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Research Progress on the Relationship between Parkinson's Disease Exercise Rehabilitation and the Dialectical Thought of "Shaoyang Governs Bone" and "Taiyang Governs Tendon" in Traditional Chinese Medicine

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Abstract: This study explores the potential influence of Traditional Chinese Medicine's (TCM) diagnostic concepts-"Shaoyang governs bones" and "Taiyang governs tendons" -on physical therapy for Parkinson's disease (PD). By analyzing both motor and non-motor symptoms in PD patients, this paper integrates TCM theories with modern rehabilitation practices to demonstrate the therapeutic value of meridian theory in PD treatment. Specifically, it focuses on optimizing blood and Qi circulation through regulating the GALLBLADDER MERIDIAN and BLADDER MERIDIAN to improve motor dysfunction. Additionally, the study reviews the application of Daoyin techniques in PD rehabilitation, offering innovative perspectives and methodologies for integrating TCM and Western medicine in Parkinson's disease recovery.

1. Introduction

In 1817, British physician James Parkinson published the seminal paper "An Essay on the shaking palsy" [1]. French neurologist Jean-Martin Charcot, recognizing James Parkinson as the pioneer in paralysis research, named the condition Parkinson's disease [2]. Modern medicine recognizes Parkinson's disease as a common neurodegenerative disorder characterized by motor symptoms including bradykinesia, resting tremor, muscle rigidity, and postural instability, along with non-motor symptoms such as cognitive impairment, mood disturbances, and sleep disorders [3].

From the perspective of TCM, the resting tremor manifested by PD can be classified as "tremor syndrome" in TCM. The understanding of tremor syndrome in TCM can be traced back to the Qin and Han dynasties two thousand years ago. The concept that "various types of wind-related dizziness and vertigo belong to the Liver" reflects an early understanding of such conditions as described in the "*Suwen·Zhizhen Yao Da Lun"* [4].

Pharmacotherapy remains the primary treatment for Parkinson's disease. Although Western medicine has made progress in drug therapy and surgical interventions, rehabilitation management

continues to pose challenges. Rehabilitation therapy is recognized as effective in improving various functional impairments in PD patients, enhancing their ability to perform daily activities independently, and even studies have reported its potential to slow disease progression [3]. In recent years, TCM theories have demonstrated unique advantages in PD treatment, particularly the dialectical concept of "Shaoyang Governs Bone" and "Taiyang Governs Tendons," which provides new perspectives for motor rehabilitation in PD management.

2. Theoretical Background

Modern medicine recognizes Parkinson's disease as a neurodegenerative disorder, yet TCM lacks the concept of a "nervous system" in its theoretical framework. TCM practitioners address Parkinson's disease through syndrome differentiation and treatment approaches based on concepts such as "tremor syndrome", "muscle meridians", "Shaoyang Governs Bone" and "Taiyang Governs Tendon." The core theoretical principles are summarized as follows:

2.1 The Idea of "Taiyang Governs Tendon"

The classic text "*Ling Shu: Meridians"* contains the earliest documented connection between the Taiyang meridian and tendon disorders, stating that "The Taiyang meridian governs tendons and their associated diseases." From a TCM perspective, this concept encompasses three key aspects: blood stagnation along the meridian's path, the influence of defensive Yang energy levels on tendon health, and symptoms related to muscles' external and superficial nature. While both Taiyang and Liver meridians govern tendons, their therapeutic focus differs significantly. Specifically, Taiyang meridians emphasize Yang energy transformation functions and address pathologies involving external meridians along with tendon pathways.

The concept of "Pathological conditions affecting the Taiyang tendon" describes blood stagnation or malnutrition in tissues near tendon nodes (e.g., muscles, tendons, and fascia) along meridian pathways. This leads to symptoms such as joint pain, muscle stiffness, and spasms. The vitality of defensive Yang directly determines the strength of these tendon tissues: abundant defensive Yang warms the tendons, while deficient Yang may cause cold-induced stiffness and muscle tension. Since defensive Qi resides on the body's surface and corresponds to meridians and internal organs, tendon-related disorders broadly refer to external surface conditions. The distribution of meridian tendons aligns with the "Taiyang govern tendon pathologies" characteristic-tendon disorders occurring near nodes along the Foot-Taiyang meridian. Treatment options include selecting acupoints within this pathway or applying tendon therapy.

The distinction between "Taiyang governs tendons" and "Liver governs tendons": The pathologies associated with Taiyang governs tendons primarily refer to conditions occurring along the bladder meridian's tendon pathways or those caused by deficient defensive Yang and cold-damp obstruction in Taiyang tendons. This differs from the physiological explanation of Liver blood regulating tendon strength through the Liver govern tendons concept. Taiyang governs tendons emphasizes Yang Qi transformation functions and external meridian pathologies along the Taiyang meridian and its associated tendons. While both Liver governs tendons and Taiyang governs tendons, their therapeutic scopes differ: Liver governs all fascial tissues throughout the body, whereas Taiyang governs the body's exterior surface and manifestations of diseases along meridians and tendon pathways. The core differences lie in their relationships with blood and Qi, as well as visceral and meridian systems. Both pathologies manifest as external meridian symptoms affecting tendon-bone joint function. Liver-related tendon disorders are deeper in location and more severe in progression, while Taiyang-related tendons, though initially milder, may penetrate into visceral organs if left untreated [5,6].

In clinical practice, acupoints and acupuncture techniques related to the distribution of sinew

channels and the relationship between defensive Yang energy and these channels can be selected for treatment. During PD rehabilitation, regulating Qi and blood circulation in the Taiyang meridian helps alleviate muscle stiffness and improve joint mobility. This fully demonstrates the clinical significance of "Taiyang meridian governs disorders of tendons" in TCM.

2.2 The Idea of "Shaoyang Governs Bone"

The concept of "Foot-Shaoyang meridian governs bone-related diseases" in *Ling Shu: "Meridians and Collaterals"* not only highlights the Shaoyang meridian's influence on skeletal health but also encompasses tendon injuries. This theory has played a pivotal role in shaping the foundational theories of orthopedics within TCM, while offering practical guidance for clinical practice. The dual perspectives of "Kidney governs bones" and "Shaoyang governs bones" provide complementary explanations for skeletal physiology and pathology, working synergistically in clinical applications. Modern medical research has further revealed the biological basis and functional mechanisms underlying the "Kidney-governs-bones" theory, which holds significant value for the prevention and treatment of renal-bone system disorders.

The phrase "The Foot-Shaoyang governs bone-related diseases" encompasses three aspects: bone physiology, bone-derived disorders, and tendon injuries [7]. In TCM, the concepts of "Kidney governs bones" and "Shaoyang governs bones" represent two distinct perspectives on bone pathology. The former emphasizes endocrine functions, while the latter focuses on meridian pathways [8]. The Kidney theory primarily refers to bone marrow production by the Kidneys, whereas the Shaoyang theory explains bone development through meridian regulation of tendons, joint mobility, and the transmission of gallbladder's vital energy via Shaoyang channels [9]. Essentially, the Kidney theory emphasizes bone formation and marrow generation, while Shaoyang theory prioritizes bone function activities such as tendon attachment, which are more closely associated with Shaoyang pathways [10].

Notably, in Parkinson's disease treatment, studies have shown that stimulating acupoints related to the gallbladder meridian can promote bone health and indirectly improve motor function [11]. Modern medical research has also revealed the material basis and functional rationale behind the "Kidney governs bones" theory. The Kidneys physiologically regulate the activity of osteoblasts and osteoclasts in bone homeostasis, playing a crucial regulatory role in skeletal development. Renal diseases affecting bones and muscles, known as "renal-dominant bone disorders," typically manifest as Kidney disease-mineral and bone metabolism disorder (CKD-MBD) caused by impaired renal function [12,13].

A review of the "*Nei Jing*" reveals that the concept of "Shaoyang governs bones" emphasizes two key characteristics: "pain in all joints" (bony pain across multiple body regions) and "bones becoming unstable without proper anchoring" (decreased bone strength and mechanical stability, increasing fracture risk). These findings align with modern osteoporosis (OP) symptoms, potentially representing the world's earliest recognition of systemic skeletal disorders associated with osteoporosis. Notably, the superficial Shaoyang meridian was identified as capable of self-regulating both physiological and pathological changes in bone strength [14].

3. Clinical Application Research

3.1 Research on Acupuncture and TCM Treatment of PD

In the treatment of Parkinson's disease using TCM, acupuncture and herbal medicine are frequently employed by practitioners. The TCM meridian theory's dual principles-"Shaoyang governs bones" and "Taiyang governs tendons" -are often applied in TCM diagnosis and therapy for PD. Some physicians posit that the core pathogenesis of PD lies in "deficiency of the Five Zang Viscera and

impaired Taiyang function," suggesting PD symptoms stem from "Taiyang syndrome." Other scholars analyze the primary pathogenesis as "impaired gallbladder Qi and stagnation in the Triple Energizer Meridian," with clinical practice demonstrating benefits from "treating Shaoyang through harmonizing relationships." Clinical studies reveal that the most frequently used acupoints are concentrated in the Foot-Shaoyang Gallbladder Meridian and Shaoyang Meridian tendons.

In the TCM diagnosis and treatment of Parkinson's disease, Wen Junxiong et al[28]. found through clinical practice that interventions guided by the "Harmonizing Shaoyang" theory can significantly improve symptoms and demonstrate notable clinical efficacy. Peng Jiandong et al[4]. proposed that from the perspective of meridian pathophysiology, different PD subtypes and disease stages may affect all six meridians, but the Foot-Taiyang Bladder Meridian has the most significant impact on human health. They summarized its core pathogenesis as "deficiency of Five Zang Viscera and impaired Taiyang meridian function," and subsequently adopted a treatment approach of "regulating and tonifying the Five Zang Viscera while unblocking the Taiyang meridian".

In the acupuncture treatment of Parkinson's disease, Xiong Kang [30] and colleagues conducted a data mining study on acupoint selection patterns for cognitive impairment. Their research revealed that from 2000 to 2021, the top five meridians most frequently selected were the Governor Vessel(GV), Foot-Shaoyang Meridian, Conception Vessel(CV), Foot-Taiyang Meridian, and Foot-Yangming Meridian. Analyzing 36 studies from 2014 to 2019, they found the most commonly used meridian was the Governor Vessel, with the Foot-Shaoyang Gallbladder Meridian being the most frequently applied [32]. Guan Zhaohua [31].and colleagues compiled over 100 literature reviews on acupuncture treatment patterns, identifying the Foot-Shaoyang Gallbladder Meridian, Governor Vessel, and Large Intestine Meridian of Hand-Yangming as the primary acupoint clusters. Xu Wei et al. [33] employed factor analysis to synthesize data from over 220 studies, ultimately extracting three principal factors, with selections predominantly concentrated in the Governor Vessel, Conception Vessel, and Foot-Taiyang Meridian.

Furthermore, He Yingli [34] and colleagues analyzed the etiology and pathogenesis of Parkinson's disease myotonia from the perspective of "contracture syndrome," while proposing treatment strategies for myotonia symptoms through the concept of "meridian tendons," providing new clinical approaches. The theories of "tendon meridians" and the correlation between "Taiyang" (the Taiyang Meridian) and "Shaoyang" (the Shaoyang Meridian) in TCM have been effectively validated [15]. This aligns with Lei Luo et al.'s [35] viewpoint that "the musculoskeletal system, nervous system, and circulatory system are closely interconnected." Through extensive application in TCM practice, the "meridian-tendon system-musculoskeletal system" framework has established a close integration between Chinese and Western medicine, advocating comprehensive management of Parkinson's disease. Clinical studies have confirmed these approaches. Research by Luo Weiping et al. [36] demonstrated that applying Qihuang acupuncture based on meridian-tendon theory shows significant efficacy in treating Parkinson's disease, characterized by high value, safety, and effectiveness. The combined use of Chinese and Western medical approaches seamlessly integrates their respective strengths, achieving complementary advantages and mutual reinforcement-making it worthy of clinical promotion.

3.2 Application of Daoyin Technique in PD Rehabilitation

Within the framework of diagnosing and managing Parkinson's disease, traditional Chinese Daoyin exercises—such as Tai Chi, Baduanjin, and Yijinjing—function as complementary modalities alongside conventional therapeutic methods, including acupuncture, moxibustion, and topical herbal treatments. These practices help balance Yin and Yang energies, promote blood circulation, and achieve preventive healthcare goals while preventing disease progression. They demonstrate

advantages in conserving medical resources and reducing patients' financial burdens, making them worthy of greater attention and research [36].

"Dao Yin," the ancient name for Qigong, derives its name from "Dao" (to guide) and "Yin" (to extend), symbolizing the regulation of Qi flow and body movement. As a vital component of Traditional Chinese Medicine rehabilitation techniques, Daoyin serves as an essential therapeutic approach for disease prevention and treatment [17]. Research has confirmed that Traditional Chinese Exercise (TCE) demonstrates proven efficacy in improving motor symptoms, balance, and gait parameters (including walking speed, 6-Minute Walking Test, and stride length) in Parkinson's patients [18-19]. Furthermore, TCE has been shown to enhance sleep quality and cognitive function in these individuals [20].

As previously mentioned, the symptoms of Parkinson's disease, such as impaired limb movement, tremors, and rigidity, are categorized under "Jingjin disease" in TCM. The Daoyin Exercise improves Qi and blood circulation by regulating tendons, thereby nourishing bones, muscles, and internal organs. Studies show that modified versions of this exercise-such as the supine knee-hugging posture, Tiger Play, standing foot-shaking, Bird Dance, and others-can enhance motor function and quality of life in Parkinson's patients while preventing falls [21]. Additionally, abdominal rotation exercises adapted from Ding Guangdi's “Research on Daoyin Methods in TCM”(1993) have shown improvements in depression, constipation, walking ability, balance, slowed movement, and overall quality of life after prolonged practice [22].

Tai Chi is a gentle exercise in TCM. It can improve the balance of Parkinson's disease patients, reduce the risk of falling down, and improve mood, sleep and quality of life, which indicates that exercise can improve Parkinson's symptoms [23,24].

4. Comprehensive Discussion

Parkinson's disease, the second most common neurodegenerative disorder following Alzheimer's disease, is recognized as the third leading health threat among elderly populations due to its high associated disability rate. Patients in the middle and advanced stages of Parkinson's disease typically require long-term care, which imposes substantial burdens on families and society. According to 2019 global statistics, approximately 8.51 million individuals worldwide were affected by Parkinson's disease, with China accounting for 2.84 million cases (33.37%), making it the country with the highest disease burden. With the continued growth of China's aging population, scholars project that by 2030, the number of Parkinson's patients in China may reach 4.9 million, accounting for 57% of the global total. [25].

Although pharmacotherapy remains the primary treatment for Parkinson's disease, effectively managing motor symptoms and associated complications, it does not alter the underlying disease progression. In recent years, rehabilitation therapy has received growing recognition. Through the development of personalized exercise programs tailored to individual patient profiles, long-term adherence to such regimens not only enhances patients' self-care capabilities and improves their quality of life, but also shows considerable promise in slowing the progression of the disease [4,26].

However, a substantial gap persists between ideal and actual outcomes in Parkinson's disease rehabilitation. At present, the field faces numerous challenges, including high demand for treatment, limited accessibility, low rates of early intervention, disparities in clinical expertise among healthcare providers, and rehabilitation approaches that are often monotonous, standardized, and of limited efficacy[25,27]. Therefore, the development of innovative, cost-effective, and accessible rehabilitation strategies has become essential to improve therapeutic effectiveness and enhance patient adherence.

Parkinson's disease manifests clinically through motor symptoms and non-motor. As the disease

progresses, both motor and non-motor symptoms progressively worsen. The development of effective rehabilitation protocols has become a critical focus for clinicians and researchers in this field. The “Chinese Parkinson's Disease Treatment Guidelines” (4th Edition) highlight that rehabilitation and exercise therapy effectively improve motor and non-motor symptoms in PD patients. These interventions may even slow disease progression. This is particularly true when patients exhibit axial symptoms such as gait disorders, postural instability, speech difficulties, or swallowing problems-symptoms where medication often proves ineffective. However, these patients may still benefit from rehabilitation interventions. Therefore, the guidelines recommend implementing rehabilitation therapy throughout the entire disease course of Parkinson's patients [26].

Western medicine typically guides rehabilitation training for Parkinson's disease patients, focusing on addressing issues such as balance dysfunction, gait abnormalities, and reduced muscle strength. Imaging studies have shown that aerobic exercise can optimize brain structure and function, while strength training improves posture and balance [23]. TCM also demonstrates unique therapeutic effects in PD treatment. Research indicates that acupuncture, TuiNa (Chinese massage), herbal medicine, and other TCM therapies effectively alleviate various non-motor symptoms of PD [3].

TCM has gained prominence due to its unique theoretical framework rooted in Yin-Yang and Wu Xing (Five Phases) theory which fundamentally differ from Western medical foundations. Ancient TCM texts contain detailed descriptions of Parkinson's disease symptoms, with many traditional therapies still widely used in modern China for both prevention and treatment. A prime example is Tai Chi-a gentle exercise regimen that enhances balance in Parkinson's patients, reduces fall risks, and improves mood, sleep quality, and overall life quality. These findings demonstrate the rehabilitative benefits of physical activity for Parkinson's symptoms [23,24].

The concepts of "Shaoyang governs bones" and "Taiyang govern tendons" represent two fundamental diagnostic principles in TCM meridian theory, which are extensively applied in Parkinson's disease treatment. Some physicians posit that the core pathogenesis of PD lies in "deficiency of the Five Zang Viscera and impaired Taiyang function," suggesting that PD symptoms stem from "Taiyang syndrome" [4]. Other scholars analyze the primary pathogenesis as "impaired gallbladder Qi and stagnation in the triple energizer meridian," with clinical practice demonstrating benefits from "treating through harmonizing Shaoyang" -indicating PD symptoms originate from "Shaoyang syndrome" [28,29]. Comprehensive reviews of acupuncture and needling therapies reveal that the most frequently used acupoints predominantly concentrate on Shaoyang and Taiyang meridians along with sinew channels [30-33].

From the perspective of TCM diagnosis and treatment plans at various places and different time periods, whether it is the herbal therapy or acupuncture therapy of "reducing Shaoyang", there are universal and regular patterns that cannot be ignored in the treatment of Parkinson's disease with acupoints related to "Taiyang" and "Shaoyang" meridians and tendons.

Traditional Chinese Medicine theory posits that the motor functions affected by Parkinson's disease fall under the TCM concept of "Jingjin" (meridian-fiber system), which is closely linked to the meridian theory mentioned earlier [34]. The three systems of movement, nerves, and circulation are fundamentally interconnected. The "meridian-fiber system-motor system" framework establishes a close integration between TCM and Western medicine [35,36,15]. In Parkinson's disease management, alongside acupuncture, moxibustion, and topical herbal applications, traditional guiding exercises like Tai Chi, Baduanjin, and Yijinjing can harmonize Yin-Yang balance and promote blood circulation. These interventions contribute to the attainment of preventive healthcare objectives and the stabilization of disease conditions, while simultaneously promoting the efficient utilization of medical resources and alleviating patients’ financial burdens, thereby warranting increased scholarly attention and further investigation. [16].

5. Conclusion

The TCM dialectical concept of "Shaoyang governs bones" and "Taiyang governs tendons" provides effective theoretical support and practical guidance for PD rehabilitation. By applying acupuncture, guided exercises, and other methods, we can significantly improve patients' motor function and quality of life. Future research should further deepen the scientific foundation of these theories while exploring more innovative rehabilitation strategies.

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