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Original article

THE ROLE OF WATER TAI CHI ON NEUROLOGICAL COMPONENTS IN AEROBIC AQUATIC PRACTICE IN THE ELDERLY

STAN AMELIA ELENA[1]

Abstract

Objective. The aim of this study as to examine this form of aquatic exercise is the best way to keep the fitness, through an environment without weight applications on joints and bones, practiced in old age.

Methods. I used old people with age between 60 – 75 years (8 males and 10 female) and a set of exercises that were influenced by balance, agility and coordination. The study was conducted in swimming pools, using water means. Data investigated were recorded in the questionnaires.

Results. People that did not exercised in the one month that I held the experiment, they experienced some deterioration of neurological components, and those who did participated, they maintened the level of fitness.

After analyzing the parameters of physical training was found that the average duration of execution on the entire group was kept at the initial time duration for the 4 men and 4 women present at final testing.

Conclusions. As a health exercise, Tai Chi helps to improve balance, lower blood pressure and promote relaxation without impact, practiced in water.

After analyzing the questionnaires have come to the conclusion that people participating in water activities during the study maintained a higher level of well being, pain relief, and self-confidence.

People who were not involved in any sports activity for a month experienced some illness and anxiety to lack of socialization, an increase in weight, it reappeared some limitations in mobility, joint pain and inflammation recurred.

***Key words*:** balance, agility, coordination, aerobic aquatic.

Introduction

Aquatic aerobic provides development of level of fitness and fun in a safe environment for practice and an opportunity to socialize, important in old age.

Neurological components: balance, agility and coordination affect aquatic aerobic activity in shallow water, and their changes due to aging, influence the ability to practice physical activity.

Aquatic exercises must be carefully selected according to the ultimate goal of each participant. General principles of preparation, when applied to the aquatic environment will enhance the final result.

The physical techniques of Tai Chi are characterized by the use of leverage through the joints based on coordination in relaxation, rather than muscular tension.

The slow, repetitive work involved in the process of learning how that leverage is generated gently and measurably increases, opening the internal circulation of chi (life energy) and increasing circulation. This is beneficial for elderly trough exactly this kind of exercise, without strength.

Thus, the blood supply to muscles increases, and more blood flow means there are more nutrients available to help cells and tissues regenerate, and speed up healing. This is helpful for mind and body also.

Tai Chi – the solo form - is complete, natural range of motion over the center of gravity. Accurate, repeated practice of the solo routine can: retrain posture, encourage circulation throughout the body, maintain joint flexibility, promote balance and coordination, practiced on land and in water also.

Shallow aquatic aerobics is a combination of arm movements and rhythmic working and action of the legs, performed in a vertical position while the body is submerged, the water level between the ribs and shoulders.

Because water is denser than air, aquatic exercise is a great environment. Activities on land are based on gravity to provide the required load in the development of fitness. In the aquatic environment load is carried mainly by the resistance provided by the water. Although many of the land exercises are applicable to the aquatic environment must be combined with better training methods designed to provide functionality of movements and improved fitness levels.

Fascination of water, its relationship with people and with civilization that we went through is not random. Water gave to people hope, that using it, will become wiser and more resistant in the face

Faculty of Physical Education and Sport, Ecological University, Bucharest, Romania
Bv. Vasile Milea, No. 1G
CORRESPONDENCE AND REPRINT REQUESTS: Stan Elena Amelia
Email amelia.stan@gmail.com, tel 0721 991 220

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of all life's challenges.

Movement in the water and swimming have crossed the borders of relaxation, of leisure in recreation of the medical recovery, people encountered in this environment spiritual fluid.

This relatively new activity has become an ideal alternative to traditional land-based programs that are contraindicated for people with musculoskeletal problems, like elderly people. Lord S., Mitchell D, Williams P. and, later, Morris S., analyzing the balance mechanism, they proposed a number of recovery programs in aquatic environment and made therapeutic principles for the management of balance disorders.

Special considerations for aquatic aerobics. Additional considerations to aquatic aerobic include stability of the muscle groups, body alignment and strengthening the abdomen.

Components of fitness. A well designed fitness program will consider the following components: cardiorespiratory resistance, strength and muscle strength, mobility and body composition. All have the same importance for fitness; they must be in balance. The biggest advantage of any fitness program is a normal quality of life.

Motor skills is an area managed by nervous system of the body and in particular „the coordonative capabilities that allow the individual to learn, organize, control, and transform movement" (Adami, 2002)

Balance, agility and orientation

Balance, or postural stability „refers to the body′s ability to control and maintain its position against an outside force, or the force of gravity, or – in the water – buoyancy" (Adami, 2002, p.16). Particularly perspicacity, „static or dinamic, it is based on information received from the neuromuscular system and the senses" (Adami, 2002) and is intermediate by systems like visual, vestibular and somatosensory. „Balance is the most basic part of coordination because it is intrinsic to all the other capabilities. Training for balance in water is both effective and safe." (Adami, 2002, p.17)

„Agility is based on maintaining balance, and refers to the body′s ability to move quickly in various direction while maintaining a stable center of gravity" (Adami, 2002, p.16).

„Orientation is a skill that is based on both balance and agility. It refers to the body′s ability to maintain balance while modifying its position in relation to itself, to objects, and to other forces" (Adami, 2002, p.16).

Methodology

Tai Chi promote health and self-defence and „has become a popular form of exercise for balance training" (Kisner, Colby, 2007, p.266) in which one movement flows into the next without pauses. „Water is the ideal medium for thai chi because it is inherently balancing for chakras" (Katz, 2004, p.65) consisting in a whole body movements or forms that are performed slow, soft, relaxed, „with an emphasis on awarness of posture alignament and synchronized breathing" (Kisner, Colby, 2007, p.266).

Older people can benefit from the aquatic exercises. To ensure the safety and effectiveness of exercising, they must:

~ work in a comfort zone;

~ use perceived exertion to determine the optimal intensity pace;

~ drink plenty of water before, during and after practice;

~ train muscular strength;

~ include mobility exercises;

~ maintain a simple exercise program;

~ out in preparation aquatic and;

~ sense as a way of socializing.

Although it is unlikely that anyone drowning during aquatic fitness activities, there are people who fear into deep water, where they can not reach the bottom. In this situation may be limited to exercising in water depth between the waist and ribs (to protect the lumbar spine), near the edge of the basin. Over time, becoming familiar, most people gain confidence and lose the fear of water.

Low blood pressure is not necessarily a contraindication for aquatic aerobics, but if requested too much to practice in water can enhance the situation.

Aqua aerobics is safe for almost everyone, with very few exceptions. The most important thing is to adapt training to the needs and remit and objectives of each.

The elderly can benefit from the exercise in water. To ensure an effective medium of practice, they should:

~ work in their comfort zone;

~ use perceived exertion to determine intensity pace;

~ drink plenty of water before, during and after practice;

~ perform aquatic training and muscle strength;

~ include mobility exercises and range of motion;

~ maintain a simple activity program;

~ keep a pleasant social work program.

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„Physical benefits of aquatic activities are well documented, like aquatic immersion, that is the ideal environment for imitating the imponderability. Physiological benefits came from two different sources: biological effects of water and physical and therapeutic benefits of participation in aquatic activities.

Although adapted aquatics activities not focus on the therapeutic exercise in water, warm water facilitates therapeutic purposes and is useful for treating certain diseases and ailments." (Stan, 2012)

Methods

The subjects were older people, former swimmers and people who participate in aquatic activities at the swimming pool into the Faculty of Medicine and Pharmacy Carol Davila from Bucharest because in here the water is maintained around the 30^0 C.

The participants in the study choose to help me in this project - 8 males and 10 female, from which 4 women and 4 men attended the acvatic program, the rest choose to stay on the side during the study. The age of the participants: form 60 to 75.

The study held place on the 03 – 28.09.2012 (on a period of 4 weeks, twice a week, with 30 minutes per session).

The aquatic exercise program included programs designed to encounter the needs and the lifestyle of all participants. So, I prepared programs to increase cardiovascular capacity, relax, strengthen and tone, or improve flexibility.

Program 1

Warm-up	5 minutes	Tai Chi walking forward Tai Chi walking backward
Workout for seniors	20 minutes	Relaxation with - foot massage - hand massage - shoulder shrubs - seated forward bend - hip hugs - neck rolls Water Tai Chi with - circle water spray right - circle water spray left - roll the ball - ying yang Water Pilates - single leg stretch - leg circles Water Yoga - mountain - cat

Relaxation	5 minutes	Rhythmic breathing Rolling down the wall

Program 2

Warm-up	5 minutes	Lion Sun salutation
Cardio – Aerobic Workout	20 minutes	Water Tai Chi with - tai chi opening - circle water spray right - circle water spray left - tai chi closing Deep water exercises - treading - jogging - jumping jacks - walking Water Pilates - ballet legs - tub turn Water Yoga - shark circle - water wheel - cat
Relaxation	5 minutes	Rhythmic breathing Rolling down the wall

Program 3

Warm-up	5 minutes	Sun salutation
Strenght Toning Workout	20 minutes	Water Pilates - leg circles - tub turn - corkscrew - spinal twist - clam - leg kicks Water Yoga

		- upward dog - downward dog - plank - toe lock - water wheel
Relaxation	5 minutes	Breath retension

Program 4

Warm-up	5 minutes	Breath of fire Alternate nostril breath
Relaxation Workout	20 minutes	Relaxation - shoulder shrubs - seated forward bend - diamond asana - aqua arms Water Tai Chi - tai chi opening - roll the ball - full moon - tai chi closing Water Yoga - child s pose - cat - chest expansion
Relaxation	10 minutes	Back float

Program 5

Warm-up	5 minutes	Breath of fire Alternate nostril breath
Flexibility Workout	20 minutes	Water Tai Chi - circle water spray right - circle water spray left - hands like clouds - ying yang - full moon Water Yoga

			- mountain - warrior - toe lock - chest expansion Water Pilates - spinal twist - mermaid/merman - single leg stretch
Relaxation	10 minutes		Rolling down the wall Calming breath

Tabel 1

Meetings made	September / day							
	4	6	11	13	18	20	25	27
Program 1		x	x	x				
Program 2		x	x	x				
Program 3					x	x	x	x
Program 4	x				x	x	x	x
Program 5					x	x	x	x

Discussion

Tai Chi combining "physical movement, breathing techniques, and cognitive tools to strengthen the body, relax the mind, and balance the flow of life force" (Vasile, L. 2011).

The complex sense of balance achieves a complex function, which combines the sensorial reception with the cortical organization and the effector programme.

The reverse is that any deterioration of the body balance has negative effects on all coordination even determining psychical disorders, an inability to correctly plan the postural conditions, etc. In these conditions we consider that hydrokinesitherapy is the best solution of treatment in the less severe balance disorders and the postural control, originating from the idea that water instability makes the task of stabilizing the body on the mobile surface of the water more difficult, which in time provides the improvement of the labyrinthine function (Vasile, Macovei, 2010).

Any balance disorder is associated with feeling anxious, which exacerbates the disease itself. Sometimes even panic attacks can occur and people with such disorders can experience extremely unpleasant sensations. (Vasile, L., 2011).

Balance, agility and coordination are important not only in sports performance. The balance may be negatively affected by aging „cell loss, changes in synapse morphology, electrophysiologic alterations, and changes in the supporting microenvironment have all been noted in portions of the vestibular systems" (Sloane, Baloh, Honrubia, 1989, pp.462). „Balance and its neuromuscular foundations also deteriorate with age. Although less predictable than strength, balance too has been shown to be responsive to training" (Wolfson, et al., 1996, p:498). Because balancing in a sensitive-sensory-motor adjustment, it also co-operates with the psychomotor systems, assuring the coordinations of the movement in space, the normal body posture in progress, the maintaining the gravity centre (center of mass) in the supporting basis, the availability of mobilizing the segment in any direction, etc.In an attempt to improve balance and agility to counter the effects of aging water Tai Chi offers a feel of greatly

energized and a higher capacity of relaxation and also improved form. Level „beginner" in exercises for balance include staying in a foot, walking on toes, walking on heels, standing on the tips. The „intermediate" level may include the execution of movements with eyes closed or practice exercises standing on one leg.

The level of „advanced" may include complex exercise with eyes closed.„Measures of postural steadiness are used to characterize the dynamics of the postural control system associated with maintaining balance during quiet standing. Studies that evaluated the relative sensitivity of center-of-pressure (COP)-based measures to changes in postural steadiness related to age.

A variety of time and frequency domain measures of postural steadiness were compared between healthy young adults and healthy elderly adults." (Prieto, Myklebust, Hoffmann, Lovett, Myklebust, 1996, pp.956)

Balance and coordonation can be incorporated into each part of the aquatic aerobic. For example, „during the walking warm up, the individual may begin with forward walking and backward (retro) walking, followed by step-sliding, tandem walking forward and backward, side stepping, and braiding. Exercises such as the mini or hlf squat and the toe raise, which werw originally performed bilaterally (bipedal), may be modified to unilateral (monopedal) squats and toe raises to incorporate the element of balance.

Activities that requuire changes of direction or that include a flight stage, such as cross-country skiing in chest-deep water, hopping, or jumping jacks, can help improve proprioception as well as cardiovascular endurance." (Koury,1996, pp.73).

The workout program that will improve strenght, flexibility, balance, or aerobic capacity can consist in exercises that incorporates techniques from water yoga, tai chi, Pilates performed in a pool, and swimming or synchronized swimming fugures.

To meet the individual fitness requirements and to create a unique workouts the instructors must know diseases affecting the elderly because these have a great impact on balance activities, and also the circular movement in the joint of the limbs.

Not every kind of balance and agility exercises may be appropriate. It must known the characteristics of Tai Chi workout and „the therapeutic recreationale for why Tai Chi may affect posture and balance include de following" (Wayne, Krebs, Wolf, 2004, pp 226). „The slow, continuous, even rhythm of the movements facilitates sensorimotor integration and awareness of the external environment" (Kisner, Colby, 2007) after addressing the underlying musculoskeletal problems. (see Figure 1)

Degenerative joint changes in the cervical spine can cause a decrease in the functioning of the cervical articular mechanoreceptors. This affects proprioception and postural stability.

The rate of falling in water is much slower than on land because of the high impedance ratio of water. The ankle strategy and a stepping response can be practised at various depths, using shallower water as a progression. Arm or leg movements can be done in unipedal stance.

This makes use of turbulence and the metacentric effect to challenge balance. Continuous weight shifting from one leg to the other „facilitates anticipatory balance control, motor coordination, and lower-extremity strength" (Kisner, Colby, 2007), „and can be done by moving the centre of gravity first within and later outside the base of suport" (Campion, 2000, pp.323), including rotation movements. Movement within and reaching outside the base of support in various directions are encouraged. Other activities that can enhances postural alignment and perception of orientation include „turning in a cicle, stepping up and down, practising timed standing with a narrow base of support or in unipedal stance, and timed standing with the eyes closed" (Campion, 2000, p.323).

The balance exercises can be performed in lying, sitting and standing position, in shallow or deep water, for a challenging variation or for less resistance, without pauses or accelerations in motions.

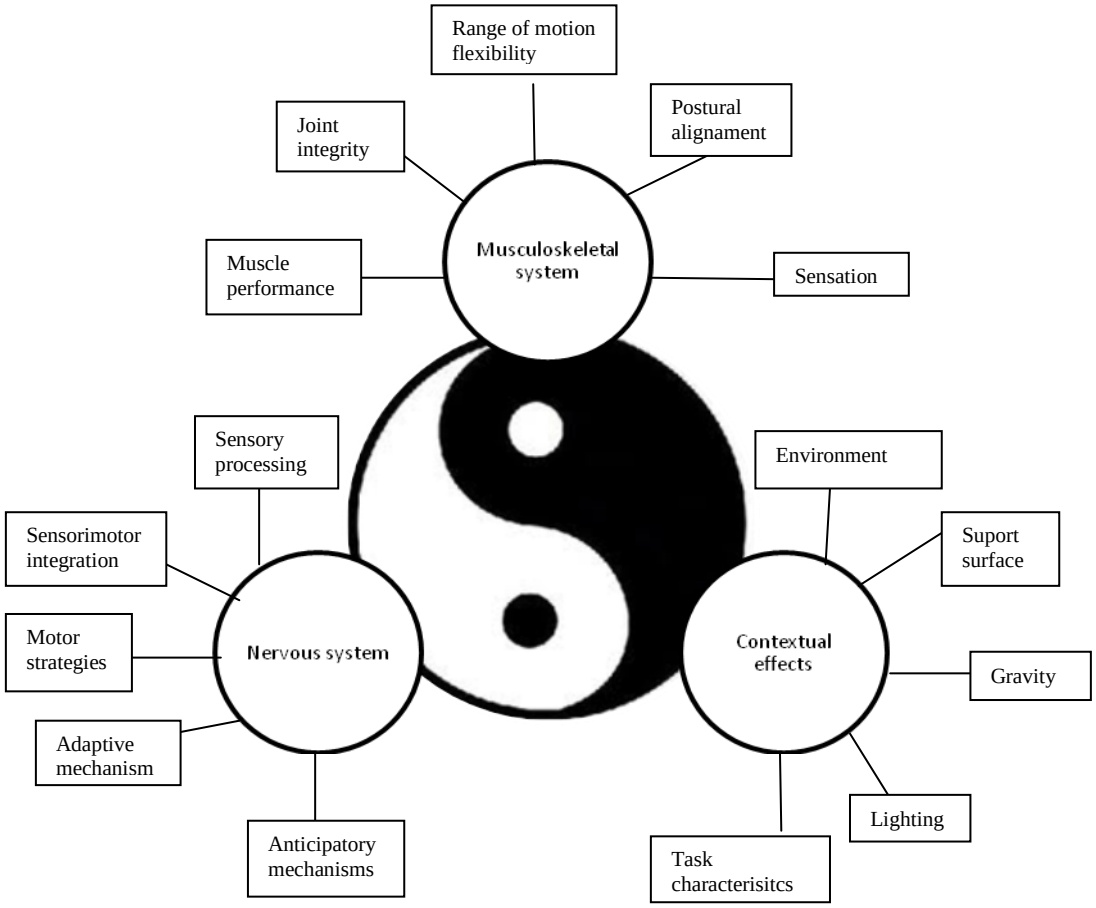

Figure 1 Interactions of the musculoskeletal and nervous systems and contextual effects for balance control (Kisner C., Colby L. A.,2007)

Pacients has to be appropriate for these type of exercises because most of the aspects in water tai chi are mental, not physical. Instructors must ensure that this form of difficult practice based on meditation it is done with constantly focus on the breath and small movements. „Tai chi performed while standing three times per week over a 6 – month period reduced the number and risk of falls and improved balance in community – residing, but inactive, elderly individuals" (Li F, Harmer, Fisher, 2005, p.127). Also, gestures being sequences of coordinated motor responses, their improvement suppose the adjusting of the command program and this can be realized in our opinion through water rehabilitation (Vasile, Macovei, 2010).

It can be created many exercise programs that can develop balance, agility and coordination as it is known the level of training.

Questionnaires

Questionnaire no. 1

1. Name and surname
2. Age
3. Sex
4. Length of aquatic exercise and swim practice
5. Assess to what extent use physical activity and recreational by placing a * in that column:

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Aspect analyzed		Frequency of use		
		High	Medium	Low
a.	Practice exercise on land			
b.	Practicing aquatic exercises			
c.	Completion of laps in swimming pool			
d.	Participation in organized programs of relaxing in the pool			
e.	Participation in recreational activities in the pool			
f.	Participation in leisure activities and recovery on land			

6. Indicate how often participate in programs carried out in the basin and for what period of time, by drawing a * right:

- Daily
- 2-3 days a week
- Weekly
- Monthly
- 15 minutes per session
- 30 minutes per session
- More than 30 minutes per session

Questionnaire no. 2

Analyzed aspect	Manifestation intensity				
	Very poor	Poor	Average	Good	Very good
To what extent do you feel satisfied with aquatic programs?					
1. Reduce pain	1	2	3	4	5
2. Increase or maintain range of movement (flexibility)	1	2	3	4	5
3. Improve strenght	1	2	3	4	5
4. Improve cardiovascular fitness	1	2	3	4	5
5. Control body weight	1	2	3	4	5
6. Increase postural awareness	1	2	3	4	5
7. Promote relaxation	1	2	3	4	5
8. Utilize functional patterns that may be very difficult or impossible to accomplish on land	1	2	3	4	5
9. Improve equilibrium reactions	1	2	3	4	5
10. Improve vital capacity	1	2	3	4	5
11. Provide opportunities for socialization and recreation	1	2	3	4	5
12. Psychological influences in terms of enhance mood, self-esteem, body image	1	2	3	4	5

References

Adami M.R. Aqua fitness, DK Publishing, New York, 2002, 16-17

Campion M. R., Hydrotherapy Principles and Practice, Butterworth Heinemann, Oxford, 2000; 323

Katz J. Your water workout, Broadway Books, New York, 2003, 65

Kisner C., Colby L. A. Therapeutic Exercise, Foundations and Techniques, F. A. Davis Company, Philadelphia, 2007, 226

Koury J.M. Aquatic therapy programming, Human Kinetics, Champaign, 1996, 73

Latash M.L., Anson J.G. Synergies in health and disease: relations to adaptive changes in motor coordination, Physical Therapy, 2006; 86 (8)

Li F., Harmer P., Fisher K. J., Tai Chi and fall reductions in older adults: a randimized controlled trial, J Gerontol A Biol Sci Med Sci 60, 2005, 187 – 196

Lord S, Mitchell, D., Williams, P. Effect of water exercise on balance and related factors in older people, Australian Journal of Physiotherapy 1993, 39(3): 217-222

McGibbon C.A., Krebs, D.E., Parker, S.W., Scarborough, D.M., Wayne, P.M., Wolf, S.L., Tai Chi and vestibular rehabilitation improve vestibulopathic gait via different neuromuscular

mechanisms: preliminary report. 2005, Bio Med Neurol, 5(3) 223.

Norton C. O., Shasa, S., Stewart, L. Aquatic versus traditional therapy: contrasting effectiveness for acquisition rates, Phys Ther ,2003,73(6): S10

Prieto T.E., Myklebust J.B., Hoffmann, R.G., Lovett, E.G., Myklebust, B.M., Measures of postural steadiness: differences between healthy young and elderly adults. In: IEEE Transactions on Biomedical Engineering, Florida, 1996, Sept. Volume: 43 Issue:9, 956 – 966

Stan E. A, The benefits of participation in aquatic activities for people with disabilities, Palestrica Mileniului III – Civilizatie si Sport Cluj; 2012, 13(1), 27-30

Sloane P. D., Baloh R. W., Honrubia V. The vestibular system in the elderly: clinical implications Nov-Dec;10(6):422-9, Pub-Med, Rockville Pike, 1989, 422

Vasile L. .Recovery and rehabilitation through aquatic resources, EDP, Bucuresti, 2011; 59

Vasile L., Macovei S. Swimming in the treatment of balance disorders, Palestrica Mileniului III – Civilizatie si Sport; 2010, 11(1), 48-50

Wolfson L., Whipple R., Derby,C., Judge,J., King,M., Amerman P., Schmidt J., Smyers D. Balance and strength training in older adults intervention gains and Tai Chi maintenance, JOURNAL-American geriatrics society, 1996, Vol 44, No. 3, 498

Wayne P. M., Krebs D. E., Wolf S.L., Can Tai Chi. Improve vestibulopathic postural control?, Arch Phys Med Rehabil., 2004, Jan;85(1):142-52.