

# Modern research, inheritance and protection of Shaolin Neigong of tuina exercise

## 推拿功法少林内功的现代研究与传承保护

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### Abstract

Shaolin Neigong (internal Qigong) of tuina exercise is a distinctive part of Neigong tuina. Since the 1980s, domestic basic study on Shaolin Neigong has mainly focused on its physiologic effects, and has preliminarily proved that Shaolin Neigong can enhance the aerobic capacity, cardio-pulmonary function, and muscle strength of human body. By summarizing the literatures studying the effects of Shaolin Neigong on respiratory, circulatory, locomotor and nervous systems, this article was to understand the modern research, inheritance and protection of Shaolin Neigong. The results indicate that the modern research on Shaolin Neigong is relatively slow. Continuous development, continuity and innovation in basic research, teaching and clinical practices are required, to enhance the general and therapeutic level of tuina exercises and tuina science of traditional Chinese medicine.

**Keywords:** Tuina; Massage; Physical and Breathing Exercises; Qigong; Exercise; Shaolin Neigong

**【摘要】** 推拿功法少林内功为内功推拿的标志性组成部分。从 20 世纪 80 年代至今,国内对少林内功的基础研究主要集中在生理效应方面,初步证实少林内功可以提高人体心肺功能和有氧运动能力,增强肌肉力量。本文总结少林内功对呼吸、循环、运动及神经系统影响的文献,以了解少林内功的现代研究与传承保护现状。研究结果表明少林内功现代研究相对缓慢,亟需从人体效应基础研究、教学及临床运用中不断发展、延续和创新,以促进推拿功法学及中医推拿学的整体水平和临床治疗水平的发展。

**【关键词】** 推拿;按摩;导引;气功;锻炼;少林内功

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Shaolin Neigong (internal Qigong) is a distinctive component of Neigongtuina. Practicing Shaolin Neigong can strengthen bones and tendons, enrich qi and blood, harmonize Zang-fu organs, and balance yin-yang. Hence, it is not only used to improve the fitness and clinical capacity of tuina physicians, but also for patients to strengthen the body and treat diseases.

In its early stage, Shaolin Neigong got popular mainly in northern part of China such as Shandong and Henan provinces, and it was known effective for asthma, cough, gastric ulcer, chronic fatigue syndrome, hypertension, osteoarthritis, and sterility. To practice Shaolin Neigong, it doesn't require a long time or a large space, and it is suitable for all age groups. Therefore, a thorough study on Shaolin Neigong is positive for the treatment of common diseases and sub-health nowadays.

### 1 Brief Introduction about Shaolin Neigong

Shaolin Neigong of tuina exercise hasn't been found in classics of Shaolin martial arts. Thus, it still remains a mystery when it started and if it's from Shaolin Temple<sup>[1]</sup>.

After tracking down, we have found that Shaolin Neigong of tuina exercise has a close relationship with Li's Zha Quan in Ji'ning, Shandong province, and is composed by the fundamental exercise of Zha Quan. This type of martial art originated in Shandong and is quite popular in Hui nationality. It has been considered as one of the five major schools of traditional Chinese Chang Quan. Now, it has been divided into three branches: Zhang's Zha Quan and Yang's Zha Quan in Guan county and Li's Zha Quan in Ren city (now belongs to Ji'ning)<sup>[2]</sup>. Li's Zha Quan was founded by Li Qi-rui (1761-1846) from Ji'ning, Shandong. His son Li Bao-tai (1798-1873) was the second-generation descendant, and his grandson Li Zhen-ji (1834-1909, style name Shu-jia) was adept at the Zha Quan passed down in his

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family and thus became the third-generation descendant<sup>[3]</sup>. Besides Zha Quan, Li Shu-jia also mastered a set of tuina skills to treat traumatic injuries and other diseases. Therefore, he has been revered as the founder of Neigong tuina school. Ma Wan-qi, who was apprenticed to Li Zhen-ji, introduced Shaolin Neigong to Shanghai in 1920 and lived as a Neigong tuina practitioner there<sup>[4]</sup>. Since then, the school of Neigong tuina had gradually developed.

Different from other Qigong exercises, Shaolin Neigong of tuina exercise is featured by natural respiration instead of emphasizing exhalation-inhalation and mind concentration. The four limbs, especially hands and feet, should exert their maximum force, in order to practice qi in a natural state, guide qi with the force, and permeate the limbs with qi. When practicing, the person needs to maintain his lower limbs weighted while upper limbs weightless, which requires the lower limbs to be straight, chest in and back stretched, heels firm on the ground, toes grasping, and thighs in, stable like a pine tree<sup>[5]</sup>. In any gestures during the practice, the upper limbs should concentrate the force on the shoulders, elbows, wrists and fingers, coordinating the movements along with natural breathing. In addition, the legs, body, and arms should keep straight, while the shoulders, hands, feet and sight keep flat or horizontal<sup>[6]</sup>. The strength should permeate the four extremities and whole back under the guidance of qi to pour into meridians and help qi and blood circulate well<sup>[7]</sup>. The purpose of the practice is to make the external tight and firm whilst the internal relaxed and flexible, so as to merge the two opposite features to nourish the whole body as well as the Zang-fu organs, and reinforce the healthy energy and expel the pathogenic factors<sup>[8]</sup>.

Shaolin Neigong of tuina exercise is mainly comprised of basic stance, upper-limb movements and paired practice<sup>[9]</sup>. The basic stance have 10 posts, which are ordinary stance, horse stance, striding stance, narrow stance, large stance, suspended stance, lower stance, sitting stance, crotch scraping and crotch display. The movements of upper limbs are: forward pushing eight horses, reverse pulling nine oxen, phoenix displaying its wings, the king of power lifting a tripod, pushing a boat along with the current, cuddling the moon, the immortal showing the way, holding a tower with stretched palm, moving palms as if combining tiles, wind swaying lotus leaves, lifting the sky with two hands, phoenix worshipping the sun, extracting the moon from the bottom of the sea, standing upright to reach the heaven and cuddling the earth, splitting through the Hua mountain, black dragon boring through a hole, hunger tiger preying, three ups and three falls, and single hand pulling a golden ring, etc. The paired practice is comprised of pushing across a bridge, two dragons stirring water, two tigers fighting for food,

pressing legs in a striding pose and eight walking postures.

Besides used for self-practice by the tuina practitioners, Shaolin Neigong of tuina exercise is also practiced by patients under professional medical guidance to treat diseases or promote the recovery. Thus, doctors and patients also become teachers and students and they can practice together, which is another characteristic of Shaolin Neigong.

## 2 Current State of Shaolin Neigong of Tuina Exercise

Until the 1980s, people started to study the effect of Shaolin Neigong on human body as well as its theories, mostly focused on the physiological effect. It's found that Shaolin Neigong can upgrade the cardiopulmonary function and aerobic capacity of human, and strengthen the muscles.

### 2.1 Effect of Shaolin Neigong of tuina exercise on respiratory system

Li JS, *et al*<sup>[10]</sup> designed an 8-month exercise, mainly containing Shaolin Neigong, for the subjects, and observed the lung capacity and hypoxia tolerance by measuring the respiration difference (difference in chest circumference between peak expiration and peak inspiration). The results showed that after practice, the respiration difference was increased and the patients were able to hold their breath for a longer time compared with the data before the practice, both with a statistical significance ( $P < 0.01$ ). It's indicated that the lung capacity and hypoxia tolerance were improved, and the respiratory function was upgraded. Through investigation, Li Q, *et al*<sup>[11]</sup> found that long-term practice of Shaolin Neigong can enhance the respiratory efficacy. They measured the dynamic changes of circulatory system during the practice of stance of Shaolin Neigong in those who had practiced this exercise for over 40 years. This study revealed that before and after the practice of Shaolin Neigong, there was no significant difference in respiration rate, but the respiratory ventilation capacity was about 2.5 times of that in the resting state, suggesting a marked enhancement in oxygen uptake. By using an automatic pulmonary function detector, Zhou XW, *et al*<sup>[12]</sup> found that the forced expiratory volume in 1 second percentage of predicted value (FEV1%) and maximal voluntary ventilation (MVV) were increased after practice of Shaolin Neigong for half a year. It's proven that this exercise can strengthen the respiratory muscles, reduce airway resistance, and improve small airway ventilation function and the elasticity of aveoli. Qin Y, *et al*<sup>[13-14]</sup> also observed the change of lung capacity after 12-week practice of Shaolin Neigong, and found an increase in lung capacity in the observation group, though without

a significant difference compared with that in the control group.

The studies above all suggest that Shaolin Neigong of tuina exercise can enhance the lung capacity and pulmonary ventilation function, strengthen the respiratory muscles, ameliorate the function of pulmonary aveoli, and benefit the respiratory system of human body.

## 2.2 Effect of Shaolin Neigong of tuina exercise on circulatory system

Heart rate is a physiological parameter most commonly used in research. It's discovered that Shaolin Neigong can improve the cardiac function. Xu J, *et al*<sup>[15]</sup> studied the relationship between heart rate and standing poses of Shaolin Neigong, and brought up that in a certain range, there is a linear relationship between the change of heart rate and the duration of standing pose practice. Wan P, *et al*<sup>[16]</sup> and Xu J, *et al*<sup>[17]</sup> detected the anaerobic threshold (AT) before and after 6-week practice of standing pose of Shaolin Neigong in volunteers. The results showed that long-term practice of such exercise can significantly increase AT. It's suggested that when the peripheral blood flow is repeatedly obstructed for a long time, the center may send a negative feedback, causing a compensatory increase in cardiopulmonary activity. Together with the intentional regulation of breathing, the arteriovenous oxygen difference will increase, as well as the muscle blood flow and the anti-oxidative effect of tissues and cells. Li JS, *et al*<sup>[10]</sup> also found that the heart rate dropped significantly after practice in the subjects, and the physical fitness index (PFI) in Harvard step test improved from above average to good (>80). The results indicate that Shaolin Neigong can augment the cardiac output, extend the diastole, improve the cardiovascular function, and provide the heart with a strong functional backup. Li Q, *et al*<sup>[11]</sup> tested the sports load of Li Qi-ming, the second son of Li Xi-jiu, the deceased tuina doctor of the school of Shaolin Neigongtuina. The test showed that long-term training by Shaolin Neigong can increase the amount of hemoglobin and immune function, help anti-aging, prevent against arteriosclerosis, and reduce the risk for cardiovascular disease. By observing 50 patients with stable angina, Shu G<sup>[18]</sup> found that Shaolin Neigong plus medication could up-regulate the number of peripheral endothelial progenitor cells (EPCs) and the level of vascular endothelial growth factor (VEGF), and effectively reduce the frequency of angina attack. Qin Y, *et al*<sup>[13]</sup> and Wu ZQ, *et al*<sup>[19]</sup> proved that long-term practice of Shaolin Neigong can lower the resting-state heart rate but increase cardiac output, so that it can improve the cardiac function.

## 2.3 Effect of Shaolin Neigong of tuina exercise on nervous system

There were barely any basic and clinical studies on the effect of Shaolin Neigong of tuina exercise on the

nervous system. In the beginning of the 21st century, Li Q, *et al*<sup>[20]</sup> detected the cerebral oxygen metabolism of a senior Shaolin Neigong practitioner during the practice by using near infrared spectrophotometry. The tested parameters included oxygen saturation (StO<sub>2</sub>), total hemoglobin (t-Hb), oxygenated hemoglobin (HbO<sub>2</sub>), and deoxygenated hemoglobin (d-Hb). In this study, the scholars found that despite isotonic muscle contraction during the practice, the level of t-Hb and StO<sub>2</sub> in the brain always maintained in the normal range. Besides, the natural breathing formed up after long-term Shaolin Neigong practice allowed the brain to consume oxygen economically and inhibit the increase of d-Hb in blood. The results all indicate that proper Shaolin Neigong training won't interfere with the interior homeostasis of human body, but enhance the oxygen uptake of brain tissues.

The basic standing poses in Shaolin Neigong belong to static tuina exercise. Research showed: persistent Shaolin Neigong training can significantly reduce the depression and anxiety indexes, and sufficient cerebral blood oxygen can produce a positive effect on the emotion of practitioners. Zhang H, *et al*<sup>[21]</sup> found that static tuina exercise could up-regulate the transcription level of hypothalamic PCMC, a gene related to the synthesis of  $\beta$ -endorphin, and the basic content of  $\beta$ -endorphin in plasma. Beta-endorphin, produced by the nervous system, is able to reduce anxiety, inhibit pain, and thus improve the emotional state of the practitioners.

## 2.4 Effect of Shaolin Neigong of tuina exercise on locomotor system

Until over twenty years ago, some scholars started to investigate the effect of Shaolin Neigong on the locomotor system, trying to find evidence from different angles to prove that this exercise can strengthen muscles, though quantitative study is missed. When studying the effect of Shaolin Neigong on the body constitution of tuina majored students, Li JS, *et al*<sup>[10]</sup> discovered that the exercise markedly increased the muscle strength of the practitioners. Prof. Yan JT from Shanghai hosted research to initially invent an animal model for tuina exercise training based on static exercise<sup>[22-23]</sup>, since tuina exercise such as Shaolin Neigong requires persistent practice of standing pose and upper-limb movements, i.e. the body and joints need to keep still during the exercise. After trained by being hung upside down, the rats were observed under transmission electron microscope (TEM). It's found that the static exercise increased the size and number of mitochondrion of biceps and carpal extensor, so that the oxidation and formation of ATP were enhanced in the involved muscle cells. Jiang Z, *et al*<sup>[24]</sup> studied the effect of Shaolin Neigong on grip strength and upper-limb muscular endurance of 111 subjects. The results showed that there was no significant difference

in grip strength after the training ( $P>0.05$ ), while the male subjects presented significant change in upper-limb muscular endurance after the training ( $P=0.008$ ). Some investigators proved that Shaolin Neigong could increase agility of hands, the muscular endurance of back and abdomen, and the flexibility of hip joint and lower-limb posterior ligaments, which could benefit the balance of body<sup>[25-26]</sup>. Meanwhile, the joints, muscles and muscle tendons were constantly pulled during the practice, which could help train the muscle strength.

During the recent years, scholars have applied Shaolin Neigong to treat metabolic diseases. Wu YC, *et al*<sup>[27]</sup> observed the mental state of patients in early stage of diabetes before and after practice of Shaolin Neigong. It's found that the mental component summary (MCS) score from the 36-item short-form health survey significantly increased after 3-month exercise in the exercise group. The result indicates that periodic practice of Shaolin Neigong can improve the mental state of the practitioners. In a clinical study on the assistant effect of Shaolin Neigong in treating early-stage diabetic patients, Wei QB<sup>[28]</sup> discovered that over a period of practice of Shaolin Neigong by twice a day could down-regulate the level of blood glucose and improve the sensitivity of body to insulin.

To conclude, long-term practice of Shaolin Neigong can strengthen the body, improve physical fitness, and prevent and treat diseases. Especially for respiratory diseases, it can produce a significant effect in both training and rehabilitation. However, current physiological studies of Shaolin Neigong mostly select a healthy population such as college students as the subject, and the rest are animal-based experimental studies. Clinical studies targeting patients are rarely seen, with limited types of disease. Although diseases of the respiratory system, circulatory system and locomotor system and metabolic diseases are involved, the studies are usually superficial and preliminary. Therefore, there is still more to learn about the selection, intensity and duration of exercise when patients affected by the above diseases choose to practice Shaolin Neigong, as well as the action mechanism.

### 3 Inheritance and Protection of Shaolin Neigong of Tuina Exercise

The basic and clinical studies on Shaolin Neigong of tuina exercise have achieved certain progress during the recent years, but the quantitative and standardized research is comparatively slower than the other fields of traditional Chinese medicine (TCM). There is a saying in tuina science: manipulations are born from exercises, while exercises are used by manipulations<sup>[29]</sup>. That is to say, exercises build up a good foundation for

manipulations, and long-term exercises allow practitioners to achieve persistent, even, forceful, tender and permeable manipulations. The teaching and inheritance of Shaolin Neigong of tuina exercise was once discontinued, resulting in the limit number of tuina practitioners and shrinkage of tuina in clinical applications and modern scientific research. Besides, quite a few tuina practitioners have a poor understanding of Shaolin Neigong of tuina exercise or they can not differentiate it from martial art or fitness exercise. Therefore, the development of Shaolin Neigong of tuina science is rather restricted.

Modern research, involving clinical and basic study of physiological effect, principle study of the exercise and teaching study, can directly affect the inheritance and protection of Shaolin Neigong of tuina exercise. It's an important way to encourage the succession, protection and promotion of traditional exercise or technique by developing modern research. In this case, the following actions need to be taken.

First, doctors and patients practice together, which is the most distinctive feature of Shaolin Neigong of tuina exercise and is also unique compared with other therapies and other schools of tuina at home and abroad. By practicing together, doctor teaches patients postures and exercises which benefit the treatment of diseases by demonstration and guiding. Patients will in turn follow the doctor to practice or practice by themselves when looking into a mirror, and finally complete the training. If necessary, the patients or patient and doctor will practice in pairs, or the doctor adopts transporting method or stick-beating method to upgrade the training. Especially, in the treatment of internal diseases featured by deficiency, 'exercise prior to tuina' is recommended, i.e. patient practices the corresponding exercises before receiving tuina treatment. This is a reflection of the treatment principle of supporting the healthy qi to drive away the pathogenic. The pathogenic will be gone when the healthy qi is sufficient. Tuina treatment can get twice the result with half the effort when the receivers have comparatively stronger Zang-fu and qi-blood function. This method can be used to treat digestive, respiratory and locomotor diseases such as consumptive diseases, internal injuries, pulmonary tuberculosis, emphysema, asthma, hypertension, gastric and duodenal ulcer, chronic gastritis, gastroptosis, diabetes and hypochondriac injury, as well as gynecopathy such as dysmenorrhea<sup>[30]</sup>. Therefore, further discovery of the effect and action mechanism of Shaolin Neigong on human body via more clinical and basic research may attract physicians and ordinary people to inherit, study, protect and promote this exercise, increase its social recognition, and promote its succession and development.

Second, after absorbed as one part of the teaching system in tuina subject by TCM schools, Shaolin Neigong of tuina exercise has gradually had its way of succession changed from master-to-apprentice to a formal course under the title of *Science of Tuina Exercise*, which is only focused on the tip of the iceberg or some common sense. This may induce inheritance crisis because of the lack of successors and missing of core skills. Hence, protection of the whole content of Shaolin Neigong of tuina exercise and educational research of teaching method and training load will be significant in its inheritance, protection and development.

However, nowadays, it's comforting that more and more scholars start to pay attention to Shaolin Neigong of tuina exercise, with a hope to extract more medical value, and scientifically objectively evaluate its function and promote it<sup>[31]</sup>. It's crucial to conduct more basic and clinical research on Shaolin Neigong of tuina exercise, for its succession and development; the modern research, succession and protection of this exercise will in turn enhance the general level of tuina exercise and TCM tuina science, promote its global transmission, display its unique cultural code and serve the human being.

#### Conflict of Interest

The authors declared that there was no potential conflict of interest in this article.

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