

# INFLUENCE OF TAI CHI SOFTBALL ON BODY COMPOSITION AND BONE DENSITY



ORIGINAL ARTICLE  
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INFLUÊNCIA DO TAI CHI SOFTBALL SOBRE A COMPOSIÇÃO CORPORAL E A DENSIDADE ÓSSEA

INFLUENCIA DEL TAI CHI SOFTBALL EN LA COMPOSICIÓN CORPORAL Y LA DENSIDAD ÓSEA

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## ABSTRACT

**Introduction:** Tai Chi Softball fully reflects the most complete and coherent concept of Tai Chi exercise, round and smooth, natural and continuous, and is very suitable for the daily exercise of middle-aged and elderly people. **Objective:** Explore the effect of Tai Chi Softball exercise on body shape and bone mineral density of middle-aged and elderly women. **Methods:** 45 volunteers were recruited and divided into a Tai Chi Softball group and a control group; the Tai Chi Softball group was guided by professional trainers to perform Tai Chi Softball exercises for six months. The control group did not perform Tai Chi Softball exercises and tested various physical indicators for comparison. **Results:** The weight and BMI of middle-aged and elderly women showed a decreasing trend. The abdominal and arm skinfold measurements were significantly different from those before the experiment ( $P < 0.01$ ). Body fat percentage decreased significantly, and muscle weight increased, showing statistical significance ( $P < 0.05$ ). **Conclusion:** Tai Chi Softball exercise can alleviate the rapid decline in bone mineral density and bone mineral content in middle-aged and elderly women. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

**Keywords:** Tai Ji; Human Body; Bone Mineral Density.

## RESUMO

**Introdução:** O Tai Chi Softball reflete integralmente o conceito mais completo e coerente do exercício de Tai Chi, redondo e suave, natural e contínuo, sendo muito adequado para o exercício diário de pessoas de meia-idade e idosas. **Objetivo:** Explorar o efeito do exercício de Tai Chi Soft Ball na composição corporal e densidade mineral óssea de mulheres de meia-idade e idosas. **Métodos:** 45 voluntários foram recrutados e divididos em um grupo de Tai Chi Softball e um grupo de controle, o grupo de Tai Chi Softball foi orientado por treinadores profissionais para realizar exercícios de Tai Chi Softball por 6 meses. O grupo de controle não realizou o exercício de Tai Chi Softball, e testou vários indicadores físicos para comparação. **Resultados:** O peso e o IMC das mulheres de meia-idade e idosas mostraram uma tendência decrescente. Entre elas, as medidas de dobra cutânea do abdômen e braço foram significativamente diferentes daquelas anteriores à experiência ( $P < 0,01$ ). O percentual de gordura corporal diminuiu significativamente e o peso muscular aumentou, apresentando significância estatística ( $P < 0,05$ ). **Conclusão:** O exercício de Tai Chi Softball pode aliviar o rápido declínio da densidade mineral óssea e do conteúdo mineral ósseo em mulheres de meia-idade e idosas. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

**Descritores:** Tai Ji; Corpo Humano; Densidade Mineral Óssea.

## RESUMEN

**Introducción:** El Tai Chi Softball refleja plenamente el concepto más completo y coherente del ejercicio de Tai Chi, redondo y suave, natural y continuo, y es muy adecuado para el ejercicio diario de las personas de mediana edad y mayores. **Objetivo:** Explorar el efecto del ejercicio de Tai Chi Softball sobre la composición corporal y la densidad mineral ósea de mujeres de mediana edad y mayores. **Métodos:** Se reclutaron 45 voluntarias y se dividieron en un grupo de Tai Chi Softball y un grupo de control, el grupo de Tai Chi Softball fue guiado por entrenadores profesionales para realizar ejercicios de Tai Chi Softball durante 6 meses. El grupo de control no realizó el ejercicio, y se sometió a varios indicadores físicos para su comparación. **Resultados:** El peso y el IMC de las mujeres de mediana edad y de edad avanzada mostraron una tendencia a la baja. Entre ellos, las medidas de los pliegues cutáneos abdominales y del brazo fueron significativamente diferentes de las anteriores al experimento ( $P < 0,01$ ). El porcentaje de grasa corporal disminuyó significativamente y el peso muscular aumentó, mostrando significancia estadística ( $P < 0,05$ ). **Conclusión:** El ejercicio de Tai Chi Softball puede aliviar el rápido descenso de la densidad mineral ósea y del contenido mineral óseo en mujeres de mediana edad y mayores. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

**Descriptorios:** Tai Ji; Cuerpo Humano; Densidad Mineral Óssea.



## INTRODUCTION

Tai Chi softball is a popular sport that has emerged in recent years, Taichi softball is a new sport that combines badminton, tennis and other balls with Tai Chi and dance, it shows the flexibility and coordination of the ball, the softness of Tai Chi and the graceful dance of individual, pair or group sports, the form of its movement is characterized by an arc, which is carried out in the shape of the body, coronal plane, and transverse plane.<sup>1</sup> It has the characteristics of performance, fitness, competition, and strong participation, which contains the theory of yin and yang of Chinese medicine. Mainly by holding a special racket, using the techniques of receiving, holding, attracting, throwing and throwing the ball, so that the body can be exercised.<sup>2</sup> This sport integrates fitness, entertainment, performance and competition. At present, domestic scholars are in the preliminary stage of scientific research on Tai Chi Softball. Hu, F. et al. analyzed the current situation, age structure, gender ratio, motivation, time, practice frequency, location and main factors restricting the development of softball in middle-aged and elderly people practicing Taiji softball, and find corresponding countermeasures and solutions, in order to provide relevant departments with a comprehensive understanding of Tai Chi softball, the development status of the elderly in the city, the formulation of relevant policies and regulations, and the better promotion and popularization of the sport, providing reference and reference.<sup>3</sup>

## METHOD

### Research object

Recruit 45 middle-aged and elderly female volunteers aged 45-65 in a community elderly activity center in A city, A province. Divided into Tai Chi softball group (25 people) and control group (20 people) as subjects. Tai Chi soft ball group is guided by professional coaches to perform Tai Chi soft ball exercise. Continue to exercise for 6 months, 4 times a week, each exercise for 2 hours (15 minutes for preparation, 90 minutes for continuous training, and 15 minutes for finishing and relaxation). The control group did not perform Tai Chi soft ball exercise and maintained the original living state.<sup>4,5</sup>

### Research methods

Exercise method: Tai Chi soft ball group is guided by professional coaches, perform 6-month Tai Chi softball routines 1-4, each exercise for 2 hours (15 minutes for preparation, 90 minutes for exercise, and 15 minutes for finishing and relaxation). The control group did not exercise and maintained the original living state.<sup>6</sup>

Test indicators: Body shape indicators: Height, weight, BMI, waist circumference, hip circumference, waist-to-hip ratio. Body composition indicators: (abdomen, upper arms, shoulder blades) skinfold thickness, body fat percentage, fat mass, muscle mass. Bone mineral density indicators: BMD of the whole body, upper limbs, thighs, trunk, and spine.<sup>7</sup>

SPS statistical software was used to analyze and process the experimental data, and the results were expressed as mean  $\pm$  standard deviation, in the same group, paired-sample T-test was used, and in different groups, independent-sample T-test was used for statistical processing.  $P < 0.05$  was considered significant difference, and  $P < 0.01$  was considered very significant difference.

## RESULTS AND ANALYSIS

### The effect of 6-month Tai Chi softball exercise on the body shape of middle-aged and elderly women

As shown in Table 1, after 6 months of Tai Chi softball practice, the weight and BMI of middle-aged and elderly women showed a significant downward trend. Waist circumference, hip circumference,

and waist-to-hip ratio did not change significantly, but they all showed a downward trend. Before and after the experiment, the weight, BMI index, waist circumference and waist-to-hip ratio of the control group increased significantly, showing a very significant difference ( $P < 0.01$ ). After the experiment, compared with the control group, the body weight and BMI of the Tai Chi softball group decreased significantly, showing a very significant difference ( $P < 0.01$ ).

### Effects of 6-month Tai Chi softball exercise on body composition of middle-aged and elderly women

As can be seen in Table 2, after 6 months of Tai Chi softball practice, the skinfolds of the abdomen and the upper arm decreased significantly before and after the experiment ( $p < 0.01$ ); Body fat percentage decreased significantly ( $p < 0.05$ ). The fat weight of the control group increased before and after the experiment, showing a very significant difference ( $p < 0.01$ ); The skinfold thickness of the upper arm was significantly increased, and the muscle weight was significantly decreased, showing significant differences ( $p < 0.05$ ). After the experiment, compared with the control group, the skinfolds of the abdomen and the upper arm of the Taiji softball group decreased significantly ( $p < 0.01$ ).

### Effects of 6-month Tai Chi softball exercise on bone mineral density in middle-aged and elderly women

As shown in Table 3 and Figure 1, before the experiment, there was no significant difference in the bone mineral density between the Taiji softball group and the control group ( $P > 0.05$ ). In the control group, the bone mineral density of the whole body and all parts showed a downward trend after the experiment compared with before the experiment, which was significantly different from that before the experiment ( $p < 0.01$ ).

### The effect of 6-month Tai Chi softball exercise on the content of bone mineral f in middle-aged and elderly women

As shown in Table 4, after the experiment, the bone mineral content of the whole body, thigh, trunk and spine in the Taiji softball group decreased compared with those before the experiment, but there was

**Table 1.** Comparison of body shape of middle-aged and elderly women before and after the experiment.

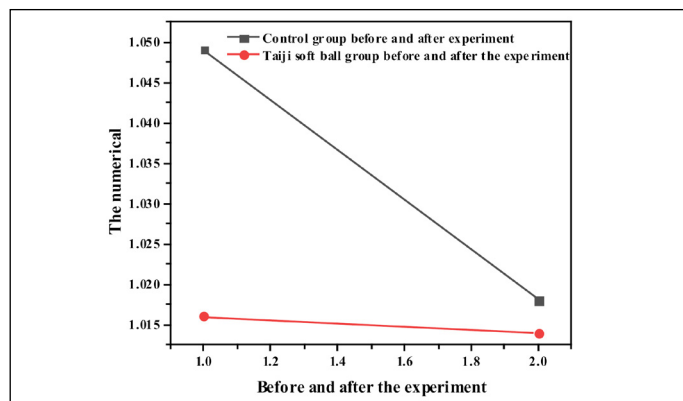
	Before experiment		After the test	
	control group	Tai Chi Soft Ball Group	control group	Tai Chi Soft Ball Group
Height (cm)	159.26 $\pm$ 5.18	161.08 $\pm$ 3.23	159.11 $\pm$ 5.23	161.01 $\pm$ 3.23
Weight (kg)	60.26 $\pm$ 5.09	59.07 $\pm$ 4.94	62.15 $\pm$ 5.08	57.32 $\pm$ 5.14
BMI	23.75 $\pm$ 1.28	22.82 $\pm$ 2.28	24.64 $\pm$ 1.18	21.95 $\pm$ 2.49
Waist(cm)	80.91 $\pm$ 10.51	79.93 $\pm$ 9.02	82.43 $\pm$ 10.32	78.78 $\pm$ 8.98
Hips (cm)	92.39 $\pm$ 4.82	91.37 $\pm$ 4.62	91.83 $\pm$ 4.49	91.16 $\pm$ 5.37
waist to hip ratio	0.88 $\pm$ 0.09	0.88 $\pm$ 0.09	0.91 $\pm$ 0.08	0.87 $\pm$ 0.08

**Table 2.** Comparison of body composition of middle-aged and elderly women before and after the experiment.

	Before experiment		After the test	
	control group	Tai Chi Soft Ball Group	control group	Tai Chi Soft Ball Group
Abdominal skinfold (mm)	31.86 $\pm$ 5.67	31.64 $\pm$ 8.96	32.65 $\pm$ 6.49	26.92 $\pm$ 6.71
Upper arm skinfold (mm)	24.06 $\pm$ 2.78	22.09 $\pm$ 4.47	24.54 $\pm$ 2.72	18.93 $\pm$ 5.04
Shoulder skinfold (mm)	23.96 $\pm$ 4.88	24.99 $\pm$ 5.54	24.14 $\pm$ 4.87	23.43 $\pm$ 6.08
Body fat percentage (%)	29.87 $\pm$ 4.13	30.51 $\pm$ 4.12	30.11 $\pm$ 4.18	29.61 $\pm$ 4.28
Fat weight (kg)	17.51 $\pm$ 1.78	17.18 $\pm$ 3.94	17.96 $\pm$ 1.76	16.83 $\pm$ 4.28
Muscle weight (kg)	35.98 $\pm$ 2.38	35.15 $\pm$ 2.83	35.68 $\pm$ 2.64	35.73 $\pm$ 3.05

**Table 3.** Comparison of bone mineral density in middle-aged and elderly women before and after the experiment.

	Before experiment		After the test	
	control group	Tai Chi Soft Ball Group	control group	Tai Chi Soft Ball Group
whole body	1.049±0.083	1.016±0.038	1.018±0.085	1.014±0.044
upper extremity	0.714±0.084	0.713±0.059	0.691±0.048	0.701±0.069
thigh	1.021±0.068	1.031±0.046	1.004±0.066	1.037±0.066
trunk	0.894±0.067	0.863±0.057	0.846±0.076	0.855±0.051
spine	0.955±0.061	0.972±0.052	0.923±0.061	0.977±0.068



**Figure 1.** Comparison of the whole body bone mineral density of middle-aged and elderly women before and after the experiment.

no significant difference. There was a certain increase in bone mineral content in the upper limbs, but there was no significant difference. In the control group, the bone mineral content of the whole body and various parts decreased after the experiment, and the decrease of the thigh and the spine showed a very significant difference.

## DISCUSSION

As women age, the basal metabolic rate decreases year by year, the energy consumption in the body slows down, and the body shape characteristics begin to change. An increase in waist circumference increases the risk of cancer, with an 8-fold increase in the risk of cancer for every 1-inch increase in waist circumference. The gradual enlargement of the waist and abdomen seriously affects the health of the body. This study found that, the waist circumference and waist-to-hip ratio of the control group increased significantly after the experiment, while the Tai Chi soft ball group did not change much, indicating that

**Table 4.** Comparison of bone mineral content before and after the experiment in Taiji soft ball group.

	Before experiment		After the test	
	control group	Tai Chi Soft Ball Group	control group	Tai Chi Soft Ball Group
whole body	2040.4±185.58	2049.97±150.36	2019.46±185.98	2046.93±179.28
upper extremity	248.51±36.61	235.61±26.28	233.86±29.79	239.77±19.95
thigh	709.81±34.49	727.49±39.38	698.46±33.33	719.17±46.05
trunk	639.71±68.35	635.69±26.74	624.81±61.87	631.69±31.99
spine	207.81±27.27	220.33±29.31	198.91±24.99	216.01±26.71

Tai Chi soft ball exercise is very helpful for middle-aged and elderly women to maintain their body shape.<sup>8</sup>

Bone mineral density is an important marker of bone quality, reflecting the degree of osteoporosis and an important basis for predicting the risk of fracture.<sup>9</sup> It shows that Tai Chi soft ball exercise can delay the rapid decline of bone mineral density in various parts of the body.<sup>10</sup>

## CONCLUSION

The author proposes the influence of Tai Chi softball exercise on human body shape and bone density, and conducts group tests on volunteers, the results show that compared with the control group before and after the experiment, the bone mineral density of the whole body and all parts showed a significant downward trend, while the Tai Chi softball group before and after the experiment, bone mineral density decreased slightly at each site. Compared with before the experiment, the bone mineral content of the whole body, thigh, trunk and spine in the Tai Chi soft ball group decreased, but there was no significant difference, there was a certain increase in bone mineral content in the upper limbs, but there was no significant difference. In the control group, the bone mineral content of the whole body and various parts decreased after the experiment, and the decrease of the thigh and the spine showed a very significant difference. It shows that Tai Chi soft ball exercise can alleviate the rapid decline of bone mineral density and bone mineral content in middle-aged and elderly women. In the experimental control, the Tai Chi soft ball has obvious improvement effect on the body shape of middle-aged and elderly women. In follow-up studies, it is recommended that, if conditions permit, extend the experimental period from 6 months to 12 months.

The author declare no potential conflict of interest related to this article

**AUTHORS' CONTRIBUTIONS:** The author made significant contributions to this manuscript. LW: writing; data analysis; article review and intellectual concept of the article.

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