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# Construction of Acupuncture Teaching and Training System based on the Cultivation of Thinking Ability of Traditional Chinese Medicine

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## Abstract

**As a basic training of acupuncture and massage specialty, acupuncture and acupoint selection is difficult to locate, memorize and practice. Under the condition of limited training resources in medical colleges, students often can only practice on themselves or each other, which has certain risks and practice restrictions. The author thinks that applying virtual reality technology to construct acupuncture teaching and training system (virtual reality system) can easily solve the above problems. Based on the cultivation of Chinese medicine thinking ability and the actual structure characteristics of 3D human body model in virtual human meridian system, this paper analyzes the 3D skin model and skin stress model, and develops a virtual acupuncture training platform by integrating various functional modules for acupuncture trainers to operate and evaluate their acupuncture level.**

## Keywords

**Cultivation of thinking ability of TCM; Acupuncture and moxibustion; Training system.**

## 1. Introduction

Acupuncture and moxibustion is a highly practical subject. However, the current teaching mode dominated by theoretical teaching still accounts for the majority, and when students enter the stage of clinical practice, they show clinical skill deviation [1]. At present, the teaching of acupuncture surgery of traditional Chinese medicine in colleges and universities of traditional Chinese medicine is mainly based on theory, and students generally report the lack of intuitive understanding of certain diseases. During the teaching process, students are found to have doubts about many knowledge points and poor practical operation ability. Acupuncture teaching and training system is a new teaching system, which has the characteristics of immersion, interaction and conception, and can cultivate students' initiative in learning and improve their practical ability [2]. There are three aspects in the application of acupuncture teaching: knowledge learning, skill training, and close combination of theory and reality.

In view of the problems of insufficient theoretical class hours, single teaching mode and outdated teaching methods in traditional acupuncture teaching for a long time, this study is based on the cultivation of thinking ability of traditional Chinese medicine, and provides students with an acupuncture practice platform for specific parts of the human body, especially the acupoints of dangerous parts, by independently developing simulation acupuncture teaching AIDS for special parts of the human body. Make them master the positioning, acupuncture angle and safe depth of these acupoints, so as to improve students' clinical acupuncture operation ability and lay a solid foundation for future clinical practice.

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## 2. Build Background

Acupuncture and moxibustion of traditional Chinese medicine is a practical, empirical and inherited clinical application discipline with the characteristics of empirical medicine. We must realize that teaching activities are not an isolated process of "teaching" and "learning", but a process of interaction between teachers and students. A benign teaching process will help teachers and students motivate each other and promote mutual growth [3-4]. It is beneficial to standardize objectively the students' operation in acupoint recognition, acupoint pressing and manipulation. Reasonable use of multimedia experimental teaching courseware, video recording, computer simulation demonstration and other modern teaching methods to assist experimental teaching not only enriches the teaching content, realizes the diversification of teaching methods, but also improves the accuracy and standardization of students' hands-on operation, making it easier for students to understand and master relevant experimental techniques. Acupuncture teaching and training system can provide students with vivid and realistic learning environment, and enable students to become a participant and play a role in virtual environment, which will play a positive role in arousing students' learning enthusiasm, breaking through the key and difficult points of teaching and cultivating students' practical operation skills.

Practice without theoretical guidance is a blind behavior, and without practice, even the best theory is just empty talk, so acupuncture training is an important guarantee to achieve teaching objectives. At present, there is a shortage of clinical talents in acupuncture and moxibustion of traditional Chinese medicine, and there is a fault in the national master of acupuncture and moxibustion of traditional Chinese medicine. It is urgent to solve the problem of standardized and large-scale training and education of acupuncture and moxibustion doctors of traditional Chinese medicine [5]. In the process of conducting the guiding experiment, it not only embodies the students' dominant position, but also can be effectively regulated and guided by teachers, which cultivates students' practical operation ability and lays a foundation for conducting research experiments independently.

## 3. Acupuncture Teaching and Training System

### 3.1. Human Body Modeling

Virtual acupuncture training system takes virtual images of adult males as human models, and carries out three-dimensional modeling of head and body in 3dsmax software. Virtual a realistic 3D human in the desktop virtual reality system, and accurately mark the position of acupoints, the composition, function and orientation of meridians in the human body.

Because the 3D mannequin in the scene needs to achieve the simulation effect, we choose ambient illumination and two point light sources to illuminate all the scenes in the scene, and use two illumination modes to enhance the fidelity. By mixing colors, the 3D mannequin effect close to the skin color of the human body is realized, as shown in Figure 1.

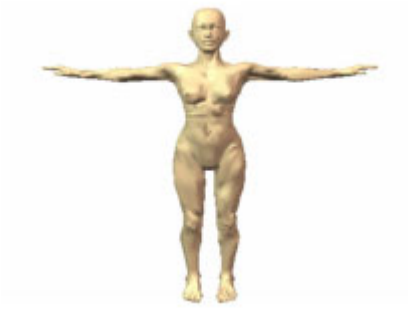

**Figure 1.** Three-dimensional manikin diagram

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In this project, the basic three-dimensional spherical body is used as acupoints, and the acupoints are drawn to the corresponding parts of the human body through various translation and expansion transformations in the content branches of the scene map [6]. Teachers use PHANTOM's joystick to manipulate filiform needles in virtual environment and demonstrate acupuncture techniques. Students located in remote network can feel the acupuncture method and strength demonstrated by teachers through PHANTOM's joystick, and see the displacement of needle body in virtual objects from the display screen.

## 3.2. Pick-up of Acupuncture Points

Acupuncture simulation prototype system requires to provide the process of interactive acquisition of acupuncture operation with users, where objects are picked up by mouse. In the simulation of acupuncture process, the main sources of force sense are the contact between needle and human tissue and the reaction force generated by the interaction between needle and human tissue after penetrating into human body. Different spring layouts have different forces on particles and different trajectories of particles, resulting in different deformation effects. Because manual extraction adopts manual intervention, it will reduce the automation degree and processing speed of the whole system. Therefore, an automatic feature extraction method is proposed. When training acupuncture and moxibustion methods, it transits from filiform acupuncture to cupping, moxibustion, electroacupuncture, skin acupuncture, acupoint injection and other comprehensive training; As for the operation position, it extends from the limbs to the head and trunk, and carries out the operation training for carefully pricking acupoints.

The face model composed of a large number of vertices and triangular patches is used to represent human skin [7]. Among them, the vertex of the grid is a particle, and the edge is a spring. Each particle is connected with the surrounding particles by a structural spring, as shown in Figure 2.

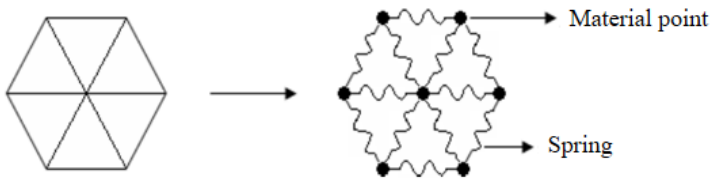


**Figure 2.** Mass-spring model of skin

The above is a surface spring model based on the skin grid structure. After research, although the surface spring model can make the skin feel a three-dimensional entity. In order to ensure the accuracy and stability of force sensing data transmission at high refresh rate, the controller preprocesses the sending and receiving force feedback data, thus reducing the system instability caused by network packet loss and delay. Trainees can click acupoints to realize acupuncture simulation training. In order to achieve the simulation effect as much as possible, the prototype system also controls the order of acupoints, which provides a relatively complete interactive process and achieves better training effect.

Using photography technology to capture students' irregular action details and mistakes, and using behavior playback teaching method to make practice more targeted. When building a mass-spring model for skin, the skin is represented discretely as a mass-spring system composed of triangular meshes. The teaching process adopts the operation of acupuncture basic skills while teaching theory, and multimedia teaching is carried out through the courseware made by teachers themselves, which makes the theoretical teaching more intuitive and vivid and enhances students' interest in learning; On the other hand, the teaching hours are

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greatly saved, so that students have enough time to operate basic skills. Therefore, the coordinate system of virtual space established by Java3D cannot be changed. In the interactive operation of virtual manikin, this project uses the method based on perspective transformation to realize man-machine interaction [8].

### 3.3. Force Rendering Modeling

When the reaction force exceeds a certain threshold, the needle will penetrate into the skin. After penetration, the force of the needle tip will decrease, and the needle body will be affected by the reaction force of fat, muscle and bone tissue. At the same time, the needle body will also be affected by the friction and clamping force of fat and muscle tissue. When deformation occurs, the particles on the skin model will be displaced due to stress, and the internal forces include spring force, that is, the pulling force of the surrounding particles, and virtual spring force, that is, the force generated after the deformation of the virtual spring with the original length of 0 attached to the control point. Firstly, select the representative diseases, then carry out acupuncture positioning and moxibustion training, and finally carry out simulation teaching; The operation objects are standardized patients, thus completing the whole process of diagnosis, prescription, positioning and acupuncture moxibustion. It also simulates the acupuncture skill examination of the skill examination of Chinese medicine practitioners, and can only enter clinical practice after passing the skill examination, so as to strengthen the mastery of skills.

The motion law of particles follows Newton's second law $F = \overline{m}\overline{a}$ , which describes the relationship among acceleration, force acting on an object and mass of an object. $F$ is the sum of vectors of various forces acting on an object at a certain moment, that is, the final total force. For each particle on the skin, the forces acting on the particle (including external force and internal force) can be added to calculate the position of the particle at each moment of motion [9]:

$$m_i \frac{\partial^2 x_i}{\partial t^2} = F_{ext}(i) + F_{\text{int}}(i)$$

In the formula, $x_i$ represents the position vector of particle, $x_i \in R^3$ is the goal of solution, $m_i$ represents the mass of particle $i$ , $F_{\text{int}}(i)$ represents the external force of particle $i$ , $F_{\text{int}}(i)$ represents the internal force of particle $i$ , which changes with the change of particle position and time.

Students can learn meridian knowledge easily and systematically through the interactive operation of 3D virtual human. At the sending end, each force feedback data packet to be sent is numbered in sequence, and at the receiving end, the received force feedback data is interpolated and preprocessed first to make up for the lack of force sensing data caused by out-of-order arrival and packet loss during network transmission. Among them, the external forces mainly include gravity and the normal pressure on the skin caused by the user's operation during needle insertion. Internal force is the force between particles, which mainly includes the spring force of surface spring and virtual body spring and the corresponding spring damping force.

## 4. Advantages of Acupuncture Teaching and Training System

### 4.1. Integration of Theoretical Teaching and Practical Teaching

According to the meridian chart of TCM human body, in the established 3D human body modeling, the meridian line is drawn with lines, and each node of the meridian line is carefully adjusted at the entry point object level to make it more accurate. According to the professional characteristics of acupuncture and moxibustion, students are required to master clinical

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operation skills actively, consciously and cooperatively, at the same time, they can integrate theory with practice and participate in clinical practice as soon as possible. Establish close partnership and synergy [12]; Students should be encouraged to exchange their feelings with teachers and put forward constructive suggestions for teachers' guidance in order to improve students' interest in acupuncture experiments. Students can test their knowledge at any time to test their mastery. The discussion and communication module is for students to discuss different topics, which is helpful to cultivate students' cooperative learning ability under the guidance of teachers.

### 4.2. Create A Situation in Which Teachers and Students Cooperate in Scientific Research Activities

To create scientific research situations for students, provide abundant learning resources and tools, guide students to consult literature materials, collect and process information, design experimental schemes, implement research processes, record experiments, analyze experimental results and write scientific research reports. Using models, wall charts and other teaching AIDS to assist teaching can simplify complexity, change abstraction into intuition, and significantly improve teaching effect. It changed the passivity of previous teaching, and made participants and teaching and training system interact and influence each other as a whole. Through the training of acupuncture practical skills, students can flexibly control the basic theory of TCM under the guidance of clinical thinking mode of TCM, deeply understand the circulation distribution of meridians and the indications of acupoints, and master the norms and skills of acupuncture technical operation. After all the practical training courses are finished, the tutor will use the laboratory to carry out comprehensive training and strengthening for the students before practice, and the students who pass the final examination can start graduation practice.

### 4.3. Increase Students' Chances of Receiving Scientific Research Training

Under the demonstration and guidance of teachers, acupuncture exercises are carried out to achieve the purpose of early training and early mastery, so that students can use acupuncture skills freely in classroom teaching. Guide students to train scientific research thinking, learn the operation technology and working principle of relevant advanced testing instruments, search the advanced literature at home and abroad, and pay attention to the most advanced research trends in the field of acupuncture and moxibustion research, so as to fully understand the whole process of scientific research activities. At the same time, simulation acupuncture teaching AIDS at specific parts are designed to help practitioners master the acupuncture angle and safe depth of these dangerous acupoints. Take the syllabus as the basis and combine it with the contents of teaching materials, so as to be targeted and highlight the key points. Let undergraduate students really participate in practical scientific research activities, so that they can put forward the treatment principles of corresponding diseases, the compatibility of treatment methods and acupoint prescriptions, and choose appropriate acupuncture and moxibustion methods to achieve the purpose of cultivating acupuncture clinical thinking mode.

## 5. Conclusions

The acupuncture teaching and training system based on the cultivation of Chinese medicine thinking ability not only keeps the advantages of traditional Chinese medicine "teaching and learning", but also breaks through its limitations to a certain extent, which can significantly improve students' clinical ability and skill operation ability of Chinese medicine acupuncture. Help students to integrate the isolated specialized knowledge they have learned, which not only broadens their horizons, but also expands their knowledge, which is conducive to improving students' clinical thinking and working ability. Simply use the mouse to adjust and control the

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human body at will, which is convenient to observe the operation from any angle, and can carry out acupuncture and moxibustion training repeatedly. In the future teaching practice, it is necessary to constantly sum up teaching experience and try teaching reform and innovation, so as to cultivate high-quality scientific research talents of Chinese medicine acupuncture and moxibustion that meet the needs of social development in the new period.

## References

[1] Zhang Li. analysis of acupuncture and massage training teaching based on employment. wisdom and health, Vol. 4 (2018) No. 09, p. 22-23.

[2] Gao Ming, Xu Gang, Liu Tangyi, et al. Development of warm acupuncture teaching training and examination system. Chinese Acupuncture, Vol. 039 (2019) No. 009, p. 1021-1023.

[3] Wang Yuying, Chai Yifeng, Su Tao. Application of acupuncture characteristic module teaching plan in clinical teaching. chinese medicine modern distance education of china, Vol. 016 (2018) No. 007, p. 127-128.

[4] Chloe Wang. Taking employment as the guide to strengthen the training teaching of acupuncture and massage. Electronic Journal of Clinical Medical Literature, Vol. 004 (2017) No. 079, p. 15605-15605.

[5] Sun Jiahao, Xin Siyuan, Guo Jian 'en. Exploration and application of scenario simulation teaching method in acupuncture clinical practice teaching. Science and Education Guide-Electronic Edition () No. mid-2019, p. 119.

[6] Lu guangbao, Lu Guoqing, Junfei Duan, et al. research on training teaching mode of acupuncture and massage aiming at comprehensive quality training. health must read, Vol. 000 (2019) No. 004, p. 223-224.

[7] Hua jinshuang, Shao suju, Yu Dongdong. thoughts on constructing the training teaching mode of acupuncture treatment based on teachers' standardized patient thought. international journal of traditional Chinese medicine, Vol. 40 (2018) No. 1, p. 58-60.

[8] Zhang Xiaoqing, Wu Jingdong, Su Zhuang, et al. Exploration on the reform of acupuncture practice teaching based on phased examination of practical skills of medical practitioners. China Off-campus Education, Vol. 656 (2018) No. 36, p. 135-136.

[9] Liu Mi, Zhong Huan, Liu Yu, et al. Design and implementation of the ability-oriented course module of Acupuncture and Moxibustion. Chinese Journal of Acupuncture and Moxibustion, Vol. 38 (2018) No. 09, p. 89-92.