EFFECTS OF TAI CHI COMBINED WITH QI GONG EXERCISE TRAINING ON LOWER LIMB MUSCLE STRENGTH, FLEXIBILITY AND BALANCE IN ELDERLY WOMEN

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EFFECTS OF TAI CHI COMBINED WITH QI GONG EXERCISE TRAINING ON LOWER LIMB MUSCLE STRENGTH, FLEXIBILITY AND BALANCE IN ELDERLY WOMEN

BY

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This 12-week study evaluated the effects of an integrated Tai Chi and Qigong program on lower limb strength, flexibility, and balance in 40 elderly women aged 60–74 years. Participants were randomly assigned to either an intervention group (n = 20) or a control group (n = 20). Pre- and post-intervention assessments included wall squats, half-squat kettlebell lifts, sit-and-reach tests, seated hands-back pulls, single-leg stands, timed up and go tests, and blood pressure measurements. Statistical analyses were conducted with the significance level set at $p < 0.05$. The results showed that the intervention group experienced significant improvements in lower limb muscle strength, flexibility, and balance compared to the control group ($p < 0.05$). Additionally, participants in the intervention group demonstrated reductions in body mass index (BMI) and blood pressure ($p < 0.05$). These findings highlight the potential benefits of incorporating culturally rooted, low-impact exercises into public health strategies to support healthy aging.

Keyword : Tai Chi, Qigong, Elderly women, Muscle strength, Flexibility, Balance

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LI KE

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CHAPTER 1
INTRODUCTION

1.1 Background

The health issues facing mid-China's aging population are getting worse as a result of the population's aging, and concerns for the elderly are now a big social issue.

The lower limb, muscle strength and balance ability of the patients are significantly reduced, which will affect the postural stability of the elderly and increase the risk of falling. Therefore, it is very important to find rehabilitation programs to improve the lower limb muscle strength and dynamic balance ability of patients with knee osteoarthritis(Pan et al., 2017).

Elderly groups have become increasingly prominent. Economic progress and social development promote the gradual increase of human life expectancy, and aging has become an inevitable problem for social development. In order to cope with the rapid aging, the strategy of "actively coping with population aging" has risen to the national strategy.

With the continuous development and progress of human society, people's material life and security mechanism are also constantly improving, and the life expectancy of the world population shows a trend of extension. In the 21st century, global population aging has become an inevitable trend of human development. According to the data analysis of China's sixth population census in 2010, there are 178 million elderly people over 60 years old in China, accounting for 13.26% of the country's total population. Relevant experts boldly predict that in 2050, the total number of elderly people in China will account for 1/4 of the total population, which may exceed 400 million people. In the international community, population aging has also become an inevitable trend of development, and the health problems of the elderly caused by aging will become a hot spot in the Chinese society.

The National Fitness Plan (2016-2020) and the Development Plan for Traditional Chinese Medicine Health Services (2015-2020) have been successively promulgated. The Wushu Sports Management Center of the General Administration of Sport of China has held several special meetings on " Tai Chi Health Project" and organized experts to draw up the overall plan, stage plan and specific measures on the basis of in-depth investigation and research. And it is included in the key work of the center, led by the director of the center, the Social activities department is specifically responsible for the implementation, and the martial arts departments in provinces and cities and martial arts associations actively cooperate and strongly promote.

As a traditional Chinese sports event, Tai Chi is of great significance for improving the functional activities of lower limbs of middle-aged and elderly people, building a healthy China and actively coping with the aging society. To analyze the activation characteristics of flexion and extension muscles of lower extremity joint surface in middle and old people, and to explore the activity characteristics of flexion and extension muscles of lower extremity surface and the influence of beginners and many years of practice on flexion and extension muscles of lower extremity surface; Explain the existing neuromuscular control mechanism, promote the popularization of Tai Chi in the middle and old age and provide practical significance for fitness exercise, and provide theoretical reference value for sports rehabilitation and physical medicine integration (Li, 2023).

As a traditional Chinese sport, Tai Chi is simple and easy to learn, and has low requirements for venue, weather and other factors. Compared with other square dance music, its background music is soothing and does not disturb others, which meets the physiological characteristics and fitness requirements of the elderly. Therefore, Tai Chi is suitable as one of the fitness programs for the elderly to maintain and enhance balance function, prevent fall injury and improve functional activity level. It should be vigorously promoted under scientific guidance, correct movements and appropriate intensity, so that more people can realize its value and fully learn and use its value to add harmony and peace to our aging society(Wang et al., 2018).

From the functional point of view of Tai Chi, Tai Chi exercise can effectively improve muscle strength, reduce muscle loss speed, and improve healthy physical quality; From the perspective of the movement characteristics of Tai Chi, Tai Chi movements are mainly cuddling, bending and twisting, which can correspondingly improve muscle endurance, improve joint motion, maintain or improve basic functional activities and healthy physical quality. Therefore, the movement characteristics and functions of Tai Chi provide realistic possibilities for the development of Tai Chi and are an important way for the development of healthy China.

Elderly women are a special group. The deterioration of physical function, the loss of social role, the death of relatives, the reduction of social contact, the decline of economic income or the absence of basic economic income, and the deterioration of physical and mental health conditions brought about by the growth of age make elderly women suffer from huge physical and mental pressure, and their physical and mental health are in a state of high tension, anxiety and fatigue for a long time. The body is very easy to be in a sub-health state, if it can not be scientifically adjusted, it is easy to cause physical and mental diseases, affecting physical health. The main characteristics of Tai Chi are that there is movement in silence, although the movement is still quiet, loose and natural, pay attention to the internal and external integration, both form and spirit, rigid and soft, so activating qi and blood and nourishing brain. Tai Chi can relax people's nerves, relieve restfulness, anxiety, tension and depression, and keep practitioners happy, relaxed and comfortable physical and mental state(Wang, 2022).

Long-term Tai Chi exercises improve ankle and knee joint stability and muscle strength, thereby improving dynamic balance. Almost all Tai Chi movements are semi-squatting, putting more pressure on the knee joint and providing a wider range of motion to control the height of the center of gravity during smooth and slow movements (Chen, 2020).

In recent years, the aging of the population has become increasingly serious and most elderly people have various diseases, and their physical functions have gradually declined with the increase of age. Tai Chi is a kind of bodybuilding exercise

with a long history in our country. It has its unique way of movement and philosophy. Tai Chi uses a series of slow and fluid movements and breathing methods to help the practitioner achieve physical and mental balance and improve health. The core idea of Tai Chi is to overcome hardness with softness, and to pursue body coordination and internal and external balance. Its movement is usually characterized by a coherent flow, slow movement and accurate posture, focusing on the control of breathing and the use of internal forces. In addition, Tai Chi also emphasizes the concentration of consciousness and the relaxation of the body, so that the practitioner can get the feeling of internal and external harmony in the movement(Yu, 2023).

As a traditional Chinese martial art, Tai Chi can not only improve flexibility, strength and balance, but also effectively reduce stress and anxiety, improve mental toughness, and significantly improve cardio-respiratory endurance, muscle strength, flexibility and balance. Especially for the elderly, Tai Chi can improve physical function, reduce the risk of falls and injuries, and improve quality of life.

Qigong, a traditional Chinese fitness practice that focuses on breath control, body posture, and mental focus, when combined with Tai Chi, can further enhance the body's energy flow and inner balance.

Breathing is an important feature of life, controlling our emotions, bodies and perceptions, and acting as a bridge between the physical and mental. Qigong exercise is different from general sports, it does not pursue short-term intense physical movement, but consciously according to the principle of practicing, gradually and slowly control activities, ease emotional reaction, make people in a very comfortable and quiet situation, especially the slow and deep breathing method in Qigong practice can make people shift from repressing tension to relaxing. It can improve the function of human organs and autonomic nervous regulation, and improve the adaptability of human body. At the same time(Wang & Wang, 2022), also proposed that fitness Qigong's impact on public health is mainly manifested in the respiratory system, endocrine system, cardiovascular system, and various muscle groups of the human body (mainly lower limb muscle groups). Through the questionnaire, it is found that the

elderly who practice fitness Qigong have a great improvement in the strength of each muscle group, as well as the body's sensitivity and flexibility. For example, in the Baduanjin Zhuquan Nu eye to increase the strength of the movement of the horse step can enhance the strength of the lower extremity thigh and calf muscle groups, and punching can enhance the strength of the upper arm and the humerus and the biceps. Qigong Tantao's and Dawei's can effectively stretch the ligaments of the muscle group of lower limbs, thus developing the flexibility of the practitioner. Through the reaction test of the elderly who practice fitness Qigong and the elderly who do not practice fitness Qigong, that is, make corresponding actions according to the light color, the test result shows that the elderly who practice fitness Qigong make actions according to the light faster than the elderly who do not practice fitness Qigong.

Tai Chi and Qigong exercises are suitable for the physical activity intensity and movement characteristics of elderly people, with a focus on relaxation, softness, and fluidity. They can help prevent injuries to muscles, joints, tendons, and other organs. The early morning temperature is moderate, with less noise and interference, fresher air, and lower levels of pollution, which are beneficial for breathing and health. After a night's rest, the body's functions have been restored, and energy levels are high, making it an ideal time for physical exercise. Practicing Tai Chi and Qigong at this time can help awaken the body, promote blood circulation, and improve the mental state of elderly people.

Prior research, Researchers at Shanghai Sport University's School of Martial Arts, led by Dr. Fuzhong et al. (2001), studied the benefits of Tai Chi for senior fall prevention. Few studies have been done to date on the effects of 24style Tai Chi on the multi-variable strength, flexibility of senior women's lower limb muscles. In actuality, Tai Chi can be viewed as a comprehensive kind of mental and physical exercise that may improve a number of health indicators(Chen et al., 2017).

However, there has not been any research on combining Tai Chi and Qigong exercises on the lower limb muscle strength, flexibility and stability in elderly women at the same time. This research places an emphasis on the intensity of Tai Chi and Qigong

exercise. Such exercise is easy for these eldry women to do and is safe for them. Therefore, in this paper, elderly women aged 6074 years old were trained and interfered with the three functional dimensions of core strength, flexibility and balance through Tai Chi training and Qigong breathing training during the training interval to adjust their body state. This comprehensive study fills in the gaps in the current combined research of Tai Chi training on the lower limb strength, flexibility and balance of elderly women in China, and hopes to play a relevant role in improving the physical function of elderly women and delaying life expectancy through this study.

To sum up, the combination of Tai Chi and Qigong is an effective method for comprehensive physical exercise for the elderly population, and it is expected to improve the physiological function of elderly women in multiple dimensions, including lower limb muscle strength, flexibility and balance. This combination of training programs can bring comprehensive health benefits to elderly women, and there is room for further development in future studies. Therefore, this paper conducted a comprehensive study on the three dimensions of core strength, flexibility and balance through elderly women aged 6074 years who practiced Tai Chi, which has important practical significance for promoting the health of the elderly and improving the quality of life. Through this study, it can provide a scientific basis for the elderly's Tai Chi prac, help them choose more effective training methods, improve physical performance, so as to obtain better self-care ability and quality of life in daily life. At the same time, this study can also provide reference for sports educators and coaches to promote the improvement of the training level of Tai Chi for the elderly.

1.2 The importance of research

Lower limb muscle strength has an important impact on the health of elderly women(Batista et al., 2012)

1.2.1 Tai Chi holds immense value for the elderly, particularly for senior women. Practicing Tai Chi significantly enhances their quality of life by strengthening heart and lung function, building muscle strength, and preventing falls. It also improves cardiovascular health and plays a positive role in preventing and managing conditions

like hypertension and heart disease. The slow movements and deep breathing exercises in Tai Chi help alleviate stress and anxiety, promoting mental health, while also encouraging social interaction and a sense of community. Regular practice of Tai Chi allows senior women to enjoy a healthier, more active, and socially fulfilling later life.

1.2.2 Qigong, as a traditional Chinese fitness method, has multifaceted positive effects on the elderly. It is particularly important for senior women to practice Qigong because it helps enhance cardiopulmonary function, improve physical flexibility and balance, and promote the circulation of qi and blood. This practice also alleviates joint pain and muscle stiffness. The deep breathing and relaxation techniques in Qigong effectively reduce stress and anxiety, uplift mental state, and boost immunity. This helps senior women maintain independent living and enjoy a high-quality later life. Additionally, as a low-intensity and easy-to-learn exercise, Qigong is highly suitable for senior women with varying physical conditions and is an effective way to promote their physical and mental health.

1.2.3 Muscle mass and strength naturally decline with age, which is known as sarcopenia. The decline is even more pronounced in older women because estrogen levels drop. The weakening of lower limb strength will not only affect the mobility of the elderly and increase the risk of falls, but also lead to the decrease of bone density, the increase of cardiovascular disease risk and the decrease of overall quality of life. Therefore, Tai Chi and Qigong training can improve the lower limb strength of elderly women to promote the overall health level of elderly women.

1.2.4 Flexibility is very important for elderly women as it relates to physical flexibility, coordination and reduced risk of injury. Training flexibility through Tai Chi and Qigong can help expand the range of motion of the joints, improve the flexibility and coordination of the body, reduce muscle spasms and fatigue, while improving the supply of nutrients to the muscles, delaying the aging of muscles and ligaments, and reducing the risk of falls.

1.2.5 Balance has a significant impact on the health and quality of life of elderly women. With the growth of age, the elderly's nervous system, sensory system

and motor system will appear degenerative changes, resulting in balance, muscle strength and proprioceptive ability decline, these changes are important physiological factors leading to fall. Tai Chi and Qigong training can improve the balance ability of elderly women, prevent falls, and improve the quality of life.

1.3 Research purpose

1.3.1 The purpose of this research examine the effect of Tai Chi combine with Qigong exercise training on muscle strength.

1.3.2 The purpose of this research examine the effect of Tai Chi combine with Qigong exercise training on flexibility.

1.3.3 The purpose of this research examine the effect of combine with Qigong exercise training on balance.

1.4 Study the population

Elderly aged 60-74 years old were selected as the study population of the Chinese old people's home in Xi'an, Shanxi province were selected as the study population.

1.5 Factors affecting the study

1.5.1 Independent variables: Tai Chi combined with Qi gong exercise training program

1.5.2 Dependent variables: lower limb muscle strength , flexibility, Balance

1.6 Explanation of terms

1.6.1 Twentyfour forms of simplified Tai Chi

Twentyfour forms of simplified Tai Chi, also known as simplified Tai Chi, is a form of Tai Chi that is suitable for public practice by simplifying and refining the essence of traditional Tai Chi. It consists of 24 movements, each of which conTains the basic characteristics of Tai Chi, such as softness, coherence, balance, slowness, and internal and external cultivation. 24 Tai Chi is characterized by simple movements, easy to learn and practice, suitable for people of all ages. It can not only help practitioners

exercise and enhance their physical fitness, but also achieve the effect of regulating body and mind, reducing pressure and relaxing through practicing the breathing and movements of Tai Chi. In addition, 24style Tai Chi also helps to improve the flexibility and coordination of the body, and has a positive effect on improving posture and balance. In general, 24style Tai Chi is a martial art form that combines the essence of traditional Tai Chi with the concept of modern fitness, which not only inherits the culture of Tai Chi, but also ADAPTS to the pace of life and fitness needs of modern people.

1.6.2 Fitness qigong

Fitness Qigong is a traditional national sports event that combines physical activity, breathing, breathing and psychological adjustment as the main form of exercise. It is an important part of the long Chinese culture. Practicing fitness Qigong plays a unique role in enhancing people's psychological quality, improving people's physiological function, improving people's living quality, and improving moral cultivation.

1.6.3 elderly woman

elderly women are usually defined as the female population aged 60 to 74 years. This definition can vary according to different cultural and social contexts, but in general, elderly women experience a unique set of changes and challenges at the physical, psychological and social levels.

1.6.4 Lower limb strength

Lower limb strength refers to the strength of the muscles of the lower limbs of the human body (including the thighs, calves and feet). It includes the strength of the quadriceps in the front of the thigh, the hamstrings in the back, the adductor muscles in the inside, the gastrocnemius and the soleus muscles in the lower leg and other muscle groups. These muscles play an important role in daily activities, sports and weight-bearing situations.

1.6.5 Flexibility

Flexibility refers to the ability and extent to which the joints and their surrounding soft tissues (such as muscles, tendons and ligaments) can move without injury. It reflects the range of motion of the joints and the extensibility of the soft tissues, and is an important part of the body's movement ability. Flexibility not only affects

athletic performance, but also plays a key role in daily life, such as bending, reaching for objects and turning and other movements require good flexibility. Having good flexibility can help reduce sports injuries, improve physical flexibility, improve posture, increase muscle balance, and help improve athletic performance.

1.6.6 Balance

Balance refers to the ability of the human body to main Tain the stability, coordination and control of the center of gravity at rest or in motion. This includes static balance (such as keeping your body steady while standing) and dynamic balance (such as keeping your body stable while walking or running). Balance relies on the coordinated work of several systems, including the vestibular system (the inner ear), the visual system, and proprioception of muscles and joints (the sense of where parts of the body are located).

1.7 Research Scope

The condition of lower limb strength, flexibility and coordination of elderly women before Tai Chi training and the improvement of lower limb strength, flexibility and coordination of elderly women after Tai Chi training in Xi 'an, Shanxi Province.

1.8 Study the population

Aged women aged 60-74years old were selected as the study population, and the aged care community in Xi 'an City was selected as the study population.

1.9 Research framework

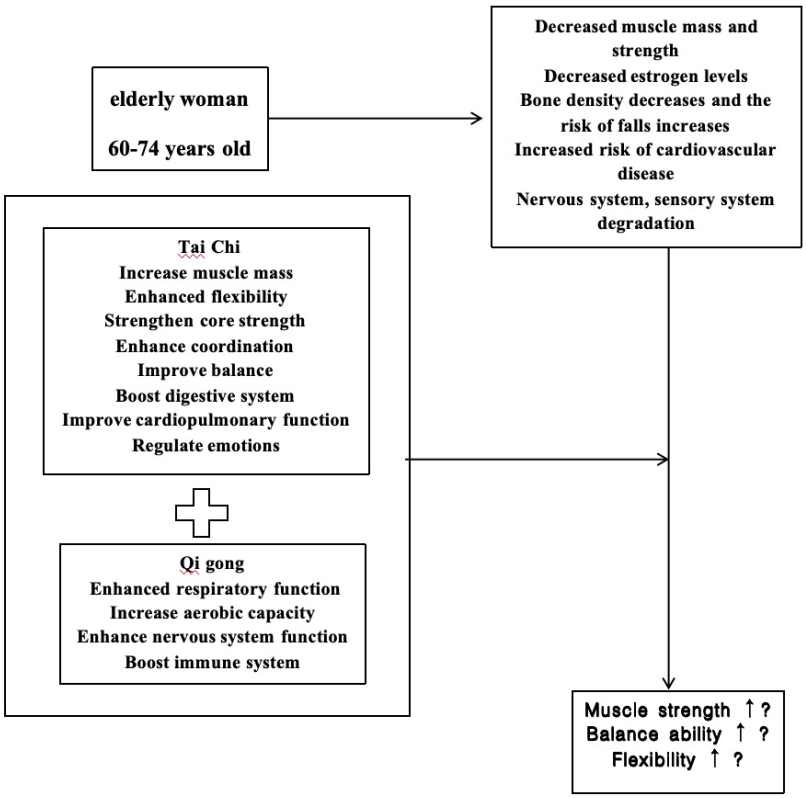

FIGURE 1 Conceptual Framework of the Tai Chi and Qigong Intervention for Elderly Women

1.10 Research hypotheses

1. Tai Chi and Qigong training is helpful to improve the lower limb strength of elderly women.
2. Tai Chi and Qigong training helps to improve the flexibility of elderly women.
3. Tai Chi and Qigong training helps to improve the balance of elderly women.

CHAPTER 2
LITERATURE REVIEW

2.1. Research on the health problems of elderly women in China

2.1.1 By the end of 2020, there will be 190 million people aged 65 or above in China. With the advent of the aging society, the health care of the elderly has become a hot topic of the government and society. The Outline of the Healthy China 2030 Plan puts people's health in a strategic position of priority development. The "Opinions on Implementing the Healthy China Action" proposed the implementation of health promotion actions for the elderly. The health problems of the elderly are mainly manifested as physical decline, functional decline, suffering from chronic diseases or other physiological and psychological diseases. elderly women are generally in poorer health and face greater health risks than older men. Elderly women usually pay more attention to their own health status, which is accompanied by a higher level of health information demand and frequent health information behavior. Efficient and good health information searching behavior is helpful to improve the health literacy of elderly women. In the field of health information behavior of the elderly, there is a lack of independent empirical research on the elderly female group. There are also few studies from the macro and meso-level, the elderly women in the social culture and community context, the overall, dynamic, interactive investigation of their health information search behavior patterns and characteristics(Wang et al., 2024). At present, the proportion of the elderly population in China is increasing year by year, and the degree of aging is deepening. Overweight/obesity has been shown to be a risk factor for chronic metabolic diseases such as type 2 diabetes and hypertension. Bone health is vital for older people. The survey shows that China's elderly obesity rate, osteoporosis incidence is increasing, of which 6069 years old elderly women central obesity rate is the highest, the incidence of osteoporosis as high as 37.5%. Previous studies have suggested that BMI is a protective factor for BMD, however, more and more recent studies have shown that BMI above a certain range has an adverse effect on BMD. It is precisely because overweight/obesity intensifies the redistribution of fat from the subcutaneous to the

visceral tissues and into other tissues such as muscles that leads to sarcosaria, which in turn increases the risk of falls and fractures, resulting in higher mortality(He et al., 2023).

1.2 With the development of society, people are paying more attention to health issues, and studies have found that eating prunes may help prevent bone loss in older women. Prunes are known to be beneficial for gut health, but new research from Penn State University suggests they may also be beneficial for bone health. A review of studies published in Advances in Nutrition suggests that prunes may help prevent or delay bone loss in postmenopausal women, possibly because of their ability to reduce inflammation and oxidative stress, both of which contribute to bone loss(Hou, 2022).Therefore, many problems in physical and mental health of urban elderly women are caused by factors such as different material conditions, marital status, education level and imperfect social security system. In order to promote the health of urban elderly women, elderly women should enhance their health awareness. Actively create a harmonious and warm family environment; Efforts to promote the role of communities; Efforts have been made to safeguard the legitimate rights and interests of elderly women. Nowadays, the health problem of elderly women has become a prominent social problem. Elderly women belong to the disadvantaged groups in society. They have low economic status, less political participation, poor health, and relatively poor spiritual life. Elderly women have made a lot of contributions to the development of the family and society, and even can be said to sacrifice, but in their later years they have entered the ranks of the disadvantaged groups in society, which is really sad. In view of this, family members should try their best to meet the various conditions that elderly women need, and society should also actively provide the social assistance needed by elderly women to promote their physical and mental health(Li, 2006).

2.1.3 With the coming of the aging society, the health problem of rural elderly women is becoming increasingly prominent. The elderly in rural areas are one of the most vulnerable groups in the current society, and the elderly women are even more vulnerable among the vulnerable groups. Due to the influence of their own conditions and social factors, their health problems are manifested in multiple levels. It is of

theoretical and practical significance to solve the health problems of rural elderly women(Zare et al., 2018). In recent ten years, the situation of population aging in China's rural society has become increasingly serious, which has led to a series of old age problems. More and more scholars believe that it is important to provide material care for the rural elderly, but with the improvement of rural living standards, it is particularly urgent to strengthen the care for the mental health of the rural elderly to improve the quality of life of the rural elderly. However, in the current research results on the rural elderly, there are very few research on the mental health problems of rural elderly women, most of them are classified into the entire rural elderly group, completely ignoring the differences between elderly women and elderly men in mental health problems. Some rural elderly women suffer from gender discrimination as well as age discrimination, which is particularly obvious in rural China, especially in some remote areas(Wang & Zhang, 2018).

2.1.4 Through the investigation and analysis of the health status of the old women in Kuantang town, the health status of the old women in Kuantang Town was understood, and the countermeasures for improving the health quality of the old women were put forward. Methods and procedures In 2014, 2,200 elderly women over 50 years old participated in the geriatric physical examination and the general survey of women's diseases in Kuantang Town. Each participant was logged into the physical examination information system with ID cards. Each person had an independent bar code, a unified computer physical examination form was adopted, and a unified physical examination by a specialist was conducted. Conclusion The elderly women in different age groups in Kuantang town have reproductive health problems such as uterine fibroids, pelvic inflammatory disease, abnormal blood sugar, hypertension, anemia, abnormal electrocardiogram and other general health problems. It is necessary to strengthen the prevention and health care of elderly women and actively do a good job in women's health management(Baoqin, 2016). The health of older women in both urban and rural areas should be addressed at an early stage(Bao, 2006). It is pointed out that the problems of poverty, medical treatment, health care, daily life care and legal rights and

interests of rural elderly women are closely related to the lack of public policies and the weak social gender consciousness. Only by incorporating the work of aging into the gender perspective, formulating social support policies for elderly women, and establishing a service system for the elderly can the above problems of rural elderly women be fundamentally solved. Meanwhile(Lu, 2019). The right to health is an important right in the human rights system. The full realization of the right to health is particularly important for guaranteeing the dignity and later life of older women. In the process of China's economic and social development, the protection of elderly women's right to health is facing certain realistic difficulties. The State has the obligation and responsibility to respect, protect and realize the right to health of older women. The state should actively fulfill its obligations and make continuous efforts to improve the protection of elderly women's right to health through a variety of practical and effective means.

2.2. Study on the physical function of Tai Chi in elderly women

2.2.1 In recent years, with the improvement of medical level, people pay more and more attention to sports rehabilitation training. With the promotion and application of Tai Chi in rehabilitation medicine, it has gradually received attention and recognition as one of the late rehabilitation training and complementary and alternative treatment methods for nervous system diseases. By systematically reviewing relevant studies at home and abroad, the author discussed the influence of Tai Chi on the motor function and balance function of elderly patients with Parkinson's disease, aiming to further clarify the therapeutic effect of Tai Chi and provide a safe, feasible and efficient rehabilitation training method for elderly patients with Parkinson's disease(Chen et al., 2020). Tai Chi is a traditional Chinese fitness program favored by the masses. For a long time, domestic studies on the effect of Tai Chi on health mainly focus on the bone and joint, cardiovascular, endocrine and other systems. In recent years, foreign countries have begun to pay attention to the impact of Tai Chi on the balance function of the human body, and there are more reports on this aspect, but fewer reports in China. Due to the slow and gentle movements of Tai Chi, emphasizing the waist as the axis and the

shift of the body's center of gravity, it is a kind of postural control movement combining static and static, which has attracted the attention of many foreign scholars. Compared with the non-exercise group, both regular Tai Chi exercise and ordinary exercise can improve the body balance control ability and walking ability of healthy elderly women, but the effect of Tai Chi in this respect is significantly better than that of the ordinary exercise group. Therefore, it is speculated that the introduction of Tai Chi into the balance function training of patients with balance dysfunction (such as stroke, brain trauma, etc.) will also have a positive effect, but further research is needed to provide objective evidence to support it(Yan, Guo, Jin, Cao, & Xie, 2005). Meanwhile(Li, 2009). It is pointed out that Tai Chi is an excellent traditional project of the Chinese nation. Based on the characteristics of the physical condition of middle-aged and elderly women, this paper expounds the effect of Tai Chi on promoting the mental health and physical health of middle-aged and elderly women, and further indicates that Tai Chi is a medical and health sports item suitable for middle-aged and elderly women.

2.2.2 Tai Chi has become a "fitness symbol" and an effective means for the elderly to participate in society. The elderly participating in Tai Chi can not only keep fit, strengthen the heart, relax the mood, but also enhance communication, re-understand themselves, and maintain the vitality of life. The creation and compilation of simplified Tai Chi caters to the needs of the contemporary elderly, and the elderly in some communities in Nanjing choose to practice 24-style Tai Chi and 42-style Tai Chi more than other types of boxing. There are various ways for the elderly to learn Tai Chi, which are mainly learned from relatives and friends and self-study through multimedia and books. In some communities in Nanjing, the elderly who practice Tai Chi generally have higher fitness awareness and regular exercise time. Most of the elderly have practiced Tai Chi for a longer period of time and have good habits of life and rest and eating. The old people who practice Tai Chi do not master the theoretical knowledge of Tai Chi, and some of them lack scientific guidance. The venue is no longer the main factor hindering the elderly to practice Tai Chi, and the selection of Tai Chi places by the elderly in some communities in Nanjing is consistent. Squares and parks have become the first

choice for the elderly to practice Tai Chi, and the perfect fitness service facilities in the community also provide convenience for the elderly to practice Tai Chi(Xia, 2013).

2.2.3 To explore whether long-term Tai Chi exercise has obvious consolidation and treatment effect on elderly patients cured of anxiety disorder. Methods 60 patients with anxiety disorder aged 60 ~ 75 years were selected and randomly divided into observation group and control group, with 30 cases in each group. The observation group received long-term Tai Chi fitness exercise intervention, while the control group received normal daily activities without participating in any special intervention treatment. After 6 months of followup, the recurrence rate, physical and mental state and cognitive function of the two groups were evaluated and compared. Results The recurrence rate in the observation group was significantly lower than that in the control group (P-VALUE< 0.05), and the scores of physical and mental state and cognitive function in the observation group were significantly higher than those in the control group (P-VALUE< 0.05). Conclusion Tai Chi is suitable for elderly patients with anxiety disorder as a means of late fitness exercise, which is not only beneficial to physical health but also conducive to the development of mental state and cognitive function(Li et al., 2017).

2.2.4 After four weeks of regular exercise, the subjects' depression and anxiety were significantly reduced, and the improvement was more pronounced after eight weeks. Long-term moderate intensity Tai Chi can effectively improve the depression and anxiety of elderly women. Psychological benefits are more likely to occur in the improvement of anxiety in elderly women(Zhou et al., 2012). In addition, the clinical therapeutic effect of Tai Chi on elderly patients with essential hypertension was observed. The effect of Tai Chi in the intervention of elderly patients with essential hypertension is remarkable, which can effectively improve the blood pressure control level, improve the sleep quality of patients, improve the psychological state and improve the quality of life(Cao et al., 2024). At the same time, it provides a scientific basis for understanding the influence of Tai Chi exercise on the body shape of rural elderly women and effectively improving the quality of life. The results showed that after Tai Chi

exercise, the body weight, upper arm fat thickness, shoulder fat thickness, body fat %, waist circumference and BMI index of the experimental group were better than before the experiment, forming significant differences (P-VALUE<0.05 or P-VALUE<0.01), and benign significant differences were also formed compared with the control group (P-VALUE<0.05 or P-VALUE<0.01). The physical exercise of rural elderly women must be targeted in order to receive the expected effect. Tai Chi exercise is a more effective exercise method, and it is suggested to take reasonable measures to promote it(Li et al., 2010).

2.3. Tai Chi on the strength of elderly women

2.3.1 Chinese martial arts are extensive, profound and inclusive, among which there are many kinds, and Tai Chi has the longest history. It is the most traditional sport of the Chinese nation, and sometimes Tai Chi represents the whole of China. The reason why Tai Chi has become a well-known sports item now, more importantly, Tai Chi and the public square dance or radio exercise are joined together, which has a good universality, easy to learn and easy to understand. At the same time, more importantly, it is beneficial to physical health, especially the exercise of heart and lung and lower limb strength is of great importance(Cui, 2018). In the study of the influence of Tai Chi on the strength of elderly women, it is found that the influence of long-term Tai Chi exercise on the attenuation effect of skeletal muscle in the elderly and the difference between genders. The results showed that the skeletal muscle content of the experimental group was higher than that of the control group regardless of gender, and there were significant differences in relative limb skeletal muscle content (RASM) and skeletal muscle index (SMI) (P-VALUE<0.05). In terms of skeletal muscle strength of lower limbs, the squat power of the experimental group was higher than that of the control group, and showed significant differences (P-VALUE<0.05). Regardless of whether or not to practice Tai Chi, there were significant differences in skeletal muscle content and skeletal muscle strength between genders (P-VALUE<0.01). This indicates that long-term exercise of Tai Chi can effectively delay the decline of skeletal muscle content and lower limb muscle strength in the elderly, but the effect is not obvious in the upper limb

grip strength. It is suggested that the elderly should increase the resistance training of small and medium intensity during physical exercise(Jiang & Li, 2024). Meanwhile,(Zhao et al., 2024). It is also proposed to explore the influence of long-term practice of Tai Chi on the lower limb muscle strength of the elderly. Through comprehensive analysis of relevant studies, it is concluded that long-term practice of Tai Chi has a positive impact on the acquisition of lower limb muscle strength of the elderly. Tai Chi can not only enhance the muscle strength of the lower limbs of the human body, but also improve the balance and coordination of the body, which can improve the physical function of the elderly in daily life. Therefore, the active participation of the elderly in practicing Tai Chi can promote their physical health and exercise ability.

2.3.2 Water disturbance Tai Chi and normal Tai Chi training can effectively improve the lower limb muscle strength, walking ability and dynamic balance ability of elderly men, and the fall risk is significantly reduced. Water disturbance Tai Chi has a better effect on walking ability, dynamic balance and anti-fall risk ability. The increase of lower limb muscle strength was not the reason for the difference in dynamic balance ability and anti-fall ability between the two types of Tai Chi aged men after the experiment, and its internal mechanism needs further study(Peng et al., 2023). Besides,(Zhang, 2019). By analyzing and comparing the changes of walking ability under the dual tasks of balance, muscle strength, flexibility, posture control, cognition and gait, as well as the changes of the fear of falling, the effects of 24-style Tai Chi on the prevention and reduction of fall risk in the elderly after 12-week exercise were demonstrated. Conclusion :(1) 12-week 24-style Tai Chi exercise can improve the balance ability, lower limb muscle strength, posture control ability and dual task walking ability of the elderly; (2) 12-week 24-style Tai Chi exercise can reduce the elderly's fear of falling. (3) 12week 24style Tai Chi exercise can effectively prevent falls in the elderly.

2.3.3 Regular physical exercise can improve muscle function, but the effect of different types of exercise, frequency and duration on muscle strength is uncertain. Tai Chi is an ancient form of exercise that is very suitable for the elderly. Regular Tai Chi practice is beneficial to the health of the body, especially to maintain the postural control

of the elderly. Long-term Tai Chi practice has been shown to be beneficial for maintaining muscle strength in the elderly, but it has rarely been compared to other exercises. Therefore, this study mainly tested the knee isokinetics muscle strength of long-term Tai Chi practitioners, long-term joggers and sedentary people, and compared Tai Chi exercises with walking exercises in order to better understand the effects of Tai Chi on muscle function(Qu & Liu, 2014).

2.4. The study of Tai Chi on the flexibility of elderly women

2.4.1 Tai Chi, as a traditional fitness exercise, has been shown to have a positive effect in improving movement ability and flexibility. By increasing muscle strength and cardiorespiratory endurance, Tai Chi improves physical performance. It also helps improve the body's coordination and balance, reducing the risk of falls and injuries. In terms of flexibility, Tai Chi significantly improves joint flexibility through exercises in body control and range of motion. The practice of Tai Chi can have a positive impact on the nervous system, muscle and skeletal system, and enhance motor response speed and coordination. In short, Tai Chi has a wide range of application prospects, and is of great significance for improving athletic ability and flexibility, as well as improving overall health and quality of life(Yu, 2023). (1) 24-style Tai Chi practice has no significant difference in height, weight, BMI and heart rate of the elderly. Since weight, BMI and heart rate require long-term practice, the 12week practice time is relatively short and there is no significant improvement. 24 type Tai Chi practice can reduce the systolic blood pressure of the elderly, after long-term practice has the effect of reducing the blood pressure of the elderly. (2) The practice of 24-type Tai Chi can significantly improve the balance ability and flexibility of the elderly, and the improvement of balance ability and flexibility can prevent the elderly from falling. (3) 24-type Tai Chi has a significant improvement effect on depression, anxiety and happiness in the elderly. Tai Chi has the characteristics of meditation. When practicing Tai Chi, the movement is light and gentle, which makes people calm. Maintaining the practice for a long time makes the practitioner's mood more stable. There are many forms of Tai Chi, of which type 24 is relatively easy, the elderly are good at remembering, the learning

process is relatively simple and easy to learn, the elderly are not difficult to learn, and it can promote physical health and help the elderly spend their old age happily(Qin, 2023). The body flexibility of Tai Chi male group was significantly higher than that of ballroom male group (P-VALUE<0.05), and the body flexibility of Tai Chi female group was also slightly higher than that of group B female group, but the difference between the two groups was not significant. There was no significant difference in bone mineral density between Tai Chi male group and ballroom dance male group, and Tai Chi female group and ballroom dance female group (P-VALUE>0.05), indicating that Tai Chi and ballroom dance have the same fitness effects in reducing the natural loss of bone minerals in the body, maintaining stable bone mineral density and preventing osteoporosis(Liu & Zhou, 2012).

2.4.2 To explore the influence of Tai Chi on the flexibility of middle-aged and elderly people, and to provide a basis for it to be used as a moderate and low load exercise to improve flexibility. Methods: A total of 421 middle-aged and elderly people in Chongwen District were randomly selected as the experimental group, including 212 people who practiced Tai Chi for a long time. A control group of 209 people who did not regularly engage in physical activity; Each group was further divided into two age groups, 45-55 and 56 years old, respectively, to perform the seated forward bending test. Results :1. The test result of the experimental group was higher than that of the control group, the difference was highly significant (P-VALUE<0.01); 2. The test results of the male experimental group were higher than those of the control group at both ages, and the difference was significant (P-VALUE<0.05); The test results of the female experimental group were similar to the male group, and both age groups were higher than the control group, the difference was highly significant (P-VALUE<0.01). Conclusion: With the increase of age, the flexibility of middle-aged and elderly people is weakened. Tai Chi can obviously improve the flexibility and flexibility of middle-aged and elderly people, which has practical significance to promote vigorously(Rong & Qian, 2010).

2.5. Tai Chi on the balance of elderly women

2.5.1 At present, with the progress of society, the degree of population aging has further intensified. First of all, the elderly play a cohesive role in a family, and secondly, some elderly people play an important role in all aspects of society, contributing their own strength to the harmonious development of society. However, due to the decline of the physiological function of the elderly, the speed of change and the loss of bone calcium make some elderly people's balance ability decline, which brings inconvenience to life and work Health can cause elderly people to fall and cause some unnecessary diseases, and some elderly people will also shorten their life because of falls. Studies have shown that some simple and easy scientific exercises in the elderly can improve balance. Therefore, this study selects 24-type Tai Chi to interfere with the balance ability of the elderly. The full set of exercise movements of 24-type Tai Chi are as follows: neutral and peaceful, soft and slow, and clear between virtual and solid, so that the elderly can maintain and improve their balance ability while strengthening their body. 24 type Tai Chi for the elderly highlighted three good, studious, good practice, good memory, very suitable for the elderly practice, and therefore has been widely praised and recognized. The 12week 24-style Tai Chi exercises have improved the leg muscles and endurance of the elderly, and have effectively improved the balance confidence of the elderly while preventing falls(Kong, 2022). Tai Chi can effectively improve the balance ability of the human body, and its technical movements, routine arrangement, training site and breathing coordination are the relevant variables that affect the effectiveness of Tai Chi. Therefore, Tai Chi step training and breathing training, which simplify upper limb movement, are also used clinically to interfere with human balance ability. Compared with complex sets of Tai Chi movements, Tai Chi footwork is simple and easy to learn, easy to master, and has a stronger pertinence to the exercise of balance function. Moreover, Tai Chi footwork has more detailed objective criteria, and there are more perfect evaluation criteria in the test, which is conducive to demonstrating the effectiveness and rationality of its balance function. Balance ability and core stability are the main components of human stability. Tai Chi footwork practice

can significantly improve balance ability, abdominal breathing can effectively improve core stability(Sun et al., 2023). Systematic evaluation is used to explore the influence of Tai Chi on the balance function of the elderly, in order to get the best plan of Tai Chi to improve the balance function of the elderly, and then prevent or reduce the occurrence of falls in the elderly. Tai Chi can improve the balance function of the elderly to some extent. Among them, Tai Chi has obvious improvement on the static balance function of the elderly, but the specific improvement effect on the dynamic balance function of the elderly is still unclear. Tai Chi can reduce the number of falls, reduce or reduce the fear of falling, and indirectly improve the balance function of the elderly. The effect of Tai Chi intervention needs a certain period of time. As far as the results of this study are concerned, the overall intervention time of Tai Chi is more than 80 hours, and its improvement effect on balance function can be stable. Compared with other exercise therapies, only some outcome indicators of Tai Chi were statistically significant, and it was not clear whether the effect was superior compared with other therapies(Li, 2017).

2.5.2 To simplify the role of Tai Chi in improving the balance ability of the elderly, the author summarized from the aspects of traditional physical health, the principle of Tai Chi movement, and previous studies, and analyzed and sorted out the examples of previous studies. This study applied the conditions of high ecological validity, and visualized the core data of such related studies through Scival. It can be seen that the research on the balance ability of the elderly is increasing year by year, and the social attention on the aging problem is also increasing. Although there are relatively few studies on the health effects of Tai Chi on the elderly, studies have shown that Tai Chi can effectively improve balance in the elderly, prevent falls, improve vestibular organs, and help improve quality of life. However, the current study still has some limitations, such as small sample size and large individual differences. Therefore, future studies need to expand the sample size and further explore the impact of Tai Chi practice time and duration on the balance ability of the elderly. The author found that Tai Chi was simplified very quickly to become a suitable exercise method for the elderly to improve their balance ability, which has great practical value and promotion potential.

With the development of the aging society, Tai Chi is expected to become one of the important means to prevent the elderly from falling and improve the quality of life of the elderly(Zheng, 2024).

2.5.3 With Chen's Essential 18style Tai Chi and simplified 24-style Tai Chi as intervention means, the purpose is to explore the differences in the effects of practicing different schools of Tai Chi on the static balance ability, dynamic balance ability and lower limb muscle strength of female elderly people, so as to provide a program reference for female elderly people to practice Tai Chi, relieve the pressure of aging society, and provide a theoretical basis for improving the balance ability of female elderly people . (1) Twelve weeks of Tai Chi can effectively improve the static balance ability of elderly women, and the improvement effect of Chen's Tai Chi is better than that of Yang's Tai Chi, especially on the single leg support; (2) Twelve weeks of Tai Chi practice can effectively improve the dynamic balance ability of elderly women. There is a regular difference between the two groups of practitioners in improving balance ability. Yang's group is better than Chen's group in improving the positive direction, and Chen's group is better than Yang's group in improving the deviating direction; (3) After 12 weeks of Tai Chi practice, the fall risk values of the two experimental groups were significantly improved by comparison before and after the experiment, but there was no significant difference between the two schools of Tai Chi. (4) After 12 weeks of Tai Chi practice, both groups of practitioners can effectively improve the lower limb muscle strength of elderly women, and the Chen group is slightly better than the Yang group(Yang, 2023).

2.5.4 By means of meta-analysis, this paper systematically analyzes the relevant topics of Tai Chi's intervention in the balance ability of the elderly or similar studies, and explores the impact of Tai Chi's exercise on the balance ability of the elderly, so as to provide theoretical basis for improving the balance ability of the elderly and delaying the aging speed of the elderly. Long-term Tai Chi exercise can significantly improve the standing time of the elderly with closed eyes, at the same time, it can significantly improve the balance beam time, and significantly shorten the interval

time between standing up and walking. All in all, long-term Tai Chi exercise can significantly improve the static and dynamic balance ability of the elderly. The elderly can use Tai Chi to improve the balance ability of the body, delay the aging speed of the body, and enhance the physical quality(Zhang, 2015). To observe the effect of Tai Chi on bone mineral density and balance force of postmenopausal women, to explore the effect of Tai Chi on postmenopausal women osteoporosis, to explore its mechanism, and to find effective non-drug methods for prevention and treatment of postmenopausal osteoporosis. Tai Chi is helpful to improve the bone mineral density of postmenopausal women, can play a role in preventing and treating osteoporosis, and also provides a new non-drug therapy for the prevention and treatment of osteoporosis. 2.Tai Chi can promote the balance ability of middle-aged and elderly people to a certain extent, improve the stability of the body, and prevent various adverse consequences caused by falls(Lin, 2010).

2.5.6 Tai Chi exercise was used as an intervention factor to explore the influence of Tai Chi exercise on the balance ability of the elderly. The balance function of women over 55 years old, men over 60 years old who regularly practiced Tai Chi (more than 2 years), and the control group of old men and women of the same age who did not do Tai Chi exercise were measured. The test results show that Tai Chi has obvious effect on maintaining and delaying the decline of the balance ability of the elderly, and can enhance the vestibular, somatic sensation, muscle strength, resistance to external interference, agility of action and coordination ability of the elderly, so as to delay the decline of balance ability(Xiao et al., 2006). At the same time, other studies have found the influence of Tai Chi, ordinary exercise and no exercise on the balance function of healthy elderly women and compared their different degrees. Balance is the ability of the human body to automatically adjust and maintain a posture when it is in a position or subjected to external forces. This ability requires dynamically adjusting the body's center of gravity so that the body's center of gravity falls within the support plane. According to the requirements of Tai Chi on boxers, it is not difficult to see that the effect of Tai Chi on improving balance function is related to the following factors: Tai Chi

is a relaxed and gentle, continuous isotonic movement, which exercises the joints and ligaments of the whole body and enhances muscle strength. When practicing boxing, "waist as the axis", led by the spine, with the twisting and winding movement of the torso, so that the shoulder, elbow, hip, knee, ankle and other joints are fully active, which is conducive to the start of the balance control of the "hip adjustment" and "ankle adjustment" mechanism, reducing the risk of falling. At the same time, more knees alternate half squat in boxing so that the body's center of gravity in a dynamic transfer and continuous adjustment process. Secondly, Tai Chi emphasizes the combination of dynamic and static center of gravity and the transformation of virtual and real. In the process of boxing, the movement and separation of the center of gravity, the advance and retreat of the pace, the movement of the left and right are very clear(Yan, Guo, Jin, Cao, Xie, et al., 2005).

2.6. Research on fitness Qigong breathing exercises

2.6.1 With the development of society, sports as a healthy way of life, more and more people's attention. As one of the traditional sports of the Chinese nation, fitness Qigong can control its own psychology and behavior, so that psychological activities and behaviors can be improved. At the same time, the essence of "heart adjustment" in fitness Qigong is to adjust people's thinking and consciousness, that is, to correctly understand the objective law to maintain mental health, and to control their own psychology and behavior, so that psychological activities and behaviors can be improved and adjusted. This is consistent with the regulation of one's own mental activity and behavior in the self-control mechanism. Therefore, it is of great significance to study the influence of fitness Qigong on self-control ability of college students(Shen, 2023). Therefore, the value and significance of fitness Qigong in the field of sports has become increasingly prominent, which closely integrates the strategic needs of national fitness and people's health, and becomes an important force to promote the health level of people's physical quality, inherit the traditional Chinese health culture and promote social harmony. Bodybuilding Qigong is a traditional national sports program that focuses on physical activity, breathing, vomiting and psychological adjustment. It uses

body regulation, breath regulation and heart regulation as the main means to achieve the practice purpose of "three tones in one", so as to achieve Yin Pingyang secret, the unity of form and spirit, and achieve the role of promoting health(Du, 2024). At present, fitness Qigong, as a traditional sports project in China, integrates fitness and health, has the characteristics of regulating physical and mental health, relieving pressure and so on, and has been loved by the majority of practitioners at home and abroad. At present, the development of fitness Qigong is facing new opportunities and challenges, and how to develop it has become a problem worthy of serious consideration. This paper analyzes the cultural connotation, health mechanism, characteristics, opportunities and challenges of fitness Qigong, and puts forward countermeasures for the development of fitness Qigong in the new era, in order to provide references for the inheritance and development of fitness Qigong(Chen & Tang, 2022).

2.6.2 With the development of science and technology and the improvement of people's health awareness, fitness Qigong has become a trend of exercise. The application of artificial intelligence technology provides new opportunities and challenges for the development of fitness Qigong. Fitness Qigong is a traditional national sport which combines physical activity, breathing, breathing and psychological adjustment as the main form of movement. It plays a unique role in enhancing people's psychological quality, improving people's physiological function, improving people's living quality and improving moral cultivation(Guo & Si, 2024).Fitness Qigong is one of the six basic methods of TCM treatment. By stimulating people's natural life energy, following the laws of nature, aiming at unblocking meridians, and pursuing the harmonious unity of body and mind, it is hailed as a mysterious "Oriental fitness technique" by Westerners. Based on the philosophy of "unity of heaven and man", it combines physical exercise, breathing techniques and spiritual cultivation, with the dual effect of fitness and cultivation, and is still widely spread after thousands of years. Fitness Qigong is suitable for all kinds of people, whether it is the fast pace of life, the work pressure of the workplace, or the retirement of the elderly, or the people with chronic diseases, can enhance the physique and cultivate the body and mind by

practicing fitness Qigong (Zhu & Wang, 2024). Inverse abdominal breathing is an important concept in traditional Chinese health Qigong, but it is not described in detail in previous literature. By combining the knowledge of anatomy, physiology and kinematics, this paper redescribes the concept of reverse abdominal breathing and its key elements in modern language, clarifying the action standards of reverse abdominal breathing and the key elements in its implementation, that is, actively regulating internal abdominal pressure, and deeply exploring the mechanism of reverse abdominal breathing in health care, promoting the concept of "three adjustments into one" and "body-medicine integration". Fit the background of "Healthy China" construction. In the era of big data, it is urgent to call on the academic community to actively develop wearable 3D monitoring equipment with realtime dynamic changes in thoracic volume to further improve medical quality and research level(Zhou et al., 2024). At the same time, Wang and Wang (2022) also proposed that fitness Qigong's impact on public health is mainly manifested in the respiratory system, endocrine system, cardiovascular system, and various muscle groups of the human body (mainly lower limb muscle groups). Through the questionnaire, it is found that the elderly who practice fitness Qigong have a great improvement in the strength of each muscle group, as well as the body's sensitivity and flexibility. For example, in the Baduanjin Zhuquan Nu eye to increase the strength of the movement of the horse step can enhance the strength of the lower extremity thigh and calf muscle groups, and punching can enhance the strength of the upper arm and the humerus and the biceps. Qigong Tantao's and Dawei's can effectively stretch the ligaments of the muscle group of lower limbs, thus developing the flexibility of the practitioner. Through the reaction test of the elderly who practice fitness Qigong and the elderly who do not practice fitness Qigong, that is, make corresponding actions according to the light color, the test result shows that the elderly who practice fitness Qigong make actions according to the light faster than the elderly who do not practice fitness Qigong. Research shows that Chan and Tsang (2019) Qigong exercises, especially Baduanjin, can relieve symptoms of depression in older people with chronic physical illnesses. This form of healthy Qigong is safe, easy to learn, and some previous

studies have shown it to have clinical effects. Therefore, health and rehabilitation practitioners can promote and use this Qigong as a complementary intervention to improve the physical and mental health of the elderly.

2.6.3 Fitness Qigong is a traditional national sport with the purpose of improving physical and mental health, and the main form of exercise is the combination of physical activity, breathing and breathing, and psychological adjustment. It is an integral part of the long culture of the Chinese nation. Different from the treatment and rehabilitation function of medical Qigong, the purpose of fitness Qigong is to prevent diseases and maintain health, so it can also be called "prevention and health care" Qigong or "health care and nourishment" Qigong. Fitness Qigong mainly achieves the purpose of promoting human physical and mental health through the three-in-one exercise methods of "regulating body", "regulating breath" and "regulating heart", which has been supported by the National Fitness Plan (2016 ~ 2020), the Development Plan of Traditional Chinese Medicine Health Services (2015 ~ 2020), the Outline of the Healthy China 2030 Plan and other policies(Li & Lu, 2022). Therefore, From the research on the basic breath regulation technology of fitness Qigong, it is found that in order to better distinguish the operating state of "qi", it is necessary to refer to a large number of research literatures and distinguish the principles of hundreds of opinions. This study is based on the breakthrough point of reviewing the name differentiation of breathing and breathing mode and operating principle of traditional sports health exercises, and divides the basic breath regulation technology into four operating steps: qi intake, qi circulation, solid qi and exhalation. The commonalities of human breathing patterns are refined, and the requirements of each breath regulation stage are emphasized. The current global situation of the novel coronavirus pneumonia also shows the importance of breathing for human survival. Deconstructing the basic techniques of fitness Qigong from the perspective of classification is to divide the written records of traditional physical health technical movements into three parts, and the technical movements and key points after "division" mainly include the practice form, practice mode and practice function of fitness Qigong. First, the exercise form of the basic technique of fitness

Qigong is to combine the requirements of The Times and strengthen the dynamic technique; Develop static technology close to health needs(Song, 2021).

2.6.4 The paper analyzes the value essence of fitness Qigong from the perspective of value philosophy, and believes that fitness Qigong can have a certain impact on people's development, which is embodied in the promotion of people's ideological and moral, physical health, mental health, and good character and professional ethics. At the same time, fitness Qigong can also play a certain value for the development of society, which is specifically manifested as the political value of enhancing national unity, building a harmonious society, promoting the economic value of local economic growth, and protecting the cultural value of traditional culture. In general, the prosperity of fitness Qigong is of great significance to the realization of "healthy China"(Cheng, 2021). There are many kinds of fitness Qigong, and they have become a common means for people to keep fit. The fitness methods of Qigong can be summarized into three points, namely breath regulation, body regulation and heart regulation. Standing pile is a kind of health maintenance technique in ancient China, and now it has become a fitness exercise for people with both static and static, internal and external warming and nourishing. Breath regulation plays a very important role in fitness Qigong, and it is necessary to pay attention to breathing when doing standing pile exercises. Suck, fine and even long, suck the essence of heaven and earth, feel the body swell, stand up to heaven; Exhale, the body shrinks, the qi goes down, and with the relaxation of the breath, the purpose of coordinating the whole body and unifying the body is achieved(Liang & Zhang, 2017).

2.6.5 Fitness Qigong has become one of the ways for the masses of people to strengthen their health and has obvious effects in improving the sub-health state of the human body. Fitness Qigong is different from ordinary gymnastics, it has the functions of regulating body, breath and heart. In order to improve the skills and effectiveness of fitness Qigong exercise, we should pay attention to the coordination of movement and breathing, and also pay attention to the coordination of movement and mind, and the coordination of movement and breathing is the key and basis of fitness Qigong

exercise(Ye, 2015). The research of fitness Qigong mainly discusses the fitness effect, but lacks the research of its fitness mechanism. Long-term fitness Qigong practitioners have self-reported reduced respiratory rate. This aligns with findings indicating that breathing rate can decrease to 4 beats per minute during a 30-minute meditation session. It was found that energy metabolism could not be reduced by simply controlling respiration, and energy metabolism decreased after Qigong practice. After excluding the influence of other interfering factors, it is speculated that the regulating effect of fitness Qigong, that is, the regulation of neural mechanism makes the body economize energy consumption. According to the characteristics of dissipative structure theory, the energy saving phenomenon in the process of practice is explained as reducing the entropy of life and increasing the entropy, thus producing positive effects(Zhang, 2013). Therefore, Guided health maintenance is rooted in the yin and yang theory of traditional Chinese culture, with breathing, exhalation as one of the main forms. By studying Zhouyi and traditional Chinese medicine theories, this paper theoretically sorts out the Yin and Yang relations between up and down, inside and outside, outside and inside (form and name), tightness, rise and fall, replenishment and release, breathing, rigor and flexibility, entry and exit, retract and release (dynamic form), which are opposed to each other and exist each other, so as to guide the cultivation of Qigong Health lovers better grasp the law of breathing and breathing, treat the qi of life with the attitude of Gu Yang Fuyang, and provide useful guidance for achieving a healthy life(Lan, 2019).

CHAPTER 3
METHODOLOGY

This chapter will discuss ethical considerations, study design, participant characteristics, research methodology, and data analysis.

3.1 Research Design

3.1.1 Tai Chi and Qigong training plan:

This study will use a true experimental parallel design to examine the effects of lower limb muscle strength, balance, flexibility and other variables in the Tai Chi and Qigong experimental and control groups. The method of random sampling will be used for experimental research. In the first step, specific sampling method (intentional sampling) was used to select the experimental group, and in the second step, simple sampling method (simple random sampling) was used to group the subjects. A sample of 40 elderly women between the ages of 60 and 74 was divided by simple random sampling into two groups, of which 20 participated in Tai Chi training and 20 participated in the control group (Wang, R., & Li, Y. 2016). Using G*Power to assist researchers in determining the sample size for experimental design, to ensure sufficient statistical power to detect the actual effects present. In this study, we specifically established a control group whose members would maintain their usual lifestyle and not participate in any form of systematic or organized physical activity. This means that control group members would continue their normal lifestyle patterns, including daily household chores, leisure activities, and social interactions, but not any additional exercise aimed at improving physical health or fitness. In this way, we can more accurately assess the potential impact of Tai Chi on participants' physical and mental health while controlling for other variables that may affect the results. The daily life of the control group will serve as the baseline for the experiment, helping us understand the differences between Tai Chi practice and traditional lifestyles, as well as the specific contributions of Tai Chi to improving quality of life, enhancing physical function, and promoting mental health. This design allows us to compare the data from the Tai Chi

group and the control group after the experiment is over and draw scientifically reliable conclusions.

Due to the numerous schools of Tai Chi, the training program of this study was simplified to the simplified 24-style Tai Chi introduced in 1956, and the 12 weeks of Tai Chi exercise were conducted under the guidance of specially selected Tai Chi instructors. The time and place were set at 07:00-8:00 on Monday, Wednesday, Friday every week for a period of 12 weeks. Lower limb strength is divided into two tests: squat against a wall and half squat kettlebell. The flexibility test was divided into two parts: sitting forward bending and sitting with hands together. Balance was divided into two tests: standing on one foot and time up and go in a straight line with alternating feet . Two weeks before the start of the training program, the participant's health and physical fitness related to the skills will be assessed and the participant's training protocol will be familiarized. Participants signed written informed consent. In addition, mental illnesses, such as depression and anxiety, are identified by doctors. If the above test results were normal, they were included in the study. Lower limb strength, flexibility and balance tests were conducted at two time points before the experiment and 12 weeks after the experiment to evaluate the effects of 24-style Tai Chi on lower limb strength, flexibility and balance.

3.1.2 Tai Chi and Qigong exercise programs

The subject exercise plan is: Since there are many schools of Tai Chi, the training scheme of this study is simplified 24 style Tai Chi and fitness Qigong Baduanjin introduced in 1956. Twelve weeks of Tai Chi practice are taught under the guidance of specially selected Tai Chi instructors. The time and place is set every Monday, Wednesday, Friday 07:00-08:00. The warm-up time is 10 minutes, the relaxation time is 10 minutes, the formal training time is 30-40 minutes, the first four weeks is 30 minutes, the 5-12 weeks is 40 minutes, the rest in the middle of the exercise to adjust the breathing rate, the training content and arrangement are shown in the following table: At the beginning and end of each Tai Chi exercise, the RPE score of the individual's feelings was recorded. The Borg RPE is between 9 and 13 over the course of the first 4

weeks of practice and between 14 and 16 over the course of the 5 to 12 weeks of practice.

0-4 weeks:

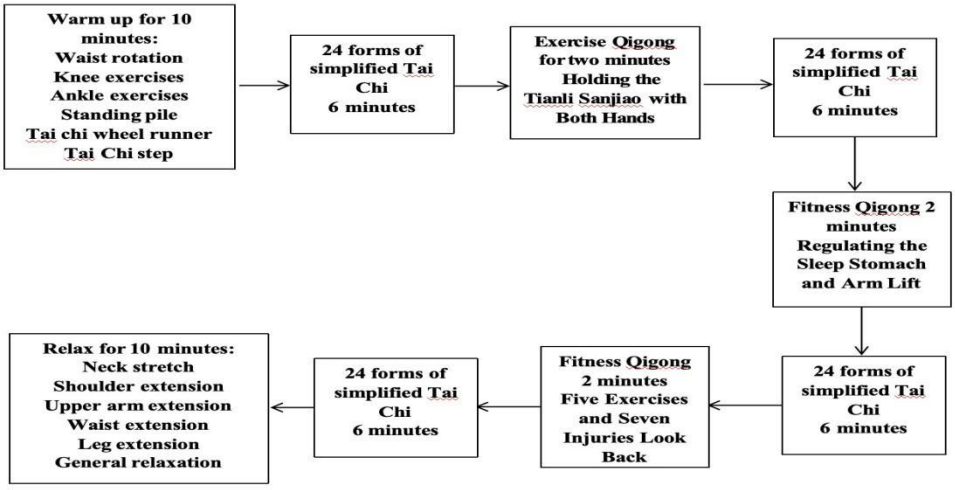

FIGURE 2 Experimental Schedule for Weeks 0-4

5-12 weeks:

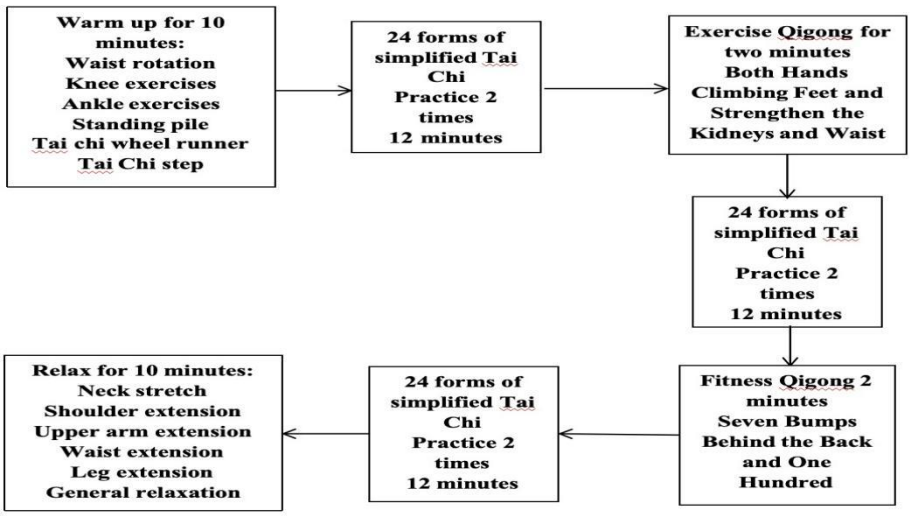

FIGURE 3 Experimental Schedule for Weeks 5-12

RPE (Rating of Perceived Exertion) is a subjective measurement method used to gauge the intensity of exercise based on an individual's perception of their effort(Zamunér et al., 2011). The scale ranges from 6 to 20, with 6 indicating "no exertion" and 20 representing "maximum exertion." Widely used in sports science and rehabilitation, RPE helps individuals adjust their exercise intensity according to their perceived effort, ensuring that the training is neither too easy nor too hard. In practices such as Tai Chi, RPE can assist practitioners in monitoring and regulating the intensity of their exercise to achieve optimal results. In the first four weeks of exercise practice, the RPE was between 9 and 13, while in the 5 to 12 weeks of practice, it was between 14 and 16.

Five experts were invited to evaluate whether the training plan of this study was in line with the Tai Chi Qigong training plan for the study. Five professors Ma Wenguo, Wang Yi, Yuan Jinbao, Liu Yaorong and Li Zhengen were the research consultants.

The scoring criteria are as follows: indicates that we disagree whether exercise training is suitable for Tai Chi Qigong, 0 indicates that we disagree whether exercise training is suitable for Tai Chi Qigong, and +1 indicates that we agree whether exercise training program is suitable for Tai Chi Qigong.

3.1.3 The exercise regimen of the control group was

The setting of the exercise program of the control group was consistent with the daily arrangement.

3.2 ethical consideration

Participants receive informed consent, protect participants' privacy, ensure data confidentiality, and sign relevant experimental safety responsibility agreements. The study has passed the ethical review, with the approval date being January 20, 2025.

3.3 Participants of the study

According to Article 2 of the Law on the Protection of the Rights and Interests of the Elderly of the People's Republic of China, the age of 60 is the starting point of the

age of the elderly, that is, citizens aged 60 and above in China are elderly, so the elderly are defined as people over 60 years old in this study.

3.4 Inclusion criteria

1. The subjects should have no hypertension, diabetes, Parkinson's disease, osteoarthritis, and no lower limb motor injury within 2 years

2. can independently complete daily activities, has not experienced systematic Tai Chi practice and other types of fitness activities, has a similar range of daily activities and physical activity

3. Good compliance, attendance rate should reach more than 80%

4. Female and age range 60- 74 years old

According to the title and research purpose of this paper, 40 people in Xi 'an elderly care community are selected as the subjects of this experiment, including 40 elderly women. A total of 40 people. In this study, qualified subjects were randomly divided into two groups with an average number, namely, the 24style Tai Chi group and the control group. All of them met the criteria for selecting subjects for the study and could ensure the smooth progress of the experiment. In addition, independent sample Ttest was used to analyze the data of subjects in the 24-style Tai Chi group and the control group before the experiment.

3.5 Exclusion criteria

In the study, participants who have chronic illnesses or conditions, or take prescribed medications or nutritional supplements that conflict with the study intervention and are unwilling to stop taking them for the duration of the study, will be excluded.

3.6 Research instrument

Height and weight measuring instrument: Used to measure the height and weight of the subject.

Blood pressure monitor： Used to test the subject's blood pressure.

CASIO HS70W stopwatch timer: It was used to record the time when the test subjects squatted against the wall, stood with one eyes open, and walked in a straight line.

Kettlebell: For the test subject to do half squat kettlebell.

Adhesive tape: Used for walking in a straight line with alternating feet.

Seat forward bend tester: used to record the maximum distance of the tester's seat forward bend.

Tape measure: Record the distance of the subject's arm extended back and measure the straight-line distance of 3 meters.

Mark rod: Used to test the time standing up and walking place the starting line 3 meters away.

Backrest chair: used to test the starting point of standing up walking preparation tools.

3.7 Research testing

3.7.1 General Physical Fitness and Muscle Strength Measures

The participants were tested for general physiological status, namely weight and height, body mass index, and blood pressure—both systolic and diastolic (Mercury sphygmomanometer, and stethoscope).

3.7.2 The muscle strength testing

3.7.2.1 Wall Squat Test Protocol(Wang, 2015):

Objective: Record the maximum duration.

Action Description: Stand with your back against the wall and your feet shoulder-width apart. Squat down until your knees form a 90-degree angle. Hold the position until you can no longer maintain it. Record the duration you were able to hold the position.

3.7.2.2 Half-Squat Kettlebell Lift Test Method(Shao, 2019):

Objective: Record the maximum weight.

Action Description: Stand with your feet shoulder-width apart and hold a kettlebell at chest height. Perform a half-squat and then stand up, lifting the kettlebell to shoulder height. Test the maximum weight you can complete.

3.7.3 Flexibility Testing

3.7.3.1 Sit and reach test method(Rong et al., 2024):

Objective: Record the maximum distance.

Action Description: Sit on the floor with your legs extended straight in front of you. Lean forward from your hips and reach forward with your fingertips. Record the maximum distance from your fingertips to your toes.

3.7.3.2 The test method of both hands and back pulling in sitting position (Zhao, 2022):

Objective: Record the maximum distance range.

Action Description: Sit on a stool with your arms extended behind you. Try to pull your hands as far back as possible and record the maximum distance range between your palms.

3.7.4 Balance testing

3.7.4.1 Single leg stand

The test method of standing with one/two feet open eyes(Zeng, 2017):

Objective: Record the maximum duration.

Action Description: Stand with feet together or on one foot, with eyes open. Maintain balance and record the duration you can hold the position.

3.7.4.2 Time up and go in a straight line with alternating feet(Liu, 2022):

Objective: Record the completion time.

Action Description: Stand up from a chair with a backrest, walk forward 3 meters, turn around and return to the chair to sit down. Record the time taken for the entire process.

3.8 Data analysis

The scores of various tests before and after the experiment were screened, sorted out and recorded, and all the collected data were statistically analyzed with

SPSS21.0. Independent sample T-test was used to compare the scores of the two groups of elderly people before and after the experiment. Independent t test: between groups after 12 weeks and Paired sample t test: with in group pretest post test and P-VALUE< 0.05 indicating significant difference. Charts were added and text analysis was performed.

CHAPTER 4
FINDINGS

4.1 Basic information of the research object

TABLE 1 Basic information of the research object (X±S)

Group	N	Age(years)	Height(M)	Weight(Kg)
Experimental group	20	67.05±2.1	1.54±0.03	54.9±2.4
Control group	20	66.02±2.5	1.55±0.04	55.1±2.6

The table presents the baseline characteristics of participants in both the experimental and control groups prior to the intervention. The data indicate that the physical attributes of individuals in the two groups are generally comparable, with no significant differences observed (P-VALUE>0.05). This suggests that the random selection process was effective in ensuring group equivalence at the outset of the study.

4.2 Comparison of Pre and PostIntervention

Statistical analysis of BMI and blood pressure changes in the experimental group and the control group

TABLE 2 Comparison of BMI and Blood Pressure Indicators Between the Experimental and Control Groups Before and After the Intervention ($\bar{x} \pm s$)

Group	Time	BMI （kg/m^2）	Systolic blood pressure （mmHg）	diastolic blood pressure （mmHg）
Experimental group	Intervention for 0 weeks	24.8 ± 1.1	126.4 ± 5.8	78.2 ± 4.9

TABLE 2 (Continued)

Group	Time	BMI （kg/m²）	Systolic blood pressure （mmHg）	diastolic blood pressure （mmHg）
Experimental group	Intervention for 12 weeks	23.6 ± 1.0#*	118.2 ± 5.1#*	72.6 ± 4.4#*
Control group	Intervention for 0 weeks	24.7 ± 1.3	125.9 ± 6.1	77.8 ± 5.2
Control group	Intervention for 12 weeks	24.6 ± 1.2	124.8 ± 5.7	77.1 ± 5.0

In this study, the blood pressure indicators included systolic blood pressure (“high pressure”) and diastolic blood pressure (“low pressure”), which were used to reflect the pressure exerted on the blood vessels during cardiac contraction and relaxation, respectively. Blood pressure measurements in both the upper and lower limbs were kept within the normal range, with no abnormal values indicating hypertension or hypo-tension.

The results showed that after the intervention, the experimental group experienced a significant decrease in both systolic and diastolic blood pressure levels in both the upper and lower limbs, with statistically significant differences (P-VALUE< 0.05). This suggests that the intervention helps to optimize circulatory system function and reduce cardiovascular burden. Although the control group also showed a slight decrease, the changes were not statistically significant.

4.2.1 BMI Comparison Analysis

Before the intervention, the BMI of the experimental and control groups were (24.8 ± 1.1) kg/m² and (24.7 ± 1.3) kg/m², respectively, with no statistically significant difference (P > 0.05). After the intervention, the BMI of the experimental group decreased to (23.6 ± 1.0) kg/m², while the control group showed no significant change ((24.6 ± 1.2) kg/m²). The difference between the groups was statistically significant (P-VALUE< 0.05), indicating that the intervention was effective in controlling weight and improving body composition.

4.2.2 Blood Pressure Comparison Analysis

Before the intervention, the upper limb blood pressure of the experimental and control groups were (126.4 ± 5.8 / 78.2 ± 4.9) mmHg and (125.9 ± 6.1 / 77.8 ± 5.2) mmHg, respectively, with no statistically significant difference (P > 0.05). After the intervention, the u blood pressure of the experimental group decreased to (118.2 ± 5.1 / 72.6 ± 4.4) mmHg, while the control group showed no significant change ((124.8 ± 5.7 / 77.1 ± 5.0) mmHg). The difference between the groups was statistically significant (P-VALUE< 0.05), indicating that the intervention had a positive effect on cardiovascular function.

4.3 Muscle strength

4.3.1 Squatting against the wall

TABLE 3 The changes in lower extremity strength of the subjects before and after the experiment ($\bar{x}$±S)

Experiment name	Time	Experimental group(s)	Control group(s)	t	p
Squatting against the	Intervention for 0 weeks	18.700±4.868	19.100±5.210	-0.251	0.803

wall(s)	Intervention for 12 weeks	22.650±5.081#*	19.150±5.432	2.104	0.042

Intragroup Comparison: Between 0 weeks and 12 weeks of intervention, # indicates P-VALUE<0.05.

Intergroup Comparison: Between 0 weeks and 12 weeks of intervention, * indicates P-VALUE<0.05.

After 12 weeks of intervention, the experimental group showed a significant increase in wall squat time, with a significant change within the group (P-VALUE<0.05). Additionally, a significant difference was observed when compared to the control group (P-VALUE<0.05), indicating that the experimental intervention had a positive effect on squat endurance. In contrast, the control group showed no significant changes before and after the intervention (P-VALUE>0.05), suggesting that those who did not participate in the intervention maintained their baseline level of ability.

In summary, the significant improvement in wall squat ability in the experimental group demonstrates that the training intervention has a clear positive impact on lower limb endurance.

4.3.2 Half squat kettlebell

TABLE 4 The changes in lower extremity strength of the subjects before and after the experiment ($\bar{x}$±S)

Experiment name		Experimental group(1-20pound)	Control group(1-20pound)	t	p
Half squat kettlebell (lbs)	Intervention for 0 weeks	14.150±2.777	13.350±2.621	0.937	0.355
	Intervention for 12 weeks	16.550±2.892#*	13.350±2.870	3.512	0.001

Intragroup Comparison: Between 0 weeks and 12 weeks of intervention, # indicates P-VALUE<0.05.

Intergroup Comparison: Between 0 weeks and 12 weeks of intervention, * indicates P-VALUE<0.05.

The experimental group demonstrated a significant increase in strength after the intervention, with statistically significant improvements within the group (P-VALUE<0.05) and outperforming the control group, showing significant intergroup differences (P-VALUE<0.05). The control group, however, showed no significant changes (P-VALUE>0.05), suggesting that the intervention training has a positive effect on enhancing lower limb explosive power.

In summary, the experimental intervention significantly enhanced the experimental group's ability in the half-squat kettlebell lift, demonstrating the effectiveness of the training in improving lower limb explosive power.

4.4 Flexibility

4.4.1 Sit and reach

TABLE 5 The change in the flexibility of the subjects before and after the experiment (X±S)

Experiment name	Time	Experimental group(cm)	Control group(cm)	t	p
Sit and Reach(CM)	Intervention for 0 weeks	1.640±0.508	1.670±0.491	-0.19	0.85
	Intervention for 12 weeks	3.590±0.771#*	1.760±0.574	8.512	<0.001

Intragroup Comparison: Between 0 weeks and 12 weeks of intervention, # indicates P-VALUE<0.05.

Intergroup Comparison: Between 0 weeks and 12 weeks of intervention, * indicates P-VALUE<0.05.

After the intervention, the experimental group showed a significant improvement in flexibility (P-VALUE<0.05), while the control group showed minimal improvement with no statistical significance (P-VALUE>0.05). The difference between the groups after the intervention also reached a significant level (P-VALUE<0.05), indicating that the training program had a positive effect on improving trunk flexibility.

In summary, the intervention training significantly improved the trunk flexibility of the experimental group, outperforming the control group.

4.4.2 Seated hands and back pull

TABLE 6 The change in the flexibility of the subjects before and after the experiment ($\bar{x}$±S)

Experiment name	Time		Experimental group(cm)	Control group(cm)	t	p-value
Standing on one foot with eyes open(s)	Intervention for 0 weeks	Left hand up	1.205±0.128	1.200±0.141	0.117	0.907
		Right hand up	2.355±0.414	2.275±0.275	0.72	0.476
	Intervention for 12 weeks	Left hand up	3.255±0.681#*	1.255±0.343	11.734	<0.001
		Right hand up	4.395±0.744#*	2.470±0.469	9.783	<0.001

Intragroup Comparison: Between 0 weeks and 12 weeks of intervention, # indicates P-VALUE<0.05.

Intergroup Comparison: Between 0 weeks and 12 weeks of intervention, * indicates P-VALUE<0.05.

The experimental group showed a significant increase in the ability to pull with both the left and right hands after the intervention (P-VALUE<0.05), and the improvement was significantly greater compared to the control group. The control group exhibited minimal changes that did not reach statistical significance (P-VALUE>0.05), demonstrating the effectiveness of the flexibility training.

In summary, the training intervention effectively enhanced the shoulder and back flexibility of the experimental group, particularly evident in the bilateral pulling movements.

4.5 Balance

4.5.1 Standing on one foot with eyes open

TABLE 7 The changes in the balance ability of the subjects before and after the experiment ($\bar{x}$±S)

Experiment name	Time		Experimental group(s)	Control group(s)	t	P-Value
Standing on one foot with eyes open(s)	Intervention for 0 weeks	Left leg	11.500±1.701	10.950±1.877	0.971	0.338
		Right leg	12.800±2.191	13.250±2.049	-0.671	0.506
	Intervention for 12 weeks	Left leg	13.350±1.872#*	10.850±2.300	3.77	0.001
		Right leg	14.750±2.173#*	13.150±2.455	2.182	0.035

Intragroup Comparison: Between 0 weeks and 12 weeks of intervention, # indicates P-VALUE<0.05.

Intergroup Comparison: Between 0 weeks and 12 weeks of intervention, * indicates P-VALUE<0.05.

After the intervention, the experimental group showed a significant increase in the standing time for both the left and right single-leg stances (P-VALUE<0.05), demonstrating a notable enhancement in balance ability. Particularly, while the control group saw a significant decline in the right single-leg stance, the experimental group experienced an improvement, with a significant difference between the groups (P-VALUE<0.05). This indicates that the training effectively enhances lower limb balance control.

In summary, the experimental group's balance ability significantly improved, with positive effects on both left and right single-leg standing, especially pronounced in the right leg.

4.5.2.Time up and go in a straight line with alternating feet

TABLE 8 The changes in the balance ability of the subjects before and after the experiment ($\bar{x}\pm S$)

Experiment name		Experimental group(cm)	Control group(cm)	t	P-Value
Time up and go in a straight line with alternating feet (s)	Intervention for 0 weeks	5.730±1.043	5.940±1.046	-0.636	0.529
	Intervention for 12 weeks	3.240±0.911#*	5.960±0.922	-9.383	<0.001

Intragroup Comparison: Between 0 weeks and 12 weeks of intervention, # indicates P-VALUE<0.05.

Intergroup Comparison: Between 0 weeks and 12 weeks of intervention, * indicates P-VALUE<0.05.

The experimental group showed a significant reduction in the time required for the seated start, with statistical significance (P-VALUE<0.05), while the control group showed no significant changes. The difference between the groups also reached a significant level, indicating that the experimental group had a marked improvement in rising response ability and lower limb coordination speed.

In summary, the experimental training significantly enhanced the seated start ability of the experimental group, effectively promoting the development of lower limb response and coordination.

CHAPTER 5
DISCUSSION AND CONCLUSION

This study systematically examined the effects of a 12-week combined Tai Chi and Qigong training program on lower limb strength, flexibility, and balance in women aged 60-74 years. The results showed that the experimental group achieved significant improvements in Squatting against the wall, Half squat kettlebell, Sit and reach, Seated hands and back pull, Standing on one foot with eyes open and Time up and go in a straight line with alternating feet

(P-VALUE<0.01), while the control group showed no significant changes (P-VALUE>0.05). The study confirmed that Tai Chi and Qigong training significantly enhanced static and dynamic lower limb strength, joint flexibility, and both static and dynamic balance abilities in elderly women, demonstrating clear empirical effects and health promotion value.

5.1 The Impact of Tai Chi and Qigong on General Physical Fitness Measures

Before joining the project, the participants were tested for general physiological status, namely body mass index, and blood pressure—both systolic and diastolic.

5.1.1. The Impact of Tai Chi and Qigong on Body mass index

The results of this study show that after a period of combined Tai Chi and Qigong training, the BMI of elderly women in the experimental group decreased from (24.8 ± 1.1) kg/m² before the intervention to (23.6 ± 1.0) kg/m², with a statistically significant difference between groups (P-VALUE< 0.05), while the changes in the control group were not significant. This indicates that the combination of Tai Chi and Qigong training has a positive effect on regulating body weight and controlling body fat. Tai Chi, as an aerobic exercise, features slow, gentle, and continuous movements that enhance cardiopulmonary endurance and promote fat metabolism. Meanwhile, Qigong training emphasizes breathing regulation and the circulation of internal energy, playing a role in reducing sympathetic nervous system excitation and balancing hormone levels. This

“combination of movement and stillness” not only burns calories but also suppresses emotional eating, thereby promoting a reasonable decrease in BMI.

This reduction in BMI may be attributed to the continuous, low-impact, and full-body movements involved in Tai Chi and Qigong practice, which increase energy expenditure and promote fat metabolism. These exercises engage multiple muscle groups in a coordinated and sustained manner, even at low intensity, enabling prolonged activity without excessive fatigue. Izquierdo et al. (2021)highlight that such gentle and sustained aerobic activity is ideal for older adults with limited exercise tolerance, contributing to a meaningful reduction in body fat and improved weight control.

5.1.2 The Impact of Tai Chi and Qigong on Blood Pressure

The experimental results show that the upper limb blood pressure of the experimental group significantly decreased from (126.4 ± 5.8 / 78.2 ± 4.9) mmHg before the intervention to (118.2 ± 5.1 / 72.6 ± 4.4) mmHg after the intervention, with a noticeable decrease and P-VALUE< 0.05, while the control group showed no significant changes. This result indicates that the combination of Tai Chi and Qigong training can effectively reduce systolic and diastolic blood pressure in the upper limbs of elderly women. This may be closely related to the exercise mechanism emphasized in Tai Chi, which includes “breathing harmony, mental guidance, and seeking tranquility in movement.” Slow and coordinated movements combined with deep breathing help stabilize autonomic nervous function, especially by reducing sympathetic nervous excitation, thereby decreasing peripheral resistance, heart rate, and blood pressure. In addition, Qigong training enhances the ability to regulate breathing patterns, which is beneficial for improving vascular elasticity.

These findings are consistent with previous studies indicating that regular Tai Chi practice can effectively lower blood pressure in both hypertensive and normotensive older adults (Yeh et al., 2008). The slow, rhythmic breathing patterns in Tai Chi and Qigong activate the parasympathetic nervous system, leading to vasodilation and decreased heart rate. Additionally, these mind–body exercises promote vascular

elasticity and reduce peripheral resistance, both of which are critical for effective blood pressure regulation.

5.2 The Impact of Tai Chi and Qigong on Lower Limb Strength in Elderly Women

5.2.1 The Impact of Tai Chi and Qigong on Squatting against the wall

The impact of Tai Chi and Qigong training on Squatting against the wall of elderly women highlights the crucial role of this combined training in enhancing static lower limb strength. The results show that after 12 weeks of combined Tai Chi and Qigong training, the experimental group's wall squat performance significantly improved from an initial average of 18.700±4.868 seconds to 22.650±5.081 seconds, with statistical significance (P-VALUE<0.01). This improvement was markedly greater than the minimal change observed in the control group, which only saw a slight increase from 19.100±5.210 seconds to 19.150±5.432 seconds, with no significant change (P-VALUE>0.05). After systematic training, the lower limb muscle strength of the participants in the experimental group significantly increased. The knee-bending, half-squatting, and weight-shifting movements in Tai Chi and Qigong, when practiced over the long term, can effectively enhance the stability of the knee and ankle joints as well as the muscle strength of the thighs and calves. This is consistent with the research conclusion of Fuzhong et al. (2001) on the enhancement of lower limb stability through Tai Chi and Qigong. Tai Chi exercise (TCE) can significantly improve lower limb strength in the elderly, similar to the Otago Exercise Program. Both Tai Chi and Qigong and the Otago Exercise Program, when combined with traditional balance training, can effectively enhance strength and reduce the risk of falls(Ghattas et al., 2024). These findings emphasize the superiority of Tai Chi and Qigong training over traditional or unstructured training methods in improving static lower limb strength in elderly women.

Tai Chi and Qigong require practitioners to maintain a low center of gravity and knee-bending posture. These movements, through slow and stable force generation, activate and strengthen key lower limb muscle groups, including the quadriceps, hamstrings, and triceps surae. The training characteristics of Tai Chi and Qigong lie in their slow and continuous movement rhythm, which can more effectively

promote the activation of deep muscle fibers, enhancing muscle endurance and control. From a bio-mechanical perspective, the improvement in Squatting against the wall reflects enhanced neuromuscular coordination and motor unit recruitment capabilities in the elderly women of the experimental group. These adaptations are crucial for elderly women to maintain their ability to perform daily activities, as they can sustain body stability and balance for longer periods, which is vital for fall prevention. The study results also have positive implications for the health of elderly women. Strengthening the quadriceps and other leg muscles through Tai Chi and Qigong training can enhance joint stability and reduce the likelihood of falls. The improved Squatting against the wall not only contributes to better activity performance but also provides a protective mechanism against muscle strains and joint injuries. In summary, the significant improvement in Squatting against the wall observed in the experimental group underscores the efficacy of Tai Chi and Qigong training in developing static lower limb strength in elderly women. This intervention not only enhances their activity capabilities but also provides additional benefits such as fall prevention and improved quality of life. These results affirm the necessity of incorporating a structured, specific exercise strength training program like Tai Chi and Qigong into the daily exercise routine of elderly women to optimize their physical performance and health levels.

5.2.2 The Impact of Tai Chi and Qigong on Half-Squat Kettlebell Lifts

After 12 weeks of Tai Chi and Qigong training, the experimental group also showed a significant improvement in the half-squat kettlebell lift (P-VALUE<0.01). Specifically, the half-squat kettlebell lift performance of the experimental group increased significantly from an initial average of 14.150±2.777 pounds to 16.550±2.892 pounds (P-VALUE<0.01), while the control group only saw a slight increase from 13.350±2.621 pounds to 13.350±2.870 pounds, with almost no significant change (P-VALUE>0.05). Long-term Tai Chi and Qigong training can significantly increase lower limb muscle strength in middle-aged and elderly people, improving jump height, peak strength of the knee and ankle joints, and overall lower limb performance, thereby helping to slow age-related functional decline and prevent falls(Huang, 2022).

These exercises continuously engage major muscle groups including the quadriceps, gluteus maximus, and core muscles. Regular activation of these muscles leads to increased muscle mass and enhanced motor unit recruitment. This phenomenon aligns with the principle of progressive overload, which asserts that progressive increases in physical demand stimulate muscular adaptation and strength development(Chaves et al., 2024). Thus, the significant gains in lower limb power observed in this study reflect a structured training effect consistent with sports science fundamentals.

In Tai Chi and Qigong practice, this directly activates and strengthens the lower limb muscle groups, especially the quadriceps, gluteus maximus, hamstrings, and triceps surae(Penn et al., 2019). Tai Chi and Qigong require a stable upper body, further exercising the coordinated force generation of the core and lower limbs(Zhang, 2022). It is evident that Tai Chi and Qigong training not only enhances static lower limb strength in elderly women but also significantly improves dynamic strength and explosive power in the lower limbs. Many movements in Tai Chi and Qigong involve rapid force generation and control in the lower limbs. By mimicking offensive and defensive transitions in combat, these movements require practitioners to quickly mobilize leg muscle strength while maintaining body stability. In this study, Tai Chi and Qigong training increased the leg muscle strength of elderly women. As the intensity of muscle movement increases, the recruitment of motor units and neural impulses also increase, leading to enhanced muscle strength. The increase in lower limb muscle strength is closely related to the muscle morphological and neuromuscular functional improvements caused by Tai Chi and Qigong training. Studies have shown that strength training can stimulate muscles, increasing the cross-sectional area of muscle fibers, providing a greater basis for muscle contraction. At the same time, its multi-muscle training pattern can improve the recruitment and coordinated contraction of muscles, promoting inter- and intra-muscular coordination, which helps to exert greater muscle strength. The results of this study confirm that Tai Chi and Qigong training not only enhance the strength of the quadriceps and other lower limb extensor muscles but also

comprehensively improve the strength performance of other lower limb muscles, making the lower limb strength of elderly women more balanced and coordinated. In summary, Tai Chi and Qigong have a significant effect on enhancing lower limb strength in elderly women, particularly in static strength and explosive power. Through slow and continuous movements, Tai Chi and Qigong effectively activate key lower limb muscle groups, enhancing muscle endurance and control. Qigong breathing exercises further improve muscle oxygen supply efficiency, delay fatigue, and enhance strength performance. Despite individual differences, the overall training effects are significant, providing a scientific basis for improving mobility and quality of life in the elderly. Future research can optimize training programs and explore personalized training models to meet the needs of different elderly groups.

5.3 The Impact of Tai Chi and Qigong on the Flexibility of Elderly Women

5.3.1 The Impact of Tai Chi and Qigong on Sit-and-Reach Performance

This study emphasizes the critical role of targeted Tai Chi and Qigong training in enhancing the flexibility of elderly women. The results show that after 12 weeks of combined Tai Chi and Qigong training, the sit-and-reach performance of the experimental group improved significantly from an initial 1.640±0.508 cm to 3.590±0.771 cm, with a statistically significant difference (P-VALUE<0.01). This improvement was much more pronounced than the modest gain observed in the control group, which only increased slightly from 1.670±0.491 cm to 1.760±0.574 cm, with no significant change (P-VALUE>0.05). Elderly women who practiced Tai Chi and Qigong experienced notable improvements in flexibility, including a 22.6% increase in hip flexion, a 17.5% increase in plantar flexion, and enhanced range of motion in the pelvis, hip, and ankle joints(Zou et al., 2017). These findings highlight the superiority of Tai Chi and Qigong training compared to traditional methods in improving the flexibility of elderly women.

Tai Chi and Qigong involve extensive stretching and rotation of the lower limbs and waist. Through slow and steady exertion, these practices promote joint mobility and muscle extensibility. From a biomechanical perspective, the improvement in sit-and-reach performance reflects an increase in the flexibility of the hips, lumbar

spine, and related muscles in the elderly women of the experimental group. These adaptations are crucial for maintaining daily activity capabilities in elderly women, as they can reduce stiffness, enhance movement flexibility, and lower the risk of injury. The modest improvement in the control group further underscores the effectiveness of Tai Chi and Qigong training. Traditional training programs often lack the comprehensive stretching and body coordination focus provided by Tai Chi and Qigong, resulting in less noticeable benefits. This difference highlights the value of incorporating Tai Chi and Qigong into the daily exercise routines of elderly women. As a low-impact, full-body exercise, Tai Chi and Qigong have a positive impact on the health of elderly women. Through Tai Chi and Qigong training, the muscles and connective tissues of elderly women become softer and more elastic, which helps to alleviate joint pressure, reduce pain, and improve overall comfort. In summary, the significant improvement in sit-and-reach performance observed in the experimental group highlights the efficacy of Tai Chi and Qigong training in developing the flexibility of elderly women, which is vital for their daily lives.

The significant gains in flexibility observed in this study are supported by Zou et al. (2017), who found that Tai Chi training improved hip flexion, plantar flexion, and range of motion in elderly adults. The slow and sustained stretching inherent in Tai Chi and Qigong promotes connective tissue adaptation and reduces joint stiffness. These biomechanical changes facilitate improved mobility and help older individuals maintain functional independence.

5.3.2 The influence of Tai Chi and Qigong on the Seated hands and back pull

After 12 weeks of Tai Chi and Qigong training, the experimental group also showed significant improvements in Seated hands and back pull. The performance with the left hand on top increased from an initial 1.205±0.128 cm to 3.255±0.681 cm (P-VALUE<0.01), and the performance with the right hand on top increased from 2.355±0.414 cm to 4.395±0.744 cm (P-VALUE<0.01). In contrast, the changes in the control group were not significant (P-VALUE>0.05). The flexibility training in Tai Chi and Qigong is not static stretching but involves dynamic, slow, and controlled stretching of

muscles and joints. This training method is more in line with the demands of actual movement and is highly effective in enhancing body flexibility and coordination. Moreover, the deep breathing and mental regulation in Qigong can reduce muscle tension, making muscles and ligaments more relaxed and elastic.the improvements in flexibility in the experimental group of this study were significantly better than those in the control group.

Tai Chi and Qigong involve extensive stretching and rotation of the shoulders, back, and upper limbs. Through slow and steady exertion, these practices promote joint mobility and muscle extensibility. In this study, Tai Chi and Qigong training enhanced the flexibility of the shoulders, back, and upper limbs in elderly women. The movements in Tai Chi and Qigong often follow arc-shaped and spiral trajectories, emphasizing three-dimensional movements such as "opening and closing, bending and stretching, and rotating." These movements help to increase the range of motion in multiple joints, especially the shoulders and spine. In summary, Tai Chi and Qigong have a significant effect on improving the flexibility of elderly women, particularly in indicators such as sit-and-reach and Seated hands and back pull. Through slow and continuous movements, Tai Chi and Qigong effectively promote joint mobility and muscle extensibility, enhancing overall flexibility and coordination. The breathing exercises in Qigong further help to relax muscles and improve flexibility. Despite individual differences, the overall training effects are significant, providing scientific evidence for improving the mobility and quality of life of the elderly. Future research can optimize training programs and explore personalized training models to meet the needs of different elderly groups.

5.4 The Impact of Tai Chi and Qigong on the Balance of Elderly Women

5.4.1 The Impact of Tai Chi and Qigong on Single-Leg Standing with Eyes Open

The impact of Tai Chi and Qigong training on the single-leg standing performance with eyes open in elderly women highlights the critical role of these practices in enhancing balance capabilities. The results indicate that after 12 weeks of

combined Tai Chi and Qigong training, the experimental group's left single-leg standing time increased from an initial 11.500±1.701 seconds to 13.350±1.872 seconds (P-VALUE<0.01), and the right single-leg standing time increased from 12.800±2.191 seconds to 14.750±2.173 seconds (P-VALUE<0.01). In contrast, the changes in the control group were not significant (P-VALUE>0.05). Tai Chi and Qigong can significantly improve balance in the elderly, as evidenced by enhanced vestibular function, muscle strength, agility, and coordination. Regular practice of Tai Chi and Qigong can effectively maintain and delay the decline in balance capabilities in the elderly(Xiao, 2006). After 12 weeks of practice, the duration of the single-leg standing test increased by 61.0%, indicating that Tai Chi and Qigong significantly improved balance control in postmenopausal women prone to falls, highlighting the effectiveness of these practices as regulatory exercises for enhancing balance in the elderly(Bai et al., 2024). These findings emphasize the superiority of Tai Chi and Qigong training compared to traditional methods in improving balance in elderly women.

Tai Chi and Qigong involve single-leg support and fine adjustments of the body's center of gravity. Through slow and steady exertion, these practices promote continuous activation of the core muscles, enhancing stability in the lower limbs and overall balance control. From a bio-mechanical perspective, the improvement in single-leg standing performance reflects enhancements in the vestibular system function, proprioception, and neuromuscular control in the elderly women of the experimental group. These adaptations are crucial for preventing falls and maintaining mobility in elderly women. The modest improvements in the control group further underscore the effectiveness of Tai Chi and Qigong training. Emphasizing "stability in movement," Tai Chi and Qigong require continuous activation of the core muscles during transitions, which not only strengthens the lower limbs but also improves overall stability and coordination. In summary, the significant improvement in single-leg standing performance observed in the experimental group highlights the important role of Tai Chi and Qigong training in enhancing balance capabilities in elderly women.

5.4.2 The Impact of Tai Chi and Qigong on time up and go

The impact of Tai Chi and Qigong training on time up and go in elderly women is also significant. The results show that after 12 weeks of combined Tai Chi and Qigong training, the experimental group's time up and go significantly improved from an initial 5.730±1.043 seconds to 3.240±0.911 seconds (P-VALUE<0.01). In contrast, the control group only experienced a slight increase from 5.940±1.046 seconds to 5.960±0.922 seconds, with no significant change (P-VALUE>0.05). Tai Chi and Qigong coordinate various body parts and regulate movement, thereby enhancing balance, promoting muscle and fascia equilibrium, optimizing force transmission, and cultivating internal strength(Ong, 2022).The improvement in balance is primarily attributed to the "stability in movement" emphasized by Tai Chi and Qigong. During the movements, the core muscles, especially the transverse abdominis, multifidus, and pelvic floor muscles, are continuously activated to stabilize the pelvis and trunk (He, 2007). This result indicates that Tai Chi and Qigong training can significantly enhance dynamic balance capabilities in elderly women. Tai Chi and Qigong involve rapid shifts in the body's center of gravity and changes in footwork. Through slow and steady exertion, these practices promote continuous activation of the core muscles, enhancing dynamic balance control. From a bio-mechanical perspective, the improvement in time up and go reflects the experimental group's enhanced ability to control their body and transition between sitting and standing positions. These capabilities are crucial for maintaining independence and preventing falls in daily life. The results are consistent with previous studies, which indicate that Tai Chi and Qigong can significantly improve balance in the elderly by enhancing their vestibular function, muscle strength, agility, and coordination. Regular practice of Tai Chi and Qigong can effectively maintain and delay the decline in balance capabilities in the elderly. In summary, Tai Chi and Qigong training significantly improves dynamic balance capabilities in elderly women by strengthening core muscles and enhancing neuromuscular coordination. This improvement is vital for preventing falls and enhancing quality of life. Tai Chi and Qigong have a significant impact on enhancing balance capabilities in elderly women, showing marked improvements in

both static and dynamic balance. Through slow and continuous movements, these practices effectively activate core and lower limb muscles, enhancing stability and coordination. Qigong breathing exercises further help regulate breathing rhythms and improve muscle control. Despite individual differences, the overall training effects are significant, providing scientific evidence for improving mobility and quality of life in the elderly. Future research can optimize training programs and explore personalized training models to meet the needs of different elderly groups.

Tai Chi and Qigong, as traditional Chinese exercises with a long history, not only embody rich cultural connotations but also demonstrate significant practical value in modern health promotion. This study clearly shows that Tai Chi and Qigong have significant effects on enhancing lower limb strength, flexibility, and balance capabilities in elderly women. These practices not only improve physical fitness but also enhance self-care abilities and safety in daily life. The slow, continuous, and gentle yet firm movements effectively activate deep muscles and the core control system. Through breathing regulation and mental guidance, they promote coordinated functioning of the neuromuscular system. Particularly in preventing falls, improving posture control, and delaying physical decline, Tai Chi and Qigong exhibit unique and lasting effects. These practices do not rely on high-intensity equipment and are suitable for widespread promotion among middle-aged and elderly groups. They are safe, low-impact, and highly effective health interventions. In the future, Tai Chi and Qigong have broad prospects and practical space in fields such as healthy aging, rehabilitation therapy, and community health promotion. They are valuable forms of exercise that integrate physical and mental well-being and are worth persisting with over the long term. The improvements in dynamic balance performance seen in this study are consistent with previous research. According to Peng et al. (2023), Tai Chi’s mindful, weight-shifting movements improve proprioception and neuromuscular coordination, which are vital for postural control. These effects enhance the body's ability to respond effectively to external challenges, reducing fall risk and improving functional mobility in older adults.

5.5 Conclusions

5.5.1. Enhanced Lower Limb Muscle Strength

Tai Chi combined with Qigong training significantly enhances the strength of the major muscle groups in the lower limbs of elderly women, including the thighs, knees, and calves. This improvement translates to better performance in basic activities such as walking, standing up, and sitting down. Compared to the control group, the experimental group showed a much greater increase in Squatting against the wall and Half squat kettlebell (P-VALUE<0.05).

5.5.2. Improved Flexibility

The coordination of movements with breathing control enhances joint mobility and muscle extensibility, preventing muscle stiffness and reducing the risk of sports injuries. Compared to the control group, the experimental group demonstrated significantly greater improvements in Sit and reach and Seated hands and back pull (P-VALUE<0.05).

5.5.3. Enhanced Balance Ability

Balance control ability was significantly improved, reducing the risk of falls and enhancing self-care capabilities, thereby delaying functional decline. Compared to the control group, the experimental group showed much greater improvements in Standing on one foot with eyes open and Time up and go (P-VALUE<0.05).

5.6 Recommendations

1. Widespread Promotion: Promote the Tai Chi and Qigong training program extensively in nursing homes, community rehabilitation centers, and other relevant institutions to improve the physical functions of the elderly.

2. Professional Guidance: Equip qualified Tai Chi and Qigong instructors to avoid injuries caused by incorrect movements.

3. Personalized Training Programs: Develop training intensity and frequency tailored to individuals with different health conditions to ensure safety.

5.7 For Future Research

1. Increase Sample Size and Regional Diversity: Incorporate samples from multiple locations and institutions to enhance the universality and reliability of the results.

2. Extend the Intervention Period: Explore the long-term health benefits of half-yearly and annual training programs.

3. Comprehensive Psychological and Physiological Assessment: Incorporate psychological measurement tools (such as GAD-7, SF-36, etc.) to assess changes in mental health.

4. Experimental Design with Separate Groups: Set up separate control groups for "Tai Chi only" and "Qigong only" to compare the differences in intervention effects and clarify their respective contributions.

In summary, this study confirms that the combined training of "Tai Chi + Qigong" significantly enhances lower limb muscle strength, flexibility, and balance in elderly women, effectively improving quality of life and self-care abilities. Future efforts to continuously optimize training programs and expand the scope of research are expected to provide scientific evidence for the "healthy aging" strategy.

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APPENDIX

APPENDIX A

Tai Chi

TAICHI

Qigong:

1.It seems there might be a misunderstanding in your request, as you've already provided the English translations for the movements of the 24Style Simplified Tai Chi Chuan. However, I'll reiterate them for confirmation:

1. Starting Posture
2. Parting the Wild Horse's Mane
3. White Crane Spreads Its Wings
4. Brush Knee and Twist Step
5. Wave Hands Like Clouds
6. Withdraw Step, Roll Back
7. Grasp the Bird's Tail on the Left
8. Grasp the Bird's Tail on the Right
9. Single Whip
10. Cloud Hands
11. Single Whip (Repeated)
12. High Pat on Horse
13. Kick with Right Heel
14. Hit the Ears with Both Fists
15. Turn and Kick with Left Heel
16. Left Parting and Independent Posture
17. Right Parting and Independent Posture
18. Shuttles to the Left and Right
19. Needle at Sea Bottom
20. Flash Through the Back
21. Turn and Move the Barrier
22. Seal and Close
23. Cross Hands
24. Closing Posture

These names are part of the standardized sequence of the 24Style Simplified Tai Chi Chuan, which is a modern, simplified version of the traditional Chinese martial art of Tai Chi Chuan.

2.It appears there's been a misunderstanding in your request, as you've already provided the English translations for the movements of Baduanjin (Eight Section Brocade). However, I'll reiterate them for confirmation:

1. Hands Hold Up to Regulate the Three Burners
2. LeftRight BowHolding and ArrowShooting
3. Regulating the Middle Burner with a Single Lift
4. Gazing Back to Heal the Five Exhaustions and Seven Injuries
5. Shaking the Head and Wiggling the Tail to Clear Heart Fire
6. Grasping the Feet with Hands to Strengthen the Kidneys and Waist
7. Clenching Fists and Widening the Eyes to Boost Qi and Strength
8. Seven Uprootings Behind to Dispel All Diseases

RPE

RPE, or Rating of Perceived Exertion, is a subjective measurement method used to assess the intensity of exercise based on how hard one feels they are working. It was developed by Swedish psychologist Gunnar Borg in the 1982s. The Borg RPE scale ranges from 6 to 20, with 6 representing "no exertion" and 20 representing "maximum exertion." By linking perceived exertion to heart rate, it provides an easytounderstand and practical way to evaluate the level of effort during physical activity. The RPE scale is widely used in sports science and rehabilitation to regulate exercise intensity and is particularly useful for tailoring exercise plans to individual fitness levels, ensuring that the training is neither too easy nor too difficult.

The main advantage of RPE is its simplicity and ease of use without the need for equipment, taking into account the different physiological states of individuals, and helping individuals better understand their body's response to exercise. This allows for better control and adjustment of exercise intensity, thereby improving the effectiveness of exercise. When using RPE, older adults can judge the intensity of exercise based on their own feelings, rather than relying solely on objective physiological indicators. This method can be applied to various forms of exercise, including aerobic exercise, strength training, and flexibility training.

It is important to note that RPE is subjective, but it is a reliable indicator when used consistently by the same individual, especially when correlated with physiological indicators such as heart rate. By integrating the RPE scale into a training program, individuals can better manage their exercise intensity, promoting more effective and safer exercise tailored to their fitness levels and goals.During Tai Chi practice, older adults can use RPE to assess their level of exertion to ensure that the exercise intensity is suitable for their physical capacity.

APPENDIX B

THE ETHICAL REVIEW FORM

The ethical review form and the date of approval.

Xiamen Institute of Technology Human Research Ethics Committee Approval Certificate

Serial number:XIT-2024SS1126001

Project title	Effects of Tai Chi combined with Qi gong exercise training on lower limb muscle strength, flexibility and balance in elderly women		
Project Source	No have		
Project Leader	Li Ke	College	Faculty of Physical Education at srinakharinwirot University
Review Category	☐ Apply for animal experiment ☐ Apply for scientific research project ☑ Human movement experiment		

(The main research content and design of the human research ethics experimental plan, including the purpose of the experiment, experimental methods, observation indicators, post-experimental tests, etc.)

Overview:This study can provide a scientific basis for the Tai Chi practice of the elderly, help the elderly choose more effective training methods, improve physical functions, and thus gain better self-care ability and quality of life in daily life.

Ethical Target:40 elderly women aged 60-74 in nursing homes in Xi'an, Shaanxi Province

Experimental:Before the experiment begins, the selected subjects are all voluntary participants, understand the experimental process, ensure that they are fully informed and respect their wishes; inquire and investigate the health status of the subjects to determine the psychological health of the subjects. All subjects have not been subject to any type of threats, coercion, or inducement. The grouping process of the subjects is objective and random. The applicant and relevant researchers have accumulated rich experimental experience in the early stage, and will strictly protect personal privacy and prevent the leakage of relevant information.

The applicant (project leader) promises:

All the contents filled in above are true, if approved, I will carry out the research in strict accordance with the provided program and comply with the ethical code of scientific research and experimentation and related regulations, and voluntarily accept the supervision and inspection by the Academic Committee of the university, and voluntarily accept the corresponding penalties in case of violation of the regulations

Signature of applicant (project leader): Date:November 16, 2024

Review opinions of the College Academic Committee:

After review by the College's Academic Senate, the project's design specifications, research content and process are in line with the ethical requirements for scientific research experiments promulgated by the state, And abide by the international Declaration of Helsinki, and it is agreed that the project will be implemented as planned

Academic Committee (Seal)

Date:November 26, 2024

Review Opinions of the Academic Committee of the University:

1、Applicant eligibility: ☑Meet the requirements ☐Does not meet requirements

2、Experimental methods: ☑appropriate ☐Inappropriate

3、Review conclusion: ☑agree ☐Discuss after modification ☐disagree

Academic Committee (Seal)

Date:November 26, 2024

APPENDIX C

Experimental testing

Experimental testing

1. Wall Squat Test Protocol （Wang, B. 2015).

Test Equipment:

Stopwatch

Test Objective:

Maximum duration of wall squat

Test Procedure:

Preparation :

Ensure the test area is free of obstacles and has sufficient space.

Participants should wear appropriate athletic clothing and shoes.

Positioning :

Participants stand with their back against a vertical wall.

Feet are positioned parallel and shoulder-width apart, toes slightly turned outward.

Distance from the wall is approximately 40–50 cm.

Action Description :

Participants slowly squat down until their knees and hips form a 90-degree angle.

Thighs should be parallel to the ground, and shins perpendicular to the ground.

Knees should not extend beyond the toes.

The back must remain in contact with the wall throughout the squat.

Arms can be placed naturally at the sides or crossed over the chest to maintain balance.

Starting the Test :

The tester starts the stopwatch as the participant assumes the squat position.

Duration :

The participant holds the squat position for as long as possible.

Test Termination :

The test ends when the participant can no longer maintain the correct posture or when the knees start to extend beyond the toes.

Recording Results :

The total duration of the squat position is recorded.

Safety Considerations :

If the participant experiences pain or discomfort during the test, the test should be immediately terminated.

Wall squats are a common static strength training method, primarily targeting the lower limb muscle groups, especially the quadriceps, gluteus maximus, and hamstrings. The key points of the movement are as follows: Stand with your back against a wall, feet shoulder-width apart and extended forward by a certain distance, then slowly squat down until your thighs are parallel to the ground and your knees form a 90-degree angle, maintaining this position for a period of time. During the training, keep your back tightly against the wall, ensure that your knees do not extend beyond your toes, and let your arms hang naturally by your sides or cross them in front of your chest. Wall squats require no equipment, are suitable for indoor practice, and can effectively enhance lower limb muscle endurance and stability. They also play a positive role in strengthening joint control and preventing sports injuries.

2. Half-Squat Kettlebell Lift Test Method (Shao, W. 2019).

Test Equipment:

Kettlebells ranging from 1 to 20 pounds, with increments of 1 pound, totaling 20 kettlebells.

Test Objective:

Maximum weight for half-squat kettlebell lift.

Test Procedure:

Participants sequentially attempt the maximum weight they can lift with standard form, and the final weight successfully lifted is recorded.

Action Description:

Participants stand naturally with feet shoulder-width apart, toes slightly turned outward by about 15 degrees, and weight evenly distributed between both feet. They grip the kettlebell handle with both hands, positioning the kettlebell in front of the body along the midline, close to the inner thighs, with elbows naturally extended. Before starting the movement, participants stand upright with chest out and abdomen drawn in, scapulae retracted and depressed, spine in a neutral position, and gaze forward. To begin, participants simultaneously flex their hips and knees to enter a half-squat position, with thighs forming an angle of approximately 45 to 60 degrees with the ground, maintaining a stable torso without leaning forward or collapsing the lower back. After reaching the designated angle, participants quickly stand up using the power from their lower limbs, simultaneously using the hip extension to lift the kettlebell upward until it reaches chest or shoulder height (depending on the training objective), with elbows slightly bent and maintaining control of the kettlebell. Throughout the movement, core stability should be maintained to avoid lateral trunk deviation or knee valgus. After completing one full repetition, participants slowly lower the kettlebell back to the starting position, ready for the next repetition.

Test Start:

The tester signals the start, and participants sequentially attempt the maximum weight they can lift with proper form. The final weight successfully lifted is recorded, with a focus on maintaining standard movement.

Test Termination:

The test ends when the participant can no longer maintain proper form or complete the half-squat kettlebell lift.

Recording Results:

The maximum weight of the half-squat kettlebell lift completed by the participant is recorded.

Safety Guidance:

Ensure participants have mastered the correct technique to avoid injuries to the back and knees. During the test, closely monitor the participants to ensure proper form and safety.

Recovery Phase:

After the test, participants should engage in appropriate stretching and relaxation to aid muscle recovery.

The kettlebell half squat press is a compound exercise that combines lower body strength with upper body explosive power, targeting the leg, gluteal, core, and shoulder muscle groups. To begin the movement, stand with your feet shoulder-width apart and hold the kettlebell at shoulder level with both hands or one hand. Then, perform a half squat by bending the knees to approximately 90 degrees and sitting back with the hips while maintaining a straight back and engaged core. Next, quickly stand up using the power from the legs and simultaneously press the kettlebell overhead with a straight arm,

completing an explosive pushing motion. The kettlebell half squat press can effectively enhance overall body coordination, power transfer, and full-body explosiveness, and is widely used in physical training and competitive sports. During the training, it is important to control the movement, avoid arching the back or caving the knees inward, to ensure safety and effectiveness of the exercise.

3. Sit and reach test method of seated forward flexion is (Rong, A., Xu, X., & Zhang, L. 2024):

Testing instrument: seat forward bending tester

Test objective: The maximum distance the seated body bends forward

Preparation: Make sure the test area is flat and free of obstacles. Test subjects should wear comfortable sports clothing and shoes.

Sitting position: The subject sits on the floor with legs straight and together, heels together and toes pointed up. Arm extension: The subject's arms are straight, parallel to the floor, palms down.

Forward bend: The subject leans forward while keeping his arms straight and tries to touch the tip of his foot or the floor with his fingertips or palms.

Record the initial position: Before starting, record the maximum that the subject can reach without touching the tip of the foot.

Test start: the tester sends a start signal, and the subject starts the forward bending motion.

Record maximum reach: When the subject reaches the maximum reach, record the distance between the tip of the finger and the tip of the foot.

End of test: The test ends when the subject is unable to reach further or feels uncomfortable.

Record the result:

Record the maximum reach of the subject, in centimeters.

Safety precautions: The test subject should avoid rapid or violent forward bending movements during the test to reduce the risk of muscle strain.

Repeat testing: In order to improve the accuracy of the test, you can conduct 23 tests and record the average value.

Posttest relaxation: After the test, the subject should slowly return to the starting position and perform appropriate stretching and relaxation.

The seated forward bend is a commonly used test and training movement for assessing the flexibility of the lumbar and posterior leg muscle groups, especially the extensor muscles of the spine and the hamstrings. The process of the movement is as follows: The subject sits on the ground with legs extended and together, toes pointing upwards, upper body kept straight, and arms naturally extended forward. Then, the subject slowly bends forward, with hands sliding forward as far as possible, while keeping the knee joints straight and not bent, to achieve the maximum forward bend distance. In physical testing, flexibility levels are usually assessed by measuring the

distance from the fingers to the toes or the length by which the fingers extend beyond the toes. This movement is simple and easy to perform, suitable for students, athletes, and the general population. Regular practice can effectively improve trunk flexibility, prevent lower back pain, and enhance overall physical performance. During training, one should avoid using excessive force and maintain a slow, even forward bend to prevent strains.

4. The test method of both hands and back pulling in sitting position is (Zhao, X. 2022):

Measuring instrument: tape measure

Test objective: sitting posture with hands behind each other in the middle hands

Preparation phase: Ensure that the test area is flat and free of obstacles, and that there is enough space for testing.

Sitting position: The subject sits on the floor or a mat with legs straight and together and heels on the ground.

Arm position: The subject's arms are extended towards the back, palms facing each other.

Interpull: The subject main Tains the position of the previous step and tries to pull the hands behind the back while keeping the back straight.

Record maximum range: record the subject's palm

End of test: The test ends when the subject feels a slight stretching sensation or is unable to move the arm further back.

Record the result: record the subject's palm.

Safety precautions: The tested person should avoid exerting too much force to avoid muscle or ligament damage.

Repeat testing: In order to improve the accuracy of the test, you can conduct 23 tests and record the best results.

Posttest relaxation: After the test, the subject should slowly relax the arm and perform appropriate shoulder and back stretches.

5.Single leg stand

The test method of standing with one/two feet open eyes is (Zeng, Q. (2017).:

Test instrument: stopwatch

Test objective: Maximum time spent standing with eyes open on one or both feet

Preparation position: The subject stands on a flat ground, feet together, hands naturally hanging down or choose one foot as a support foot, the other foot slightly raised, about 510 cm from the ground.

To begin the test, subjects open their eyes and choose a fixed point to look at. The timer starts.

Record time: subject only Record how long the subjects were able to main Tain balance.

Repeated tests: You can average multiple tests.

The behind-the-back bilateral stretch is a common flexibility exercise that primarily targets the shoulder joints, pectoralis major, latissimus dorsi, and triceps brachii, enhancing upper limb flexibility and shoulder range of motion. The key points of the movement are as follows: One hand reaches down from behind the head to the middle of the back, while the other hand reaches up from the waist area, attempting to clasp or bring the hands as close together as possible behind the back, while maintaining an upright posture without bending or leaning to the side. The exercise should be performed alternately with the left and right hands. This movement is often used for warm-ups, stretching, or flexibility assessment in physical tests, effectively relieving shoulder and back tension, preventing periarthritis of the shoulder, and improving posture. During the exercise, it should be performed slowly to avoid forceful pulling. Beginners can use auxiliary tools such as towels to gradually increase the range of motion and prevent strains.

6. Time up and go in a straight line with alternating feet (Liu, H. 2022).:

Test instruments: backrest chair, marker rod, stopwatch, colored tape, tape measure.

Test goal: speed in a straight line.

Preparation position: The subject is seated in a backrest chair at the beginning of a straight line, with the body resting on the back of the chair and the hands resting naturally above the thighs, facing the straight line.

Start the test: the tester sends the start signal, the patient stands up from the backrest chair, walks forward at a normal pace, walks 3 meters away, turns back to the chair and sits down, the tester uses a stopwatch to record the whole process time. The unit of record is second.

Record time: Record the time required for the subject to complete the walk. When the subject reaches the end point, the test ends.

Repeated testing: In order to improve the accuracy of the test, multiple tests can be conducted and the average time or number of errors can be recorded.

The Time Up and Go in a straight line with alternating feet test is a commonly used comprehensive movement for assessing lower limb muscle strength, dynamic

balance, and functional mobility, particularly suitable for testing and training the physical functions of the elderly. The procedure is as follows: The subject begins in a seated position on a chair, and upon hearing the command, quickly stands up, walks in a straight line to a designated point, turns around, and walks back to sit down again. The entire process should be completed as quickly as possible while maintaining stability and coordination. This test reflects an individual's reaction speed and balance control in daily activities such as standing up, walking, and turning. During practice or testing, ensure a safe environment to prevent slipping, and if necessary, have an assistant nearby for protection. Regular practice can effectively improve physical flexibility, muscle strength, and fall prevention capabilities.

VITA