



### Review Article

## Effect of Water Exercise (Non-Chemical Treatment) on Back Pain and Motor Function in Inactive Elderly: A Systematic Review

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### KEYWORDS

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### ABSTRACT

**Introduction:** Concerning the benefits of water exercise compared with dry land and the lack of presenting its results as a single study, we decided to systematically review the results of eight weeks of water exercise on back pain and motor function of the inactive elderly so that we can make correct and rational decisions in the planning and anomalies treatment related to the last decades of life.

**Methods:** The present study is a systematic review.

**Results:** Initially, 51 articles were found and 25 articles were removed in the review of abstracts. of the remaining 25 articles, 21 articles were removed from the remaining articles due to the low quality of the articles, and finally 4 articles were included in this study.

**Conclusion:** Exercises in water lead to the reduction of back pain and improvement of mobility of inactive elderly people, and these exercises can be used to improve the back pain condition of non-functional elderly people.

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# GRAPHICAL ABSTRACT



## Introduction

In recent years, the elderly population is the most important demographic phenomenon in the world at the end of the 20<sup>th</sup> century and the beginning of the 21<sup>st</sup> century. Currently, the world's population over 60 is about 13%, and this will increase to 21% in 2050 and 28% in 2100 [1-3]. In the old age, what is certain is that as the age increases and reaches this age, the risk of

contracting diseases increases and functional ability decreases. Back pain is one of the most common musculoskeletal disorders that is observed in the elderly in people who have an inactive lifestyle [4-6]. The results of a review study indicate an increase in the prevalence of back pain over the past decade. Back pain reduces the level of physical activity in daily life, and this leads to a decrease in physical fitness and, as a

result, more disability and chronic back pain [7-9]. One of the important factors that may cause back pain in the old age is changes in the body composition, including an increase in body fat mass, especially abdominal fat, and muscle atrophy in the central areas of the body. With the increase of the abdominal obesity, the curvature of the lumbar arch increases and puts pressure on the intervertebral discs from L4 to 1S and causes back pain [10-12]. Likewise, with the increase in the arc of the lumbar region, the body goes out of its normal position and causes an increase in the excessive fluctuations in the body's center of gravity and causes changes in the way of walking, disturbance in body control, increasing the risk of falling, and reducing the ability to move [13].

Falling is one of the common problems of the old age, which occurs due to changes in the mechanism of skeletal-muscular, vestibular, sensorimotor, and physiological systems involved in balance. The level of motor disability,

especially in daily tasks, among the elderly in Iran is very high compared with the developed countries such as South Korea and Europe, and given that sports and physical activity play a very important role in increasing ability and preventing diseases, addressing the issue of exercise for the elderly seems very important and necessary [14-16].

Meanwhile, the role of physical activity on mental and physical health is of particular importance as the most important effective factor in the promotion and development of humans, especially among the elderly. Therapeutic exercise in water is one of the recommended solutions to improve the conditions of these patients, and if its design and implementation are carried out under the supervision of a rehabilitation medicine specialist, it can have a significant effect in reducing the complications caused by skeletal and muscular pains. Exercising in water has many advantages over exercising on land (Figure 1).



**Figure 1.** Water-based training frequency on the balance and motor function

The force of water buoyancy reduces the pressure on the joints and helps to perform closed chain exercises that cause a lot of pressure

on the joints of the lower limbs [17-19]. In addition to the mentioned cases, water turbulence is considered as a natural and good

resistance for water activities and allows the elderly to exercise in an environment with the minimal pain [20]. Research has shown that therapeutic exercises in water reduce Pasteur fluctuations and decrease blood lipids, and functionally, by improving muscle strength and increasing range of motion, it reduces pain, increases self-confidence, and improves body composition in the elderly [21].

Furthermore, the results of a study have shown that by performing regular physical activities throughout life, the loss of motor function of these people can be delayed to some extent. During their research, the researchers concluded that a course of pilates exercise has a positive effect on the motor performance of elderly women. Moreover, given that prevention methods are less expensive than treatment, studying the effect of physical activity on the elderly is of great importance [22-24].

Water provides an environment where the basic movements can be performed in a supportive environment, and slow movements in the water provide more time for control and allow the individual to experience multiple movement errors without severe consequences [25-27]. So far, most of the studies investigated the movement function and back pain of the elderly have used the methods of training on land, and concerning the benefits of training in water compared with dry land, it seems necessary to conduct research in this field [28-30]. Therefore, we decided to present the research results of the effect of 8 weeks of water exercise on back pain, body composition, and movement performance of inactive elderly women in a systematic review, so that we can make decisions in planning and treating abnormalities related to the last decades of life [31-33].



**Figure 2.** Water-based training

**Study design:** The present study was conducted as a systematic review based on the steps of the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) statement during the last six months of 2022 in Tabriz University of Medical Sciences [34].

**Keywords:** At first, a face-to-face meeting was held with the presence of both researchers of the present study, and based on their experiences, the keywords of the present study were

determined based on the search in scientific texts. These keywords are as follows: rehabilitation, hydrotherapy, back pain, body composition, aqua therapy, elderly women, and motor function. These keywords were searched with the help of boolean operators (AND, OR, and NOT) in Persian and English language databases by both authors of this article [35].

**Search strategy:** The mentioned keywords were searched in English and Persian language

databases Iranmedex, SID, Magiran, MEDLINE, SCOPUS, science direct, PUBMED, Cochrane Library, google scholar, EMBASE, ProQuest, and Ebsco/CINAHL and sources and the articles published during the 5 years ending in 2022 were selected for review in the present study. The search was done by both authors of this article separately, and if there was a difference in the selection of an article between the authors, a researcher who was not a member of the group of authors of this article would resolve the difference. The reason for selecting articles in the last 5 years is to select new and new studies [36-38].

### Criteria for selecting articles

- ✓ Articles randomized clinical trials or quasi-experimental studies.
- ✓ Human-made articles [39].
- ✓ Articles whose target group were elderly women with chronic back pain.

✓ Articles with full text and articles published in either Persian or English were included in this review.

✓ Review articles, letters to the editor, descriptive analysis, rare reports, and animal studies were excluded from the review process. It should be noted that the main criterion for selecting articles was the high quality of the articles, which were checked based on the CONSORT checklist, and the articles with high quality were included in this study [40].

**Extraction of information:** The information of each article, including the name of the first author, the year of the study, the sample size, the relevant intervention, and the final result were entered in the information registration form and their results were used.

**Results:** Initially, 51 articles were found, and the review of abstracts led to the removal of 25 articles. From the remaining 25 articles, 21 articles were removed from the remaining articles due to the low quality of the articles, and finally 4 articles were included in this study.

**Table 1.** The summary of the most important information of the studies included in this systematic review

The Final Result	Type of Intervention for Each Group	The Sample Size	The First Author/Year
Continuous participation in sports exercises can reduce the amount of abdominal fat and improve neuromuscular control related to back pain and increase the quality of maintaining balance and walking speed in the elderly. It is hoped that this study will shed light on researchers for further research to improve the living conditions of the elderly and lead to an increase in the efforts of community health officials in the field of welfare and well-being of these people.	The intervention group: for 8 weeks and three sessions per week in the pool with a temperature of 28 to 31 °C and with a height of 1.40 to 1.80 m, they engaged in certain physical activities for 45 minutes in each session. Control group: After 8 weeks, they showed up for the post-test without doing any specific sports activity, and during this time they did their daily activities.	Intervention group: 15 people Control group: 15 people	<b>Babaei Bonab/2021</b>
Performing eight weeks of aquatic exercises with an emphasis on sensory-body and proprioceptive exercises	Intervention group: For eight weeks, three sessions a week, they implemented a protocol of aquatic exercises	Intervention group: 15 people Control group: 15 people	<b>Amin Shafiee/2022</b>

in the elderly can improve posture control and balance. Also, the results indicated that after applying the exercise protocol, there was a significant improvement in the strategies used to restore balance.	based on strengthening the body sense. These exercises were performed in the shallow part of the pool in such a way that the water was up to the chest of the subjects. Control group: They did their daily activities and did not participate in any special training program. Intervention 1: For eight weeks and three sessions per week in the shallow part of the pool, they performed simple exercises.		
Sports exercises in shallow and moderate water lead to significant improvement of postural stability in the elderly.	Intervention 2: For eight weeks and three sessions per week in the medium depth part of the pool, simple exercises were performed. Control: they did their daily activities and did not participate in a special exercise program. Intervention 1: For six weeks, three sessions of simple exercise were performed in the pool every week.	Intervention 1: 15 people Intervention 2: 15 people Control: 15 people	<b>Ramin Beyranvand/2021</b>
Exercises in water lead to the improvement of back pain and balance in the elderly, and no difference was observed between the number of exercise sessions in water.	Intervention 2: For six weeks, two sessions of simple exercise were performed in the pool every week. Control: they did their daily activities and did not participate in a special exercise program.	Intervention 1: 12 people Intervention 2: 12 people Control: 12 people	<b>Abdiyan/2016</b>

## Discussion

The aim of the current research was to investigate the effect of water exercise on the variables that can affect the movement control indicators. Some factors such as body composition, back pain, balance, and walking speed, all of which enrich functional independence in life. In general, today, therapeutic exercises are considered as a non-drug method with a positive effect and have been tested in various researches in the form of

various sports. The obtained results show that exercising in water reduces the physical and psychological symptoms of back pain, reduces abdominal obesity and visceral fat, as well as improves balance and walking speed.

A review of research shows that water sports is a particularly and uniquely suitable tool for the exercise of the elderly. In the present study, the water environment was used to deal with the exercise of the elderly. Because the environmental conditions of the water improve



the control of the body position for the elderly and allow them to perform a wide range of movements without increasing the risk of falling or injury. Similarly, the water environment is suitable for people with lack of balance due to the increased reaction time of such exercises. Because due to the viscous properties of water, the movements are slower and as a result, people have more time to respond and react. On the other hand, studies show that exercising in water improves physical factors such as maintaining balance and walking speed, which the results of the current research confirm this theory [41].

In this regard, Schavin *et al.* investigated the effect of an exercise protocol in water on the balance, speed, strength, and mental health of the elderly and the results of the research emphasized that the exercise protocol has a positive effect on the balance, strength, and power of the elderly has put in addition to this, exercise in water creates many physical, physiological, and movement effects, which in terms of its important role in maintaining and improving the range of motion of the joints, reducing back pain, reducing muscle tension and balance as an auxiliary factor in rehabilitation or preventing functional changes.

Likewise, in explaining the mechanism of this effect, it can be mentioned that performing sports exercises increases muscle strength, static stability, and dynamics of the pelvic girdle, increases flexibility, and finally centralizes the pain and improves the performance of people with back pain immediately after treatment. Other researchers argue that improving capillary blood circulation, eliminating mild spasms in the deep fibers, and releasing relaxin hormone, which leads to pain relief, is an effective mechanism in reducing back pain. On the other hand, there is a direct relationship between abdominal obesity and back pain.

Therefore, one of the main reasons for the reduction of back pain mentally and physically in the water exercise group can be related to the

reduction of their abdominal obesity. The current research shows that reducing abdominal fat reduces back pain in the elderly women, which is in line with the results of the research of Gianpelo *et al.*, who concluded in their research that reducing abdominal fat during a period of exercise reduces back pain in the elderly.

## Conclusion

According to the results of the current research, it can be mentioned that exercising in water reduces abdominal and visceral fat and lower back pain, and also improves the functional status of the elderly women. Also, on the other hand, the findings of the current research show that 8 weeks of water exercise reduces body mass in the elderly women. Abbasi *et al.* investigated the effect of water aerobics on the body composition of inactive middle-aged women and reported a significant decrease in body fat percentage.

It seems that the age of the subjects and the exercise intensity are different findings of this research with the findings of the present study. Regarding the improvement of body mass as a result of exercise in water, we can point out various reasons, among which is probably the increase in the amount of muscle mass. Water activity can be effective in increasing muscle hypertrophy and increasing lean mass due to the resistance created by it. On the other hand, increasing the blood flow of adipose tissue and increasing the activity of hormone-sensitive lipase can be further effective in reducing the amount of subcutaneous fat and improving body composition. This action leads to increased consumption of stored fats and subsequent improvement of body composition.

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