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Effect Of Aquatic Therapy Versus Otago Exercise In Community Dwelling Older Adults With Impaired Balance: A Randomized Control Trials

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Abstract

Background: Falls are a serious health concern among the elderly in both developed and non-developed countries, and they have been identified as the 5th highest cause of injury and death in senior citizens. Weightless physical activity in the form of hydrotherapy has improved motor-related functions and cognitive processes in an aging population in a safe setting. Hydrotherapy is the practice of performing exercises while submerged in water. It is widely used in therapeutic fields for training interventions to improve muscular strength, balance, and cardiovascular fitness. When combined with physical exercises, the properties of water, such as buoyancy, resistance, and temperature, can help relieve many physiological issues associated with natural aging and promote physical activity.The Otago exercises consist of a set of exercises for leg muscle strengthening and balance retraining and are designed to prevent falls.

Objective: To see the effect of aquatic therapy in community-dwelling older adults with impaired balance.

Methodology: Total of 30 subjects within the age range of 65 to 85 years were screened and assessed as per the inclusion and exclusion criteria. Group A subjects were assigned for hydrotherapy, and group B subjects were assigned for Otago exercise. Subject had to perform a 5-minute warm-up exercise after which subject was asked to perform exercise protocol under observation, followed by a 5-minute cool-down exercise, and terminate the exercise session. At the end of the session, the subjects were assessed for any discomfort and, if any, given any treatment or advice for rest. Baseline and post-test records were noted for statistical evaluation of both groups.

Results: The mean difference between the pre and post treatment range obtained on pre and post outcome measures based on the results of the test analysis at the 5% significance level indicates a significant and statistically reliable difference between the pre and post treatment values with a p-value less than the 5% significance level (i.e. $0.001 < 0.05$). Both hydrotherapy exercise and otago exercise showed statistically significant results. Further, when compared, the hydrotherapy exercise protocol was more effective than the Otago exercise.

Conclusion: The present study concluded that there was improvement in balance in the older adult age group (65-85) when treated with "Group A" hydrotherapy and "Group B" Otago. The study also concluded that "Group A" hydrotherapy showed more significant improvement in balance compared to "Group B," which is Otago, on the outcome measures Time Up and Go (TUG) and Falls Efficacy Scale (FES).

Keywords: Balance, Aquatic, Otago, community dwelling older adults.

Introduction

Aging is defined as the accumulation of a variety of molecular and cellular damages that may lead to a gradual loss in the individual's physiology, increasing the risk of disease [1] . Falls are a serious health concern among the elderly in both developed and non-developed countries, and they have been identified as the 5th highest cause of injury and death in senior citizens [2]. According to the new age classification, young people are between the ages of 25 and 44, middle-aged people are between the ages of 44 and 60, elderly people are between the ages of 60 and 75, and long-lived people are over 90 [3]. The number of elderly people in India is increasing rapidly. In 2011, India's elderly population was estimated at 10 crore and was projected to reach 20 crore by 2030 [4]. India is the first; as a result, it has been "an ageing nation." with 7.7% of the population is over 60 years old [5]. Fear of falling is defined as a lack of trust in one's ability to undertake routine activities without falling [6]. Fall are the primary cause of injury-related death and the 3rd major cause of poor health among those 65 and older [7]. Physical inactivity, combined with degenerative processes in the central neurological (loss of sensory and motor neurons) and muscular (loss of muscle fibers) systems, increases with age (type II muscle fibers), resulting in a loss of balance and muscular power/strength performance in individuals [8]. According to Shumway-Cook and Woollcott, balance can be separated into two types: static and dynamic steady-state; static means maintaining a constant location in space; proactive means anticipatory; static means sitting, standing, and walking; and reactive means compensating in the event of a foreseen disruption [9]. The typical factors in senior age group that impair cognition, balance and gait are extrinsic and intrinsic in nature, environmental variables like uneven walking surfaces and barriers in the surroundings are examples of extrinsic risk factors similarly physiological variables like arthritis, depression, fear of falling, lack of strength. [10] Sarcopenia is a progressive decrease of skeletal muscle mass and function that occurs as a result of the ageing process. Aging is also accompanied by an increase in intermuscular adipose tissue [11].The visual and musculoskeletal systems are two of the most important systems in the human body when cognition is present, which combines both attention and response time [12]. Proprioception and awareness have been linked to muscle strength and endurance, flexibility, and mobility for improved endurance of the heart and lungs [13]. Excessive muscle mass loss and loss of balance control in the elderly group particularly with lower-limb weakness has been recognized as a risk factor for falls; therefore,preventing muscle mass loss, enhancing balance control with strength training for the lower limbs appears to be important in preventing falls [14]. Therapists have identified risk factors, along with muscle strengthening exercises, which are the most effective fall prevention techniques along with psychotropic medication and balance training [15]. Strengthening exercises based on isokinetics appear to be well-suited to the higher-intensity activities required to increase RTD in older persons [16] Some studies have found out that Yoga-based activities include stretching and balancing, standing postures are beneficial in improving balance of an individual . [17]

In the community-dwelling older adult population, gait and balance evaluations are frequently used to screen falls risk and identify the requirement for physical therapy [18]. The Otago exercise program (OEP) encompasses all the aforementioned aspects and was developed for community-dwelling older adults. The OEP is helpful for improving actual balance, including static, dynamic, and proactive balance; enhancing confidence in balance control; and reducing fear of falling in older adults. The OEP consists of a set of exercises for leg muscle strengthening and balance retraining and is designed to prevent falls, particularly for individuals aged >80 years who have fallen in the previous year [19].

Weightless physical activity in the form of hydrotherapy has improved motor-related functions and cognitive processes in an aging population in a safe setting. Hydrotherapy sessions are carried out in ordinary water at a temperature of 33.5°C to 35.5°C, as indicated [20]. Hydrotherapy is the practice of performing exercises while submerged in water. It is widely used in therapeutic fields for injury rehabilitation and training interventions to improve muscular strength, balance, and cardiovascular fitness. The properties of water, such as buoyancy, resistance, and temperature, when combined with

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physical exercises, can help relieve many physiological issues associated with natural ageing and promote physical activity [20]. Water immersion reduces the gravitational force on the body, and hydrotherapy allows people to accomplish activities they wouldn't be able to do on land [21].These compressive effects also aid to boost muscular blood flow when compared to dry land training, increasing oxygen availability to skeletal muscles and promoting relaxation and tissue healing . [21] A number of screening tools have been developed to identify people with balance deficits. Many were designed primarily to identify elderly adults at risk of falling. One such instrument is the "Time-up-and-Go" (TUG) test, which has the subject get up from a chair, walk 3 meters, turn around, return to the chair, and sit down. Performance [22]. Fear of falling is an ongoing concern about falling, which ultimately limits the performance of activities of daily living. In order to minimize the assessment burden and increase acceptability, a 10-item version of the FES has also been developed, validated, and recommended for the community-dwelling older population [23]. The positioning of the patients for MMT was according to standard norms [24].

Methodology

Procedure

Participants were selected based on inclusion and exclusion criteria, and the test procedure was explained to the subject in his or her vernacular language. Informed consent was obtained from the subjects. Then the subjects were assessed for baseline data and divided randomly into groups A and B.

For group A subjects, exercise was explained, along with all the norms and protocols of entering a swimming pool as per the COVID-19 guidelines. Subjects were asked to perform a 5-minute warm-up

exercise, after which they will enter the swimming pool and start the protocol of aquatic exercise therapy. After the exercise phase, the subject was asked to do cool-down exercises and terminate the exercise session. At the end of the session, the subject will be assessed for any discomfort and, if necessary, advised to rest.

For group B subjects, exercise was explained, including all norms and protocols of Otago exercise, and subjects are advised to follow COVID-19 guidelines. Subjects were asked to perform a 5-minute warm-up exercise, after which they will go to the ground and start the exercise protocol of Otago. After the exercise phase, the subject were asked to do cool-down exercises and terminate the exercise session. At the end of the session, the subjects were assessed for any discomfort and, if necessary, advised to rest.

Materials Used For Study:

1. Pen and paper.
2. Measuring tape.
3. Stop watch.
4. Written informed consent.
5. Chair
6. Noodles (Blue 118 cm)

Result

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Between groups analysis using independent t test:

Variable	Time Frame	Group	Mean	SD	t-value	p-value
TUG	Pre	Group Otago exercise	27.20	4.60	0.809	0.426
		Group Hydrotherapy exercise	26.00	3.44		
	Post	Group Otago exercise	23.93	4.54	1.107	0.278
		Group Hydrotherapy exercise	22.27	3.65		
	Difference	Group Otago exercise	3.27	1.67	-0.776	0.444
		Group Hydrotherapy exercise	3.73	1.62		
FES	Pre	Group Otago exercise	61.33	4.73	0.151	0.881
		Group Hydrotherapy exercise	61.60	4.97		
	Post	Group Otago exercise	57.87	5.42	0.414	0.682
		Group Hydrotherapy exercise	57.07	5.16		
	Difference	Group Otago exercise	3.47	2.10	1.358	0.185
		Group Hydrotherapy exercise	4.53	2.20		

From the above table, it is observed that the between-groups analysis is not significant for the TUG outcome. Similarily, it is observed that the between-groups analysis is not significant for the FES outcome across both the time frames as well as the difference score at the 5% level of significance.

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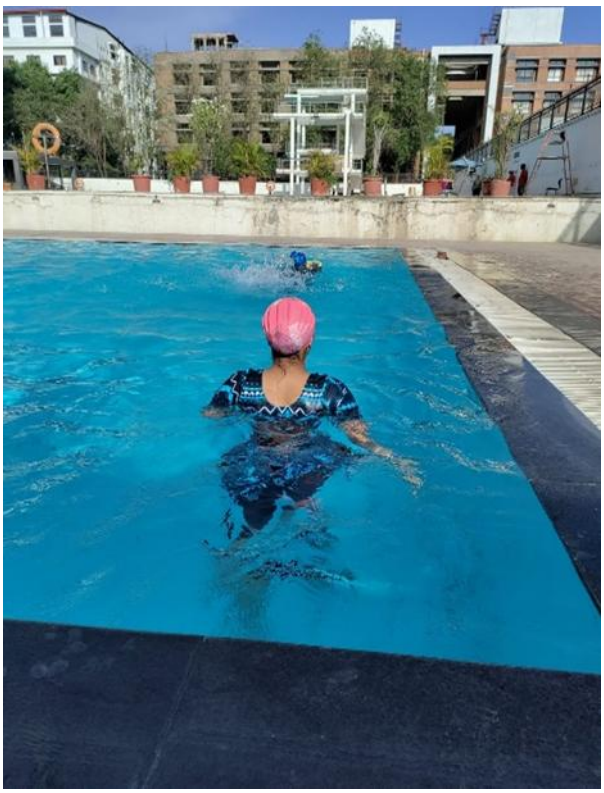
OTAGO Exercise

Hydrotherapy exercise



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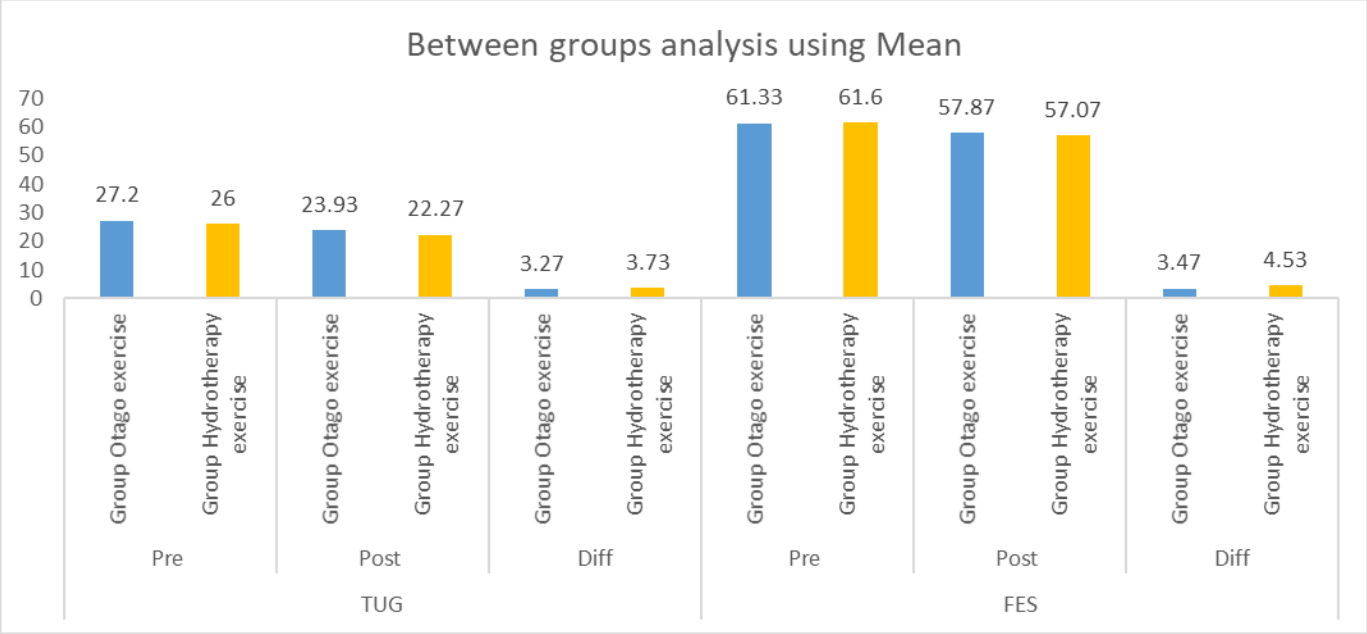

Discussion

In our study, we took different age groups (65-85), and subject and gender were equally distributed in both groups. The group distribution was done by the chit method. Baseline data was entered after an explanation of the treatment procedure and signed informed consent. then, post-treatment outcome measures were recorded at every level, Both the individual and group treatments were beneficial and showed significant improvement in the balance retraining program. The most studied explanation for the positive results is that both the treatment exercises and the balance retraining program designed to prevent falls in older adults are beneficial to improving the cognitive function of older adults and enhance their lower limb muscle strength and dynamic and static balance abilities.

Though both the treatment programs were beneficial, the Group "A" program, which was hydrotherapy, showed a more significant improvement statistically when compared with the Group "B" Otago treatment. The most understood reason is that the properties of water, which include buoyancy, resistance, and temperature, combined with physical exercises, can help relieve many physiological issues of aging and promote physical activity. The aquatic environment is considered safe and efficient for the rehabilitation of elderly people, and water provides a supportive, low-risk exercise environment that may reduce the likelihood of acute injury and fear of falling while improving participation and adherence. The weight-relieving property of water immersion allows for smoother movements with less pain, which may also be a result of the warmth of the water.

Hydrotherapy sessions are performed in ordinary water at a recommended temperature of 33.5°C to 35. 5°C.This temperature range helps to provide immediate and delayed therapeutic effects without over-cooling or over-heating during exercise. As water immersion helps to decrease the gravitational load on the body, hydrotherapy allows individuals to perform exercises that they may not be able to do on land.

Hydrotherapy also reduces the risk of falling during exercise to a greater extent than on land. Also, it is helpful to improve the falling efficiency of older adults, help older adults overcome the fear of falling and form a positive emotion of "exercise improves exercise," and improve the gait stability and posture control abilities of older adults, which have significant positive benefits for the prevention of falls in older adults.

Conclusion

The present study concluded that there was improvement in balance in the older adult age group

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(65-85) when treated with "Group A" hydrotherapy and "Group B" Otago. The study also concluded that "Group A" hydrotherapy showed more significant improvement in balance compared to "Group B," which is Otago, on the outcome measures Time Up and Go (TUG) and Falls Efficacy Scale (FES).

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