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Clinical Study

Effect of *Yi Jin Jing* (Sinew-transforming Qigong Exercises) on skeletal muscle strength in the elderly

易筋经对老年人骨骼肌肌力的影响

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Abstract

Objective: To observe the effect of *Yi Jin Jing* (Sinew-transforming Qigong Exercises) on the muscle strength in senile sarcopenia.

Methods: Sixty-five old people with sarcopenia were randomized into *Yi Jin Jing* group and a blank control group. Thirty-three patients in *Yi Jin Jing* group practiced *Yi Jin Jing* (Sinew-transforming Qigong Exercises), while 32 patients in the blank control group didn't receive any interventions. The muscle strength was measured before and after 12-week training.

Results: During the study, each group had 1 dropout. The muscle strength was improved after 12-week training in *Yi Jin Jing* group, and the difference was statistically significant ($P<0.05$); there was no significant difference in the blank control group ($P>0.05$). After the intervention, there was a significant difference between *Yi Jin Jing* group and the blank control group in comparing the muscle strength ($P<0.05$).

Conclusion: Constant *Yi Jin Jing* (Sinew-transforming Qigong Exercises) training can notably improve skeletal muscle strength in senile sarcopenia.

Keywords: *Yi Jin Jing*; Physical and Breathing Exercises; Qigong; Exercise; Sarcopenia; Muscle Strength; Aged

【摘要】目的：观察易筋经锻炼对老年骨骼肌减少症者肌力的影响。**方法：**将65例骨骼肌减少症老年人根据随机数字表随机分成易筋经锻炼组和空白对照组，易筋经锻炼组33例进行易筋经锻炼，空白对照组32例不进行任何治疗干预。于锻炼前和锻炼12星期后进行肌力测量。**结果：**研究过程中，2组均有1例脱落。易筋经锻炼组锻炼12星期后肌力较锻炼前明显增加，与本组治疗前有统计学差异($P<0.05$)；空白对照组干预前后肌力无统计学差异($P>0.05$)。治疗后，易筋经锻炼组肌力与空白对照组有统计学差异($P<0.05$)。**结论：**易筋经持续锻炼可以明显增强骨骼肌减少症老年人的骨骼肌肌力。

【关键词】易筋经；导引；气功；锻炼；骨骼肌减少症；肌力；老年人

【中图分类号】R247.4　　**【文献标志码】**A

Sarcopenia, coined by Rosenberg (from the United States) in 1989, is a degenerative loss of muscle mass, quality and strength associated with aging, consequently causing a decline in body structure and function, leading to a series of symptoms[1-2]. Skeletal muscle quality changes significantly with aging, 1%-2% loss per year after the age of 50. The reduction of muscle strength is even more striking, 1.5% per year at the age of 50-60 and approaching 3% after the age of 60[3-5]. The term of sarcopenia hasn't appeared in any international classifications about health issues, but generally it belongs to frailty, and the scope of preclinical condition or early-stage Wei-flaccidity in traditional Chinese medicine (TCM). *Yi Jin Jing* (Sinew-transforming Qigong Exercises) is a type of static exercise. It's shown that static exercises benefit the muscle strength and can slow down the development of senile sarcopenia[6]. This study observed the effect of constant practice of *Yi Jin Jing* (Sinew-transforming Qigong Exercises) on the muscle strength in senile sarcopenia. The report is given as follows.

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1 Clinical Materials

1.1 Diagnostic criteria

According to the evaluation criteria stipulated by Janssen I, *et al*, people aged over 60 years old will develop sarcopenia[7-8]. The current study recruited healthy old people aged over 60 years old as the subjects.

1.2 Inclusion criteria

Between ages 60-80 years old; both genders; recently, no serious internal complications or traumas; willing to

participate in the trial and sign the informed consent form.

1.3 Exclusion criteria

Muscle atrophy due to diseases of motor neuron, peripheral nervous system, neuromuscular junction, or muscles, or other internal diseases; life-threatening primary diseases; psychosis; those who were receiving other interventions which may influence the observed indicators.

1.4 Rejection criteria

Presenting severe complications during the study; those quitted halfway or lost during the study.

1.5 Statistical analysis

The SPSS 11.0 version software was used for data analyses. Measurement data were tested for normal distribution first. Those in normal distribution were expressed as mean ± standard deviation ($\bar{x} \pm s$) and analyzed by *t*-test; those in non-normal distribution were analyzed by non-parametric test. Enumeration data and ranked data were processed by Chi-square test or rank-sum test. The level of significance was α=0.05, and $P<0.05$ indicated a statistical significance.

1.6 Clinical data

A total of 65 old people aged over 60 years old from Jiaxing, conforming to the inclusion criteria of sarcopenia, were recruited via voluntary application. They were randomized into a blank control group and *Yi Jin Jing* group by random number table. The recruited subjects all signed the informed consent form. Of the 32 cases in the blank control group, 1 case dropped due to hospitalization during the study, and finally 31 cases were involved in the efficacy evaluation; of the 33 cases in *Yi Jin Jing* group, 1 case quitted halfway, and 32 cases were finally involved in the efficacy evaluation. There were no significant differences in comparing the data of gender, age, and body weight between the two groups (all $P>0.05$), indicating the comparability (Table 1).

Table 1. Comparison of clinical data

Group	*n*	Gender (case)		Average age ($\bar{x} \pm s$, year)	Average height ($\bar{x} \pm s$, cm)	Average body weight ($\bar{x} \pm s$, kg)
		Male	Female			
Yin Jin Jing	32	17	15	65.6±11.4	165.0±11.9	53.4±9.7
Blank control	31	15	16	66.3±10.8	166.3±12.9	52.3±9.8

2 Methods

2.1 *Yin Jin Jing* group

2.1.1 Health education

Knowledge about fall and sarcopenia, self-prevention and cautions were imparted to the subjects. Pamphlets were also produced for better health education.

2.1.2 *Yi Jin Jing* (Sinew-transforming Qigong Exercises) training[9-10]

In addition to the health education, patients in *Yi Jin Jing* group practiced *Yi Jin Jing* (Sinew-transforming Qigong Exercises). It's consisted of 12 movements: Wei Tuo presenting the pestle Ⅰ (Figure 1); Wei Tuo presenting the pestle Ⅱ (Figure 2); Wei Tuo presenting the pestle Ⅲ (Figure 3); grabbing and resetting a star (Figure 4); dragging nine oxen by their tails (Figure 5); showing claws and spreading wings (Figure 6); nine demons drawing their swords (Figure 7); three plates falling to the floor (Figure 8); a bluish dragon extending claws (Figure 9); a hungry tiger at its prey (Figure 10); bowing in salutation (Figure 11); and wagging the tail (Figure 12).

In the first 2 weeks, a doctor from our department specialized in *Yi Jin Jing* (Sinew-transforming Qigong Exercises) performed and demonstrated the exercise till each participant mastered it. A notebook was handed out to each subject for tracking and recording the practice each day. They were required to keep quiet and relaxed and even breaths during the whole practice each time. Each person was allowed to choose a proper intensity as long as they didn't feel tired. The exercised were practiced once each day, 40 min each time. The muscle strength was measured before and after 12-week training.

2.2 Blank control group

The people in the blank control group only received the same health education. They also received muscle strength measure on the recruitment day and 12 weeks later.

3 Observation of Results

3.1 Muscle strength measurement

3.1.1 Bilateral upper-limb muscle strength

Bilateral upper-limb muscle strength (grip strength of both hands) was measured by EH101 electronic hand grip dynamometer (CAMRY).

3.1.2 Bilateral lower-extremity muscle strength

The lower-extremity muscle strength was majorly estimated by in-chair sitting-to-standing and squatting-to-standing[11].

In-chair sitting-to-standing: Patient stood up from a chair without a handle or other supports. The number of times that the patient managed to finish this movement in 15 s was recorded.

Figure 1. Wei Tuo presenting the pestle I

Figure 2. Wei Tuo presenting the pestle II

Figure 3. Wei Tuo presenting the pestle III

Figure 4. Grabbing and resetting a star

Figure 5. Dragging nine oxen by their tails

Figure 6. Showing claws and spreading wings

Figure 7. Nine demons drawing their swords

Figure 8. Three plates falling to the floor

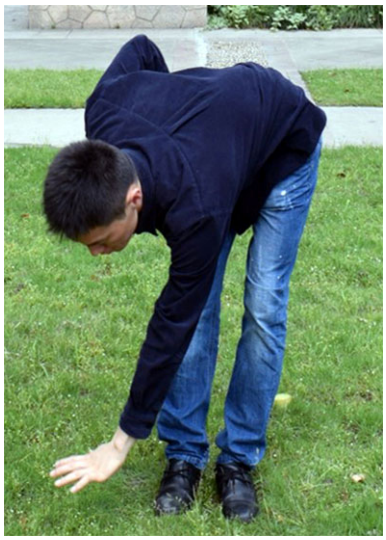

Figure 9. A bluish dragon extending claws

Figure 10. A hungry tiger at its prey

Figure 11. Bowing in salutation

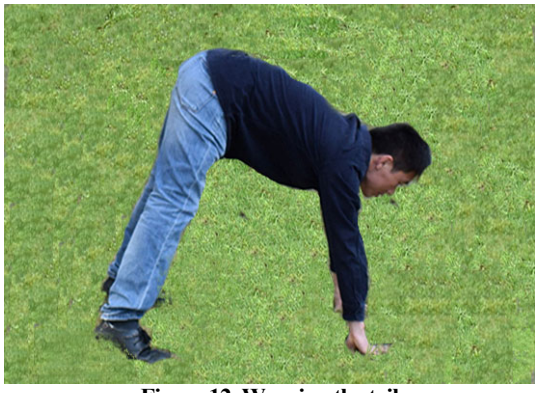

Figure 12. Wagging the tail

Squatting-to-standing: The patient was supposed to stand up right after squatting. The number of times that the patient managed to finish this movement in 15 s was recorded.

3.2 Results

Before the intervention, there were no statistical between-group differences in bilateral hand grip strength, and sitting-to-standing and squatting-to-standing frequencies ($P>0.05$). The bilateral hand grip strength, and sitting-to-standing and squatting-to-standing frequencies didn't show significant changes in the blank control group after the intervention ($P>0.05$). After 12-week training, *Yi Jin Jing* group showed significant increases in the bilateral hand grip strength, and sitting-to-standing and squatting-to-standing frequencies ($P < 0.05$). There were statistical between-group differences in bilateral hand grip strength, and sitting-to-standing and squatting-to-standing frequencies after the intervention ($P<0.05$), (Table 2 and Table 3).

Table 2. Comparison of grip strength before and after the intervention ($\bar{x}\pm s$, kg)

Group	*n*	Left-hand grip strength		Right-hand grip strength	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
Yin Jin Jing	32	45.26±12.35	52.62±10.72[1)2)]	47.35±10.21	54.50±11.38[1)2)]
Blank control	31	46.43±10.12	46.35±12.16	48.22±11.35	48.13±10.67

Note: Intra-group comparison, 1) $P<0.05$; compared with the blank control group after the intervention, 2) $P<0.05$

Table 3. Comparison of the frequencies of standing up from a seated position and squatting-to-standing up in 15 s ($\bar{x}\pm s$, time)

Group	*n*	In-chair sitting-to-standing		Squatting-to-standing	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
Yi Jin Jing	32	9.72±2.44	12.72±1.61[1)2)]	9.59±2.35	12.26±1.12[1)2)]
Blank control	31	9.35±1.22	9.88±1.86	8.41±2.11	9.62±1.17

Note: Intra-group comparison, 1) $P<0.05$; compared with the blank control group after the intervention, 2) $P<0.05$

4 Discussion

The pathogenesis of sarcopenia is possibly related to insufficient physical activity, age-related nerve degeneration and death, decreased protein synthesis, declined insulin-like growth factors and hormone levels, obesity, and inflammatory factors[11-12]. A Mexican study showed that over 50% of the people aged >80 years old are affected by sarcopenia. Compared to normal people, men with sarcopenia are 3.6 times more likely

to become disabled, and it's 4.1 times among the women[13]. Sarcopenia may cause a variety of problems such as reduction in muscle strength, joint pain, osteoporosis, and arthritis. The grip strength of hands reflects a person's skeletal muscle strength of upper extremities and motor function. Accordingly, it's reported that decreased hand grip strength of a healthy adult indicates the reduction in muscle strength, limit in function or increased risk for disability[14]. Therefore, evaluation of hand grip force can be adopted in measuring the general muscle strength. In the current study, the subjects who received 12-week training of *Yi Jin Jing* (Sinew-transforming Qigong Exercises) got significant improvement in hand grip force, also better than those in the blank control group at the end of the intervention. Sarcopenia makes it difficult for old people to accomplish daily skills, like walking, climbing, sitting and standing up, and lifting. Gradually, they will even have problems with getting up from bed and keeping balance, which increase the risk for falling down and subsequent disability. Some patients are even deprived of self-care ability and develop mental disorders[15]. This study showed that the in-chair sitting-to-standing and squatting-to-standing frequencies were significantly improved in those who practiced *Yi Jin Jing* (Sinew-transforming Qigong Exercises), while no significant change was discovered in those in the blank control group. The results indicated that *Yi Jin Jing* (Sinew-transforming Qigong Exercises) can improve skeletal muscle force, activities of daily living (ADL) and the quality of life (QOL) in the elderly.

In the developed countries, fall in old people is a crucial public health problem, and also a key causal factor in decreased QOL and loss of independent living ability. Studies focused on the relation between quadriceps strength and fall in old people in America and Japan suggested: the rate of falling presented an obvious declining tendency in old people in America with the increase of quadriceps strength, telling that the reduction in quadriceps strength should be an important risking factor in fall[16-17]. Indeed, sarcopenia is inevitable, but it can be postponed through training of muscle strength[18]. Resistance training has been considered as the most effective and least risky method in preventing sarcopenia. Resistance trainings reported by foreign countries are mostly limited to equipment-based ones in rehabilitation organizations, which cost high but fail to combine both active and passive movements. *Yi Jin Jing* (Sinew-transforming Qigong Exercises) is a traditional fitness exercise with a history of over a thousand years in China. Persistent practice will not only benefit tendons and bones but also internal organs, producing a positive effect on physiological structures and pathological conditions. Its high static load helps the growth of muscle strength, thus postpones the development of sarcopenia in the elderly[19-22]. Some scholars adopted isokinetic muscle contraction method to evaluate the effect of *Yi Jin Jing* (Sinew-transforming Qigong Exercises) in training skeletal muscle strength in old people. The results showed that the working efficiency of both slow and fast switch muscle fibers were boosted after training, and the muscle strength gained a significant increase[6,23]. The current study also demonstrated that continuous practice of *Yi Jin Jing* (Sinew-transforming Qigong Exercises) improved the skeletal muscle strength of old people who were suffering from sarcopenia.

In conclusion, persistent training of *Yi Jin Jing* (Sinew-transforming Qigong Exercises) can raise the skeletal muscle strength, improve the motor function and ADL in the elderly. As a traditional fitness exercise method, *Yi Jin Jing* (Sinew-transforming Qigong Exercises) is worth further promoting in communities.

Conflict of Interest

There was no potential conflict of interest in this article.

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Statement of Informed Consent

Informed consent was obtained from all individual participants included in this study.

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