

Exercise Prescription for the Elderly Based on TCM Physique Characteristics of Sub-healthy Group

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Abstract:

There are three states of human body health: healthy, sub-healthy, and diseased. These three states are gradually transitioning. For a long time, people only pay attention to the diagnosis, treatment and rehabilitation of diseases, ignoring the research on sub-health. "Preventive treatment of disease" is an important prevention and treatment thought in Chinese medicine for thousands of years. Actively implementing the "prevention first" policy, and conducting research on identification and intervention of sub-health conditions under the theme of "preventive treatment of disease" carries important practical significance for preventing and treating diseases, saving health resources, and improving the life quality of the elderly. By analyzing TCM physique characteristics of the sub-healthy groups and based on the theory of TCM physique identification and conditioning, this study takes the sub-healthy elderly as the research object, and develops a sub-health exercise prescription with traditional Chinese sports as the main approach, aiming to promote health outcomes of the elderly sub-healthy population through exercise conditioning

Keywords: *sub-health; TCM physique; elderly; exercise prescription*

I. INTRODUCTION

Health status research is a hot spot in the field of health and disease prevention research in the 21st century. With the advancement of science and technology, the development of productivity and the improvement of living standards, people pay more attention to improving life quality and life value, maintaining and promoting health, exerting intellectual and physical potential, and yearn for a perfect state in physical, spiritual and social adaptability. However, according to WHO's standards, on a global scale, the truly healthy population accounts for only about 5%, the diseased population accounts for about 20%, and about 75% population is in sub-healthy state. [1] Sub-health is a kind of "transition state" between health and disease. It is directly manifested as reduced human vitality, decreased function and adaptability, which plagues people's daily life, threatens the public's physical and mental health. Sub-health intervention has become a major contemporary topic, arousing great concern in the medical field and the whole society. Foreign studies have shown that one factor contributing to sub-health is people's natural aging. [2] TCM physique reflects the ups and downs of the human body's physiological functions to a

certain extent, which is the root cause for the occurrence of sub-health and the different manifestations of sub-health. Biased physique in TCM physique science is the foundation for the formation of sub-healthy state, and sub-healthy state is the manifestation and appearance of biased physique. Biased physique affects the sub-health prognosis, and regulating biased physique helps to correct sub-health.

II. THE CONCEPT AND CLASSIFICATION OF SUB-HEALTH

2.1 The concept of sub-health

In the mid-1980s, the former Soviet Union scholar Buchman discovered through a lot of research that in addition to healthy and diseased states, there is an intermediate state of non-health and non-disease in the human body. He referred to this state as sub-health. Sub-health is also called the third state, gray state, pre-clinical state, sub-clinical state, pre-morbid state, and latent disease period.

The concept of health put forward by the World Health Organization (WHO) is: "Health is not only free from disease or weakness, but also a perfect state in the three aspects of physical, psychological and social adaptability." Correspondingly, sub-health means the human body is between healthy and diseased state. The sub-healthy population mainly manifests fatigue, lack of energy, muscle and joint pain, palpitations, chest tightness, dizziness, headache, memory loss, learning difficulties, abnormal sleep, depression, irritability, interpersonal tension, social communication difficulties and other physical or psychological symptoms of discomfort.

In 2006, the Chinese Society of Traditional Chinese Medicine defined sub-health in the "TCM Clinical Guidelines for Sub-health" as a state of the human body between health and disease. People in a sub-health state cannot meet the health standards, manifesting symptoms of reduced vitality, decreased function and adaptability within a certain period of time, but they do not meet the clinical or sub-clinical diagnosis standards of diseases in modern medicine. [3]

2.2 Sub-health classification

The WHO's definition of health includes three dimensions, namely physical health, mental health, and social adaptation. Using this as the basis for classification of sub-health, sub-health states are divided into physical, psychological, and social sub-health states. [3]

2.2.1. Physical sub-health state

The general characteristics of physical sub-health state are persistent fatigue difficult to recover, frequent feeling of exhaustion, laziness to exercise, easy drowsiness and fatigue. According to the various physical manifestations, it is divided into the following subtypes: 1) Fatigue sub-health. The main manifestation is fatigue and weakness lasting for more than 3 months, and all diseases that may cause fatigue are excluded; 2) Sleep disorder sub-health. The main manifestation is various pains lasting for more than 3 months, and various diseases that may cause pain are excluded.

2.2.2. Psychological sub-health state

The most common types of psychological sub-health include: 1) Anxiety sub-health. There is anxiety lasting for more than 3 months and the diagnostic criteria for anxiety is not met; 2) Depression sub-health. There is depression lasting for more than 3 months and the diagnostic criteria for depression is not met; 3) Memory loss sub-health. The main manifestation is the recent memory loss lasting for more than 3 months, or inability to concentrate on doing things, while organic diseases or non-organic mental diseases are excluded; 4) Constipation sub-health. There is constipation lasting for more than 3 months and the diagnostic criteria for constipation is not met.

2.2.3. Social communication sub-health state

The characteristics of social communication sub-health state are mainly manifested as a decrease in the interpersonal communication frequency that lasts more than 3 months or a decline in social adaptability such as interpersonal tension.

III. OVERVIEW OF TCM PHYSIQUE

3.1 The formation of TCM physique

Beginning in the 1970s, the team of Academician Wang Qi of the Chinese Academy of Engineering put forward the concept of "TCM Physique Theory" and published the monograph "TCM Physique Theory" in 1982, which laid the theoretical and practical foundation for modern TCM physique research, marking the formal establishment of this theory. TCM physique has been successively listed as China's key basic research and development plan ("973 plan") and a major project of the National Natural Science Foundation of China. "Research and Application of TCM Physique Classification Judgment Criteria" won the second prize of 2007 Science and Technology Progress Award from the Ministry of Science and Technology. After more than 40 years of research, Wang Qi's team put forward three key scientific issues of "dividable physique", "physical illness relevance", and "adjustable physique", four basic principles of "endowment inheritance theory", "life course theory", "form and spirit composition theory", "environmental restriction theory" and four basic laws of physique formation, physique classification, physique evolution, and physique onset, which constitute the theoretical system of TCM physique. [4]

3.2 The connotation of TCM physique

As medical research shifts from "disease"-centered to "people"-centered approach, the research on TCM physique has received general attention. According to TCM physique, physique is a comprehensive and relatively stable inherent trait in terms of morphology, physical function, and psychological state formed in the human body's life process on the basis of innate endowments and later acquisition. It refers to human body characteristics adapted to the natural and social environment in the process of growth and development, which is manifested as individual differences, group convergence, relative stability and dynamic variability in terms of structure, function, metabolism and response to external stimuli. The physique characteristic is manifested in the process of health and disease either implicitly or presently. [5]

TCM physique is closely related to onset, diagnosis, treatment, disease outcome and prevention. It can be seen that TCM physique research is directed to "people", and the core concept is oriented toward health, which can best embody the principles of "people-oriented" and "individuality-concerned treatment". There is an inseparable "kinship" between "physique" and "sub-health". Biased physique can reveal its internal relevance to sub-health. Theories about physique separability and physical illness relevance can provide a basis for correct understanding and dynamic grasp of sub-health state, and physique variability and adjustability make it possible to intervene in the sub-health. Therefore, TCM physique can play an important role in preventing and treating sub-health and improving the population health.

3.3 Classification of TCM Physique

By inheriting the basic principles of ancient physique classification and combining clinical practice, Wang Qi proposed the nine classifications of physique, namely 9 basic types of type A (balanced constitution), type B (qi deficiency constitution), type C (yang deficiency constitution), type D (yin deficiency constitution), type E (phlegm dampness constitution), type F (dampness heat constitution), type G (blood stasis constitution), type H (qi stagnation constitution) and type I (inherited special constitution). A clinical epidemiological survey was conducted for analysis and verification, and the standard of "Classification and Judgment of TCM Physique" was formulated, which provides standardized tools and methods for physique classification and offers standardized basis and guidelines for physique discrimination.

IV. TCM PHYSIQUE CHARACTERISTICS OF SUB-HEALTHY PEOPLE

In order to study the physical characteristics of sub-health subtypes, according to the standard of "Classification and Judgment of TCM Physique", Wang Qi et al. investigated 2519 cases of sub-healthy people and found that pain sub-health is negatively related to balanced constitution and positively related to yang deficiency, dampness heat, and blood stasis constitutions. Premature aging sub-health is negatively related to balanced constitution, positively related to yang deficiency, phlegm dampness constitutions. Fatigue sub-health is negatively related to balanced constitution and positively related to qi deficiency, dampness heat and qi stagnation constitutions. Psychological sub-health is negatively related to balanced constitution, positively related to qi deficiency, yin deficiency, and qi stagnation constitutions. Shi Zhouhua et al. investigated 1350 urban residents in Jinan City and found that sub-health status is positively related to yang deficiency, yin deficiency, qi stagnation constitutions and negatively related to balanced constitution. Physical sub-health is positively related to yang deficiency, yin deficiency, qi deficiency and qi stagnation constitutions and negatively related to balanced constitution. Psychological sub-health is positively related to yang deficiency, phlegm dampness, and qi stagnation constitutions. Socially adaptive sub-health is positively related to yin deficiency and qi stagnation constitutions. Ou Aihua et al. conducted a physical survey on 2748 sub-healthy people and found that in the three sub-health subtypes, physical sub-health corresponds to yang deficiency and yin deficiency constitutions, physiological sub-health corresponds to qi deficiency and blood stasis constitutions, social adaptation sub-health corresponds to balanced constitution. In the seven sub-health categories, fatigue sub-health corresponds to qi deficiency

and phlegm dampness constitutions; Sleep disorder sub-health corresponds to yang deficiency constitution; Pain sub-health corresponds to dampness heat and blood stasis constitutions; Anxiety sub-health corresponds to qi stagnation constitution; memory loss sub-health corresponds to balanced constitution; depression sub-health corresponds to qi-stagnation constitution; constipation sub-health corresponds to yin deficiency constitution. These research results provide a useful reference for the prevention and treatment of sub-health by differentiation of individual. [3]

V. TCM PHYSIQUE CONDITIONING AND EXERCISE PRESCRIPTION FOR SUB-HEALTHY ELDERLY

Health and longevity is the common goal of mankind, but unfortunately, studies at home and abroad have shown that although the life expectancy of the elderly is increasing, life quality of the extended life is unsatisfactory. [6,7] TCM physique conditioning of sub-health involves a series of concepts and methods for sub-health state based on the thoughts, methods and successful experiences of treatment by differentiation of individual, which gives play to the unique advantages of TCM intervention in sub-health. Individuality-concerned treatment is an important principle in TCM treatment. In sub-health conditioning, according to the individual's physical characteristics, reasonable mental adjustments, diet recuperation, daily care, exercise prescriptions can be adopted to improve the physical state, prevent and control sub-health.

The concept of exercise prescription was first put forward by the American physiologist Kapović in the 1950s. It refers to the method of using prescriptions to regulate the exercise content and amount of bodybuilders based on individual physical condition. It features individualized approach and targeted medicine. The World Health Organization (WHO) pointed out that the most positive and effective way to treat sub-health is to change personal bad behaviors and promote a healthy lifestyle. Where, active participation in physical exercise is one of the most effective means to improve life quality. Scholars at home and abroad agree that sports participation helps improve people's physical and mental health and enhance social adaptability. [8-13] TCM physique and health science believes that for the elderly, regular practice of traditional sports such as muscle-bone strengthening exercises, five-animal exercises, eight trigrams boxing, and six-character formula can effectively increase the probability of transformation from sub-health to health, thereby improving life quality of the elderly and prolong their lives.

5.1 Exercise prescription for fatigue sub-health

According to the empirical research on the determination of TCM physique in sub-health group, fatigue sub-health corresponds to qi deficiency and phlegm dampness constitutions.

People with qi deficiency have low physical fitness. Low-intensity, multi-repetition exercises are recommended. It is necessary to appropriately increase the exercise times, reduce the total load of each exercise, control the exercise time, and proceed in a gradual manner. It is not advisable to do heavy-load and sweating exercises, and vigorous and long-term suffocation movements should be avoided.

People with phlegm dampness tend to be obese and easily get tired. Therefore, they should proceed step by step according to specific conditions and keep long-term exercise. Those with phlegm dampness should strengthen the body's material metabolism and do aerobic exercise for a longer period of time to make the loose skin and flesh gradually firm and dense. The exercise time should be between two o'clock and four o'clock in the afternoon, and the sports environment should be warm and pleasant. People with phlegm dampness are generally heavy, so when the exercise load intensity is high, they should pay attention to exercise rhythm and exercise step by step to ensure safety.

According to exercise conditioning for qi deficiency and phlegm dampness constitutions in TCM physique, the traditional softer traditional fitness programs can be selected, such as eight trigrams boxing and six-character formula. After completing the whole set of eight trigrams boxing, repeat "touching feet with both hands to strengthen the kidney and waist", "assembling fist to strengthen force" and "blowing" in the "six-character formula" one to three times. From the perspective of modern exercise physiology, jogging and brisk walking are also effective exercise methods, which can be selected appropriately.

5.2 Exercise prescription for sleep disorder sub-health

According to the empirical research on the determination of TCM physique in sub-health group, insomnia sub-health corresponds to yang deficiency constitution.

People with yang deficiency are afraid of cold and are more susceptible to wind and cold. They should keep warm and avoid the cold when exercising, conduct soothing and gentle outdoor activities in a sunny environment, and avoid exercising in strong wind, severe cold and heavy snow. According to the viewpoint of TCM health preservation, it is best for people with yang deficiency to exercise in spring and summer. Sunny morning is the best time for exercise of the day, and exercise should be done indoors at other times. People with yang deficiency constitution should not exercise too much, especially avoiding excessive sweat.

Some exercises in traditional Chinese sports, such as eight trigrams boxing and five-animal exercises, can invigorate yang and promote the rise and circulation of yang. After completing the whole set of eight trigrams boxing, repeat "looking back", "touching feet with both hands to strengthen the kidney and waist" and "tiger exercise" in the "five-animal exercises" one to three times. From the perspective of modern sports physiology, appropriate short-distance running and jumping sports, such as rope skipping, can also be exercised appropriately.

5.3 Exercise prescription for pain sub-health

According to the empirical research on the determination of TCM physique in sub-health group, pain sub-health corresponds to dampness heat and blood stasis constitutions.

Dampness heat constitution is characterized by damp turbidity and excessive yang heat. High-intensity, high-volume exercise is recommended to consume excess heat in the body and excrete excess water to achieve the purpose of clearing heat and eliminating dampness. People with dampness heat constitution should avoid hot environment when exercising.

People with blood stasis constitution have poor circulation of qi and blood in the meridians and collaterals. Exercise can unblock the qi and blood in the meridians and collaterals and harmonize the internal organs. Regular and persistent exercises beneficial to the circulation of qi and blood are recommended. People with blood stasis constitution have weak cardiovascular function. Exercise intensity should depend on the physical condition and high-intensity, heavy-load physical exercises should be avoided, but small-to-medium-load and multiple-repetition exercises are recommended.

According to exercise conditioning for qi deficiency and phlegm dampness constitutions in TCM physique, it is possible to alternately exercise the whole set of eight trigrams boxing and "raising both hands", "bending both legs", "raising single hand for spleen and stomach regulation", "leg bounce" plus "exhalation" and "Xi" in six-character formula step by step. Exercise intensity should depend on personal physical condition. From the perspective of modern sports physiology, one can also choose Tai Chi, Tai Chi sword and dance.

5.4 Exercise prescription for anxiety sub-health

According to the empirical research on the determination of TCM physique in sub-health group, anxiety sub-health corresponds to qi stagnation constitution.

Qi stagnation is formed due to long-term bad emotions and stagnant qi. Physical exercise can regulate qi and ease emotions. Exercise can promote the circulation and operation of qi and blood. People with qi stagnation constitution should adhere to appropriate physical exercise every day, try to increase outdoor activities. It is best to choose a sunny place with beautiful environment, fresh air for exercise. A suitable environment can relax the mood and enable the optimal exercise effect.

People with qi stagnation constitution have poor qi and blood circulation. "Shh" in the "six-character formula" can be practiced to soothe the liver qi. It is possible to practice "Shh" in the "six-character formula" one to three times after the whole set of eight trigrams boxing, five-animal exercises or muscle-bone strengthening exercises.

5.5 Exercise prescription for memory loss sub-health

According to the empirical research on the determination of TCM physique of sub-health group, fatigue sub-health corresponds to balanced and inherited special constitutions.

People with balanced constitution have a moderate body, ruddy complexion, full energy, plus good

exercise and fitness habits. Exercise and fitness items can be selected in light of personal hobbies and tolerance, as well as temperature in different seasons, such as outings, shuttlecock kicking, etc. with less exercise volume; rope skipping, climbing, archery, etc. with moderate exercise volume. There are also some traditional fitness exercises, such as Tai Chi, five-animal exercises, eight trigrams boxing, muscle-bone strengthening exercises and so on. The duration should not be too long, and violent exercise should be avoided.

The formation of inherited special constitution is related to congenital inheritance. It is possible to practice "blowing" in the "six-character formula" to reinforce kidney essence and kidney qi. It is not advisable to choose large-volume activities and long-term outdoor exercise in spring or at the turn of the seasons should be avoided to prevent the onset of allergic diseases. Take care to avoid wind and cold when exercising. Stop exercise in time in case of asthma or depression.

According to exercise conditioning for balanced and inherited special constitutions in TCM physique, it is possible to exercise "blowing" in the "six-character formula" 1 to 3 times after the whole set of eight trigrams boxing, five-animal exercises, or muscle-bone strengthening exercises. From the perspective of modern exercise physiology, outdoor activities such as jogging and walking are advisable.

5.6 Exercise prescription for depression sub-health

According to the empirical research on the determination of TCM physique in sub-health group, depression sub-health corresponds to qi deficiency and qi stagnation constitutions.

People with qi deficiency constitution have weak physical fitness. It is advisable to adopt low-intensity, multiple-repetition exercises, appropriately increase the number of exercises, reduce the total load of each exercise, control the exercise time, and proceed step by step. It is not advisable to do heavy-load exercises and sweating exercises. Avoid vigorous and long-term suffocation movements. One can choose softer traditional fitness programs, such as Tai Chi, Tai Chi sword, eight trigrams boxing, etc., and it is also possible to practice "blowing" in the "six-character formula".

Qi stagnation is formed due to long-term bad emotions and stagnant qi. Physical exercise can regulate qi and ease emotions. Exercise can promote the circulation and operation of qi and blood. People with qi stagnation constitution should adhere to appropriate physical exercise every day, try to increase outdoor activities. It is best to choose a sunny place with beautiful environment, fresh air for exercise. A suitable environment can relax the mood and enable the optimal exercise effect. People with qi stagnation constitution have poor qi and blood circulation. "Shh" in the "six-character formula" can be practiced to soothe the liver qi.

According to exercise conditioning for qi deficiency and qi stagnation constitutions in TCM physique, after the whole set of eight trigrams boxing, it is possible to alternately exercise "touching feet with both hands to strengthen the kidney and waist", "assembling fist to strengthen force" and "blowing" and "shh"

in the "six-character formula" step by step. Exercise intensity should depend on personal physical condition.

According to the empirical research on the determination of TCM physique in sub-health group, constipation sub-health corresponds to yin deficiency constitution.

Due to insufficient body fluid, sperm, blood, etc., people with yin deficiency constitution are prone to symptoms such as dry mouth, flushing, and less urination during exercise. Small-to-medium-intensity and intermittent exercises are recommended. Control sweating, supplement water in a timely manner. It is not advisable to do high-intensity, large-volume exercise. Avoid exercise in hot summer or sultry environment. One can choose traditional fitness programs such as Tai Chi, Tai Chi sword, eight trigrams boxing that integrate motion and stillness. It is also possible to practice "Shh" in the "six-character formula". People with yin deficiency constitution can do more chest expansion exercises to allow the entire chest cavity to open and close accordingly. Strengthening chest exercises helps smooth the Ren channel. People with yin deficiency constitution tend to have dry skin, who can also swim to moisturize the skin and reduce itching.

According to exercise conditioning for yin deficiency constitution in TCM physique, after completing the whole set of eight trigrams boxing, it is possible to practice "nodding head", "touching feet with both hands to strengthen the kidney and waist" and the "shh" in the "six-character formula" one to three times.

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REFERENCES

- [1] Evengard B., Klimas N. (2002) Chronic fatigue syndrome: probable pathogenesis and possible treatments. *Drugs*, 62(17): 2433-2446.
- [2] YANG B, QIN QZ, HAN LL, et al. Spa therapy (balneotherapy) relieves mental stress, sleep disorder, and general health problems in sub-healthy people. *Int J Biometeorol*, 2018, 62(2):261-272.
- [3] Wang Qi, Jin Qi. (2012) Identification and conditioning of sub-healthy TCM physique[M]. China Press of Traditional Chinese Medicine, 05: 48.
- [4] Ni Cheng. (2019) TCM physique and health preservation[M]. People's Medical Publishing House, 12.
- [5] Wang Qi. (2005) TCM Physique [M]. People's Medical Publishing House, 08.
- [6] Zhang Wenjuan, Wei Meng. (2015) How high is the disability level of the elderly in China? A comparison of multiple data sources. *Population Research*, (03).
- [7] Crimmins EM, Beltran-Sanchez H (2011) Mortality and morbidity trends: is there compression of morbidity? *J Gerontol Ser B, Psychol Sci Soc Sci*, 66(1):75-86.
- [8] Blackwood SK, Mac Hale SM, Power MJ, Goodwin GM, Lawrie SM. (1998) Effects of exercise on cognitive and motorfunction in chronic fatigue syndrome and depression. *Neurol Neurosurg Psychiatry*, 65:541.

- [9] Torenbeek M, Mes CA, et al. (2006) Favourable results of arehabilitation programme with cognitive behavioral therapy and graded physical activity in patients with the chronicfatigue syndrome. *Ned Tijdschr Geneesk.* Sep, 23:150(38).
- [10] Rosanneoutts, Robert Weather, et al. (2001) The use of symptom self-report inventory to evaluate the acceptability and efficiency of a walking program for patients suffering with chronicfatigue syndrome. *Journal of Psychosomatic Research*, 51: 425-429.
- [11] Petruzzello S J, Landers D M, Hatfield B D, Rubitz RA, Salazar, W. (1991) A meta-analysis on the anxiety reducing effects of acute and chronic exercise. *Sports Medicine*, 11(3):143-182.
- [12] Zhang Jingwen, Yang Yang, Tang Hongliang. (2011) A Clinical Randomized Controlled Trial of Tai Chi Intervention on the Sub-health State of the Middle-aged and Elderly in the Community. *Journal of Nanjing Sport Institute: Natural Science Edition*, 10(6):18-20.
- [13] Gao Yuxia, Yang Guizhen, Wang Guiru. (2011) The sub-health state of the urban elderly with and without exercise. *Chinese Journal of Gerontology*, 31(13):2536-2537.