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Integration and Symbiosis: A Study on the Disciplinary Correlation between Rehabilitation Therapy, Acupuncture and Tuina, and Systematic Anatomy

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Abstract : *As important components of modern medical technology and traditional Chinese medicine, rehabilitation therapy and acupuncture and tuina have a natural intersection based on the epistemological foundation of human structure and function. As a bridging discipline connecting the two, systematic anatomy provides an ontological framework for understanding the heterogeneity and complementarity of Chinese and Western rehabilitation technologies. Based on the learning experience at the undergraduate stage, this paper systematically explores the correlation between the three disciplines from three dimensions: theoretical basis, practical skills, and clinical thinking. The study finds that: at the theoretical level, systematic anatomy provides a morphological interpretation for the "meridian-acupoint" system of acupuncture and tuina, and lays a biomechanical foundation for the movement analysis of rehabilitation therapy; at the practical level, acupuncture and tuina techniques and rehabilitation therapy technologies realize functional integration on the platform of modern rehabilitation medicine, forming an optimized "integrated Chinese and Western" treatment plan; at the thinking level, the "structure determines function" logic of anatomy, the "qi-blood circulation" concept of acupuncture and tuina, and the "function-oriented" thinking of rehabilitation therapy penetrate each other, giving birth to a clinical decision-making model combining holism and reductionism. This paper proposes a three-dimensional knowledge integration model of "Anatomy-Acupuncture-Rehabilitation", advocating to strengthen the interdisciplinary integration of the three disciplines in curriculum setting, clinical training and scientific research innovation, so as to provide theoretical reference for cultivating new rehabilitation talents with an integrated medical perspective.*

Keywords: *Rehabilitation Therapy; Acupuncture and Tuina; Systematic Anatomy; Interdisciplinary Integration; Integration of Traditional Chinese and Western Medicine*

1.INTRODUCTION

1.1 Research Background and Significance

Entering the 21st century, the medical model is undergoing a profound transformation from "biomedical model" to "bio-psycho-social model". In this context, rehabilitation medicine, as a comprehensive discipline focusing on functional recovery, has become increasingly prominent. At the same time, traditional Chinese medicine has gained more and more recognition worldwide for its unique theoretical system and definite clinical efficacy. The World Health Organization's *Traditional Medicine Strategy (2014-2023)* clearly points out that promoting the integration of

traditional medicine into the mainstream medical system is an important direction for the development of health undertakings in various countries. Although the education of rehabilitation therapy major in China started late, it has developed rapidly. At present, more than 100 universities across the country have set up undergraduate programs in rehabilitation therapy. The curriculum system includes not only the core content of modern rehabilitation medicine, but also generally incorporates traditional Chinese medicine courses such as acupuncture and tuina. This "integration of traditional Chinese and Western medicine" training model is not only a feature of Chinese rehabilitation education, but also brings profound academic challenges: modern rehabilitation therapy is based on empirical sciences such as anatomy, physiology and biomechanics, while acupuncture and tuina are supported by the traditional Chinese medicine discourse system such as meridian theory and qi-blood theory. How to achieve true integration between the two within the same cognitive framework, rather than a simple "curriculum patchwork", is a core issue related to the quality of talent training and disciplinary development [1]. As a cornerstone course of medical education, systematic anatomy plays a bridging role between the two. From the perspective of class hour allocation, the anatomy class hours of rehabilitation therapy major are generally higher than those of other medical technology majors. The teaching syllabus of Guangzhou University of Chinese Medicine shows that the experimental class hours of systematic anatomy for this major reach 90, exceeding the 81 class hours of traditional Chinese medicine and acupuncture and tuina majors. This difference itself indicates that anatomical knowledge is of special importance for the training of rehabilitation therapy talents [2].

1.2 Personal Learning Experience

As a student majoring in rehabilitation therapy at a university of Chinese medicine, my curriculum covers exactly the three disciplines: systematic anatomy and functional anatomy in the first and second years laid the morphological foundation; acupuncture and tuina in the second and third years introduced meridians, acupoints and manipulation techniques; courses such as rehabilitation assessment, physical therapy and occupational therapy in the third and fourth years built the technical system of modern rehabilitation. During the four-year study process, a profound feeling is that although these three types of knowledge belong to different teaching and research sections and use different textbooks in class, they must be integrated in clinical thinking. I still remember when learning peripheral nerves in systematic anatomy, the teacher mentioned the typical manifestation of "claw hand" after ulnar nerve injury. At that time, I only mechanically memorized the nerve course and innervated muscles. When learning acupoints such as Shousanli (LI10) and Waiguan (TE5) in acupuncture, I found that these acupoints are exactly located near the nerve trunks or branches. The muscle strength training for intrinsic hand muscles in rehabilitation assessment corresponds to the functional reconstruction after nerve injury. This "triple confirmation" learning experience prompted me to think: is there a deep structural logic between the three disciplines? If such connections can be established earlier and more consciously in teaching, will learning efficiency and clinical ability be significantly improved?

1.3 Research Objectives and Methods

The purpose of this paper is to systematically explore the disciplinary correlation between rehabilitation therapy, acupuncture and tuina, and systematic anatomy, sort out their internal connections from three dimensions of theoretical basis, practical skills and clinical thinking, and put forward suggestions for curriculum construction to promote interdisciplinary integration. The research method combines literature review and theoretical analysis. By searching relevant studies on platforms such as CNKI and Wanfang Database, and integrating the author's learning experience at the undergraduate stage, this paper strives to form original theoretical understanding

[3].

2 Correlation of Theoretical Basis: From Morphological Structure to Functional Regulation

2.1 Systematic Anatomy: The Common Cornerstone of Rehabilitation and Acupuncture

Systematic anatomy is a science that studies the normal morphological structure of the human body, and its core is to reveal the basic law of life that "structure determines function". For rehabilitation therapy and acupuncture and tuina, the mastery of anatomical knowledge directly determines the scientificity and safety of clinical operations [4]. From the perspective of rehabilitation therapy, anatomy is a "roadmap" for functional assessment and therapeutic intervention. The measurement of joint range of motion needs to clarify the shape of the joint surface and the direction of the movement axis; muscle strength assessment needs to be familiar with the origin, insertion and nerve innervation of each muscle; gait analysis needs to understand the coordinated contraction mode of lower limb muscle groups. The digital human anatomy system equipped in the Anatomy Laboratory of Heilongjiang University of Chinese Medicine can three-dimensionally reconstruct more than 5,000 anatomical structures, allowing students to intuitively observe the course of muscles, the distribution of nerves and the adjacency of blood vessels in a virtual space. This visualized learning has greatly improved students' overall grasp of the motor system [5]. From the perspective of acupuncture and tuina, anatomy is a "decoder" for understanding the essence of meridians and the location of acupoints. Although the essence of meridians has not yet been determined, a large number of studies have shown that the course of meridians is closely related to anatomical structures such as nerves, blood vessels and lymphatic vessels. Since the 1970s, Wenzhou Medical University has carried out integrated research on acupuncture and anatomy. Professor Chen Tongfeng proposed the hypothesis of the relationship between the spinal substantia gelatinosa and meridian sensory transmission, and discovered new acupoints on this basis. Modern research further reveals that most acupoints are located near nerve trunks or their branches, or at the transition of muscle origin, belly and tendon. For example, the deep part of Huantiao (GB30) is directly opposite the sciatic nerve, and the area below Zusanli (ST36) is traversed by the deep peroneal nerve. This anatomical location feature provides a morphological explanation for the "acupoint-target organ" connection in acupuncture treatment [6].

2.2 Dialogue between Meridian Theory and Neuroanatomy

Meridian theory is the theoretical core of acupuncture and tuina, while neuroanatomy is the basis for modern medicine to understand the human regulatory mechanism. Although there are differences in their discourse systems, they have many similarities in functional description [7].

The course of the Twelve Meridians is consistent with the distribution of peripheral nerves to a certain extent. The Three Yin Meridians of the Hand run from the chest to the hand, overlapping partially with the innervation areas of the median nerve, ulnar nerve and radial nerve; the Stomach Meridian of Foot-Yangming runs along the anterolateral aspect of the lower limb, exactly corresponding to the distribution area of the deep peroneal nerve and superficial peroneal nerve. This spatial correspondence suggests that acupuncture stimulation may produce segmental or systemic regulatory effects by activating nerve endings [8]. "Qi arriving at the affected area" is a key link for acupuncture to take effect, which is interpreted as the establishment of a neural reflex arc in modern research. After the needle is inserted into the acupoint, the stimulation signal reaches the spinal cord through the afferent nerve, then is transmitted upward to the thalamus and cerebral cortex, and after integration, regulates the function of the target organ through the efferent nerve. This process is similar in mechanism to the neurofacilitation techniques in rehabilitation therapy. For example, the reconstruction of motor function after central nervous system injury relies on repeated sensory input to activate cortical plasticity, and the continuous acupoint stimulation

provided by acupuncture may play a similar role of sensory input [9].

2.3 Motor System Anatomy: The Common Language of Rehabilitation Assessment and Tuina Manipulation

The motor system is composed of bones, joints and skeletal muscles, which is the material basis for the human body to complete motor functions. Both rehabilitation therapy and tuina take the motor system as the main object of work, so they share the same anatomical language [10]. In rehabilitation assessment, the Lovett grading of muscle strength, the goniometer measurement of joint range of motion, and the Ashworth grading of spasticity all take anatomical knowledge as the premise. The assessor must be clear about the function of each muscle and the movement axis of each joint to accurately judge the nature and degree of functional impairment. Similarly, although the tuina manipulations such as pressing, rubbing, pushing and grasping are guided by traditional Chinese medicine theory, they also require precise anatomical knowledge in specific operations. For example, the key point of the lumbar oblique pulling manipulation is to make the lumbar spine reach the limit of physiological movement, which requires the operator to be familiar with the arrangement and movement range of the lumbar zygapophysial joints [11]. As an extension of anatomy, biomechanics provides a new perspective for understanding the mechanism of tuina manipulation. Studies have shown that the force acting on soft tissues during rolling manipulation changes periodically, which can promote local blood circulation and release adhesions. These effects can be fully explained by mechanical principles and pathophysiological knowledge, without resorting to supernatural theories. This "interpretability" is an important entry point for the integration of traditional Chinese and Western medicine.

2.4 Docking of Neuroanatomy and Central Nervous System Rehabilitation

The nervous system is the most complex regulatory system of the human body, and it is also a core field of common concern in rehabilitation therapy and acupuncture and tuina. The functional recovery after central nervous system injury is a major issue faced by modern rehabilitation medicine, and acupuncture and tuina have a long history of application in this field [12].

Neuroanatomical knowledge is crucial for understanding the functional disorders after stroke. Damage to the motor area of the cerebral cortex leads to contralateral limb paralysis, lesions of the basal ganglia cause abnormal muscle tone, and cerebellar damage results in ataxia—these clinical manifestations can only be accurately understood on the basis of neuroanatomy. The Bobath technique, Brunnstrom technique, and Proprioceptive Neuromuscular Facilitation (PNF) in rehabilitation therapy are all designed based on neurodevelopmental and motor control theories, aiming to promote functional reorganization by utilizing neural plasticity. Acupuncture also has rich experience in the treatment of stroke sequelae. Scalp acupuncture stimulates the projection area of the cerebral cortex, body acupuncture selects acupoints of the Yangming Meridian to promote muscle strength recovery, and electroacupuncture regulates muscle spasticity—these methods have been proven in modern research to promote the expression of nerve growth factor, inhibit inflammatory response, and improve local blood flow. In other words, the curative effect of acupuncture can also be explained by neurobiological mechanisms, and the two have achieved dialogue on the common platform of neuroanatomy.

3 Correlation of Practical Skills: Manipulation and Functional Reconstruction

3.1 Anatomical Basis in Acupuncture Operation

The safety and effectiveness of acupuncture therapy are highly dependent on the operator's accurate grasp of anatomical structures. Every step, from the selection of needle insertion depth and angle to the avoidance of damage to important organs, requires the guidance of anatomical knowledge [13].

Taking dangerous acupoints as examples: the deep part of Fengchi (GB20) contains the medulla oblongata and vertebral artery, and improper needle insertion direction may be life-threatening; the area below Jianjing (GB21) is the lung apex, and excessive deep insertion may lead to pneumothorax; deep insertion of back acupoints may damage the spinal cord. These risks can only be effectively avoided after systematic learning of regional anatomy. The curriculum system of rehabilitation therapy major in Fujian Medical University includes both systematic anatomy and functional anatomy, which is precisely to strengthen students' anatomical literacy. The generation of needling sensation is closely related to anatomical structures. The so-called "deqi" refers to the patient feeling soreness, numbness, distension and heaviness, and the doctor feeling the needle sinking and tight. The objective basis of this subjective feeling is that the acupuncture stimulates receptors such as nerve endings, muscle spindles and tendon organs. Studies have shown that there are differences in needling sensation produced by needling different tissues: stimulating nerve trunks mostly causes numbness, stimulating blood vessel walls mostly causes pain, and stimulating periosteum mostly causes soreness. Understanding these corresponding relationships helps operators choose the appropriate needling depth according to the treatment purpose.

3.2 Tuina Manipulation and Soft Tissue Anatomy

There are many types of tuina manipulations, ranging from gentle rubbing to deep pressing, acting on different layers of tissue structures. Understanding the anatomical effects of manipulations is the premise of improving curative effect and avoiding injury. According to the depth of action, tuina manipulations can be divided into different layers acting on the skin, subcutaneous tissue, muscles, fascia, periosteum, etc. Rubbing mainly acts on the epidermis and dermis, promoting local blood circulation through mechanical stimulation; kneading acts on the superficial layer of muscles, which can relieve muscle spasm; plucking acts on tendons and fascia, which can release adhesions; pressing acts on the periosteum, producing deep sensation. This layered mechanism of action can be fully explained by anatomical knowledge. The anatomical basis of tuina in the treatment of soft tissue injuries is more intuitive. After muscle strain, local hemorrhage and edema occur, forming adhesions and scars. Through mechanical stretching, squeezing and kneading, tuina manipulations can release adhesions, promote hematoma absorption, and restore tissue mobility. For example, the improved three-step tuina method of "releasing, adjusting and unblocking" for the treatment of lumbar disc herniation works by releasing the lumbodorsal fascia, adjusting facet joint disorders, and restoring the nerve root channel. Each step can be reduced to an anatomical operation.

3.3 Commonality of Manipulations in Rehabilitation Therapy Techniques

Joint mobilization and soft tissue stretching in rehabilitation therapy techniques are highly similar to tuina manipulations in operation form. Both emphasize the rhythm of manipulation, force control and observation of patient response. Joint mobilization is divided into schools such as Maitland and Mulligan, whose core is to improve joint range of motion and reduce pain through passive movement. During operation, the sliding direction must be determined according to the anatomical shape of the joint, and the mobilization level must be determined according to the tension of the joint capsule. This is highly consistent with the thinking of shaking, pulling and flexion-extension manipulations in tuina. The difference is that joint mobilization emphasizes evidence-based basis and quantitative operation more, while tuina manipulation focuses more on "hand feeling" and experience inheritance. Soft tissue stretching is used to increase muscle extensibility and improve flexibility, which has a synergistic effect with tuina manipulations such as pressing-kneading and plucking. In clinical practice, tuina manipulations are often used to relax muscles first, then stretching training is performed, and the combination of the two is better than

a single method. This "integrated Chinese and Western" operation mode is a specific embodiment of integrated and optimized medicine.

3.4 Practical Cases of Integrated and Optimized Medicine

The concept of integrated and optimized medicine is to combine the advantages of different technical systems to form a "1+1>2" treatment plan. The team of Professor Jiang Songhe from Wenzhou Medical University has carried out long-term exploration in the integrated research of acupuncture and rehabilitation, and proposed the idea of "acupuncture feedback law and rehabilitation assessment-based typed acupuncture". Its core is to select acupuncture schemes according to rehabilitation assessment results: inhibitory acupoints and stimulation parameters are selected for spastic paralysis, and excitatory acupoints and stimulation parameters are selected for flaccid paralysis. This individualized treatment model not only retains the syndrome differentiation and treatment characteristics of acupuncture, but also introduces quantitative assessment tools of rehabilitation medicine, reflecting the advantages of the integration of traditional Chinese and Western medicine [14]. The treatment of cervical and lumbar spondylopathy is a typical case of integration and optimization. Modern rehabilitation medicine emphasizes core muscle training, posture control and physical factor therapy; acupuncture and tuina are good at dredging meridians, releasing muscles and tendons, and reducing joint disorders. In clinical practice, acupuncture and tuina are often used first to relieve pain and relax muscles, then rehabilitation training is performed to consolidate the curative effect and prevent recurrence. The two technologies are used alternately in the same patient to form a complete treatment chain.

4 Correlation of Clinical Thinking: The Cognitive Path from Reduction to Integration

4.1 Reductionist Thinking of Anatomy and Its Limitations

Systematic anatomy adopts a reductionist research paradigm, decomposing the human body into different levels such as organs, tissues and cells, and studying their morphological structures one by one. The advantage of this way of thinking is precision, controllability and repeatability, which is the basis for modern medicine to establish scientificity. In the process of learning anatomy, students gradually form a "localization-qualification" diagnostic thinking: infer the possible lesion organ according to the location of symptoms; infer the damaged nerve or muscle according to the performance of functional impairment. However, reductionist thinking also has its limitations. The human body is not a simple sum of its parts, and the overall function is far greater than the sum of local functions. Taking the shoulder joint as an example, simply analyzing the anatomical structure of the glenohumeral joint cannot explain the synergistic effect of the scapulothoracic joint, sternoclavicular joint and acromioclavicular joint in the shoulder joint complex. Similarly, simply treating the damaged local tissue and ignoring the adjustment of the overall posture and movement pattern often leads to unsustainable curative effect and high recurrence rate.

4.2 Holistic Thinking of Acupuncture and Tuina and Its Scientific Connotation

Different from the reductionism of anatomy, acupuncture and tuina emphasize the holistic concept and syndrome differentiation and treatment. Meridian theory connects the inside and outside, upper and lower, zang-fu organs of the human body, and holds that local lesions can reflect the overall state, and overall disorders can also be manifested as local symptoms. In tuina treatment of lumbocrural pain, it is often necessary to not only treat the waist, but also adjust the lower limbs and pelvis; in acupuncture treatment of stomach pain, not only the local Zhongwan (CV12) is selected, but also the distal Zusanli (ST36) and Neiguan (PC6) are selected. This holistic thinking is not metaphysics, but has a basis in systems science. The human body is a complex self-organizing system, and there are nonlinear interactions between various subsystems. Local input stimulation (such as acupuncture at acupoints) can trigger systemic reactions through the

neuroendocrine-immune network. Modern research has confirmed that acupuncture at Zusanli (ST36) can regulate gastrointestinal motility, enhance immune function and affect the emotional center, which is an embodiment of overall regulation.

4.3 Bio-Psycho-Social Model of Rehabilitation Therapy

The core thinking of rehabilitation medicine is the "bio-psycho-social model". This model goes beyond the traditional biomedical model and takes function, activity and participation as the focus of assessment and intervention. For stroke patients, rehabilitation therapy not only focuses on the recovery of motor function of the hemiplegic limb, but also pays attention to the activities of daily living, social participation ability and quality of life. This function-oriented thinking is naturally integrative. Functional assessment itself requires comprehensive interdisciplinary knowledge. Gait analysis needs to combine anatomy, kinematics and dynamics; assessment of activities of daily living needs to combine cognitive function, psychological state and environmental factors. The formulation of treatment plans also requires interdisciplinary collaboration: physical therapists deal with motor disorders, occupational therapists train living abilities, speech therapists improve communication functions, and psychologists adjust emotional states. The role of rehabilitation therapists is to integrate these scattered professional knowledge to form a patient-centered comprehensive intervention plan.

4.4 Construction of the "Anatomy-Acupuncture-Rehabilitation" Three-Dimensional Thinking Model

Based on the above analysis, the author attempts to propose a three-dimensional thinking model of "Anatomy-Acupuncture-Rehabilitation" as a framework for integrating the cognitive paths of the three disciplines. The first dimension (anatomical perspective): based on morphological structure, answer the question of "what is it". Faced with functional impairment, first analyze from the anatomical level: which muscle is weak? Which joint has limited range of motion? Which nerve is damaged? This analysis provides objective and quantifiable assessment basis. The second dimension (acupuncture and tuina perspective): based on the framework of meridian and qi-blood, answer the question of "why". On the basis of anatomical analysis, further think: which meridian disorders do functional impairments reflect? Which acupoints have regulatory effects? How do manipulations affect the operation of qi and blood? This analysis provides an overall and dynamic pathophysiological explanation. The third dimension (rehabilitation therapy perspective): aiming at functional recovery, answer the question of "what to do". Based on the understanding of the first two dimensions, formulate a specific treatment plan: select which rehabilitation technologies to train muscle strength and improve range of motion? How to coordinate with acupuncture and tuina technologies? How to evaluate the curative effect and adjust the plan? The three dimensions are interdependent and mutually corroborative: without anatomical basis, acupuncture and tuina are prone to blindness, and rehabilitation therapy lacks precision; without the holistic concept of acupuncture and tuina, anatomy is prone to mechanicality, and rehabilitation therapy ignores individual differences; without the functional orientation of rehabilitation therapy, the first two dimensions are prone to stay in theory and difficult to be transformed into clinical effectiveness. The integration of the three can find a balance between reduction and integration, structure and function, local and overall.

5 Paths and Prospects of Interdisciplinary Integration

5.1 Insufficient Integration in the Current Curriculum System

Although rehabilitation therapy majors generally offer courses in systematic anatomy, acupuncture and tuina, there is an obvious separation phenomenon in the actual teaching of the three courses.

Separation of teaching content: Anatomy teachers often do not understand the needs of subsequent

courses, and the key content explained may be disconnected from the practical application of rehabilitation therapy and acupuncture and tuina. For example, when explaining peripheral nerves, excessive emphasis is placed on the origin and branches of nerves, but little connection is made to clinically common nerve compression points and nerve mobilization techniques in rehabilitation therapy. When acupuncture teachers teach acupoint location, although they also mention anatomical landmarks, they often only scratch the surface and fail to deeply explain the hierarchical relationship between acupoints and nerves, blood vessels and muscles.

Dislocation of teaching sequence: The opening sequence of the three courses lacks overall design. Some majors teach acupuncture and tuina first, then systematic anatomy, leading students to rote memorize acupoint names without a morphological basis; some majors have a long interval between anatomy and rehabilitation therapy courses, and students have forgotten most of the anatomy knowledge when they enter clinical courses after learning anatomy. The "major-specific collective lesson preparation" carried out by Zhengzhou Shuqing Medical College is precisely to solve this problem. The leader of the rehabilitation therapy major proposed that anatomy teaching should "strengthen motor system anatomy and add clinical rehabilitation cases". Singleness of teaching methods: The three courses still mainly rely on classroom lectures, and interdisciplinary integrated case teaching and problem-based learning are insufficient. Students are used to memorizing knowledge points by subject, lacking the training of integrating and applying interdisciplinary knowledge in real clinical situations.

5.2 Suggestions for "Stage-Based and Integrated" Curriculum Integration

In view of the above problems, the author suggests constructing a "stage-based and integrated" curriculum integration model.

Basic stage (Freshman and Sophomore years): Take systematic anatomy as the core, and strengthen the connection with subsequent courses. Add a "clinical application" module in anatomy teaching, with the participation of rehabilitation therapy and acupuncture and tuina teachers, explaining the application scenarios of anatomical knowledge combined with cases. For example, when learning upper limb nerves, introduce the typical manifestations and rehabilitation strategies after ulnar nerve, median nerve and radial nerve injury; when learning lower limb muscles, introduce the tuina treatment methods for common sports injuries. This early "anatomy-clinic" contact helps stimulate learning interest and establish knowledge connections.

Bridge stage (Sophomore and Junior years): Offer integrated courses such as functional anatomy and applied anatomy. Functional anatomy focuses on dynamic functional analysis, transforming static anatomical knowledge into the understanding of motor functions; applied anatomy focuses on clinical operation guidance, transforming anatomical knowledge into the practical basis of acupuncture, tuina and rehabilitation technologies. The acupoint anatomy course offered by Heilongjiang University of Chinese Medicine is an embodiment of this idea.

Clinical stage (Junior and Senior years): Focus on problem-based learning (PBL) and case-based learning (CBL) to strengthen the training of comprehensive application ability. Select typical cases (such as cervical spondylopathy, stroke, spinal cord injury), and require students to analyze problems from the perspectives of anatomy, acupuncture and tuina, and rehabilitation therapy, and formulate integrated treatment plans. Through group discussions, role-playing, clinical internships and other methods, simulate real work scenarios and cultivate clinical decision-making ability.

5.3 Sharing and Upgrading of Clinical Training Platforms

Curriculum integration requires the support of corresponding training platforms. It is recommended to build an "Integrated Traditional Chinese and Western Medicine Rehabilitation Training Center", integrating the functions of anatomy laboratory, acupuncture and tuina training

room and rehabilitation therapy training room to realize resource sharing. Application of digital anatomy technology: The digital human anatomy system can convert two-dimensional images into three-dimensional models, allowing students to observe anatomical structures from multiple angles. The system can also be combined with acupuncture acupoint location and rehabilitation movement simulation to form "visualized" teaching resources. For example, clicking Zusanli (ST36) not only displays its location and anatomical layers, but also links relevant information such as nerve innervation, muscle function and rehabilitation indications. Equipping multi-modal training equipment: Introduce assessment equipment such as surface electromyography, motion capture and pressure distribution, so that students can objectively measure the effects of acupuncture, tuina and rehabilitation therapy. For example, during tuina manipulation, the pressure distribution pad can display the force distribution and rhythm changes of the manipulation in real time; during rehabilitation training, the motion capture system can analyze joint angles and movement trajectories. This real-time feedback helps students combine subjective feelings with objective data, improving the standardization and accuracy of operations. Development of interdisciplinary training projects: Design a number of integrated training projects, such as "comprehensive assessment and treatment of patients with low back pain" and "rehabilitation plan design for stroke sequelae". Under the guidance of teachers, students complete the whole process from consultation, assessment, diagnosis to treatment and follow-up in groups, experiencing the clinical work mode of interdisciplinary collaboration.

5.4 Interdisciplinary Directions in Scientific Research Innovation

Interdisciplinary integration is not only reflected in the teaching level, but also should be extended to scientific research innovation. The following directions are worthy of attention: Neuroanatomical research on acupuncture mechanism: Use techniques such as neural tracing and functional magnetic resonance imaging to track the conduction pathway and central integration mechanism of acupuncture signals, and reveal the neuroanatomical basis of "acupoint-zangfu" correlation. Such research helps integrate acupuncture into the cognitive framework of modern neuroscience and provide scientific support for the international promotion of acupuncture [15]. Biomechanical research on tuina manipulation: Use techniques such as motion capture, pressure sensing and finite element analysis to quantify the mechanical characteristics of tuina manipulation and its mechanism of action at the tissue level. For example, study the effect of rolling manipulation with different frequencies on the stress distribution of soft tissues, providing a basis for the standardization of manipulation. Evidence-based evaluation of integrated traditional Chinese and Western medicine rehabilitation programs: Design integrated traditional Chinese and Western medicine rehabilitation programs for common diseases such as cervical spondylopathy, lumbar disc herniation, osteoarthritis and stroke, carry out randomized controlled trials, and evaluate their efficacy and health economic value. Accumulate evidence-based basis through high-quality clinical research and promote the improvement of clinical guidelines.

6 Conclusion

Rehabilitation therapy, acupuncture and tuina, and systematic anatomy belong to three different knowledge fields: modern medical technology, traditional Chinese medicine and basic medicine, but they have achieved in-depth integration on the common basis of human structure and function. Systematic anatomy reveals the morphological structure of the human body, provides a safe boundary for the acupoint location and manipulation of acupuncture and tuina, and provides a scientific basis for the functional assessment and training design of rehabilitation therapy. The holistic concept and regulatory philosophy contained in acupuncture and tuina have an inherent fit with the "bio-psycho-social model" of modern rehabilitation medicine, and the two can achieve

complementary advantages in clinical practice. For students majoring in rehabilitation therapy, the three disciplines are not isolated knowledge modules, but an organic whole that constitutes clinical ability. Anatomy is the "skeleton", providing a cognitive framework and operational basis; acupuncture and tuina are the "meridians", endowing a holistic perspective and regulatory thinking; rehabilitation therapy is the "muscle", implementing functional goals and therapeutic effects. The three support and penetrate each other, jointly forming the knowledge structure of integrated traditional Chinese and Western medicine rehabilitation talents. Future rehabilitation education should strengthen the interdisciplinary integration of the three disciplines in curriculum setting, teaching methods, training platforms and scientific research directions, and cultivate new professional talents with an integrated medical perspective, solid anatomical foundation and proficient Chinese and Western medicine rehabilitation technologies. Only in this way can we truly achieve the goal of "imparting Chinese technology and telling Chinese stories" and contribute Chinese wisdom to the development of global rehabilitation medicine.

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