

Applications of Baduanjin in Exercise Rehabilitation and Discussion on Channel Conditioning Mechanism

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Abstract: Baduanjin is regarded as a model of China traditional daoyin, and its application value in the field of sports rehabilitation has been paid more and more attention. This paper aims to systematically explore the specific application of Baduanjin in exercise rehabilitation and its conditioning mechanism based on meridian theory. Firstly, the core concept of Baduanjin and its theoretical basis such as holistic view of traditional Chinese medicine and Yin-Yang Five Elements Theory were sorted out, and the interdisciplinary explanation was provided by combining modern sports science theory. Furthermore, the paper analyzes the application mode and effect of Baduanjin in the rehabilitation of chronic musculoskeletal diseases, metabolic syndrome, cardiovascular and cerebrovascular diseases and nervous system diseases, and points out that it has comprehensive advantages in improving physical function, relieving pain, enhancing balance ability and promoting mental health through low-intensity physical and mental coordination training. Baduanjin dredges the circulation of qi and blood in meridians and indirectly regulates the functions of related zang-fu organs through specific movement design. Meanwhile, from the perspective of modern exercise physiology, its mechanism of action is closely related to physiological processes such as improving circulation, regulating autonomic nerve balance and enhancing neuromuscular control. This study provides a theoretical reference and practical path for the scientific and standardized application of Baduanjin in the field of exercise rehabilitation.

Keywords: Baduanjin, Exercise Rehabilitation, Meridian Conditioning, Mechanism Exploration, Traditional Chinese Medicine Exercises.

1. Introduction

With the deepening of the pursuit of healthy lifestyle, exercise rehabilitation as a non-drug intervention means, its importance is increasingly prominent. While modern rehabilitation medicine has made remarkable progress, it also faces challenges such as how to improve the sustainability, psychosomatic synergy and long-term compliance of intervention measures [1]. Under this background, physical and mental practices such as Baduanjin originated from China traditional culture gradually show their unique value and potential in the field of sports rehabilitation. As a long-standing daoyin technique, eight-segment brocade has soft and slow movements and stresses the combination of shape, qi and meaning. It is not only a kind of physical exercise, but also an internal conditioning and self-cultivation. In recent years, it has become a research direction worthy of attention to include Baduanjin into rehabilitation programs in the fields of chronic diseases, orthopedic diseases and senile sexual decline.

The purpose of this study is to systematically explore the application of Baduanjin in exercise rehabilitation and the meridian conditioning mechanism behind it. Although the current research has preliminarily confirmed that Baduanjin has positive effects on improving body function, relieving pain and improving quality of life, the research on its mechanism, especially from the perspective of the combination of meridian theory of traditional Chinese medicine and modern physiology, needs to be strengthened. Explaining clearly how Baduanjin affects the circulation of qi and blood through specific movement design, and then regulates the function of viscera, not only can provide solid theoretical support for the clinical application of Baduanjin, but also promote the deep integration of traditional health

cultivation methods and modern rehabilitation medicine. Therefore, this paper analyzes the core concept and application status of Baduanjin, focuses on its application mode in different rehabilitation situations, and deeply discusses its conditioning mechanism based on meridian theory, in order to provide academic reference for promoting the scientific and standardized development of Baduanjin in the field of sports rehabilitation.

2. Core Concepts and Theoretical Basis

2.1. Definition of Core Concepts

Ba Duan Jin is an important part of China's traditional guiding health technique. Its name implies that the whole set of exercises is as beautiful and smooth as brocade, and consists of eight independent and interrelated movements [2]. In essence, Baduanjin is a low-intensity physical and mental training method that integrates body posture adjustment, breathing exercise and psychological adjustment. Its core is not to pursue external strength and speed, but to guide the rise and fall of qi in the body through slow, coherent and elastic movements, so as to achieve the purpose of health preservation and rehabilitation of dredging meridians, harmonizing qi and blood and strengthening viscera. In the context of exercise rehabilitation, Baduanjin is valuable as a safe and mild auxiliary intervention for patients in rehabilitation to improve joint mobility, enhance muscle strength and endurance, enhance balance stability and relieve anxiety. Sports rehabilitation refers to a systematic process that uses exercise as the main means to help individuals recover optimal physical function after injury, prevent recurrence of dysfunction and improve overall health level. Its scope ranges from functional recovery after the acute phase to management of chronic diseases, with the core goal

of maximizing patients' physical mobility and quality of participation in social life. The inclusion of Baduanjin in the exercise rehabilitation system means that it is regarded as a special therapeutic exercise prescription characterized by an emphasis on conscious, coordinated movement of the whole body rather than isolated muscle training. This holistic view accords with the trend of emphasizing functional integration in rehabilitation medicine.

2.2. Relevant Theoretical Support

The creation and efficacy interpretation of Baduanjin are deeply rooted in the holistic concept of TCM and the theory of Yin-Yang and Five Elements. Holism emphasizes that the human body is an organic whole and closely related to the natural environment. Each style of Baduanjin does not move a single joint or muscle group in isolation, but requires up and down coordination, left and right coordination, internal and external integration, reflecting the coordinated mobilization of all systems of the whole body. The theory of yin and yang five elements provides philosophical basis for its balance regulation function. The elements of unity of opposites, such as hardness, deficiency, opening and closing, rising and falling, act on human body together to correct the excess and decline of yin and yang and restore the dynamic balance of zang-fu functions. From the perspective of modern science, the mechanism of action of Baduanjin can be theoretically supported from multiple dimensions such as exercise physiology, neuroscience and psychology. Physiologically, its slow, sustained aerobic exercise properties contribute to improved cardiovascular function, enhanced immune system activity, and optimized energy metabolism. Its control of the body's core muscles and the requirement to maintain a low center of gravity posture can effectively enhance neuromuscular control and static and dynamic balance functions. At the neuropsychological level, the mental concentration and deep breathing required during Baduanjin exercise are believed to regulate the function of the autonomic nervous system, induce a decrease in sympathetic excitability and an increase in parasympathetic activity, thereby inducing a relaxation response and relieving physiological and psychological stress. This interaction is highly consistent with the theoretical model of psychosomatic medicine. Therefore, the rehabilitation effect of Baduanjin can be understood as the result of the combined action of traditional Chinese medicine theory, modern sports science and psychosomatic medicine, and its mechanism is a comprehensive regulation of multi-level and multi-target.

3. Analysis on the Application of Baduanjin in Sports Rehabilitation

3.1. Sports Rehabilitation Applications for Different Diseases

The application of Baduanjin in exercise rehabilitation is expanding with the deepening of practical research, and it shows unique value in the intervention of many chronic diseases and functional decline diseases. In the field of chronic musculoskeletal diseases, Baduanjin is especially widely used.

For chronic non-specific low back pain, Baduanjin's multiple moves can effectively stretch the tense muscles and fascia of the waist through gentle spinal lateral flexion, rotation and forward flexion movements, enhance the stability and endurance of the core muscles, and thus improve the

mechanical balance of the lumbar spine. This low-intensity continuous exercise helps break the vicious cycle of pain-limited mobility-decreased muscle strength and provides a safe and active way for patients to recover.

In the rehabilitation of osteoarthritis patients, especially knee osteoarthritis, stable horse stance and deficiency conversion movements in Baduanjin, such as horse stance support, can enhance muscle strength around knee joint, improve joint proprioception, promote joint synovial fluid circulation, thus relieving pain and delaying joint function degradation under the premise of minimizing joint impact load [3].

In the rehabilitation management of chronic metabolic and cardiovascular diseases, Baduanjin, as a kind of moderate aerobic exercise, is increasingly valued. For people with type 2 diabetes, regular Baduanjin exercises help improve insulin sensitivity and help control blood sugar levels. Its soothing rhythm and physical and mental characteristics are conducive to reducing sympathetic nerve tension, regulating stress hormone secretion, stabilizing blood pressure and improving cardiovascular function. It is suitable for patients with hypertension and coronary heart disease in rehabilitation period.

In addition, Baduanjin also plays a role in the rehabilitation of neurological diseases. For Parkinson's disease patients, the emphasis on center of gravity shift, slow and coherent movement track and high concentration of mind can train the balance ability, gait rhythm and posture control of patients, which has positive significance in delaying disease progression and preventing falls.

3.2. Application Effectiveness and Influencing Factors

The application effect of Baduanjin in exercise rehabilitation is reflected in the positive changes in physiological and psychological dimensions. At the physiological level, the effect is mainly manifested in the improvement of physical function indicators. Long-term practice can effectively enhance upper and lower limb muscle strength and muscle endurance, improve joint flexibility and range of motion. The continuous requirement for body weight control in exercises can significantly improve static and dynamic balance ability, which is critical for preventing falls in the elderly. In cardiopulmonary function, deep, long, thin and even abdominal breathing combined with gentle exercise can enhance respiratory muscle strength, improve lung ventilation efficiency, and have a benign regulatory effect on heart rate variability, and promote cardiovascular health. From biochemical indicators, regular exercise showed potential benefits in regulating blood glucose, lipid metabolism and maintaining endocrine stability. At the psychological level, the application effect is mainly manifested as the decrease of negative emotions and the enhancement of positive psychological resources. The mental guidance and physical perception during the exercise can reduce stress levels, alleviate anxiety and depression symptoms, and enhance individuals' sense of control over their own health and self-efficacy, thus promoting the overall improvement of physical and mental health.

However, the effect of Baduanjin in exercise rehabilitation is not constant, and its effect is affected by many internal and external factors. The primary factor is the quality and compliance of the exercises. The accuracy and standardization of movements are the basis for producing the

desired results. Wrong postures are not only difficult to achieve results, but may also bring sports risks. The frequency, duration and total cycle of practice are directly related to the accumulation and consolidation of effects [4]. Short-term or intermittent practice often only produces temporary effects. Second, individual differences are inherent factors that cannot be ignored. There are significant differences in age, sex, severity of basic diseases, physical condition and exercise basis among different patients, which determines their physiological and psychological reactions and adaptability to Baduanjin. Thirdly, the professionalism of guidance and the integration of rehabilitation programs constitute key external influencing factors. Whether there are professional rehabilitation therapists or traditional health mentors for correct guidance, supervision and timely adjustment of movements is the core link to ensure safe and effective practice.

4. Discussion on the Regulation Mechanism of Meridians of Four-Eight-Segment Brocade

4.1. Regulating the Circulation of Qi and Blood in Meridians

The meridian conditioning mechanism of Baduanjin is firstly reflected in its systematic regulation of the circulation of qi and blood throughout the body [5]. According to the theory of TCM, qi and blood are the basic substances to maintain human life activities, and their smooth circulation depends on the smoothness of meridian system. Each movement design of Baduanjin contains profound meridian theory, which realizes benign stimulation and dredging of main meridians through specific body guidance. For example, the movement of "supporting Tianli Sanjiao with both hands" fully pulls the circulation route of Hand Sanyin Meridian and Hand Sanyang Meridian through lifting and stretching of upper limbs, especially produces significant excitation effect on Hand Shaoyang Sanjiao Meridian. This upward lifting action combined with deep breathing helps to spread the atmosphere in the chest, promote the dissemination and descent of upper energizer lung qi, dredge the qi of middle energizer spleen and stomach, guide the rise of lower energizer qi, thus regulating the function of "three energizers" located in the body cavity as a whole, promoting the smooth qi movement and the smooth regulation of water channels. Similarly, "regulating spleen and stomach must be lifted singly" acts on the liver meridian of foot Jueyin and the gallbladder meridian of foot Shaoyang running along the flank, and forms traction on the spleen meridian of foot Taiyin and the stomach meridian of foot Yangming in the abdominal region by alternately pulling up and down the left and right upper limbs. This symmetrical stretching action can regulate the function of liver qi, relieve qi stagnation, and promote the coordination of spleen and stomach qi, so as to achieve the effect of "dispersing qi and blood, so as to adjust it" as stated in the Yellow Emperor's Internal Classic. Through this systematic guidance, the whole set of cultivation methods can stimulate and comb the twelve meridians and eight extraordinary meridians of the whole body in an orderly manner, thus fundamentally improving the circulation of qi and blood.

4.2. Indirect Conditioning Mechanism for Zang-Fu Functions

The regulating mechanism of Baduanjin to zang-fu organs is realized indirectly through the connection of meridian system and the direct nourishing effect of qi. According to the theory of Zangxiang in TCM, the physiological functions of Zang-fu organs are expressed through their meridians on the body surface, and the stimulation of meridians on the body surface can also react on the corresponding Zang-fu organs. Many moves of Ba Duan Jin are based on this principle of "external training of bones and muscles, internal adjustment of viscera". Take "climbing feet and strengthening kidney waist with both hands" as an example, this movement fully stretches the waist by bending forward greatly, and the waist is the house of kidney, and the kidney meridian and bladder meridian of foot Shaoyin all run here. Mild stimulation of lumbosacral region and traction of bladder meridian can stimulate essence in kidney, strengthen kidney's function of controlling water, reproduction and bone marrow, thus indirectly strengthening waist and knee, benefiting essence and filling marrow. Another example is "shaking head and tail to remove heart fire", the core of which lies in the rotation and swing of the spine. This movement can effectively massage the bladder meridian of foot Taiyang located on both sides of the spine, while the back shu point of bladder meridian is a specific point where the qi of zang-fu organs is infused into the back and waist. Stimulating these acupoints can indirectly regulate the functions of the corresponding zang-fu organs, especially the movements near Xinshu and Ganshu, which is helpful to clear the deficiency fire of the two meridians of the heart and liver, and achieve the goal of balancing yin and yang and calming the mind. In addition, the deep breathing emphasized in the exercise itself is the exercise of lung function, and the regulation of breathing directly affects the rise and fall of qi, thus producing extensive and far-reaching regulation on the gasification activities of the whole body.

4.3. Combined Interpretation with Modern Exercise Physiology

Explaining the conditioning mechanism of Baduanjin from the perspective of modern exercise physiology can provide a scientific understanding framework for its traditional efficacy and promote the dialogue between traditional health cultivation methods and modern medicine. First of all, Baduanjin's regulating effect on meridian qi and blood circulation can be understood from the angle of improving blood circulation, microcirculation and tissue fluid flow. The slow, coherent, twisting and stretching patterns of the exercises are like a gentle "massage" of blood vessels and lymphatic vessels. This periodic muscle contraction and relaxation enhances the "muscle pump" function, promotes venous blood and lymph return, and thus helps to improve peripheral circulation, reduce peripheral vascular resistance, and accelerate the elimination of metabolites. This is similar to the effect of "activating qi and activating blood" described by traditional Chinese medicine. Secondly, part of the indirect regulation mechanism of Baduanjin on zang-fu function can be explained by the regulation of autonomic nervous system function. Exercise requires mental introspection and even breathing, which can induce the body to shift from the state of sympathetic excitation to the state of parasympathetic dominance. This shift in autonomic balance leads to a decrease in heart rate, a stabilization of blood pressure, an

increase in gastrointestinal motility, and a stabilization of the endocrine system, thus having a positive overall impact on cardiovascular, digestive, immune and other systems. Therefore, the mechanism of action of Baduanjin can be regarded as a comprehensive physiological process that affects nervous system, endocrine system and circulatory system through body movement, and finally realizes multi-system function optimization.

5. Concluding Remarks

This study systematically discusses the application of Baduanjin in exercise rehabilitation and its meridian conditioning mechanism, and draws the following conclusions. Baduanjin, as a traditional health-preserving exercise with body and mind in harmony, is suitable for rehabilitation auxiliary treatment of many chronic diseases and functional decline diseases because of its gentle and slow movement design and emphasis on the combination of form, qi and intention. It shows multidimensional and comprehensive application effects in improving joint mobility, enhancing muscle strength, enhancing balance stability and alleviating negative emotions. Promoting the deep integration of Baduanjin and modern rehabilitation medicine, strengthening the training of professional talents and standardized guidance will be the key to improving the

scientificity and effectiveness of its application. The ultimate goal is to construct a new paradigm of exercise rehabilitation that integrates the wisdom of Chinese and Western medicine, and is both scientific and practical.

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