

The Effect of Superbrain Yoga Exercises On Cognitive Functions of The Older Adult

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Abstract

Background: Cognitive disorders are considered one of the most important and controversial disorders among the elderly, which significantly reduces the quality of life and efficiency, and ultimately increases the mortality rate of the elderly. The purpose of this study is to investigate the effect of superbrain yoga exercises on the cognitive function of the elderly.

Methods: This study is a quasi-experimental performed on 60 people of the elderly aged 60-75 years who regularly went to the centers of comprehensive health services in Khaf, a city in the west of Iran, in 1399. Participants were randomly selected and divided into two groups. A brief questionnaire was used to assess cognitive status which was completed at the beginning and end of the intervention. The elderly, after obtaining a score of 21 to 23 from the brief cognitive status questionnaire, were divided into two groups of intervention and control. The intervention group did superbrain yoga exercises three days a week for one month. The study data were analyzed using SPSS software version 20.

Results: There was no statistical difference between the two groups in terms of cognitive function score before the intervention. Comparison of the mean score of cognitive status in the two groups after the intervention showed that there was a significant difference between the two groups ($P < 0.001$).

Conclusion: Superbrain yoga exercise affects the cognitive status of the elderly and is recommended to prevent Alzheimer's disease in the elderly with mild cognitive impairment.

Background

Aging is a process that affects all living things, including humans. Aging is not a disease but a vital phenomenon that involves everyone and is in fact a natural process during which the body changes physiologically and psychologically [1]. The aging process of humans involves a gradual decline in the function of body systems including cardiovascular, respiratory, urogenital, endocrine, and immune systems. Aging turns a healthy adult into a weak person with a decrease in various physiological capacities, increasing susceptibility to many diseases and death [2].

Today, thanks to advances in medical science, the world is experiencing a new phenomenon called population aging [5]. In the first half of this century, the world's elderly population is predicted to reach two billion by 2050 [6]. According to the 2016 census by the Statistics Center of Iran, our country has about seven million elderly people, which constitutes 8.8% of the population [7].

During old age, the risk of developing one or more chronic diseases increases, with cardiovascular disease, stroke, cancer, diabetes, musculoskeletal disease, and mental illness becoming more common [8]. One of the deficiencies that have currently attracted the attention of many experts is cognitive disorders among the elderly. Cognitive disorder is one of the most important and controversial disorders among the elderly and have different types [2].

Cognitive status depends on the full functioning of different brain systems. As age increases, declining and functional changes taking place in the brain cause dysfunction in these parts of the brain and result in cognitive problems. These problems can be very different and include a wide range of disorders in the elderly. Optimal cognitive function is a vital factor in promoting and maintaining mental health and quality of life in the elderly [1]. Numerous studies have shown disorders in the cognitive abilities of the elderly, including a decrease in linguistic performance, attention, orientation, and explicit and implicit learning ability [2].

The mild cognitive disorder is an intermediate condition between the normal cognitive status of old age and dementia, and it is a clinical syndrome that falls into the category of cognitive impairments. In this age-related memory disorder, there is no obvious functional impairment and the person's cognitive and memory impairment is not so severe that it interferes with the person's daily functioning, but the person's daily functioning is in any case weaker than normal, which occurs in the realm of memory or other cognitive domains. Benign aging is associated with slowing of neural responses in aging, yet the person's intellectual function and personality remain stable and they can remain independent in their daily lives. In many cases, the symptoms of this disorder are similar to the early symptoms of Alzheimer's, which can lead to dementia [10].

Mild cognitive disorder is a transitional stage of cognitive function between changes observed in normal aging and dementia, which provides an opportunity for early detection and prevention of Alzheimer's disease. Since mild cognitive disorder has adverse effects on quality of life and functional ability, it is vital to reduce its risk, and early diagnosis and intervention at the stage of the mild cognitive disorder can delay or prevent the onset of dementia [11]. As one of the clinical problems in the elderly, mild cognitive disorder is growing. Studies show that in the elderly with mild cognitive disorder, developing Alzheimer's disease increases by 10 to 30 percent per year, while in the elderly without it, the annual dementia rate is 1 to 2 percent. Despite effective treatments available to reduce the progression of the disease, many people with Alzheimer's remain undiagnosed for years [10].

There is currently no definitive treatment for cognitive disorders, so it is better to use preventive interventions for cognitive disorders [4]. One of the recently considered methods is yoga. Yoga is a physical-mental exercise that is related to physiological and psychological processes [12]. Its exercises are performed in both static and dynamic modes and it focuses on relaxation. Yoga includes meditation exercises, breathing regulation, and physical exercises [13]. There is some evidence that the activity of neurotransmitters as the main inhibitor of the brain can be affected through yoga exercises [14]. And such exercises generally reduce the symptoms of anxiety and increase relaxation and treatment of high stress and anxiety [15].

According to studies, yoga is a therapeutic technique that does not require special technology and equipment and can be done almost at any time and place. As a result, it is cost-effective and, more importantly, the individuals can do it independently [16]. Superbrain yoga is a type of yoga in which the main energy centers are the points of acupuncture. In this yoga, the person stands facing east, the legs

open as wide as the shoulders and the tongue sticks to the palate. The acupuncture points of the ears (earlobes) are touched with the fingers of the opposite hand, that is, the right earlobe is touched with the left hand and the left earlobe with the right hand so that the hands are crossed in front of the chest. The index finger should point inward and the thumb should point outward. In the same state, the person performs 14 squats, inhaling while sitting down and exhaling while standing up (17, 18). Superbrain yoga balances the body's energy levels for optimal brain function (19). In mental and neurological disorders, energy is trapped in the lower chakras (the main points of acupuncture), thus preventing sufficient energy from being sent to the brain.

In 1997, reviewing the previous studies on the effect of yoga exercises on improving the balance of the elderly, Survey et al. showed that a moderate-intensity daily workout program of at least 30 minutes a day will help seniors maintain adequate levels of strength, balance, agility, and flexibility; and that exercises such as yoga which are done regularly can have positive effects on balance and some factors of physical fitness [20].

Since prevention precedes treatment, it is necessary to pay attention to mild cognitive impairment, which is the prelude to Alzheimer's disease. Considering the importance of quality of life in the elderly, whose population is growing, and the prevalence of cognitive disorders among them, and taking into account the growing trend of doing yoga exercises and its positive effects on strengthening intelligence and memory with very low side effects on the elderly, as well as the cost-effectiveness of this method, we decided to investigate the effect of yoga exercises on the cognitive function of the elderly.

Materials And Methods

This study is quasi-experimental two-group research that examined the effect of superbrain yoga on the cognitive function of the elderly. The study population consisted of all people aged 60 to 75 years under care of comprehensive health service centers in Khaf city in 2020. After the pilot study and considering test power 80% and confidence interval 95% and calculating the mean and standard deviation of the cognitive impairment score in the two groups based on the formula for comparing the means, the sample size was calculated as 60 people. Convenience sampling method was used in which all the elderly aged 60 to 75 years who were supported by the comprehensive health service centers of Khaf city who met the inclusion criteria were screened with a brief cognitive status questionnaire. Then the selected population was divided into an intervention and a control group, on a random allocation basis. Therefore, the research sample was 60 people of elderly selected from the research community who met the inclusion criteria. Inclusion criteria were an age of 60 to 75 years, literacy, having a mild cognitive impairment according to the results of the standard questionnaire of mini mental status examination (MMSE), not using drugs for cognitive disorders, completing the consent form to participate in the research. Exclusion criteria included not exercising on a regular basis (exercise should be done regularly and daily, at least three times a week), acute physical illness during the period, absence of two or more sessions during the intervention, hospitalization, reluctance to continue cooperation at any stage of the research, and the death of the elderly. The tools used in this study are explained below.

Elderly Demographic Characteristics Questionnaire

The variables of age, sex, education, marital status, insurance, and disease were examined in this questionnaire.

Minimal Mental Status Examination (Mmse)

The standard MMSE was used to assess cognitive status. It contains 11 questions having 30 scores, including 16 scores on the memory and orientation subscale, 5 scores on the attention and focus subscale, 8 scores on assessing linguistic production and comprehension, and finally, 1 score on spatial visual ability. The maximum score for the above test is 30 points. A total score between 24 and 30 is a sign of cognitive health and a score of 23 or lower indicates cognitive impairment. A score of 21 to 23 indicates mild cognitive problems, a score of 10 to 20 moderate cognitive disorders, and a score below 9 severe cognitive disorders [19].

The MMSE questionnaire developed by Folstein et al. in 1975, is the most common screening tool for cognitive disorders worldwide and has been translated into different languages and standardized in different cultures [21]. Applying some modification to it, Maziar Seyedian et al. tested the Persian version of MMSE on 30 people with dementia and 200 healthy people in Iran. It showed good validity and reliability [22].

This research was approved in the session of the ethics committee of Gonabad University of Medical Sciences, on 20 October 2020 with the ethics code **IR.GMU.REC.1399.084**. The study was conducted in accordance with the ethical principles provided by the Declaration of Helsinki and the guidelines of the Iranian Ministry of Health and Medical Education. Throughout the research process, from beginning to end, in accordance with the proposal approved by the ethics committee, was carried out.

In the sample selection process, the purpose and method of research were explained to the patients, then they were invited to participate in the study, and the written and oral informed consent form was completed by them.

The study data were analyzed using SPSS software version 20. The Chi-square test was applied to determine the homogeneity of qualitative demographic variables in the two groups. Kolmogorov-Smirnov test was used for normality of quantitative data in each group. An independent t-test was used to compare the variables that had a normal distribution in the two study groups, and the Mann-Whitney nonparametric test was used for the variables without normal distribution. Also, the Wilcoxon test was used to compare the mean score of cognitive status within each group (before and after). The significance level was considered less than 0.05.

Results

The normality of quantitative variables including age, weight, and cognitive impairment score before and after the intervention in each group was evaluated by the Kolmogorov-Smirnov test. The age variable had a normal distribution in both groups. However, weight and cognitive impairment variables did not have a normal distribution before and after the intervention. Therefore, non-parametric tests were used to analyze the data related to these variables (Table 1).

Table 1
Comparison of demographic characteristics of the two groups

Group		Intervention	Control	Chi-square test
Sex	male	25 83.3	26 86.7	$x^2 = 0 / 131$ Df=1 P=0/718
	female	15 26.7	4 13.3	
Marital status	unmarried	—	4 13.4	$x^2 = 4 / 503$ Df=2 P=0/105
	married	28 93.3	25 83.3	
	widow(er)	2 6.7	1 3.3	
Education	primary school	14 46.7	14 46.7	$x^2 = 0 / 125$ Df=2 P=0/939
	high school	8 26.7	9 30	
	university	8 26.6	7 23.3	
Financial Status	adequate	27 90	28 93.3	$x^2 = 1 / 018$ Df=2 P=0/601
	wealthy	1 4.3	—	
	inadequate	2 6.7	2 6.7	
Job	worker	4 13.3	2 6.7	$x^2 = 6 / 365$ Df=5 P=0/272
	retired	17 56.7	19 63.3	
	employed	1 3.3	1 3.3	
	businessman	3 10	4 13.3	
	housewife	5 16.7	4 13.3	
Taking medicine	no	21 7	21 7	$x^2 = 0$ Df=1 P=1
	yes	9 30	9 30	
Disease	kidneys	4 13.3	5 16.7	$x^2 = 5 / 274$ Df=6 P=0.509
	respiration	2 6.7	1 3.3	
	glands	4 13.3	1 3.3	
	hypertension	5 16.7	3 10	

*independent sample T test **Mann-Whitney U test

Group	Intervention	Control	Chi-square test
others	9 30	8 26.7	
no disease	9 20	11 36.7	
Age	3.115±63.5337	3.571±64.2667	P=0.4 ⁻ T=0.84 DF=58
Weight	12.245±72.033	15.544±69.6	z= 0.348** P=0.728
*independent sample T test **Mann-Whitney U test			

Table 2
Comparison of cognitive function score before and after the intervention in the two groups

Group	Intervention	Control	Mann-Whitney
Cognitive Score	SD	SD	U-test
	Mean	Mean	
Before	22.133	21.533	Z = -2.6
	0.899	0.776	P = 0.009
After	0.78	21.033	Z = -5.3
	24.33	1.691	P < 0.001

The mean score of cognitive status in the intervention group was higher than the control group and the two groups were significantly different (P = 0.009) before the intervention (Table 2). Comparison of the cognitive status score of the research units after the intervention using the Mann-Whitney U test showed that the cognitive status score of the intervention group was higher than the control group and the two groups were significantly different (P <0.001) (Table 2).

Table 3
Comparison of differences in cognitive status scores after the intervention in the two groups

Group	Intervention	Control	Mann-Whitney
Cognitive Score	SD ± Mean	SD ± Mean	U-test
After	-0.5 ± 1.34	2.2 ± 1.34	Z = -5.5 P < 0.001

Comparison of the mean of the cognitive status score after intervention shows that there is a significant difference between the two groups (P <0.001) (Table 3).

Discussion

The findings of the present study showed that there was a significant difference between the scores of the cognitive status of the elderly in the intervention and control groups before and after the intervention. Also, after the intervention, the scores of the cognitive status of the subjects had significantly increased in the intervention group, while no significant difference was observed in the control group. Comparison of the cognitive status score before and after the intervention in each group showed that in the intervention group, the cognitive status score of the subjects increased significantly (P <0.001) compared to the one before the intervention.

In line with the findings of this study, Thomas et al. conducted a comparative study entitled the effect of superbrain yoga and aerobic exercise on cognitive functions among medical students in Bangalore, India. The results of the study showed that superbrain yoga had a positive effect on attention control and components of working memory. The effect was more prominent on working memory than attention control in the superbrain yoga group compared with the group that performed simple squats [19].

In 2006, Mitchell Haas et al. conducted a comparative and controlled study on the yoga effects on different aspects of quality of life in the elderly. The results of the study showed a relative improvement in cognitive function, quality of life, and physical activities of healthy elderly in the yoga group compared to the control group, which are also consistent with the results of our study [23]. Hariprasad et al. found that yoga positively influenced the cognitive function of the elderly. They confirmed that yoga is useful for improving cognitive function in the elderly, which is consistent with the results of our study. [24].

Irandoust et al. investigated the effect of yoga and Pilates on the motor function of the elderly. The results showed that the Pilates and yoga training protocol increases muscle weight and reduces the percentage of fat in the lower limbs. Also, the use of yoga and Pilates exercises improves the static and dynamic balance as well as the muscular strength of the lower limbs. These findings are consistent with the results of our study [25].

Piri et al. examined the effect of breathing exercises and yoga relaxation on depression in older women. The results showed that after eight weeks of breathing exercises and yoga relaxation, the difference in

scores between the two groups was significant. Their findings showed that breathing exercises and yoga relaxation can be used as a complementary treatment to reduce depression in the elderly, which is consistent with the results of our study [26].

Khezri et al. studied the effect of exercise and physical activity on the reaction time and response time of the elderly. According to the results of their study, reaction time and response time were significantly shorter in the group with exercise and physical activity than the inactive group, which is consistent with the results of our study [27].

Eskandarnejad et al. studied the effect of aerobic exercise on neural networks of attention and working memory. The results showed that working memory in the experimental group increased significantly compared to the control group, which was consistent with the results of our study [28].

Alivand et al. reviewed the effect of exercise on memory enhancement. The results showed that exercise, as a non-invasive method, can improve memory and learning ability, in addition to undeniable effects on the function of many organs, including the respiratory system, and cardiovascular and gastrointestinal enhance. These effects are associated with cellular and molecular changes in brain structure that are consistent with the results of our study [29].

The results of a review study conducted by Survey et al. on the effect of yoga exercises on improving the balance of the elderly showed that exercises such as yoga that are done regularly can have positive effects on balance and some physical fitness factors. The findings are consistent with ours [20].

Conclusion

According to the results of the present study, superbrain yoga exercise has a positive effect on the cognitive status of the elderly with mild cognitive impairment, and after a month of exercise by the intervention group, the cognitive status scores of the elderly increased significantly. The results of the study can be an effective step to improve the memory of the elderly and prevent Alzheimer's at old age. Exercise and motor activities affect memory and attention control as well as cognitive functions.

Abbreviations

MMSE: Minimal Mental Status Examination

Declarations

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Availability of data and materials

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Contributions

AD and LS wrote the manuscript text, AD and TB and MT collecting data, and SK analyzed the collected data. All authors read and approved the final manuscript prior to submission.

Ethics approval and consent to participate

This research was approved in the session of the ethics committee of Gonabad University of Medical Sciences, on 20 October 2020 with the ethics code **IR.GMU.REC.1399.084**. The study was conducted in accordance with the ethical principles provided by the Declaration of Helsinki and the guidelines of the Iranian Ministry of Health and Medical Education. In the sample selection process, the purpose and method of research were explained to the patients, then they were invited to participate in the study, and the written and oral informed consent form was completed by them. Throughout the research process, from beginning to end, in accordance with the proposal approved by the ethics committee, was carried out.

Consent for publication

Not applicable.

Competing interests

The authors declare that there they have no conflicts of interest.

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