



## Research on Interaction Design of Somatosensory Games Based on User Experience - A Case Study of Cervical Spine Health Somatosensory Games

**Wang Zhi\* and Zheng Yang-Shuo**

*School of Art and Design, Wuhan University of Technology, Wuhan, China*

**\*Corresponding Author:** Wang Zhi, School of Art and Design, Wuhan University of Technology, Wuhan, China.

**Received:** September 07, 2018; **Published:** September 20, 2018

### Abstract

In the contemporary society, people have used digital products more and more often. Besides, with the growing pressure of studying and working, university and college students have to remain seated for a long time. Thus, naturally, there is a wide-spread phenomenon that university students have suffered from cervical vertebra disease. Specifically, cervical vertebra disease, a chronic disease, is difficult to recover. At present, doing cervical exercise is the main measure to relieve the pain. Fortunately, with the advancement of the technology, the treatment measures have become diverse. The game therapy has been applied in precaution and treatment of the cervical vertebra disease, which can be well-accepted by the young people.

The paper is aimed at serving college students cervical spine care. Additionally, the paper has used motion sense game as the interactive media, to conduct research on the interactive design of cervical health care games, which combines the subjects of motion sensing games and cervical vertebra health care to explore the feasibility and practicability of applying motion sensing games to cervical vertebrae health care.

The paper has used quantitative analysis, questionnaire and literature research to analyze the factors that cause cervical disease in today's college students, and to investigate the students' awareness of prevention and motion sensing games of cervical disease. Based on this, the paper has summarized the factors that affect the formation of cervical vertebra disease of college students. Starting with the classification and development trend of motion sensing games, the paper has analyzed the practicability of motion sensing games in rehabilitation medicine, children's education and social entertainment. Then, the interactive movement mode of cervical vertebrae therapy in motion sensing games is summarized and refined. The paper has provided the demand source for the practical design of cervical health motion sensing game through interviews, typical user establishment and user test, and then, has designed the framework of cervical health care motion sensing games.

Finally, based on the principle, concept and characteristics of the interactive design, the paper has analyzed interactive design method of the motion sensing games for the cervical vertebra health care. On the theoretical basis of the five elements of interactive design for the motion sensing game of cervical vertebrae health care, the expression mode of the interactive design of the motion sensing game is extended. The model movement of the motion sensing game is designed to complete the prototype output of interactive design practice of cervical health care motion sensing games, and the feasibility is tested. Based on the characteristics of college students' life style and behavior model, and the design principle of interactive design, the paper has developed a new application field for the motion sensing games. This paper attempts to provide guidance and reference for the future design of medical and health service system and closed-loop health system.

**Keywords:** User Experience; Somatosensory Game Design; Cervical Health Care; Interactive Design

## Introduction

Internet medical is a new application of Internet technology in the medical field. With the human-computer interaction technology-oriented, people-centered experience design more reflected in the Internet medical industry. More traditional medical devices, more now is to promote the use of new science and technology as relying on the combination of user-centered service design concept to solve the patient's physical illness. Therefore, based on the experience of somatosensory game, this article will focus on the service design and practice of cervical spondylosis medical services, and makes bold prediction on the intelligent closed-loop feedback-based health management information exchange system of internet medical data. In the traditional rehabilitation medical treatment, there still exist many problems such as asymmetric information between doctors and patients, unbalanced supply and demand between rehabilitation physicians and patients, and the status quo. Based on the innovation of man-machine interaction mode, the amusement and sports of somatosensory game medical treatment are continuously improved, and the interaction between somatosensory and user interaction is also more and more. Driven by this, somatosensory games provide more choices and support for medical rehabilitation. By using somatosensory devices instead of traditional rehabilitation exercises, Internet medical services can provide huge benefits in terms of medical costs and alleviating the imbalance between supply and demand help. At the same time relying on somatosensory game as a media point of contact to better reflect the user in the course of easy to learn, friendly and entertaining, patients experience through somatosensory gaming experience have contributed to the medical service system design forward.

The study of cervical spondylosis medical service system design, mainly relying on the somatosensory game-based approach, so patients experience in the game experience has become the focus of service design. This article will demonstrate the design and practice of enhancing medical service system through user experience in somatosensory game from the following three aspects.

### Somatosensory games help to improve the user experience

Nowadays, many somatosensory games have no mandatory requirements on users' age, gender, geographical location and environment. When using the somatosensory device, the user may use the somatosensory game to guide the understanding and cognition of the relevant exercise mode and the cervical spine therapeutic

function. By interacting with the guidance in the somatosensory game, the user can learn quickly and at low cost. The learning aspect is simple and easy Reduce the cost of learning and the cost of teaching doctors, and somatosensory game each guide learning is detailed and complete, you can continue to allow users to trial and error, until users learn to understand.

### Friendly and entertaining medical services

Relying on the way to experience the game, somatosensory games to enhance fitness results, the medical services to show the unique friendship, while the use of entertainment games, to avoid the boring flavor of education-based medical, entertaining persuasion medical more Allow users to accept, but also be able to better achieve the effect of medical fitness and cervical rehabilitation treatment. Under the premise of obtaining the correct guideline of cervical protection behavior and combining with their own pain points, doctors and patients can use the relevant expertise obtained under the guidance of all kinds of information collected and summarized in light of their own situation to make the corresponding analysis and treatment, Through the use of somatosensory game unique interactive sports and entertainment will be the integration of sports activities, more effective through the game experience to enhance patient's health level. Psychologically and physiologically, somatosensory play can be done in ways that promote patients' well-being.

### Enhance and optimize somatosensory game user experience

Somatosensory games refer to the games that rely on the body to feel and interact with the input method of identifying the human body. The players interact with the content of the scenes by interacting with the environment in the television. Somatosensory game interaction with the correct method of treatment of cervical spondylosis, both to help patients with cervical disease treatment, while enhancing the user experience in somatosensory games, from two physical and psychological point of view, to achieve the game and medical highly meet, due to the real "treatment" in the music. In somatosensory games for cervical spondylosis treatment exercise, not a single copy according to the video image on the movement to imitate the game process will join the story design, or the medal reward. Users through the completion of the corresponding training, you can get the reward in the game. Then the user through the somatosensory game to obtain both the sense of achievement in the game or cervical spine rehabilitation aspects of the sense of accomplishment to a great extent to meet the user's

inner needs for the establishment of an intelligent health management system to establish a solid foundation. At the same time, somatosensory game exercise without any restrictions on the venue, both the hospital or the patient's own home can be cervical spondylosis treatment and rehabilitation, in the use of the environment, to be relatively simple medical venues for the design, for patients Also reduce the number of hospital treatment, at home you can do the treatment and the game at the same time, it is an optimized experience gaming experience.

With the advent of big data and the Artificial Intelligence era, data is changing the way in which the world's information management is transformed from a paper version to an online cloud version. In the process of using the somatosensory game for cervical patients, patients can generate corresponding personal data whenever participating in the treatment. The longer the period of the treatment is, the higher the credibility of the personal data is. Such massive data information can be used for medical treatment The cause of Internet closed-loop feedback type of health management. When patients first use somatosensory equipment, they can rely on the somatosensory equipment for basic health assessment and personal lifestyle information data collection. Based on the information collected by the equipment, the computer background analysis and conversion of data, the system will automatically formulate corresponding Health goals and individualized somatosensory exercise. After a period of prescription treatment, intelligent fitness feedback is formed. Once the patient is re-treated, he/she can start from the health evaluation to form a closed-loop feedback-based health management interaction system.

Establish a service process that includes health assessment, personal lifestyle information collection, health management goal setting, personalized exercise recommendations, and intelligent fitness feedback in a game environment that is easily supported by big data support and somatosensory games. A one-stop solution not only for patients and preventors but also reduces hospital costs and saves hospital resources. To correct the patient's bad posture by means of game movement to help users develop healthy living habits. It is envisioned that in the future Internet medical industry, the medical treatment through data collection and treatment will be a continuation of a better service to promote the development of medical services and the general public's health services.

### Game therapy design thinking brings new ideas to healthy exercise

Social progress and scientific and technological development have changed people's original way of life, speeding up the pace of work, bringing many conveniences and laying down many hidden dangers for people. The incidence of chronic diseases caused by unhealthy lifestyles has been increasing year by year, trend. The 2014 Global Report released by WHO shows that the number of deaths due to chronic diseases was 38 million in 2012 and is expected to reach 53 million in 10 years. An about 6 published live reports in 2017 show that chronic diseases cause 40 million deaths annually, Equivalent to 70% of the world's total deaths. Chronic diseases include sub-health and strain of cervical spine. According to WHO's "Spinal Cord Injury from an International Perspective," this new WHO report provides an overview of the experiences, prevention, care and personal experience of spinal cord injury among those with spinal cord injury The best available evidence. Men are most likely to develop spinal cord injuries 20 to 29 years of age and above, while women at greatest risk are 15 - 19 years of age and 60 and older [1]. The study showed that the risk of adult men and women at least 2: 1 ratio. Spinal cord injury results in lower enrollment and economic participation, and children with spinal cord injuries are less likely than their peers to enroll in school and less likely to stay in school even if they enroll. Adults with spinal cord injury face similar barriers to participation in socioeconomic life, and the unemployment rate for adult patients worldwide is above 60%. Spinal cord injury is accompanied by huge personal and social costs. Many of the outcomes associated with spinal cord injury are not caused by the disorder itself but by the lack of access to adequate healthcare and rehabilitation services and the lack of access to community life due to physical, social and policy environment barriers. This shows that cervical health has seriously endanger the normal life. The main object of this article is the crowd of young college students who are often referred to on the Internet as nowadays. In such people, a series of degenerative changes have taken place in people's body posture, such as sedentary, lack of exercise, late sleep and other bad habits. There have been many bad body posture problems, but also led to a variety of body imbalances.

In our daily life, we can see that the problem of body posture can be seen everywhere and it has become very common. For example, the "dumb group" (ape-man family or cell phone family) that can be seen from work inside and outside school, indoor and outdoor, Students with glasses and hunchback not only look unsightly but also seriously affect the pathological changes that can occur in our body and at the same time reduce our exercise capacity and affect our health. Lack of exercise is a very important incentive because of lack of attention to lifestyle and cervical spine pressure. Due to the nature of their work and working hours, most work-study people sit in most of their daily work life In the rest of the time is sitting or lying on the bed, the lack of time to exercise enough, over time, there will be cervical spondylosis, causing cervical ringing, dizziness, vomiting symptoms. Working and studying under such long-term stress, it is conceivable that the patient's own physical condition can have a huge impact.

#### Game therapy design thinking brings new ideas to healthy exercise

As a highly specialized medical service industry, the difference of education background makes the information asymmetrical between doctors and patients, and the patients who receive the limited resources and weak resources need a great deal of information from physicians Or get information on the Internet to help you get your own treatment, which can make it more difficult for the average patient to seek medical help without these medical information. At the same time as a patient in rehabilitation medicine to some extent, the existence of certain physical problems in the body, such as through the patient themselves through the network for more information, the degree of difficulty will give patients more trouble and pain, then through the doctor Treatment and explanation is even more important, however, in our country's rehabilitation medical institutions and beds in short supply. According to the research report of China Research Think Tank for 2017 - 2022 Market Analysis and Investment Strategy Analysis of Rehabilitation Industry in China, in 2015, the number of rehabilitation and rehabilitation specialist institutions in general hospitals in China was about 4,000, accounting for 14.50% of the total number of hospitals. Rehabilitation The number of beds was 129,300, accounting for 2.43% of the hospital beds [2]. Taken together, our country has not yet formed a systematic, complete and sufficient supply system of rehabilitation medical services. At present, the proportion of rehab doctors to basic population in China is about 0.4/100,000. Compared with the 5 or 100,000 rehabilitative physicians in developed countries such as Europe, the United States and Japan, the gap

is huge. Such information on the medical information and medical doctors said the number of asymmetric information to the doctor's troubles is that a doctor may need to face at the same time about 7 patients, rehabilitation is also the need for prolonged treatment to alleviate the situation to improve the patient's condition The ability to process the process of treatment, a doctor responsible for the large number of patients for doctors, the pressure can be imagined.

Driven by such environmental effects, auxiliary tools for rehabilitation work have emerged. Aids for rehabilitation include various categories, both physical types and virtual types. Compared with the physical type, the virtual scene interactive rehabilitation training belongs to a new type of treatment behavior; using computer graphics and image technology, the use of infrared scanning of the human body, the patient exposure and a virtual environment, combined with different patients themselves Problem, the computer has a variety of training games corresponding to the treatment, the patient need only according to the changes in the screen scenarios and prompts to imitate and respond to a variety of actions to maintain the screen in the scene mode to continue until the final completion of training objectives. This interactive learning feedback of virtual situation can not only improve the rehabilitation efficiency and reduce the disability rate, but also enhance the patient's initiative and participation, in line with the concept of modern rehabilitation medicine, and bring a new direction for the design of medical rehabilitation.

#### Game therapy design thinking brings new ideas to healthy exercise

With the rapid development of science and technology, the rapid changes in people's lives have brought about changes in people's lives. More convenient, efficient and comfortable human beings have emerged in their daily life, in their studies and in their work. Designing helps people to do their jobs efficiently in a limited amount of time. Bring us convenience, but also bring some pressure and discomfort to people, fast-paced life style, intense competitive life conditions, heavy work pressure and irregular work life bring more people's body Many physical and psychological health problems. The arrival of an era of rising consumption power has also seen tremendous improvement in the minds of Chinese consumers. More and more people are paying more attention to the improvement of health. Both knowledge and lifestyle have tremendous thinking and action Changes, including the government agencies, public welfare funds, education and other external resources are always concerned about the health of people's livelihood, are ad-

vocating a healthy lifestyle movement, through the combination of technology and medicine, to a greater extent to persuade the public to enhance their own Awareness of healthy lifestyles and how to cultivate a healthy lifestyle at work, to remind and help improve the public's unhealthy lifestyles in everyday life.

Game therapy [3], also known as game therapy or game-assisted therapy, as the name suggests refers to the game as a therapeutic medium or carrier of an intervention. It is based on the human brain plasticity theory and functional reorganization theory as the basis for research, entertainment therapy for the purpose of the game activity. It has gone through three stages of development: psychoanalytic game therapy, structural game therapy and humanistic game therapy. The applicability of game therapy The crowd first used in children. Children's game therapy is mainly through the game of children's inherent anxiety psychology manifested in the interaction with the game therapist to increase awareness of individual behavior and emotions, thereby enhancing children's courage to face difficulties, challenge the difficulty of ability to promote Children's personal development. Game therapy originated in psychoanalysis. Sigmund Freud, a famous Austrian psychologist and psychoanalytic pioneer, pioneered the use of games to treat children's mental illness.

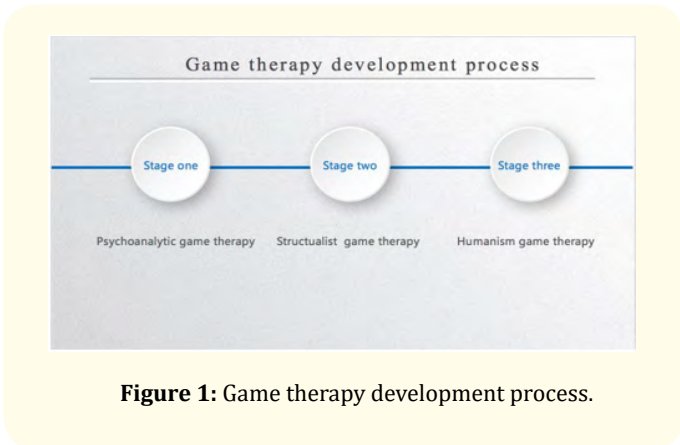


Figure 1: Game therapy development process.

Nowadays, game therapy is widely used in the treatment of depression in children, which lays a corresponding theoretical basis for the game therapy of multi-aging sports. In order to reach a certain therapeutic result and establish a persuasive user experience, in order to achieve the goal of the user, interactive guidance and behavior guidance need to be implemented step by step. In the entire guidance process, users may lose their user status or mood Prod-

uct patience and tolerance, then game therapy design can be very good attention to stimulate people through the game to achieve their ultimate goal. Game therapy design in today's social life is also numerous cases, such as the game "Peter Shut up" is a treatment for stuttering children's games, children in the game by way of talking to the game, in the game with the game characters Communicate with each other, complete corresponding tasks arranged in the game, score and record the children after the end of the game, and the corresponding learning status of the children will be reflected in the parents' cell phones, so that the children and parents can work together to overcome the children Language defects.



Figure 2: Game screenshots.

Game therapy theory to guide children in many ways the use of games to help children solve problems, thereby increasing the confidence and courage of children. However, with the expansion of the target population, game therapy theory can be extended to users at all levels, game therapy for the elderly population, and more for the scientific brain of the elderly, cognitive training and prevention of negative psychology. Game content mostly puzzle-based, supplemented by entertainment. The game is not limited to desktop games. It also includes video games, which play games on electronic devices such as computers, tablets and touchscreen phones. Gaming Medical Design Thinking brings more creativity and promotion to our life. People pay more attention to the healthy exercise mode, which gives us more opportunity to apply new ideas to game therapy design.

**Somatosensory gaming technology brings more possibilities to medical service design**

Compared to the traditional fitness equipment, somatosensory game is a new way of fitness, which is characterized by easy to use,

interesting, easy to attract non-fitness enthusiasts to participate. Conventional outdoor activities such as running, rafting, cycling, boxing, archery and the like have some basic requirements on external sites and environments and require professional venues and professional protection facilities as a basis. However, somatosensory game technology has largely alleviated the basic requirements of external venues. Somatosensory games are the basis of family games. They cannot only solve the problem of venue equipment, but also increase the interactive of family games and enhance the social interaction of family entertainment. Somatosensory games are less demanding on the field and have no specific time requirements than the limited physical equipment and physical equipment used in real sports games. They also have a wealth of sports aids that create a boom among young people Not difficult to understand. Want to play somatosensory game is very simple, only need a two meters by two meters of space, which allows players to unobstructed in which the limbs do not need daily life expensive sports equipment and broad venues, can be very good In schools and families play an alternative place for outdoor exercise. Somatosensory technology is that people can directly interact with their surroundings through physical gestures instead of using any sophisticated wear control devices to allow people to interact with the contextual content as much as they like.

The main research purpose of this subject is to apply somatosensory technology to active motor training and physical rehabilitation of patients and to use somatosensory games to assist patients in rehabilitation. The limb rehabilitation training system developed by somatosensory technology can replace traditional limb rehabilitation training equipment and save a series of costs such as manpower, material resources and space and effectively relieve the current shortage of rehabilitation medical practitioners in our country, Families are more effectively assisted by rehabilitation services, bringing more possibilities to the medical and rehabilitation work, alleviating the asymmetry of doctor-patient information, helping patients to heal their own treatments, and seeing themselves in constant circular and reciprocal training Rehabilitation medical progress.

### Research Status

#### Research status of college students' physical health

In recent years, due to sedentary, the body appears cervical pain, frozen shoulder, obesity, muscle strain and other sub-health disorders are increasingly plagued ordinary college students.

Modern lifestyles make people's lives more comfortable, but bad habits also make people's body posture a series of degeneration. Long-term past will cause deformation of the body joints, triggering functional disorders and other issues. Modern ordinary college students, comfortable lifestyle, poor eating habits, the overall poor self-control, fitness awareness is weak, confused at the same time, often stay up late to play online games, mobile phones anytime, anywhere, a variety of body posture problems also will come. There are some serious problems in the daily living habits of ordinary college students. For example, they have to go to bed late and exercise time is too short, they are sedentary for a long time, and their understanding of their attitude is not clear enough and they have not got enough attention from themselves. These factors are all potential factors that affect the health of college students. The author in China Known online search "cervical spine" a total of 305 academic articles. There are 230 periodicals, 21 dissertations, 25 conference papers. there are 183 categories of medical and health care, 43 science and education, 6 industrial technology, and only 1 in each category of economy, literature, art and biology. From the academic development curve of the journal, it was found that the first periodical published in 1999 related to the cervical spine health of university students "the correlation between the height of the sternum jugular vein notch and its relationship with vital capacity", the 2010 study Up to 30 peaks, in recent years, gradually declined.

It can be seen in the cervical spine, we still continue to deepen the attention, but most of the articles are still based on clinical medical analysis, and game therapy related to cervical spine related articles are few and far between.

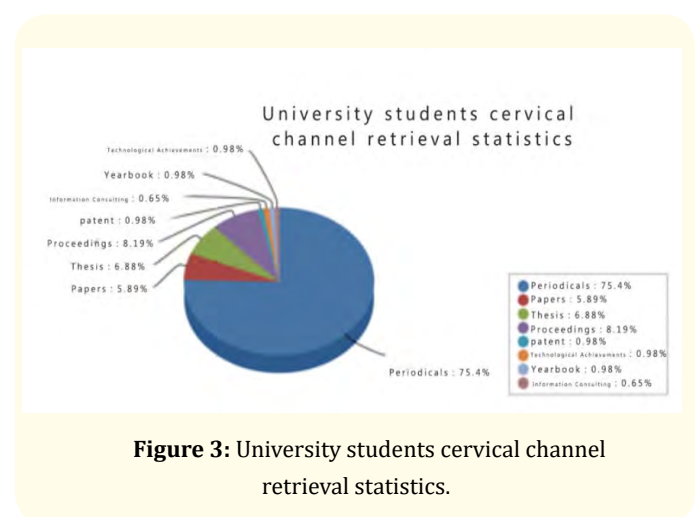


Figure 3: University students cervical channel retrieval statistics.

**Research status of somatosensory game design**

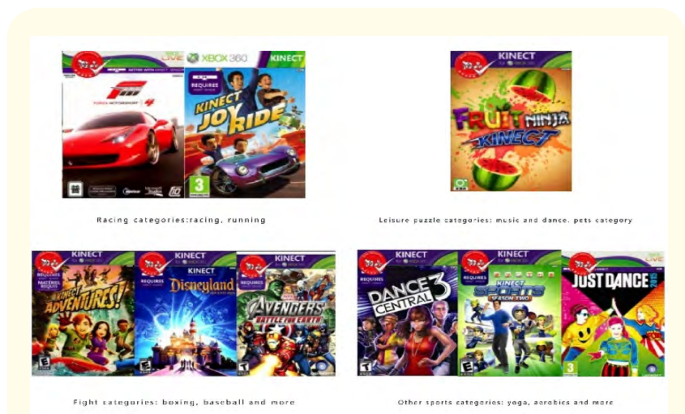
Somatosensory game refers to the use of the body to feel the video game. Different from the PC game controller or keyboard mouse to control the game, somatosensory game is a new type of video game.

The difference between somatosensory games and online games lies in the fact that the users can participate in the game as far as possible without being affected by the location, the time or the weather. For example, the user wants to go out and play today and experience the helplessness of the weather. The restriction is not good. The user's travel, the user desperation can only choose to indoor activities, such online games has become a choice, but most online games are still sitting in front of a long time in front of the computer, for a long time to maintain the position of not only the user. Of the cervical spine injury, but also contrary to the user initially wanted to play outdoor activities, so the experience of the game in this not only became an indoor game has also become a new way to experience the movement. Normal sports venues such as basketball courts, soccer fields require large enough space and norms, in the somatosensory game only need to meet body somatosensory body scanning system can be based on high-tech technology-based fitness games. The author searches for "Somatosensory" in China with 3373 articles, of which 621 are industrial technology, 437 are cultural and scientific, 135 are economic, 76 are literature, 57 are art, 55 are medical and health [4]. From the academic support analysis system can be learned that the topics closely related to somatosensory games include games, virtual reality, human-computer interaction.

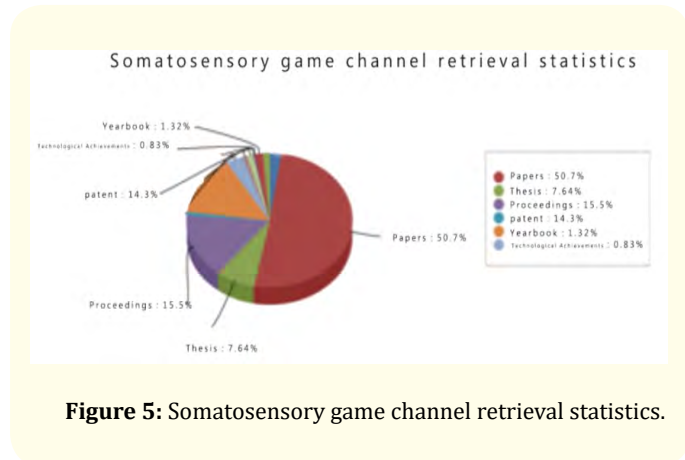
The somatosensory game The author is mainly divided into four categories, racing categories: racing, running, etc., the confrontation categories: boxing, baseball, etc. leisure puzzle categories: music and dance, pets, drama, other sports categories: yoga, aerobics, Mental exercise and so on.

**Research status of somatosensory game design**

Cervical spondylosis refers to the degenerative changes of cervical disc tissue and its secondary pathological changes involving the surrounding tissue (nerve root, spinal cord, vertebral artery, sympathetic and spinal cord anterior central artery, etc.) and the clinical manifestations of the corresponding changes in imaging. Is the cervical osteoarthritis, hypertrophic cervical spondylosis,



**Figure 4:** Somatosensory classification game screenshots.



**Figure 5:** Somatosensory game channel retrieval statistics.

cervical nerve root syndrome, cervical disc disease in general, is a kind of degenerative pathological changes based on the disease. The disease mainly in the neck, shoulder, arm three parts. Cervical spondylosis generally longer duration, easy to repeatedly onset and clinical manifestations, which inevitably give people daily life and work and study have a serious impact. Clinical patients with multiple age over 40 years old. However, in recent years, many studies have found that cervical spondylosis is getting younger and younger, with the incidence of students, especially college students increasing year by year. This is mainly due to the pressure of graduation and the high dependence on electronic products. Among them, long-term overdrafts, over-learning, poor posture and weak health awareness are the main causative factors. Cervical disease is a chronic degenerative disease, which is divided into three stages (cervical degeneration, spur formation stage, stage of injury) clini-

cal manifestations of seven categories (cervical spondylosis, nerve root type cervical spondylosis, cervical myelopathy, Vertebral artery type of cervical spondylosis, sympathetic cervical spondylosis, esophageal compression of cervical spondylosis, mixed cervical spondylosis) in our study is mainly due to the first category of the third stage: cervical degeneration stage neck Cervical spondylosis.

The author searches for "cervical vertebra health" in China. There are altogether 8897 related articles, including 3230 medical and hygiene categories, 89 industrial technology categories, 88 cultural and educational categories, and only 1 art category. Most of the cervical spine health related academic papers for the medical industry, the art of cervical spine research is relatively limited, indicating a huge potential for mining.

**Theoretical exploration**

**Experience the design thinking for the game-oriented treatment**

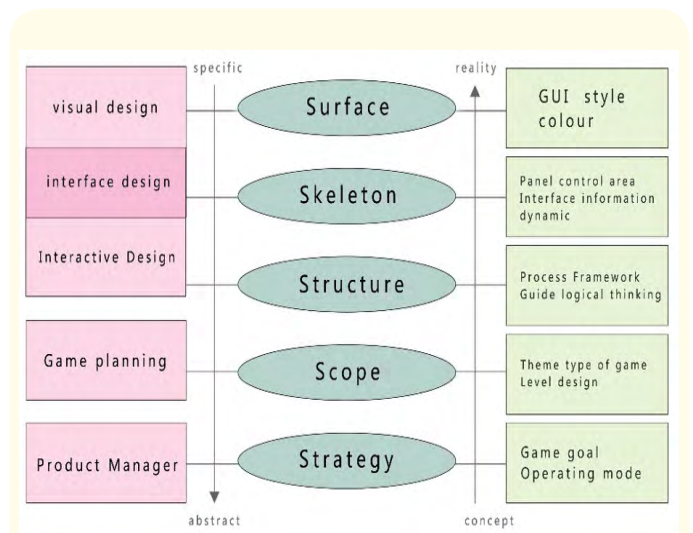
The range of user experience is not limited to the visual and auditory levels, but also includes touch, taste and more. Many of the actual product cases in life are showing us the importance of experience design so that sustainable design concepts are constantly innovating and breaking through. In game design for therapeutic purposes, user experience design requires us to observe the user in more detail. Because the user is not only the user of the product, he has another identity that is the patient and needs to think about the user from two identities Experience design. Therapeutic game experience design strategy is based on the experience of game therapy in the design of thinking-oriented role, so that each patient's specific situation to complete the program design, dig deep pain points and needs. In order to meet the immersive experience and emotional experience of young people in the treatment of the game, mobile touch screen game design experience should start from what aspects of the study? Next, I will be further analyzed from the perspective of "five levels of user experience design".

**Five levels of user experience design**

American writer Garrett (J.J), author of "The Elements of User Experience," in addition to emphasizing the importance of user experience, elaborates on the five levels of experience design. They are: presentation layer, framework layer, structure layer, scope layer and strategy layer [5-11].

**Design of cervical vertebrae health somatosensory game for college students**

For the undergraduate cervical vertebrae health somatosensory game experience design, can be based on the "user experience design of the five levels", combined with several major game design module to experience the design of the dimension. In general, game design requires game planners and designers to have a thorough division of labor and cooperation in game visual arts, game interaction, game planning, and game business models. Through the previous analysis of "five levels of user experience design", I will be the game design and several major modules corresponding and related.



**Figure 6:** Five levels and the link between the game.

Through the understanding of experience design, the author extracts five specific operations in game design, in which the content of the presentation layer, the framework layer and the structure layer partially overlap with each other, but the contents are still divided. I will analyze from five perspectives for the cervical vertebra health somatosensory game experience design strategy. I went to a top three hospital in Wuhan City Department of rehabilitation inspection, combined with the actual scenario of virtual device rehabilitation products from user experience design in turn from the five levels of detailed analysis to explore game-based somatosensory game interactive product design. The article will be the game "sitting bingo" and "digital arrangement" somatosensory game as a case study.



### Strategic level: product goals and user needs

The strategic layer needs to find out the needs of users when using somatosensory games through pre-market, user research and brainstorming, and how to ensure the medical treatment needs during the game so as to formulate corresponding design directions and design goals. In order to rehabilitation fitness for the purpose of the virtual body therapy game products first and foremost is the product development goals and user needs to participate in the game. The goal is divided into two major content (product goals, user goals) Product objectives: developers hope that the expected value of game products and product development. Target users: emphasize the main product service crowd, and ordinary somatosensory game difference, the medical type of somatosensory game in the entertainment at the same time to ensure that to a certain extent, to do the role of physical training. Therefore, the initial formation of the product in terms of the strategic level is more need to target (including products and target users) and user needs analysis.

Wuhan, a rehabilitation of three subjects in somatosensory rehabilitation equipment, the sports system is divided into seven categories are sitting upper and lower limb training, standing balance training, walking training, upper limb training, shoulder and neck training, cognitive training, daily life test training. Games "sitting bingo" and "digital arrangement" belong to the upper limb training exercise, cervical health have some help. From the strategic level of the target analysis (product targets, target users), the product objective is through a simple modular action to assist users to strengthen the workout and exercise, the game needs to add rules and training of specific operations to reach the upper extremity neck and shoulder Exercise, while adding to the game's entertainment. The target user is a user who is troubled or has difficulty in exercising the upper limbs. The author through the actual investigation in the hospital learned that the rehabilitation division will require patients to carry out rehabilitation training every day, every day training programs also include physical therapy and exercise therapy. Physiotherapy is the need for appropriate medical treatment with a prescription medical electronic equipment, such as physical therapy equipment, traction belt, massage and so on. Somatosensory virtual training is a routine training, requiring patients daily homework. The daily goal of doing things needs to be done in terms of product goals, such as "sitting bingo." The game is designed in the game with the patient having a response to the numbers, the numbers in the basket are the same as those on the

right, and The number of numbers you can choose can be a straight line in the final success. Throughout the training not only to consider the patient's ability to respond, but also exercise the patient's waist, upper neck and neck movement ability.

The low-to-high human needs theory proposed by American psychologist Maslow: physical needs, security needs, social needs, respect needs and self-actualization needs. Somatosensory game products first cut into the user's necessary needs, that is, physiological needs and safety needs. In normal life, the regularity of people's exercise gradually weakened, and somatosensory game captures the user's pain point, the traditional fitness and turn to the game of movement, in the completion of the game can enhance their own cognitive response Ability to ensure a certain movement process. Second, somatosensory games need to enhance patient-product interaction experience and emotional communication, that is, we often say that social needs, respect for the needs and self-actualization needs, somatosensory game products after exercise, there will be scores displayed, and can Stored in the game belong to the personal folder, the formation of a personalized service patient files, the file will be the length of each exercise, exercise range, error rate, action will be documented, for the latter part of doctors consider the user's follow-up medical More helpful.

### Scope layer: functional sections and content design

Through the design of the strategic layer, the goals and requirements of the somatosensory game product can be clearly defined, and transforming the user's needs into the functional blocks actually required in the product is the work that needs to be clearly defined in the scope layer. Product features of the plate and each plate in the content design is the core content of the product.

The "digital arrangement" follows the ease-of-use, functionality, and content of the user experience in game functionality. Ease of use in the user experience refers to the simple level of use of the product to quickly understand the usefulness of the product's functionality and use. Functional refers to the functional design of the product to meet the needs of users. Content refers to the accuracy of the information and structure provided by the product. Somatosensory game products more important is the need to somatosensory game and exercise the way combined with each other, which in the product ease of use, functionality and content have a clear direction. In the "Numeric Arrangement" game, in order to ensure the basic medical needs of the cervical and lumbar verte-

brae to move together, the game needs to be designed so that the user can frequently use the lumbar spine before and after. The product uses a numerical arrangement of methods, the number of orders is a very simple operation, the user begins to quickly understand the game's final purpose, the clever use of user experience ease of use. The highlight of the game is that the top of the interface will be placed a correct number of permutations, the user can see the figures on both sides of the fill-in area, swinging the body to the center of the waist or the user standing sideways to select the correct numbers to arrange, By adding to the waist as the center of the vertical and horizontal movement to achieve the effect of sports and fitness, but also to meet the functional design. This undoubtedly enhances the fit and exchange between the user's exercise mode and somatosensory exercise, which also promotes the stickiness between the user and the product, which greatly increases the ease of use of the product when the user uses the somatosensory game Sexual, functional and content satisfaction.

### Structure layer: Information architecture and interaction design

Information architecture refers to the product content of the information in a series of related analysis, organization and design, the required information accurately presented information structure. Simply put, is the user from point A to point B need to go through what steps, through the structural layer of the boot design to help users to achieve the goal.

In somatosensory game "sitting bingo", from the beginning of the user to select the mode you need to select specific controllability, before the start of the system will automatically enter the game settings, from the number of players: single mode or double mode, Mode of exercise: sitting or squatting mode, the difficulty of the game contains the number of grid settings, number arrangement, reaction time, rest time, where the number of picture, the game is divided into 3 x 3 mode, 4 x 4 mode, 5 x 5 mode, Arranging divided into ordered numbers and disordered figures. Icon form: black and white mode or color mode. After the setting is over, the scanner prompts the user whether the station is fixed or not. After confirmation, the player directly enters the game. After the game is trained, the settlement accuracy rate forms a motion report and stores the personal file record.

Interaction design, you need to understand the psychological and behavioral characteristics of the target user, dedicated to the completion of two objectives of usability and ease of use. In the process of human-product interaction, we need to achieve these usability goals, which are safe, effective, easy to learn, and interesting to use, and have corresponding emotional and experiential features to make users feel happy, happy, inspired, or emotionally charged Meet and so on. Interaction design here not only refers to the interactive design of the process, but also includes the design of modular interactive sports, the action is completed at the same time be able to get the appropriate score in the game, allowing users to interact when using somatosensory games More deep move, the demand for treatment gradually eased, more immersive sense of the game. In the somatosensory game "Sitting bingo", after the correct number is completed, the numbers are crossed off, proving that they have been used correctly, and that the prompt tone is displayed correctly. These subtle interactive design behaviors, which minimize medical seriousness and add to the fun and immersive gameplay, also reinforce more realistic and effective interactions between users.

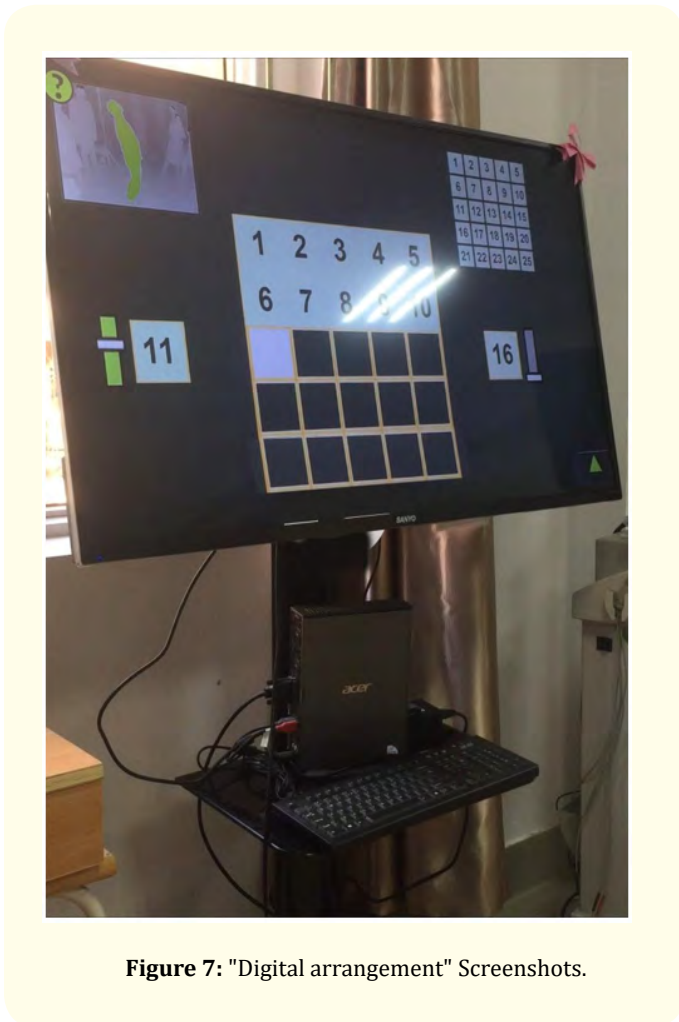


Figure 7: "Digital arrangement" Screenshots.

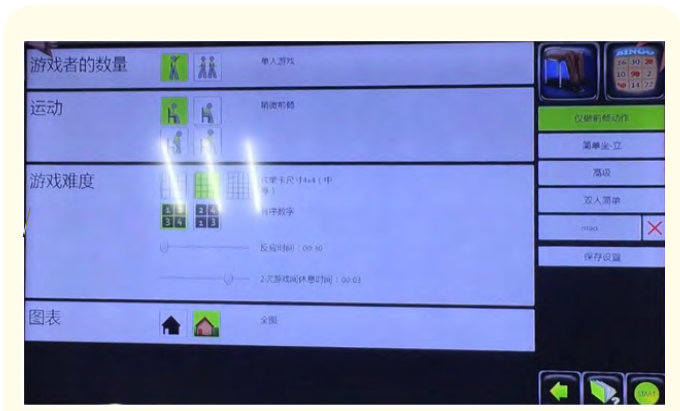


Figure 8: Game Screenshots.

**Framework layer: interface design and information design**

Successful interface design often allows the user to see the "most important thing" in the interface at a glance, and therefore needs to understand and master the habitual behavior of the user so that the user can acquire and understand the interface element in the simplest way while considering for the user, the right interface elements of the completed task are highlighted in the interface through a method that can be quickly accessed and used. Throughout the game interface, you need to gather a variety of information content displayed on the same level interface, you need to understand the user's habitual behavior, so that users can be simple analysis and thinking to obtain and understand interface information and elements, and can be correct And quickly complete the corresponding task.

In "sitting bingo", the game interface needs to display information elements, including get the number machine, identify portraits, shake out the number of numbers, picture on the figures and other information. The game will be the most important get the number machine placed in the middle of the interface, allowing users to access the interface when the player can understand the use of get the number machine. In the interface next to the user shows the image of sitting immediately, always remind the user's sitting status and standing up. In the user error or the camera failed to identify the player user, the screen will display prompts to help users adjust their stance and standing point in time to successfully complete the game. In the game, if the number of players correctly identify the appropriate number of picture crossed out, if the number of get the

number aircraft does not match the numbers in picture, the player can remain in place, waiting for the countdown beep to restart shaking Number appears new numbers. In the entire game interface tips of these information need to appear to help game player users to successfully complete the related game operation therapy. In the entire game interface effectively communicate between users and products presented, with value, to reach the user's satisfaction, to the user a sense of reliability. The accuracy and accuracy of the information in the product interface design can better help users understand the product, the trust of the product, so as to better help the product content and function of the extension.



Figure 9: Game Screenshots.

**Research status of somatosensory game therapy products**

The author interviewed a local hospital in Wuhan, a top three field hospital for field research, for rehabilitation subjects involved in somatosensory game patients interviewed. Most patients currently exposed to somatosensory game products are in patients with dyskinesia in the upper and lower limbs. Somatosensory games more games are based on the main treatment of hemiplegia, motor blockage in patients with neurological use, exercise types are also divided into six categories, namely sitting upper limb training, standing balance training, walking training, upper limb training, shoulder Neck training, cognitive training, daily life ability test training. The doctor will adjust the corresponding exercise work according to the patient's physical activity and training items. Next, 1 - 2 games will be taken in each category for usage analysis and product barrier analysis to pave the way for the design of somatosensory game products for future cervical health care.

Game type	Name	Sports mode	Advantages and disadvantages	Difficulty
Upper and lower limb training	Sitting bingo	Sit down – stand - sit down	Exercise mode is more common, exercise lumbar	1
Balance	Hamster	Forward - back - left pan of Variety Sports patterns, choose the size of sports venues	Training mode is aimed at patients with balance problems, such as rehabilitation training after a car accident, limb rehabilitation training for stroke patients.	3
walking	Collect flowers	Forward - back - left pan	Training model for car accident patients, stroke patients. Add difficult interference in the game, there are interference items collection activities, in order to improve patient acquisition speed. The difficulty of the game options are limited.	2
Shoulder	Take the golden egg	Neck and neck movement Hold up your arms and down - shake left and right - shake 45 degrees obliquely	The difficulty of the game is limited, the activity area is relatively narrow, can only be moved by hand, easily lead to shoulder stiffness	3
Cognitive training	Number arrangement	Waist strength training Before - after - left - right	Single game mode, exercise user’s waist power exercise. The game is less difficult for normal users	1
Daily life training	Image sorting	Arm strength, walking exercise, cognitive ability	The beginning of the game will give the correct picture sequence, after scrambling by the user self re-collage. Exercise mode diversification, you can choose to hold the picture through the arms, you can walk through the picture  Before the choice. However, the number of pictures is only four, there is no choice of difficulty and advanced choices.	3

Table 1: Game analysis.

Through the game analysis, the six categories of somatosensory sports games are targeted at patients with different conditions, mainly for hand and foot inconvenience, after a car accident or stroke and other diseases plagued rehabilitation training. The basic simple operation treatment is satisfied, but the difficulty level and difficulty of the game are not fulfilled, and the difficulty and the operation and play are relatively simple. There is no uniform requirement for professional modular action. At the same time, the standard of the action still needs external medical staff to help to adjust.

On the other hand, the fun of the game, the beauty of the screen is relatively lacking. Most of these somatosensory sports games are functional and functional products. In the game the picture requirements are relatively simple, there are many problems for the treatment of patients, you need a variety of games for treatment, the main way to game therapy is more diversified is the need to strengthen such games, and add the story of the game, Easier to help users adhere to complete.

**Design exploration**

**User research**

In order to tap the emotional needs of users in cervical health care somatosensory games, this design has taken a questionnaire survey and in-depth method of user research. For the crowd of users mainly for 18-30-year-old user groups, mainly with undergraduate and graduate academic backgrounds of knowledge-based youth groups.

The questionnaire was distributed and filled in using the image of the online questionnaire. Questionnaires were delivered from two aspects of cognition of somatosensory games and awareness of cervical spine care. A total of 137 questionnaires were received. Table 2 shows the answers to some of the representative study questionnaires.

Problem	Option	Statistical results
Do you understand somatosensory games?	Never heard of	18.64%
	Heard, no contact	32.2%
	Contact the relevant game	49.15%
Which of the following types of somatosensory games you will try?	Racing categories: racing, running and so on	57.63%
	Confrontation categories: boxing, baseball and so on	61.02%
	Leisure puzzle categories: music and dance, pets, drama category	57.63%
	Other sports categories: yoga, aerobics, mental exercise and so on	35.59%
Do you think somatosensory games can be used as a way of fitness?	Yes	86.44%
	No	13.56%
Do you have an experience when you have finished your day's work and study?	Head left and right, up and down, tilted 45 degrees rotation obstruction	51.72
	Head twisting with a slight impact sound	55.17%
	Dizziness headache, difficulty concentrating	48.28%
	Limbs weakness, appear numb leg phenomenon	24.14%
	Palpitation, a slight vomiting	12.07%
	Neck stiffness, pain	48.28%
	None of the above	13.79%
For cervical health you have a detailed understanding of it	A very detailed medical understanding	5.17%
	Slightly know one or two, understand the related cervical exercises	37.93%
	Not yet	55.17%
	Other	1.72%
In your usual life, is there any of the following?	Lying in bed or reading a book on the sofa, television, cell phones and so on	89.66%
	For a long time to maintain a certain posture or how to do one thing	79.31%
	Lying on the table to sleep	53.45%
	Pillows too high or too low	18.97%
	Long shoulder bag	18.97%
	Frequent wear high heels	5.17%
Which of the following healthy cervical health care habits do you have?	A combination of work and rest, work and study to stand up after a period of activity	87.93%
	Moment to remind myself the correct sitting, standing and so on to the hospital to regularly check the physical condition	15.52%
	To the hospital to regularly check the physical condition	10.34%
	Standing office study	6.9%
	Cervical health exercises	17.24%
	Yoga relax	12.07%
If you have a chance to learn about cervical health and cervical vertebra exercise through somatosensory games, would you choose to try it?	Yes	31.03%
	Maybe	65.52%
	No	3.45%

**Table 2:** Document investigation.

Through some of the questionnaires can be summarized as user research:

1. Somatosensory game therapy market has a vast space, most students are willing to buy and use somatosensory games for the treatment of cervical products, and that has a certain value.
2. In the interview and exchange, found that most users have a sense of recreational body somatosensory game, more emphasis on the screen requirements, entertainment is also required better, for the medical class somatosensory game less involved, it is not exposed Professional somatosensory game.
3. In life, students are more willing to spend time to touch the somatosensory game, to enhance physical activity, but related to cervical spine treatment expertise has not been enough to learn and expand, there are some limitations.
4. Players are more willing to multiplayer games, to play with their friends and roommates. If you can learn in ordinary life after classmates with non-regular use of somatosensory game movement is considered to have been a good exercise mode.

From the above questionnaire survey, we can draw some directions for improvement. From the five levels of user experience described earlier in this article, we can explore deeper and more systematically the design and study of cervical spondylosis in somatosensory games in the future.

### The strategic level - product goals and user needs

Through just the questionnaire survey, the purpose of the user needs to be clear, the user's needs can be better understood in future somatosensory game iteration and innovative design exploration. In the face of different student groups, we can better face the design group, make the product's goal decision. For the somatosensory game products, more is needed to allow players to accept the concept of cervical health and fitness, and to meet the basic needs of users of the product.

### The scope of layers - functional sections and content design

In the range of layers of the plate design, according to the user's social needs, incentives, cooperation, increase the difficulty of the game, time mode control, multi-dimensional mind map for game design to help users can exercise in the usual holy lake In the exercise of cervical exercise.

### The structure layer - information architecture and interactive design

The interaction between late-stage product design and the plot is also a way to exchange feelings between the user and the product. In the exchange of sports on the medical health care activities of the cervical vertebra so as to achieve the goal of the product, cervical care somatosensory game design.

### The framework layer - interface design and information design

Throughout the design of visual design in the game accounted for the main position in the previous figure you can see the beauty of the article in the article pictures and information management problems in the iterative innovation process, the interface information integration and dispersion need to think, but also need to use the usability test for the user to complete the appropriate design ideas back to the card. The interactive research on the operational experience and emotional experience of the product seeks to achieve the product's usability, ease of use and friendliness.

### Future Developments

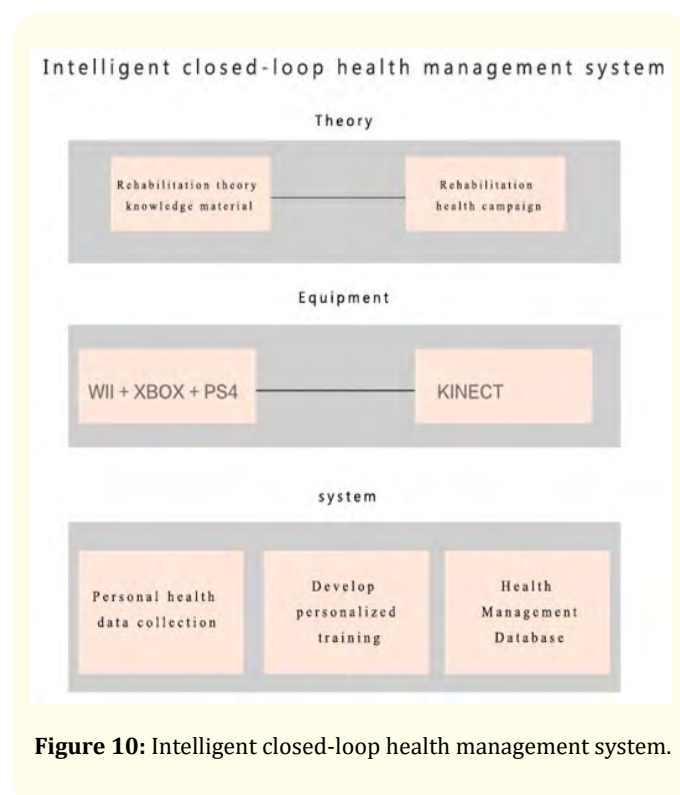


Figure 10: Intelligent closed-loop health management system.

The topic of cervical health status, combined with today's increasingly serious outdoor pollution and the rise of somatosensory games, somatosensory game to prevent and treat cervical spondylosis feasibility and significance are discussed. First of all, the author of the current status of scientific development of the cervical spine to investigate and understand the doctor and patient information imbalance, college students lack of knowledge of cervical health. Secondly, through the five levels of user experience design, it analyzes how the five levels in the game are reflected, and adds the design of the game in the actual hospital. According to the actual product design and the case analysis method, which performed. Through quantitative research to investigate white-collar workers on their own cervical spondylosis cognitive status and their perception of somatosensory game, and through qualitative research to analyze the rehabilitation exercise hospital existing somatosensory game mode of motion, and the advantages and disadvantages of the game and evaluation of the difficulty. After that, I carried out the interactive design elements of somatosensory game, and summarized the principle of interactive design of somatosensory game and the design strategy of somatosensory game of cervical vertebra health according to the five levels of user experience design for the psychological needs of undergraduates, and provided the follow-up design for somatosensory game model Suggestion.

Influenced by the era of "Internet +", the health-based somatosensory sports games, as a platform combining entertainment with medicine, provide a multi-dimensional space for the development of medical services under the Internet platform and provide the basis for future health assessment based on somatosensory devices And personal lifestyle information data collection, information collected will be systematic, informative and personalized for the development of health goals and somatosensory exercise for patients, in order to form an intelligent closed-loop feedback system of health management to pave the way.

## Conclusion

As the frequency of use of digital products in China continues to increase, work and learning pressures are gradually increasing, and people living in sedentary for a long time cause cervical spondylosis. After discovering this pain point, the author hopes to seek a new interaction mode and operation mode between the cervical vertebra health care and the somatosensory game by using the somatosensory game as an interactive medium.

## Acknowledgement

This paper was supported by the research project from Chinese National social science fund "4D evaluation model research and application of information interaction design (16CG170)".

## Bibliography

1. "Emergency medical teams: minimum technical standards and recommendations for rehabilitation". [EB/OL] Geneva: World Health Organization. Licence: CC BY-NC-SA 3.0 IGO (2016).
2. China Industrial Information Network, Report on the Operation Situation and Investment Strategy of China Rehabilitation Medical Market from 2017 to 2022 [EB/OL] (2017).
3. Liang Qing. The research of experience design based on play therapy-taking the mobile touch screen game of the quasi aged as an example[D] Jiangnan University (2016).
4. I-research, 2015 Chinese Host Somatosensory Game Research Report [EB/OL] (2015).
5. Garrett JJ. "The elements of user experience [M]". Fan X-Y. Beijing: China Machine Press (2008).
6. He Zhao. "Intelligent Health Promotion Service System For Chronic Diseases Exercise Intervention [D]". University Of Science and Technology of China (2016).
7. Corbin C and We G. "Concept of physical fitness: active lifestyle for wellness [M]". New York (2003).
8. Shih JL and Hsu Y. "Advancing Adventure Education Using Digital Motion-Sensing Games". *Educational Technology and Society* 19.4 (2016): 178-189.
9. Kathrin M Gerling, *et al.* "Full-Body Motion-Based Game Interaction for Older Adults". CHI (2012).
10. Chen YP, *et al.* "Use of virtual reality to improve upper-extremity control in children with cerebral palsy: a single-subject design". *Physical Therapy* 87.11 (2007): 1441-1457.
11. Widman L, *et al.* "Effectiveness of an upper extremity exercise device integrated with computer gaming for aerobic training in adolescents with spinal cord dysfunction". *The Journal of Spinal Cord Medicine* 29.4 (2006): 363- 370.

Volume 2 Issue 7 October 2018

© All rights are reserved by Wang Zhi and Zheng Yang-Shuo.