on reducing agitation, it can be said that cognitive rehabilitation probably affects the symptoms of agitation in the acute post-traumatic stage, and by improving the function of cognition and memory indirectly increases the patient's efficiency and indirectly reduces the patient's agitation (27).

Based on the results of this study cognitive rehabilitation also was effective in improving apathy in elderly men with MCI. This finding was congruent with the study of Montoya-Morillo et al., (28), Brodaty & Burns (29). In the study of Montoya-Murillo et al. (28) cognitive function, apathy and mental complaints of the elderly who participated in the rehabilitation intervention decreased. Brodaty & Burns (29) stated that apathy is one of the most challenging behavioral symptoms of dementia, the symptom that non-pharmacological interventions have the potential to reduce it. This study showed that therapeutic activities have the best evidence for effectiveness in psychiatric symptoms such as apathy to dementia (29). In explaining the effectiveness of cognitive rehabilitation on reducing apathy, it can be said that there are several reasons that cognitive rehabilitation affects symptoms of apathy in the acute phase after stroke. Cognitive rehabilitation addresses the main shortcomings of apathy (ie, Initiation and persistence) by focusing on goal setting and planning, self-monitoring, and problem solving. Similarly, cognitive rehabilitation may extensively prevent further consequences that affect apathy symptoms (30). Improving cognitive functions may also prevent the reduction of interest and the onset of targeted behavior that normally appears after a stroke. Cognitive rehabilitation may also improve mood. It seems that cognitive rehabilitation deals with cognitive (interested in targeted activities) and behavioral (initiation and completion of targeted activities) symptoms of apathy (31).

The results of this study showed that cognitive rehabilitation was also effective in improving cognitive function in elderly men with MCI, Which is consistent with other studies (14, 16-18, 32). In explaining the effectiveness of cognitive rehabilitation in improving cognitive function, it can be said that improvement in cognitive function leads to improvement in psychological status, which can be seen immediately after cognitive intervention. However, in people without cognitive disabilities who received cognitive rehabilitation, it led to an increase in cognitive function and learning processes (33). In conclusion, cognitive intervention can have a significant effect on the cognitive function of people with MCI, and this intervention is necessary for the elderly at risk of dementia (34). However, cognitive rehabilitation in healthy elderly has a protective effect on neuropsychological function (18).

Conclusion

Cognitive rehabilitation is effective in reducing agitation, apathy and improving cognitive function in elderly with MCI. Therefore, it is suggested that health professionals, in addition to conventional medical and pharmaceutical treatments, use psychological interventions such as cognitive rehabilitation to achieve performance improvement, individual autonomy of elderly with cognitive impairment.

Study limitations

Lack of random sampling was the limitations of this study. Considering that this study was conducted on elderly men with MCI, therefore, generalization of this issue to elderly women with cognitive impairment should be done with caution.

Conflict of interest

The authors declare no conflicts of interest.

Acknowledgment

This article was derived from a doctoral dissertation of health psychology at Islamic Azad University, Tonekabon Branch, Iran. We appreciate all the elderly residents of Kahrizak who participated in this study, as well as the management and staff of this hospice who, in their compassionate cooperation, provided the possibility of this research.

Authors' contributions

All authors read the final draft of the manuscript, provided the necessary revisions, and accepted the responsibility its contents.

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[DOR: 20.1001.1.24236179.2022.8.1.5.7]
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