

## *The effects of recreational Ai Chi exercises*

# on bone mineral density among **POSTMENOPAUSAL** **women**

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### *Introduction*

*World Health Organization (WHO) (2004) indicated that osteoporosis has been recognized as an established and well-defined disease that affects more than 75 million people in the United States, Europe and Japan. Osteoporosis causes more than 8.9 million fractures annually worldwide, of which more than 4.5 million occur in the Americas and Europe. The lifetime risk for a wrist, hip or vertebral fracture has been estimated to be in the order of 30% to 40% in developing countries – in other words, very close to that for coronary heart disease. Osteoporosis is not only a major cause of fractures, it also ranks high among diseases that cause people to become bedridden with serious complications. These complications may be life threatening in elderly people. In the Americas and Europe osteoporotic fractures account for 2.8 million disability-adjusted life years (DALYs) annually, somewhat more than accounted for by hypertension and rheumatoid arthritis, but less than diabetes mellitus or chronic obstructive pulmonary diseases. Collectively, osteoporotic fractures account for approximately 1% of the DALYs attributable to non-communicable diseases. (15)*

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Throughout life, our body keeps a balance between the loss of bone and the creation of new bone. Menopause—the time when menstrual periods end, which usually happens around age 51—dramatically speeds up bone loss. It is associated with a constellation of physical changes. Some of these changes are directly attributable to the loss of estrogen, including hot flashes, bone demineralization and vaginal dryness. However, a matter of controversy, an increased incidence of cardiovascular disease and dementia seem to be associated with both menopause and aging. Furthermore, other conditions, such as breast cancer, are associated primarily with aging but certainly are impacted by ovarian hormones. (14)

It has become important for the treatment of any pathology consider the repercussions of disease on the quality of life of individuals. Exercise, calcium and vitamin D supplementation can help protect women from bone loss. By engaging in regular weight-bearing exercise, women lose less bone than those who are sedentary (Puntilla, et al.2001). Supplementing a woman's diet with at least 1200 mg of calcium daily can help protect her from menopausal bone loss. Adequate vitamin D levels are also crucial for calcium homeostasis. Cholecalciferol (vitamin D3) 1000 IU or more should be taken daily to assure adequate vitamin D stores. This is particularly important for women who do not have sufficient sunlight exposure (at least 15 minutes per day to non-sun screened skin) and women over 60 years of age (3).

Oriental medicine believes that the balance of Yin and Yang is fundamental for quality of life. Ai Chi is a good foundation for creating balance for both body and mind, as well as feeling the smooth movement of life energy. Through Clinical Ai Chi (EASY), we will consciously connect with the universal energy of Yin and Yang by inviting it into our bodies and minds.

The method Ai Chi (AC) was created by Jun Konno in Japan in 1996 from the combination of Tai-Chi and Qi Gong concepts with Watsu techniques, and is performed standing in shoulder-depth warm water using a combination of deep breathing and slow, broad movements of the arms, legs, and torso. (9)

AC is a physical activity performed in the water that originated for health, self-defense and spiritual growth. Graceful movements, slow tempo, relaxed yet dynamic in beautiful natural postures. It is recommended as a perfect activity for the elderly due to its low or moderate intensity, its health benefits, its calm and non-competitive character, the fact that it does not require specific equipment and its enormous flexibility with regard to time devoted to practice and where it can be performed (11).

Ai Chi is a water-based total body strengthening and relaxation progression that bridges East and West philosophies, and integrates mental, physical, and spiritual energy. It is believed that the physiologic and therapeutic effects provided an Ai Chi method would allow an improved metabolism and blood circulation, increasing oxygen consumption, which will

benefit these patients, calming the mind and reducing stress and insomnia, provided them a better quality of life (1).

Chinese physicians have long prescribed Ai chi as physical therapy as "gymnastic medicine," in combination with herbs, acupuncture, and acupressure to provide a holistic treatment for disease. The often-amazing results of proper practice suggest that, in some way not fully known to Western science, Ai chi can indeed relieve many chronic ailments and impart longevity (2).

The researcher believed that AI CHI offers a comfortable workout without stress to the joints, the risk of injury associated with walking, jogging, tennis, and other land based exercise. The effect of periods of the menstrual cycle and interrupted the efficiency physical and functional various body organs and thus to achieve in the daily business due to physiological changes accompanying one of the important elements in the ring physiology and sports especially with regard to female older because of their effect on bone density and exposure bones to the types of fragility. Therefore, the aim of this study to investigate the effects of the recreational Ai Chi exercises on bone mineral density and certain physical variables for Menopausal women.

## **Materials and Methods**

### **Experimental Approach to the Problem:**

Two groups (experimental and control), performed a pre and post-training designed intervention in flexibility, balance,

strength tests and bone mineral density (BMD) recorded. The experimental group (EG) (15 women) trained 1 hour per day 3 times a week on Ai chi training for twelve weeks. The control group (CG) (15 women) continued their daily life, while the experimental group completed the AI Chi training program to see whether this type of training modality would have a positive or negative or no effect on flexibility, balance, strength and bone mineral density.

### **Samples:**

The sample consisted of 30 female (51 ± 4.36 years old; 165 ± 4 cm height; and 81 ± 5 kg weight), workers in Helwan university. Subjects were required to read and complete a health questionnaire and informed consent document; there was no history of coronary heart disease, diabetes or recent surgery.

### **Training Protocol:**

The 12-week in-season training program consisted of (3) session per week, total (36) session

1) Special Considerations for Ai Chi practice

- ✓ Maintain adequate core temperature of participants. Water movements are performed approximately 4 times faster than comparable land movements.
- ✓ Position in mid-rib cage to chest depth water to allow for stabilization.
- ✓ Optional wearing of water shoes for improved traction, footing, grounding and protection.

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### 2) Movements Techniques for Ai Chi

- ✓ Works with spring loaded joints
- ✓ Uses only the amount of energy needed to execute movements, adds the quality of relaxation.
- ✓ Works from a lower center of gravity, softening knees.
- ✓ Creates circular movements to work intrinsic muscles, gently expanding the range of motion.
- ✓ Shift and transfer body weight as you move to integrate leg power.
- ✓ Develops coordination of arm and hand motions to the whole body, moving as if your spine was a third arm.
- ✓ Moves from the center, using the abdominal muscles. The center is the energy source.

### *Ai Chi Exercises:*

- ✓ Brush Knee Push
- ✓ Part the Wild Horses Mane
- ✓ Double Cloud Waving Hands
- ✓ Single Cloud Waving Hand
- ✓ Five Animal Qigong
- ✓ Five Element Qigong
- ✓ Lifting Pressing Water
- ✓ Single Whip
- ✓ Sweep The Sea

### *Testing Procedures:*

Subjects were assessed before and after a 12-week training program

Tests followed a general warm-up that consisted of running, calisthenics, and stretching.

BMD measurement. Regional BMD was measured by a bone densitometer (QDR-1000®, Hologic Inc., Waltham, Massachusetts, USA) using dual-energy x-ray absorptiometry. DXA scans are used primarily to evaluate bone mineral density. DXA scans can also be used to measure total body composition and fat content with a high degree of accuracy comparable to hydrostatic weighing with a few important caveats. However, it has been suggested that, while very accurately measuring minerals and lean soft tissue (LST), DXA may provide skewed results because of its method of indirectly calculating fat mass by subtracting it from the LST and/or body cell mass (BCM) that DXA actually measures. The measured regions were lumbar spine (L2, L3, L4) and the femoral regions of the left leg, neck (NECK), trochanter (TROCH), ward's triangle (WARDS). The region "lumbar spine" (L2-L4) is defined by the mean value of L2, L3 and L4; the coefficient of variation was < 1.5percentage.

*Static strength test (LS) (BS).* A Takei leg and back dynamometer was used to measure the static leg and back strength. The subjects stood on the dynamometer platform and crouched to the desired leg bend position, while strapped around the waist to the dynamometer. At a prescribed time, they exerted a maximum force straight upward by extending their legs. They kept their backs straight, head erect and chest high. Three trials were allowed to the subjects and the best

score was taken. Subjects had a rest between the trials.

**Sit and Reach Flexibility Test (SRFT).** This test involves sitting on the floor with legs stretched out straight ahead. Shoes should be removed. The soles of the feet are placed flat against the box. Both knees should be locked and pressed flat to the floor - the tester may assist by holding them down. With the palms facing downwards, and the hands on top of each other or side by side, the subject reaches forward along the measuring line as far as possible. Ensure that the hands remain at the same level, not one reaching further forward than the other. After some practice reaches, the subject reaches out and holds that position for one-two seconds while the distance is recorded. No jerky movements. The score is recorded to the nearest centimeter at the distance reached by the hand.

**Balance Board Test (BBT).** The participant is instructed to stand on the platform with toes pointed outward (15°

and heels 15 cm apart. The participant must try to keep the platform balanced for a period of 30 seconds. The timer stops when the contacts touch the floor. After one practice trial, the best score of three trials is recorded. The score is the total time that neither contact touches the floor, expressed in counts (one count = 0.3 s; 100 counts = 30). Thus the maximum score is 100 (for 30 seconds), and higher scores indicate better performance.

### Statistical analysis

All statistical analyses were calculated by the SPSS statistical package. The results are reported as means and standard deviations (SD). Differences between two groups were reported as mean difference  $\pm$  95% confidence intervals (meandiff  $\pm$  95% CI). Student's t-test for independent samples was used to determine the differences in fitness parameters between the two groups. The  $p < 0.05$  was considered as statistically significant.

## Results

**Table (1):**

*Age and Anthropometric Characteristics of the Groups (Mean  $\pm$  SD)*

Group	N	Age [years]	Weight [kg]	Height [cm]	BMI [kg/m <sup>2</sup> ]	menstruation status
Experimental	15	52 $\pm$ 3.2	87 $\pm$ 8.9	169 $\pm$ 7.1	23.5 $\pm$ 1.8	6.23 $\pm$ 2.8
Control	15	51 $\pm$ 4.9	90 $\pm$ 7.1	163 $\pm$ 5.2	23.3 $\pm$ 2.1	5.89 $\pm$ 3.1

Baseline measurements showed homogeneity in age, anthropometric variables, and menstruation status between the Experimental and control groups.

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**Table (2):**

Mean  $\pm$ SD for BMD measurements, (LS), (BS), (SRFT) and (BBT) in the experimental group.

Variables	Experimental			T SIGN
	pre	post	change%	
Fem Neck	0.334 $\pm$ 0.005	0.349 $\pm$ 0.010	4.49	Not sign
Troch	0.324 $\pm$ 0.004	0.333 $\pm$ 0.02	2.78	Not sign
L2-L4	0.456 $\pm$ 0.003	0.471 $\pm$ 0.008*	3.29	sign
LS	53.79 $\pm$ 5.29	56.68 $\pm$ 6.03	5.37	Not sign
BS	42.09 $\pm$ 5.39	44.69 $\pm$ 6.34	6.18	Not sign
SRFT	5.11 $\pm$ 1.12	7.25 $\pm$ 2.27*	41.88	Sign
BBT	6.55 $\pm$ 1.14	8.25 $\pm$ 1.57*	25.95	Sign

Table 2. Showed significant differences were shown between pre-and post-training scores for all variables in the experimental group( $P \geq 0.05$ ) in L2-L4 BMD, SRFTand BBT. Add to no significant differences were shown in the other variables. And the highest improvement in Sit and Reach Flexibility Test (SRFT) 41.88%.

**Table (3):**

Mean  $\pm$ SD for BMD measurements, (LS), (BS), (SRFT) and (BBT) in the control group.

Variables	Experimental			T SIGN
	pre	post	change%	
Fem Neck	0.331 $\pm$ 0.002	0.330 $\pm$ 0.004	0.30	Not sign
Troch	0.325 $\pm$ 0.005	0.322 $\pm$ 0.008	0.92	Not sign
L2-L4	0.456 $\pm$ 0.003	0.452 $\pm$ 0.002	0.88	Not sign
LS	54.23 $\pm$ 4.09	55.06 $\pm$ 5.11	1.53	Not sign
BS	41.22 $\pm$ 5.26	42.39 $\pm$ 5.78	2.83	Not sign
SRFT	5.01 $\pm$ 0.87	5.19 $\pm$ 1.02	3.59	Not sign
BBT	6.47 $\pm$ 1.04	6.44 $\pm$ 0.98	0.46	Not sign

Table 3. No significant differences were shown between pre-and post-training scores for all variables in the control group( $P \geq 0.05$ ).

**Table (4):**

*Mean ±SD for BMD measurements, (LS), (BS), (SRFT) and (BBT) in the control and experimental groups*

Variables	Control	Experimental	T SIGN
	Post	post	
Fem Neck	0.330 ± 0.004	0.349 ± 0.010	Not sign
Troch	0.322 ± 0.008	0.333 ± 0.02	Not sign
L2-L4	0.452 ± 0.002	0.471 ± 0.008	sign
LS	55.06±5.11	56.68±6.03	Not sign
BS	42.39±5.78	44.69±6.34	Not sign
SRFT	5.19±1.02	7.25±2.27	Sign
BBT	6.44±0.98	8.25±1.57	Sign

Table 4. Showed a significant difference between pre-and post-training scores for all variables ( $P \leq 0.05$ ) except static strength (LS , BS) Fem Neck and Troch for the experimental group .However no significant differences were shown between pre-and post-training scores for all variables in the control group ( $P \geq 0.05$ ).

## Discussion

The main findings from this study were the significant Increases in BMD measurements, (SRFT) and (BBT) in the experimental group, which proved the Ai chi-exercises efficacy.

There are a number of potential explanations for these findings.

Ai chi-exercises are a low-impact activity, it is a good exercise for older people who may have joint degeneration and other physical problems. In addition, it practiced in the water that in fact produces weight-bearing force and thus helps maintain and often increase

bone density (9). Moreover, it is recommended for anyone who has difficulty with land-based exercise. According to Harush, and Rotstein, (2004) the water exercise could effect on bone density among Postmenopausal Women.(5)

Ruth Sova, (2012) indicated that Ai Chi was created to help aquatic practitioners (including aquatic exercise instructors, personal trainers, and aquatic therapy and rehabilitation practitioners) and students enjoy the water in a flowing yet powerful progression. An efficient exercise program increase oxygen and caloric consumption through correct form and positioning in the water,

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a perfect relaxation technique for highly stressed, over-challenged clients, and is ideal for creating improved range of motion and mobility.(11)

In addition, Flexibility and core (abdominal) strength are the benefits most mentioned by aquatic exercise instructors. The trunk stabilization/balance and pain management benefits of the program are the two most frequently cited by aquatic therapists. Clients' comments include "a soothing experience," "mind and body relaxation," and "a symphony for my body." Such benefits increase with practice (4). As a person becomes more familiar with the program, relaxation will be improved, with a focus on the smallest movement of the hand, wrist, or eyes, and improved mental alertness. Water lessens edema in the

joints, which allows clients to improve range of motion and mobility. (7). The soft, round flowing motions strengthen core muscles while providing a soothing experience, and the circular movements create harmony, based on a principle of yielding to, rather than resisting the natural flow. The flowing movements of Ai Chi can increase metabolism and blood circulation. Studies show that simply breathing while submerged to the shoulder in the water can increase oxygen consumption from 7 to 25 percent. This, in turn, increases caloric consumption. (12)

It is concluded that the recreational Ai Chi technique improved the balance, flexibility and bone mineral density for hip and backbone but no change in the strength in the elderly independent.

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