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## Clinical Review Article

# Qigong for the Prevention, Treatment, and Rehabilitation of COVID-19 Infection in Older Adults

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## ARTICLE INFO

## Article history:

Received April, 24 2020

Revised May, 6 2020

Accepted May, 10 2020

## Keywords:

Qigong

COVID-19

respiratory infections

older adults

## ABSTRACT

*The elderly are at high risk of contracting respiratory infectious diseases, including COVID-19 infection. The recent pandemic has the potential to cause significant physical and mental damage in older adults. Similarly to other mind-body exercises in Traditional Chinese medicine, Qigong features regulation of breath rhythm and pattern, body movement and posture, and meditation. Given these traits, Qigong has the potential to play a role in the prevention, treatment, and rehabilitation of respiratory infections, such as COVID-19. Potential mechanisms of action include stress reduction, emotion regulation, strengthening of respiratory muscles, reduction of inflammation, and enhanced immune function. Three forms of Qigong; abdominal breathing, Ba Duan Jin and Liu Zi Jue, all of which are gentle, smooth, and simple for the elderly to practice, are recommended in this context. (Am J Geriatr Psychiatry 2020; ■■■:■■■-■■■)*

## INTRODUCTION

The outbreak of coronavirus disease 2019 (COVID-19), that was first reported by local health facilities in Wuhan, China, in December 2019, has rapidly spread throughout the world. Older people and patients with existing medical conditions are prone to have severe complications associated with Covid-19 infection.<sup>1</sup>

Clinical practitioners and researchers are working to find effective treatments for COVID-19, and complementary and alternative medicine may be a feasible and valuable option. In China, Traditional Chinese medicine (TCM) and Qigong have played important roles in the battle against this disease. The Chinese herbs Qingfei Paidu decoction have been recommended by the National Health Commission of China as a treatment for COVID-19 infected patients with mild to moderate symptoms.<sup>2</sup> For COVID-19 infected patients with severe respiratory symptoms,

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<https://doi.org/10.1016/j.jagp.2020.05.012>

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the herbs were used in combination with Western medicine. In the Wuhan Fangcang Hospitals, field hospitals for the isolation of mild cases instead of home quarantine, patients practiced Ba Duan Jin Qigong under the guidance of TCM doctors for treatment and exercise.<sup>3</sup> This review discusses the application of Qigong in older people for the prevention, treatment, and rehabilitation of respiratory infectious diseases, including COVID-19.

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## METHODS

Studies for inclusion were identified by querying Pubmed, the China national knowledge infrastructure, the China Science and Technology Journal Database, and Wanfang data. The main mechanisms for the occurrence and development of COVID-19 are immunosuppression and cytokine storm.<sup>4</sup> COVID-19 patients with severe symptoms may develop respiratory impairment and need rehabilitation, including respiratory muscle training, whole-body movement and psychological rehabilitation.<sup>5</sup> We searched in the above databases using terms to address the potential mechanism of Qigong in the prevention, treatment and rehabilitation of COVID-19, including "immune function," "inflammation," "cytokine," "respiratory muscle," "stress," "mood" and "emotion," combined with terms which address different types of Qigong: "Qigong," "Qi Gong," "Tai-Chi," "Tai Chi," "Taichi," "Taiji," "Yi Jin Jing," "Yijinjing," "Wu Qin Xi," "Wuqinxi," "Liu Zi Jue," "Liuzijue," "Ba Duan Jin," "Baduanjin," as well as "abdominal breathing" and "abdominal respiration." Given that clinical studies on the intervention of Qigong for COVID-19 are limited, we used the terms "respiratory infection" and "respiratory rehabilitation," combined with terms mentioned above to search for clinical evidence about the application of Qigong in the treatment and rehabilitation of respiratory infection. The abstract and the full text of each article were reviewed and included if it identified as clinical research or as a clinical systematic review published in English or Chinese.

### Understanding Qi and Qigong

"Qigong" is composed of two Chinese characters "Qi" and "Gong." "Qi" refers to the energy that motivates human life activities, and "Gong" refers to the regulation of Qi through practice.

The concept of Qi in TCM is very broad, and it is involved in nearly all physiological and pathological processes.<sup>6</sup> According to its different functions, Qi can be divided into different types, for example defensive Wei Qi, and the organ Qi that regulates the function of each organ. The channels through which Qi moves in the body are called meridians, which are distributed on the surface of the limbs and trunk and extend to the inside organs.

Qigong is a mind-body training skill that can regulate body, breath and mind under the guidance of theory of TCM to guide Qi operation in the meridian, to regulate physical function, and to prevent and treat diseases.<sup>7</sup> Qigong regulates the body through an adjustment of body movement and posture. Qigong's body regulation is aimed at relaxation, so the movements are typically gentle and smooth. Regulation of breath involves changes in respiratory movement, rhythm, and pattern. Breath in Qigong needs to be slow, long, and deep. Sometimes changes in breath pattern are also required, such as abdominal breathing, and breathing with phonation, both of which are typical patterns of Qigong respiration. Abdominal breathing refers to a breathing pattern with obvious abdomen movement, and breathing with phonation is a combination of breath and the production of speech sounds. Regulation of mind includes focusing attention and visualization. Most operations of mind regulation are similar to meditation, therefore Qigong is also considered a meditative movement.<sup>8</sup>

Qigong originated in the primeval time of China as a means of self-care. According to the first historical record in China "Shang Shu," 4,000 years ago, ancient Chinese people found that stretching and dancing could release pain. This is the rudiment of Qigong. Almost all religions and philosophical schools, such as Taoism, Buddhism, TCM, and martial arts, have elements of Qigong practice methods, with different appellations. In the 1950s, experts and scholars reached a consensus and coined this methodology "Qigong", and the first Qigong institute was established in China in 1954.

Many studies on Qigong have been carried out through modern research methods, including the observation of physiological and psychological changes during or after Qigong practice, along with clinical trials of treating various diseases with Qigong. Qigong is particularly appropriate for older people due to its gentle and smooth movements, and

there are wide applications of Qigong in geriatric medicine,<sup>9</sup> including in the treatment of musculoskeletal disorders, pain relief, and muscle strengthening. As a mind-body skill, Qigong has been found to impact internal and psychosomatic diseases, such as asthma, hypertension, peptic ulcers and diabetes. Qigong is also used as a meditative movement for treating geriatric mental conditions including mood disorders and cognitive impairment.<sup>10,11</sup>

### Classification of Qigong

According to different operations, Qigong techniques can be divided into two groups: dynamic or active Qigong, and passive or meditative Qigong. Dynamic Qigong refers to those techniques that primarily focus on body movements and involve more movements of the whole body or limbs. Tai-chi, Yi Jin Jing (Muscle Change Classic), Wu Qin Xi (Five-animal Exercise), Liu Zi Jue (Six-Healing Sounds), and Ba Duan Jin (The Eight Brocades) are examples of dynamic Qigong that have gained worldwide popularity. Contrastingly, passive Qigong techniques have almost no body movement, but require maintaining a certain posture and carrying out exercises mainly involving the breath and mind.

Dynamic Qigong is more successful than passive Qigong with regards to physical regulation, therefore it can be more effective in treating musculoskeletal and psychosomatic disease. Practitioners who have difficulty focusing their attention can concentrate on movements and actions in dynamic Qigong, which is an easier skill to master. Passive Qigong pays more attention to mind regulation. Attention training is an important and common technique of mind regulation that asks practitioners to focus attention on an object or on the present, which is similar to mindfulness meditation. According to theory of TCM, through extensive practice of focusing attention, practitioners can enter a state of tranquility. Passive Qigong has few requirements for physical strength, as it can be practiced in any posture without movement. In addition, for those with impaired body movement ability, passive Qigong is a better choice than dynamic Qigong. A study on mindfulness, conducted by Lacaille et al.,<sup>12</sup> indicated that prolonged mindfulness practice was associated with an increase in mindful responding, which was in turn associated with increased positive affect and with less perceived

stress and negative affect. Thus, those who engage in extensive practice of passive Qigong may be likely to experience better psychological outcomes.

### How Qigong Can Treat Respiratory Infective Disease Utilizing TCM Theories

Respiratory infectious diseases belong to the category of external pathogens diseases in TCM. Its pathogenesis is that external pathogens invade the human body and produce tension in the balance between “good and evil.” The “evil” refers to exogenous pathogens, which can be considered similar to the pathogen of infection. “Good” refers to the defensive function of the human body. When exogenous pathogens invade the human body, defensive Wei Qi fights against them. It can be considered that Wei Qi represents immune function from the perspective of modern medicine. The relationship between Wei Qi and exogenous pathogens determines whether the disease will develop and the prognosis of the disease. If Wei Qi is strong enough to defend against the exogenous pathogen, the disease would not occur, or would be easier to heal, and the prognosis would be good.

Because of a decline in organ function and an increase in chronic medical conditions, older people are considered to be in a state of weakness or insufficient energy, conceptualized as Qi and blood deficiency in TCM. Wei Qi is thought of as being scarce in the elderly. Therefore, according to theories of TCM, when encountering infectious diseases such as COVID-19, the elderly are more likely to be affected, and infections are more likely develop into severe diseases with poor prognoses. Given that Qigong regulates the function of Qi in the human body, in which Wei Qi is included, it may prevent respiratory infection or promote recovery from respiratory infection in the elderly.

### Potential Mechanisms of Qigong in Respiratory Infectious Diseases

#### 1. Management of Stress and Emotion

Outbreaks and illness are a source of stress, and stress reactions or emotional problems can occur in hospital inpatients, people in isolation, and those in the general population. Benson et al.<sup>13</sup> observed physiological changes during meditation, and found that

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meditation can counteract stress response. Benson coined the physiological change elicited by meditation a “relaxation response.” As a meditative movement, Qigong has been studied as a tool for stress management. Ryu et al.<sup>14</sup> observed changes in stress hormones during Qigong practice, and found that beta-endorphins increased in the middle of training while levels of adreno-cortico-tropic-hormone declined mid and postpractice suggesting decreased stress levels. It has been suggested that Qigong regulates emotion through enhancing nonreactivity to aversive thoughts and impulses by focusing attention, regulating the hypothalamus-pituitary-adrenal axis reactivity and the balance of the autonomic nervous system, and through changing the function of the brain, limbic system, and expression of genes linked to inflammatory responses and stress-related pathways.<sup>15</sup> In a meta-analysis on treating chronic obstructive pulmonary disease (COPD) with Qigong, Wu et al.<sup>16</sup> reported that Qigong alleviated depression and anxiety among patients with COPD. Meanwhile, during the Severe Acute Respiratory Syndrome outbreak, practicing Qigong was found to strengthen individuals’ sense of control, and taking part in a practicing group improved their senses of social support.<sup>17,18</sup>

## 2. Strengthening the Respiratory Muscles

Qigong can enhance physical strength through the training of specific muscle groups. Liu et al.<sup>19</sup> found through measuring grip strength, jumping height, and toe contact test in older people that Qigong can increase muscle strength. With regards to respiratory muscles, studies in stroke patients found that the myoelectricity and activity of the diaphragm increased after a 3-month abdominal respiration training when compared with thoracic breathing.<sup>20</sup> In COPD patients, Wu et al.<sup>21</sup> observed improvement of respiratory muscle strength after 3-month Liu Zi Jue practice.

## 3. Reducing Inflammation

Qigong can reduce both inflammatory factors and inflammatory response. Irwin et al.<sup>22</sup> examined the cytokines in older adults who had participated in a 6-month Tai-Chi program, and found reductions in levels of IL-6 in subjects in the intervention group who previously showed high levels of this inflammatory marker. In another study, Irwin et al.<sup>23</sup> found that in

older adults with insomnia, Tai-Chi reduced proinflammatory gene expression and marginally reduced C-reactive protein by the end of the 4-month practice, and reduced monocyte production of proinflammatory cytokines at the end of the program and at the follow-up after 7 and 16 months, when compared to the control group. Additionally, a 12-week program of Tai-Chi has been found to increase levels of the anti-inflammatory cytokine IL-10 in middle-aged adults.<sup>24</sup> Chen et al.<sup>25</sup> found that in COPD patients, 60-day Liu Zi Jue practice lowered the level of IL-4, IL-13 and IL-17, and increased the level of IL-10 when compared to a regular treatment control group.

## 4. Enhancing the Immune Function

Qigong’s enhancement of immune function has manifested in both nonspecific immune response and specific immune response. Regarding nonspecific immune response, Qigong can increase the amount or activity of immune cells in the body. Yeh et al.<sup>24</sup> found that in middle-aged healthy people, after a 12-week program of Tai-Chi practice, there was a significant increase in the ratio of T helper to suppressor cells (CD4/CD8), CD4CD25 regulatory T cells, and the production of the regulatory T cell mediators transforming growth factor  $\beta$ . Qiu et al.<sup>26</sup> studied a sample of elderly people using Ba Duan Jin and found CD4, CD4/CD8 and NK cell percentage increased after a 24-week program when compared to a control group who received health education without exercise. Yu et al.<sup>27</sup> observed the effect of Wu Qin Xi on NK-cell activity in elderly adults tested by lactate dehydrogenase release assay, and found that the activities of NK cells increased after practicing for half a year when compared with a blank control group. Study results indicated that Wu Qin Xi is a moderate intensity exercise for older people. According to Nieman,<sup>28</sup> moderate exercise can lower the risk of respiratory tract infection, and heavy exercise can increase the risk of infection.

The effect of Qigong on specific immune response can be observed in the increase of immune cells and immunoglobulin. Chiang et al.<sup>29</sup> selected 20 sedentary males as subjects, and found that Tai-Chi increased the number of circulating myeloid dendritic cells when compared with a blank control group, but that plasmacytoid dendritic cells remained the same in both groups. The degree of growth in myeloid

dendritic cell significantly increased with the years of practice. Vera et al.<sup>30</sup> examined the acute effect of Qigong on adults who participated in a 1-month-Taoist Qigong program. The researchers took blood samples the day before the experiment commenced and 1 hour after the last session of the training program ended, and found higher values in the number and the percentage of B lymphocytes, as compared with a control group that did not engage in the practice. Niu<sup>31</sup> investigated the effect of Tai-Chi on middle-aged participants and observed that blood IgA, IgG and IgM levels increased significantly in the Tai-Chi exercise group with increasing exercise time.

The promotion of Qigong in the specific immune response has also been reflected in the level of antibodies after vaccination. In Irwin's study,<sup>32</sup> participants took part in Tai-Chi or health education for 25 weeks, and after 16 weeks of intervention, subjects were vaccinated with Varivax. They found the Tai-Chi group showed higher levels of cell-mediated immunity to VZV than the health education group. In Yang's study,<sup>33</sup> older adults practiced Tai-Chi and Qigong for 5 months and then received the influenza vaccine during the first week of the intervention. Improvement of the magnitude and duration of the antibody response to influenza vaccine were observed when compared to the control group.

### Clinical Evidence on Qigong in Respiratory Infectious Diseases

#### 1. Application of Qigong to the Prevention of Respiratory Infectious Diseases

Some studies have demonstrated the effectiveness of Qigong in preventing respiratory infectious diseases. Hu et al.<sup>34</sup> selected elderly men as experimental subjects and randomly divided participants into either a Qigong intervention group or a control group who performed jogging. Compared with the control group, the experimental group experienced significantly fewer respiratory tract infections after Qigong exercise for two years, and the difference between the two groups increased with exercise time. Wright et al.<sup>35</sup> found that in swimmers who practiced Qigong at least once per week, cold and flu symptoms showed a significant nonlinear association with frequency of Qigong practice, with a strong, inverse relationship between practice frequency and symptom scores.

#### 2. Use of Qigong in Treating Respiratory Infectious Diseases

There are few studies on the intervention of Qigong in the acute phase of respiratory infection, but according to limited research results Qigong can be found to shorten the course of infection. In Ties' study,<sup>36</sup> 90 female healthy students were separated into three groups; a control group, a three times a week movement group, and a five times a week movement group, after a six-month Tai-Chi training. In the two Tai-Chi groups, the levels of IgA and IgG became higher, as compared with the control group. There was no difference in the frequency of respiratory tract infection in the three groups, however the duration of each onset became shorter in the Tai-Chi group.

#### 3. Application of Qigong to Rehabilitation in Respiratory Infectious Diseases

Severe respiratory infections can cause reduced respiratory function and require rehabilitation. Although research on the application of Qigong in the rehabilitation of respiratory infections is limited, researchers have shown that Qigong can promote the rehabilitation of other respiratory diseases which cause impaired respiratory function. Tong's meta-analysis<sup>37</sup> on 10 studies examined 993 participants who were in the stable stage of COPD infection. Results indicated that Qigong can improve lung function in COPD patients, including forced expiratory volume in 1s (FEV1), forced vital capacity rate of 1s (FEV1/FVC), and forced expiratory volume in 1s/predicted (FEV1/pre). Additionally, results showed that it can improve exercise capacity, Functional Task Evaluation, COPD Assessment Test for exercise, and increase the score of Short Form-36 Health Quality Survey, which indicates improvement in quality of life. The researchers analyzed the function of Ba Duan Jin, Yi Jin Jing and Liu Zi Jue respectively, and found the first two resulted in significant improvement, and that Liu Zi Jue did not have significant effect. However, other studies have shown Liu Zi Jue to be effective in the rehabilitation of COPD patients. A study by Li et al.<sup>38</sup> indicated that COPD patients' lung function (FEV1/pred, FEV1/FVC) improved significantly with Liu Zi Jue practice, as did the 6-minute walking test, 30-second sit-to-stand test, and St George's Respiratory Questionnaire score. Chen<sup>39</sup> observed

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that in chronic bronchitis patients who practiced Ba Duan Jin, hospital stays decreased, and lung function (FEV1/FVC) and arterial blood gas analysis (PaO<sub>2</sub>, PaCO<sub>2</sub>) improved when compared with the control group who received regular treatment.

### How to Learn and Practice Qigong

Some simple Qigong can be learned independently through watching Qigong videos. Before learning Qigong, consulting with doctors is necessary for safety reasons. Learners can begin with physical movements of the forms. After practitioners acquire the sequences of both isometric and isotonic segmental movements in upper and lower extremities, they can try to combine breathing techniques and focus their attention on movement, breath and Qi.

### Tips for Practice

*Practice environment:* Qigong can be practiced both indoors and outdoors, though indoor practice is more appropriate during an epidemic of infectious disease. The practice environment should be clean and quiet for breathing exercises and concentration. Practice space needs to be chosen according to the type of Qigong being practiced. For patients with fall risks, an instructor who is experienced in working with elderly people may be necessary.

*Practice time:* Qigong practicing needs to be persistent. Fixed time can help in forming a habit. Being either too hungry or too full is not suitable for practice.

*Intensity:* Attention needs to be paid to personal condition at each practice, on which intensity should depend. As mentioned above, moderate exercise is the best option for respiratory infection patients. However, what can be considered moderate exercise differs between individuals, thus the increase in heart rate can be a indicator of intensity. Increasing heart rate by 60%-80% is recommended.

### Recommending Forms of Qigong

Considering the physiological characteristics of the elderly, the pathological features of respiratory diseases, and the psychosocial factors in the face of the COVID-19 epidemic, we recommend Ba Duan Jin, Liu Zi Jue, and abdominal breathing. According to the research results mentioned above, these three

kinds of Qigong are often used in the prevention and treatment of respiratory infections, for the movement is smooth with low intensity, and easy to learn. In addition, the range of these three Qigong movements is small, and the space requirements are not significant. Thus, they are suitable for home practice during the current epidemic.

#### 1. Abdominal Breathing

Abdominal breathing can be found in a variety of mind-body exercises, including yoga, meditation, and Qigong. The technique is very straight forward: consciously move your stomach when inhaling, tightening your stomach muscles, and let them fall inward as you exhale, while focusing attention on breathing. Do not hold your breath.

Abdominal breathing can enhance respiratory function, and create a relaxation response. Abdominal breathing has been found to stimulate the vagus nerve,<sup>40</sup> which can regulate breathing and help with relaxation. Focusing attention on breath is one of the simplest ways to achieve emotional regulation and to decrease anxiety-related dysfunctional thoughts about the pandemic. Abdominal breathing requires the least amount of exercise of the three Qigong exercises recommended, and can be practiced standing, sitting, or lying on the back so that it can meet the needs of practitioners with poor physical conditions or more serious illness. Since abdominal breathing can be practiced anytime, anywhere, and in most physical conditions, it is a highly recommended method for coping with COVID-19 related stress.

#### 2. Ba Duan Jin

Ba Duan Jin exercise consists of eight separate, delicate, and smooth exercise movements, to achieve self-psychosomatic regulation and enhance function. Since Ba Duan Jin exercises emphasize body and Qi, slow body movements along with musculoskeletal stretching should be combined with physical relaxation, deep breathing, and mental concentration.<sup>41</sup> Movements of the whole body can enhance physical well-being. According to TCM theory, stretching the upper limbs, where the lung meridians are, can facilitate Qi moving in the respiratory organs and thereby promote recovery from respiratory symptoms. Deep, rhythmic breathing along with slow bodily

movements accompanied by mental focusing frequently leads to a state of meditation, which can produce a relaxation response and stress reduction. We recommend using Ba Duan Jin for the prevention of COVID-19 and treatment of respiratory symptoms if infected, as well as for the management of stress derived from the pandemic.

### 3. Liu Zi Jue

Liu Zi Jue combines abdominal breathing and pursed lip breathing with uttering six different sounds, along with corresponding mild-body movements and a calm state of mind. This exercise is easy to learn and can be performed in any position including standing (preferred), sitting, or lying down, since the exercise mainly involves mild upper-body movements.<sup>42</sup>

The type of respiratory pattern of pursed lip breathing performed by expiration to produce six different sounds (xu, he, hu, si, chui, and xi) is similar to the pursed-lips breathing in rehabilitation training for COPD patients.<sup>43</sup> It can modify rapid shallow breathing patterns and retard the expiratory flow rate. Additionally, the different sounds can produce vibrations with different frequencies, which is commonly used in neurorehabilitation<sup>44</sup> and tension relaxation.<sup>45</sup> Research indicates that Liu Zi Jue might help tissue and organs in respiratory recovery through these vibrations. Liu Zi Jue is a good choice for people seeking to recuperate from respiratory dysfunction and sequela of COVID-19 infection.

## CONCLUSIONS

The available biological and psychological evidence suggest Qigong may be potentially useful for

the prevention, treatment, and rehabilitation of respiratory infections, including COVID-19. The elderly, in particular, could benefit from Qigong during the ongoing pandemic, for it is easy to practice. Future studies are needed to confirm the effectiveness of Qigong in this context and to provide more evidence on this topic.

## AUTHOR CONTRIBUTIONS

*Albert Yeung*: Design of the work; Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

*Fan Feng*: Literature searching; Preparation of the manuscript.

*Sylvie Tuchman*: Preparation of the manuscript.

*John W. Denninger*: Preparation of the manuscript.

*Gregory L. Fricchione*: Preparation of the manuscript.

## DISCLOSURE

Declaration of Interest: Dr. Denninger reports non-financial support from Basis/Intel, grants from Onyx/Amgen. His declared interests are not related to the submitted work. The other authors report no conflicts with any product mentioned or concept discussed in this article. The authors alone are responsible for the content and writing of this article.

*No funding sources were used in preparation of this review.*

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