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The Effect of Eight Weeks of Exercise in Water on the Levels of Stress, Anxiety and Depression of Elderly Men

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Abstract

Introduction: Nowadays, the trend of dramatic growth in the aging population and its relation with mental disorders is on the rise. In this vein, the present study aimed to investigate the effect of eight weeks of exercise in water on the levels of stress, anxiety and depression of elderly men in Gachsaran city.

Methods: In this semi-experimental study, 30 male volunteers with a mean age of 66 ± 0.5 years, who met the inclusion criteria of the study, were randomly selected and assigned into two control and experimental groups of 15 subjects. The experimental group performed the selected exercises in water in accordance with the planned protocol, and the control group just performed their daily routine activities during this period. Running pretest and post-test, stress (GHQ questionnaire), anxiety (Cattle's questionnaire) and depression (Beck's questionnaire) were measured in both groups. To analyze the findings, analysis of covariance was employed using SPSS software (version 21) ($p \leq 0.05$).

Results: Exercise in water had a significant effect on stress components such as reduction of physical symptoms, anxiety symptoms and symptoms of depression and an increase in symptoms of social action compared to control group ($p \leq 0.05$), exercise in water had a significant effect on anxiety reduction compared to control group ($p \leq 0.05$) Also, exercise in water had a significant effect on depression reduction compared to control group ($p \leq 0.05$).

Conclusion: Regarding the results of this study, it seems that exercise in water reduces anxiety and depression and some stress factors in elderly people.

Keywords: Exercise, Stress, Anxiety, Depression, Elderly

Introduction

The dramatic increase in the aging population around the world is a phenomenon that has begun since the twentieth century, and continues in the twenty-first century, which is the century of aging of the world's population (1). In the current conditions, Iran is moving from the young population to the aged population and will soon join the nations with the aging populations (2). The aging process usually involves lowering the function of the body's systems and reducing physiological capacities along with increased susceptibility to disease (3). One of the most important problems of elderly people is the issue of mental health and cognitive problems that has a significant impact on their quality of life. Depression and anxiety are both the most prevalent and most important factors affecting the psychosocial function of the elderly, which can reduce the quality of life of the elderly and increase the cost of care, drug use and the length of admission to the hospitals (4). Hence, researchers believe that depression and anxiety can increase the dependence of the elderly on other people (5). Although drug prescription has always been one of the treatments for this age group, it has now become more and more recognized that the use of synthetic drugs has side effects such as hypotension, increased need for higher dose after some use, cardiac toxicity, cholinergic effects, memory impairment and other side

effects in the elderly. Therefore, sport exercises by increasing the quality of life and having positive effects on the endocrine glands and brain function, can be used as a supplement to replace the medication methods for the elderly (4). Researchers believe that exercise improves social performance and increases beta-endorphin levels and hence can have positive effects on depression and psychological problems (6, 7). The more frequent participation in day-to-day activities is in the elderly, the greater its beneficial effects will be in terms of life expectancy and fewer symptoms of mental illness (8). The results of Mokhtari *et al*. in 2013 showed that a 12-week aerobic exercise program had an effect on reducing depression and improving the balance of elderly women in Isfahan elderly home (9). Walker *et al*. (2015) found that the elderly involved in physical activity had higher self-esteem and higher quality of life and lower depression (10). Some researchers reported anxiety reduction after 10 weeks of training (3 sessions per week for 45 minutes). On the other hand, some studies examined the impact of participation in the aerobic exercise program on depression, anxiety and self-esteem, and explained that mental function improved considerably in all aspects except depression (11). Studies have also shown that participation in sports activities causes gastrointestinal disorders and increased impulsive behaviors (11, 12). Although many studies point to the positive effects of physical activities on physical and mental health, industrialization and a tendency to low mobility have reduced the incentive to participate in regular sports activities, especially in elderly people (13). Therefore, introducing entertaining and enjoyable exercises that can have anti-depressant and anti-anxiety effects can have a significant effect on improving the quality of life and happiness for people with limited mobility. Moreover, despite the importance of sport exercises and physical activities in individuals, unfortunately, this type of intervention in our country has received less attention on behalf of the researchers, and little has been done to assess the effectiveness of exercise, especially exercise in water, on the health of the elderly. Therefore, the present study aimed to investigate the effect of eight weeks of exercise therapy in water on the levels of stress, anxiety and depression in elderly men of Gachsaran city.

Methods

This study was a semi-experimental with pre-test and post-test design. The statistical sample consisted of 30 elderly men (with the mean age of 66 ± 0.5 years, height 168.22 ± 8.31 cm, and weight 67.35 ± 6.37 Kg) who had referred to the sports club of Gachsaran oil company. The subjects had no history of skeletal diseases (orthopedic, muscular), cardiovascular disorders, metabolic diseases and congenital disorders, and to ensure the health of the subjects and to complete the training period, the medical questionnaire and simple tests of 0.4 km walking, removing large objects, bending, kneeling, climbing, and carrying a weight of 4.5 kg were used (14). The criteria for inclusion into the research comprised age over 60 years, lack of participation in sports exercises in the past 4 months, and the absence of any type of disease that could limit subjects in performing exercises. Afterwards, in a briefing session, the research goals and process were explained to the subjects, and after completing the consent form, the participants were randomly divided into two groups of 15 including (1) exercise in water and (2) control. The exercise group received exercise interventions for 8 weeks. The exercise protocol in water (Table 1) lasted for 45 minutes (15). In this study, all steps of exercise protocol were carried out in the indoor pool. After warm-up and stretching movements, subjects underwent training and flexible exercises (based on Table 1) and, in the end, they cooled down and performed recovery moves. During the exercises, the heart rate started at 65 % of the maximum

heart rate and increased to 70 % at the end of the exercise. The duration of the exercise program was 45 minutes per session. To control the intensity of exercise, heart rate was measured 3 times per session before and after aerobic exercises and once at the time of cooling, using Polar heart rate monitor. The principle of diversity was also observed in performing the exercises.Based on Table 1, the number of exercise sessions was 3 in the first week, which increased to 5 sessions in the last week. Subjects' stress was measured by the standard GHQ questionnaire designed by Goldberg and Hiller in 1979, which contained 28 questions and included four areas (scales) of seven questions (physical health, anxiety and sleep disturbances, Social dysfunction and depression) to be assessed. Also, the reliability of its Persian version was confirmed by Cronbach's alpha (16). The level of anxiety was measured by Cattle's Standard Questionnaire, which included 40 questions, with components such as tendency to guilt, organ stress, lack of solidarity, I-weakness, and paranoid insecurity. It should be noted that each question was scored on a three-graded scale and had appropriate validity and reliability in Iranian society (17). Depression was measured by Beck's 21 item questionnaire. The questions of this questionnaire consisted of a four-point Likert Scale (score 0 was the lowest and score 3 was the highest) and it had reliability and validity in the Iranian community (18). Pre-test and post-test were administered and measured in both groups. Data were analyzed through analysis of covariance using SPSS 21 software ($p \leq 0.05$).

Results

Demographic characteristics of the subjects in the study are presented in Table 1; also the research variables are presented in Table 2. To investigate the difference between pre-test and post-test of the research variables, the results of paired samples t-test showed that the pre-test and post-test levels of physical symptoms (t=-1.46 , p = 0.16), anxiety symptoms (t=-1.59, p = 0.13), social action symptoms (t=-2.09 , p = 0.055), depression symptoms (t = 0.16, p = 0.87), stress (t=-1.44, p = 0.17), tendency to guilt (t = 0.44, p = 0.66), organ stress (t = 0.10, p = 0.91), lack of solidarity (t=-0.4296 , p = 0.77), I-weakness (t = 0.001, p = 0.99), paranoid insecurity (t = 2.02, p = 0.051), anxiety (t=0.28 , p = 0.77) and depression (t = 0.88 , p = 0.39) were not significantly different in the control group; however, the scores of physical symptoms (t = 13.81, p =0.001), depression symptoms (t = 3.44 , p = 0.001), stress (t =10.44, p = 0.001), tendency to guilt (t = 6.90 , P = 0.001), organ stress (t = 7.38 , p = 0.001), lack of solidarity (, t = 6.16 , p = 0.001) , paranoid insecurity (, t= 3.74 , p=0.001), anxiety (t =4.03 , p =0.001) and depression (t = 2.25 , p =0.001,) in the exercise group significantly reduced in the post-test compared to the pre-test; also the anxiety symptoms (t = -7.26, p = 0.001) and social action symptoms (t = -3.90 , p = 0.001) in the exercise group significantly increased compared to the pretest. The results of the analysis of co-variance (ANCOVA) test in Table 3 showed that eight weeks of exercise in water had a significantly effect on the reduction of the components of the physical symptoms (F = 6.11, P = 0.02, ŋ2 = 0.19), anxiety symptoms (F = 19.96, P=0.001, ŋ2 = 0.43) and depression symptoms (F = 6.63, P = 0.01, ŋ2 = 0.20), and increase in the score of social action symptoms (F = 13.63, P=0.001, ŋ2 = 0.34); however, eight weeks of exercise in water had no significant effect on the reduction of the stress component (F = 0.02, P = 0.87, ŋ2 = 0.001). The results of ANCOVA test in Table 3 showed that eight weeks of exercise in water had a significant effect on reducing the tendency to guilt (F = 5.27, P = 0.03, ŋ2 = 0.16), organ stress (F = 6.99, P=0.01, ŋ2= 0.212), I-weakness (F = 6.67, P = 0.01, ŋ2=0.20), paranoid insecurity (F =7.56, P = 0.01, ŋ2=0.22),

Table 1. Exercise protocol in the experimental group

Time	Warm up	Aerobic Exercises	Recovery	Resistance Exercises	Cool down
First Week (3 sessions a week)	Walking with the bending leg and bending hand around the Pool (5 minutes)	Walking with flat leg and flat hands in water (10 minutes)	Stretching and lying in water (10 minutes)	Opening and folding the hand in different directions, Opening and folding the leg in different directions (5 minutes)	Stretching walking with flat and bending leg, lying in water (15 minutes)
Second Week (3 sessions a week)	Walking in water with the bending leg-running in water (5 minutes)	Rapid walking in water (15 minutes)-65% of maximum heart rate	Stretching and lying in water (5 minutes)	Opening and folding the hand in different directions, Opening and folding the leg in different directions (10 minutes)	Stretching walking with flat and bending leg, lying in water (10 minutes)
Third two weeks (4 sessions a week)	Walking in water with the bending leg (5 minutes)	Aerobics in water (15 minutes)-65% of Maximum heart rate	Walking in water and doing stretching (5 minutes)	Resistance exercise of walking in water with a rope attached to a 5 kg weight at the side of the pool (5 minutes)	Stretching walking with flat and bending leg, lying in water (15 minutes)
Fourth two weeks (4 sessions a week)	Walking in water on the side (5 minutes)	Aerobics in water (15 minutes)-65% of maximum heart rate	Walking in water and doing stretching (5 minutes)	Resistance exercise of walking in water with a rope attached to a 5 kg weight at the side of the pool (10 minutes)	Stretching walking with flat and bending leg, lying in water (10 minutes)
Fifth two weeks (5 sessions a week)	Walking in water with the bending leg and walking on the side (5 minutes)	Aerobics in water (15 minutes)-75% of Maximum heart rate	Walking in water and doing stretching (5 minutes)	Resistance exercise of walking in water with a rope attached to a 10 kg weight at the side of the pool (5 minutes)	Stretching walking with flat and bending leg, lying in water (15 minutes)

Table 1. Demographic characteristics of the subjects

Variable / Group	Experimental (M ± SD)	Control (M ± SD)
Age(year)	66.16±4.4	65.34±3.84
Height(cm)	168.22±8.31	167.65±7.27
Weight(kg)	67.35±6.37	66.83±5.28

Table 2. Mean and standard deviation of stress, anxiety and depression components in experimental and control groups

Variable	Group / Components	Experimental		Control	
		Pre-test	Post-test	Pre-test	Post-test
Stress	Physical symptoms	9.66±2.84	4.20±3.10	6.60±2.74	7.13±3.37
	Anxiety symptoms	8.73±2.28	33.3±2.84	5.46±1.80	6.06±1.94
	Social action symptoms	7.06±2.21	12.60±2.89	6.33±2.35	7.01±2.90
	Depression symptoms	3.46±1.80	1.06±0.96	5.20±2.17	5.06±2.34
	Stress	28.93±5.27	21.10±5.18	23.60±5.85	25.26±6.78
Anxiety	Tendency to guilt	14.66±2.99	8.86±5.16	13.46±1.72	13.40±2.89
	Organ stress	12.40±3.85	7.73±3.49	10.80±2.21	11.03±2.24
	Lack of solidarity	8.20±1.82	5.13±1.50	5.66±2.12	5.66±1.75
	I-weakness	6.66±1.58	3.60±1.84	8.06±1.53	6.73±1.53
	Paranoid insecurity	3.66±0.89	2.06±0.79	4.80±0.94	4.66±1.23
	Anxiety	45.60±8.81	27.40±8.91	42.80±5.04	41.46±3.75
Depression	Depression	13.60±4.42	8.60±4.22	12.93±3.41	12.46±3.13

Table 3. The results of ANCOVA test for investigate the effects of exercise in water on stress, anxiety and depression

Variable	Components	Sum of squares	F	P- Value	Total Separation
Stress	physical symptoms	14.18	6.11	0.02	0.19
	anxiety symptoms	37.99	19.96	0.001	0.43
	social action symptoms	64.24	13.63	0.001	0.34
	depression symptoms	22.81	6.63	0.01	0.20
	Stress	18.45	0.02	0.78	0.001
Anxiety	tendency to guilt	31.94	5.27	0.03	0.16
	organ stress	34.65	6.99	0.01	0.21
	lack of solidarity	10.81	5.01	0.03	0.16
	I-weakness	18.16	6.86	0.01	0.20
	paranoid insecurity	7.96	7.56	0.01	0.22
	Anxiety	394.47	33.05	0.001	0.56
Depression	Depression	56.30	5.53	0.02	0.17

anxiety component (F = 33.05, P = 0.001, ŋ2=0.56) and depression component scores (F =5.53 , P = 0.02, ŋ2 = 0.17).

Discussion

Old age is a critical period of human life (1) and as a part of the natural process of human life is a normal and inevitable biological phenomenon (4) in which elderly people are exposed to potential threats such as increased chronic illness, loneliness, isolation and lack of social support; and, in many cases, their individual autonomy is threatened because of physical and mental disabilities (4). Difficulties and issues such as loneliness of the elderly, family structure changes, job loss and rapid social and cultural changes, accelerate anxiety, depression, social isolation and, consequently, the reduction of self-esteem in the middle-aged and elderly people (4, 19). Since aging is usually directly associated with symptoms such as cognitive impairment of depression, anxiety, hypertension and heart disease, it seems that regular exercise can be effective in enhancing the elderly's physical and mental functioning and improving their quality of life (20, 21). Researchers have shown that regular physical activity has a significant relationship with depression, stress and anxiety. Also, the results have shown the effect of exercise, especially exercise in water on the individuals' mood and mental health and happiness (13). The results of this study showed that eight weeks of exercise therapy in water had a significant effect on the reduction of anxiety and depression. On the other hand, although the results showed that exercise therapy in water had a significant effect on some of the stress factors, in general, there was no significant difference in stress scores between exercise group and control group. In line with the current study, Patkey *et al*. (2014), Wenger *et al*. (2014), and Yagley and Olger (2015) showed the beneficial effects of exercise on psychological factors, anxiety and depression (22- 24). Also, researchers have shown that in addition to the effect of aerobic exercise on the physical and mental aspects of quality of life, symptoms of depression also decreased in the elderly (25, 26) and postmenopausal women (27) and patients with depression (28). Studies have shown that exercise in water maintains and improves physical fitness and also reduces stress and calmness. Therefore, the therapeutic effects of this exercise can also be mentioned (29) Physical activity seems to improve the quality of life of individuals, especially the elderly; this is manifested by increasing endurance, greater autonomy, and increasing role play in life. (30, 31). Also, the effect of exercise activity on reducing stress and depression can be attributed to the role of neurotransmitters, since imbalance in the levels of serotonin, dopamine and other neurotransmitters may have an effect on the individual's mood, so that it can initially result in stress, fatigue, aggression and ultimately lead to depression and affect the psychological function associated with quality of life (32). In addition, the researchers believe that exercise can increase the general public's morale and gives people the feeling of energy and happiness for doing everyday life activities. Exercise also increases the secretion of endorphins, which have a relaxing effect (4). Among the psychological benefits of exercise is improving self-esteem; that is, in the pursuit of sporting activities, the individual feels that he is as capable as others. In this way, a person will feel more self-confidence and self-esteem, and this also effective on the reduction of stress, anxiety, depression and social isolation (33). Therefore, physical activity is one of the most effective methods for preventing aging disorders and delaying aging which rises elderly's health and vitality and increases the quality of life in them (16). On the other hand, inconsistent with the present study, the researchers reported that impulsive behaviors, neurosis and psychosis in students who performed regular exercise were higher than non-athletes of the same age (11). Reasons for incompatibility with the present study can be

the difference in the age of subjects and type of sport activity as well as duration of the activity. Regarding the results of this study, it seems that exercises in water can be introduced as a non-invasive method with minimal and low cost side effects, as well as the best way recommended to prevent mental disorders in the middle-aged and elderly people. Regarding the excitement and willingness of people to do physical activities in leisure time and public sports, the researcher did not succeed in studying and comparing the effect of public sports on stress, anxiety and depression with the current practice protocol. Thus, it is suggested in future studies the effects of public sports on these factors along with exercise in water should be investigated and the type of exercise ought to be compared simultaneously. Regarding the daily routine and reluctance of some middle-aged and elderly people to do regular exercise, it is suggested that in future studies, longer periods of exercise and fewer sessions should be considered.

Conclusion

Regarding the results of this study, it seems that exercise in water reduces anxiety and depression and some of the stress factors in elderly people.

Ethical issues

Not applicable.

Authors' contributions

All authors equally contributed to the writing and revision of this paper.

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