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Article

Prevention and rehabilitation training of aerobics sports injuries based on intelligent wearable sensing devices

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Abstract: Aerobics is a kind of sports activity, which can not only exercise the body but also cultivate the sentiment and reduce the psychological burden. With the improvement of people's living standards, aerobics is becoming more and more popular, but in fitness activities, there are often some sports injury accidents, which cause certain harm to human health. Therefore, people must take effective precautions against aerobics. Intelligent wearable sensor device is a new high-tech product developed based on Internet technology. It can not only realize real-time monitoring and diagnosis analysis of human body status information, but also combine with mobile terminals such as mobile phones to apply in the field of health management, and also provide personalized services according to user needs. The data collected by the sensor can be used to judge the human health status and exercise situation and make corresponding decisions, to help patients reduce or eliminate the disease burden. It collects the patient's body data stores it in the database, and then generates corresponding action commands and corresponding motion tracks or speed control modules according to the results fed back by the sensors. At last, it sends these signals to the cloud server to complete the operation process required by the entire system, to achieve the purpose of real-time measurement, processing user health, and assisting athletes in learning training methods. According to human neuroscience, based on intelligent wearable sensing devices, this paper analyzed the prevention and rehabilitation of aerobics injuries and discussed the factors that lead to injuries in aerobics, injury treatment effects, rehabilitation time, and injury treatment satisfaction. The experimental results show that the patient's satisfaction with the application of intelligent wearable sensing devices in the prevention of aerobics injury and rehabilitation training has increased by 6.84%. The intelligent wearable sensor device realizes the collection and processing of human health data. Applying big data analysis to user behavior analysis, can provide scientific and effective guidance and suggestions for athletes and improve their physical fitness and competitive level.

Keywords: aerobics injuries; smart wearable sensing; human neuroscience; rehabilitation training

1. Introduction

Smart wearable sensing devices can accurately identify and analyze complex sports movements through data fusion of multiple sensors. These devices use advanced signal processing algorithms and machine learning techniques to analyze sports data in real time to monitor athletes' movement status, posture, and physiological reactions. Sensors can capture tiny posture changes during exercise, evaluate whether athletes' movement patterns are standardized, and predict potential injury risks. Combined with neuroscience principles, the devices provide support for the prevention and rehabilitation of sports injuries by evaluating mechanisms such as neuroplasticity, muscle memory, and neuromuscular coordination. Neuroplasticity

refers to the adaptive changes that occur in the brain and nervous system during sports training or rehabilitation, which can help improve sports performance and accelerate recovery. Studies have shown that personalized training programs can effectively promote neuroplasticity, optimize movement patterns, and reduce injuries caused by improper movement posture or excessive exercise. During the injury rehabilitation process, smart devices can help athletes train within a safe range by monitoring changes in exercise data and adjusting exercise load in real-time, thereby improving rehabilitation effects and reducing the risk of re-injury.

Sports injuries are getting more and more attention. Bolling explored a new perspective on the complexity of sports injury, and he acknowledged the contemporary views on sports injury and its prevention. From the perspective of the social-ecological model, he proved that the complex nature of sports injury needs to be considered in the first step. He proposed an alternative method to explore and understand the injury background through qualitative research [1]. Emery believed that participation in sports and recreation has an important positive impact on public health throughout the life cycle. However, the burden of sports-related musculoskeletal injuries is very heavy. Braces and tapes are used to reduce the risk of recurrent ankle sprains, but they cannot be used to prevent primary injuries. Wrist protectors are proposed to prevent sprains in sports [2]. Song used an optimized convolutional neural network based on the deep learning model to ensure the successful detection and risk assessment of sports injury medical diseases and adopted a self-adjusting size algorithm enhanced by the convolutional self-coding method. This model helps evaluate sports medicine in multi-dimensional results and promotes multi-dimensional sports medicine data analysis [3]. To create clinically useful prediction models for musculoskeletal injuries in sports, Bullock evaluated the methodological behavior and reporting completeness of prediction models for musculoskeletal injuries in sports using regression, machine learning, or deep learning models [4]. Rafel explained the basic mechanism of sports injury and the innovative prevention method based on the complex dynamic system method. He reviewed the actual examples and challenges in the future and explained how the complex dynamic system position changed the way of thinking about sports injury, which provided innovative ideas for improving sports injury prevention [5]. Haraldsdottir explored the psychosocial impact of sports injuries on adolescent athletes to identify areas for future research and aid clinicians in the management of this population [6]. Renton's study found that athlete status was significantly associated with depressive symptom severity, performance characteristics, social network size, physical self-worth, motivation, recovery over-adherence, mental toughness, and playing with pain, as well as injury severity and functional recovery outcomes. Positive correlation [7]. These researches focus on sports injuries, but sports injuries are still relatively common in life.

The application of intelligent wearable sensors in sports is conducive to monitoring the sports state of athletes. Clermont discussed the user experience between runners and wearable technology, which was critical to designing personalized and effective wearable technology functions to prevent injuries. By understanding the importance of different user experiences of leisure and competitive runners related to wearable technology, he encouraged the human-computer interaction research community to determine the methods for personalized wearable

technology data related to complex running [8]. Seshadri studied the application of wearable technology in the evaluation of biomechanics and physiological parameters of athletes to further improve the practicability of this technology and help athletes in various sports fields return to the competition field [9]. Tarbert mentioned that hip fracture was an event in which thousands of elderly people were injured in the community and nursing institutions every year. He studied an intelligent wearable device to overcome compliance barriers and provide hip joint protection through fall sensing technology. This intelligent wearable device is emerging in residential facilities for the elderly to catch falls and avoid injuries [10]. Stammel mentioned that in the professional football league, a device combining GNSS (Global Navigation Satellite System), accelerometer, and gyroscope technology was developed. Now it is usually installed between the lower shoulder blades of each player's jersey, and these wearable microsensors allow real-time recording and reporting of players' movements during the game [11]. Leal-Junior introduced the development and application of multi-parameter quasi-distributed intelligent textiles based on embedded high-tensile polymer optical fiber sensors. Sensors are also used for activity detection, where PCA (Principal Component Analysis) is used for sensor response, indicating the possibility of detecting basic activities (such as walking, sitting on a chair, and squatting) [12]. Although the application research theory of intelligent wearable sensors in sports is relatively rich, some are still lacking in practical verification.

In order to study the role of intelligent wearable sensing devices in the prevention and rehabilitation training of aerobics sports injuries, this paper analyzed the role of intelligent wearable sensing devices, the causes of aerobics injuries, and preventive measures to reduce injuries in aerobics and promote the healthy development of aerobics sports.

2. Intelligent wearable sensing devices and neuroscience

Smart wearable sensing devices rely on the high integration and collaboration of multiple sensors in high-precision data collection and analysis, including accelerometers, gyroscopes, heart rate monitors, surface electromyography (sEMG) sensors, etc. These sensors can provide accurate data on subtle movement details, detect athletes' gait changes, joint angles, muscle activity intensity, and heart rate reactions, and thus provide comprehensive support for the assessment of exercise intensity, exercise posture, and fatigue level. Through efficient data fusion algorithms, smart devices can accurately capture tiny posture deviations or irregularities in movement patterns during exercise, and identify potential injury risks promptly. The connection with neuroscience principles is that the processing of movement signals by the cerebral cortex during exercise and its feedback mechanism is crucial to sports performance and injury prevention. Neuroplasticity plays a core role in sports training and rehabilitation — the motor neural network can reduce the possibility of sports injuries by strengthening neural connections and optimizing motor control during repeated practice or recovery from injury.

2.1. Intelligent wearable sensing device

Intelligent wearable technology is a comprehensive high technology integrating electronics, machinery, biology, and other disciplines. It is a system that integrates computers and sensors, monitors and analyzes human physiological function information through data acquisition and processing, and provides valuable decision support services. In recent years, with the development of science and technology, various intelligent devices have emerged, which has become one of the current research focuses. Wearable technology is a technology integrated into daily life, which is closely related to the daily life of users and can be operated at any time. Its intelligence is reflected in the access to users, realizing the service for users, and helping to extend the limbs and memory of the body. At the same time, the data is processed and the results are displayed to the user in an intuitive way [13]. The intelligent wearable sensing device is shown in **Figure 1**.

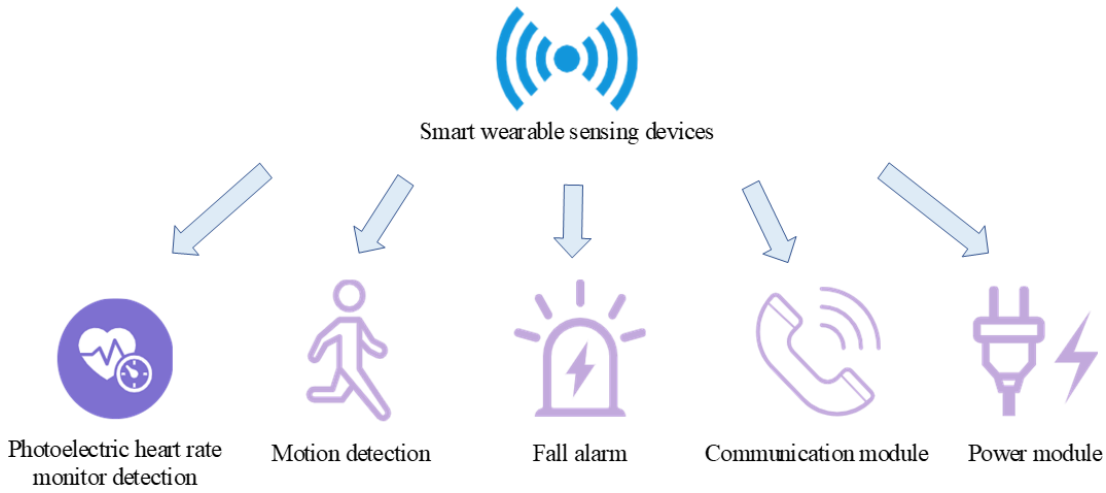

Figure 1. Smart wearable sensing devices.

2.1.1. Photoelectric heart rate meter detection module

The photoelectric heart rate meter measures the heartbeat through the principle of light reflection. When the heartbeat occurs, the oxygen and hemoglobin in the blood would change with the heartbeat. Therefore, it injects light into human tissues, and then measures the light intensity intermittently, and obtains the change in heart rate through the data calculated by heart rate. The photoelectric heart rate detector only needs one test, but it is vulnerable to the influence of light, so the motion elimination method is adopted to improve the accuracy of the measurement results.

2.1.2. Motion detection module

The motion detection module is designed to meet the needs of users to process and analyze the data collected by the sensor to achieve real-time feedback control. In this process, the signals collected by the sensor need to be converted into electrical signals, and then converted into digital signals through the converter and sent to the microcontroller processor for processing. Finally, the required information is obtained.

2.1.3. Fall alarm module

The three-axis acceleration in the fall process is measured with the aid of an acceleration sensor, and then it is input into the embedded system to analyze and

process the fall process, so as to make a correct judgment on the human movement. When someone falls to the ground, the system would use GPS (Global Positioning System) and GSM (Global System of Mobile Communication) modules for long-distance data transmission. It transmits the fall situation and location information to users for detection and rescue.

2.1.4. Communication module

The communication part mainly includes short-distance communication and long-distance communication. Proximity communication technology is realized through Bluetooth technology. Through Bluetooth connection with the user's mobile phone, people can know their health in real-time. Remote communication is realized through the GSM module. Once the alarm module is triggered, the alarm module transmits its location information to family members. In this way, family members can know what happened in the shortest time and avoid secondary injury caused by improper operation.

2.1.5. Power module

The power supply adopts a modular design. By improving and optimizing the existing power management chip, the circuit structure is more compact and the cost is reduced. Intelligent wearable devices often need a lot of computation and network communication. They use a relatively mature lithium battery with the best capacity and capacity, which can meet the energy demand of intelligent wearable devices.

2.2. Neuroscience

Neuroscience is an attempt to explain the biological mechanism of mental activity, that is, the mechanism of cells and molecules. Neuroscience attempts to understand how neural circuits assembled in development perceive the world around them and how to restore perception from memory, and once restored, these circuits affect perception, memory, or behavior. The research fields of neurobiology mainly include the nervous system, brain system, learning, and cognition. In recent years, with the rapid development of artificial intelligence technology, people have deepened their understanding of brain structure and function and began to pay attention to its important impact on human life.

Smart wearable sensor devices can efficiently and accurately monitor the human body's motion status by integrating multiple sensors (such as accelerometers, gyroscopes, heart rate sensors, etc.) to collect motion data in real-time, and combined with advanced data processing and analysis technologies. These devices can not only capture basic parameters of motion, such as gait, speed, and posture, but also infer physiological and neural responses during exercise by analyzing physiological indicators such as heart rate, skin temperature, breathing rate, etc. The deep connection with neuroscience principles is reflected in that they can reveal the brain's response to motor commands, the neural mechanisms of motor control, and adaptive changes in the nervous system. For example, the activation of the motor area of the cerebral cortex during exercise, changes in nerve conduction, and muscle coordination can all be quantified and analyzed through these sensor devices, thereby providing personalized and precise exercise intervention suggestions to help improve sports performance or rehabilitation effects.

3. Prevention and rehabilitation training measures of aerobics injury

3.1. Causes of injury in aerobics

There are many reasons for injury in aerobics, and the main reasons are shown in **Figure 2**.

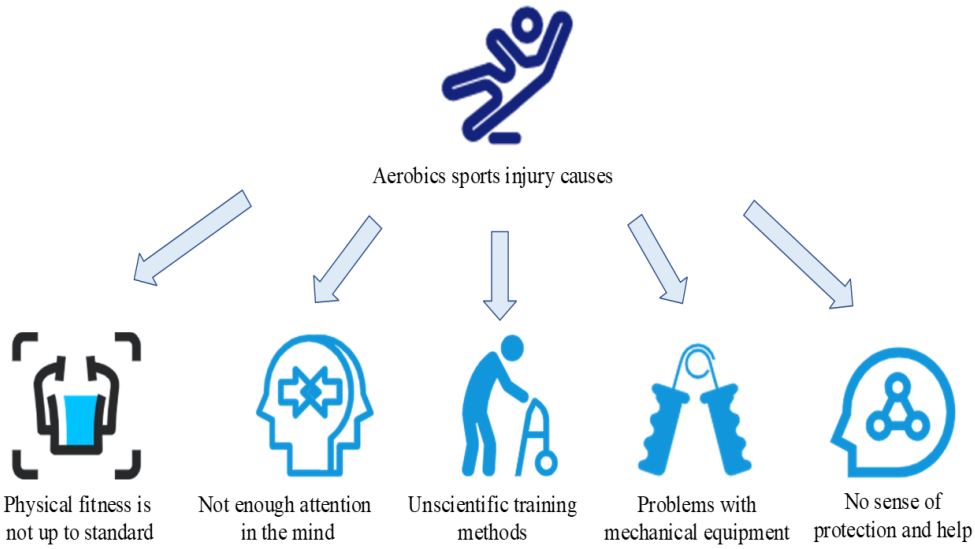

Figure 2. Aerobics sports injuries cause.

3.1.1. Poor physical fitness

Gymnasts should not only bear their weight but also have enough physical strength during gymnastics training, so as to ensure correct, coherent, and well-completed movements. Therefore, they must have certain physical qualities, sports skills, and higher psychological qualities, otherwise, it would affect the smooth progress of the whole physical education teaching and even lead to serious consequences.

3.1.2. Inadequate emphasis on ideology

At present, coaches and athletes do not pay attention to the safety problems in training and lack safety awareness, which would not only cause fatigue, injury, and other accidents in the training process but also affect the entire sports performance. Therefore, to improve the level of athletes, people must strengthen their physical education and their awareness through various forms. Physical education should pay attention to cultivating students' safety awareness and prevention awareness, and prevent and reduce accidents through reasonable and effective training activities. While doing a good job in daily management and education, people should also strengthen team building, and improve sports skills and physical fitness.

3.1.3. The training method is not scientific

The athletes did not receive professional guidance during the initial training, so they could not use scientific methods for training, but the proficiency of the action could effectively reduce the occurrence of sports injuries. Therefore, before training, students should design actions according to the current situation and the content they

have learned. Some athletes' training methods are not scientific enough. When they engage in intense training, the possibility of sports injury increases.

3.1.4. Problems with mechanical equipment

In the process of gymnastics training, it is generally necessary to improve the technical level of athletes with the help of relevant training equipment. Due to the defects of the equipment itself and improper use methods and other reasons, the equipment has been damaged to varying degrees, which seriously affects the training effect, and even causes damage to athletes, bringing great trouble to coaches.

3.1.5. No awareness of protection and help

Athletes who do not have a sense of protection and help would be vulnerable to injury. To achieve good results, people must guide and train movements correctly, comprehensively, and reasonably. Therefore, it is an important subject to cultivate students' self-protection awareness. If the means of protection and rescue are improper, others will be injured. Therefore, in gymnastics training, teachers should teach students to strengthen their awareness of protection and help-seeking and master the correct methods of protection and help-seeking, to reduce the incidence of sports injuries during training.

3.2. Prevention of sports injury in aerobics

In order to prevent and reduce the incidence of injuries in aerobics and maintain good classroom teaching and management order, the preventive measures for teaching and training are shown in **Figure 3**.

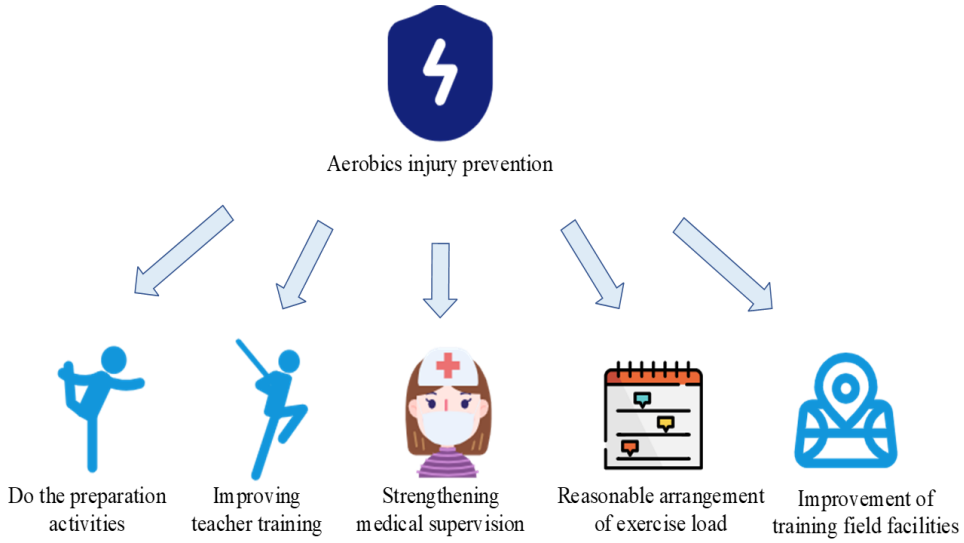

Figure 3. Aerobics injury prevention.

3.2.1. Prepare for activities

Making full preparations before gymnastics can improve students' learning interest and initiative. First of all, people should make clear the teaching purpose and choose the teaching content purposefully. The teaching method should be reasonably designed to meet the requirements of the physical education syllabus. People should attach importance to the organizational form and method of physical education.

Attention should be paid to the training of motor skills and psychological adjustment in the process of practice. After the exercise, many people think that it is very important to relax properly after the training. After a long period of aerobics training, learners generally suffer from muscle soreness, high body temperature, and faster heart rate and respiratory rate. Contractive reflexes, exercise fatigue, and even spasms may occur in human muscle tissue. Therefore, after aerobics training, attention should be paid to the activities of various parts of the body, and relaxation exercises should be done appropriately. It is used to relieve muscle fatigue, relieve body pressure, and prevent ligament strain and other sports injuries in relevant parts of the human body caused by excessive exercise.

3.2.2. Improve the training level of teachers

People must adopt scientific and effective teaching methods. Teachers must follow the laws and principles of physical education teaching. In teaching, teachers should take different forms and methods to implement targeted education in combination with students' psychological characteristics and their actual conditions. At the same time, people should combine theory with practice, pay attention to cultivating students' good learning habits and innovation ability, and make them become high-quality talents with all-round development. It is an important way for aerobics athletes to obtain higher sports results by using reasonable training methods.

3.2.3. Strengthen medical supervision

In the practice of difficult movements, technical errors, poor physical response, weak muscle strength, and other phenomena are easy to occur. Teachers should increase the popularity of knowledge about sports injuries in aerobics, and carry out safety education and training. People should strengthen students' physical exercise, improve their physical quality, enhance their physical health, and promote the development of physical and mental health. To strengthen security, the school should formulate and implement various activities management systems, and improve the mechanism of troubleshooting and governance of security risks around the campus. It is necessary to establish a school emergency response plan, make preparations for emergencies, and ensure the personal safety of teachers and students. People can establish and improve various rules and regulations, standardize sports teaching behavior, and ensure the stable improvement of teaching quality. In addition, people should pay attention to the reasonable arrangement of training time and load intensity in aerobics to prevent various complications caused by excessive fatigue.

3.2.4. Reasonably arrange exercise load

The reasonable arrangement of exercise load in aerobics teaching has a great influence on students' physiological functions. The reasonable arrangement of exercise intensity and rhythm can effectively improve the teaching effect of aerobics and is one of the important factors in ensuring the normal development of students' physical and psychological. The physical indexes of aerobics athletes are tested and analyzed, the characteristics and laws of physiological changes of aerobics athletes in different periods are studied, and the methods of reasonably controlling the intensity of physical exercise and improving physical fitness are used to enhance physical ability and promote the development of physical and mental health.

3.2.5. Improve training ground facilities

The training ground affects students' sports ability and training level. Uneven training ground, too hard ground, and poor training clothing are also the reasons for injuries. To eliminate hidden dangers and reduce sports injuries as much as possible is the first prerequisite to ensure the smooth development of aerobics teaching and training. Therefore, the school should improve the field equipment and facilities in teaching, the trainers should check the sports shoes, wrist guards, and knee pads, and pay attention to the selection of field equipment.

3.3. Sports injury rehabilitation training of intelligent sensor equipment

With the rapid development of sports competitions and the continuous progress of science and technology, real-time sports information monitoring has been widely used. At present, the industry of sports intelligent wearable devices is developing rapidly, and its application fields are more and more extensive. The intelligent wearable sensing device can not only assist in daily sports but also collect and sort out the sports data of athletes, providing better training programs for athletes. The exercise injury rehabilitation training of intelligent sensor equipment is shown in **Figure 4**.

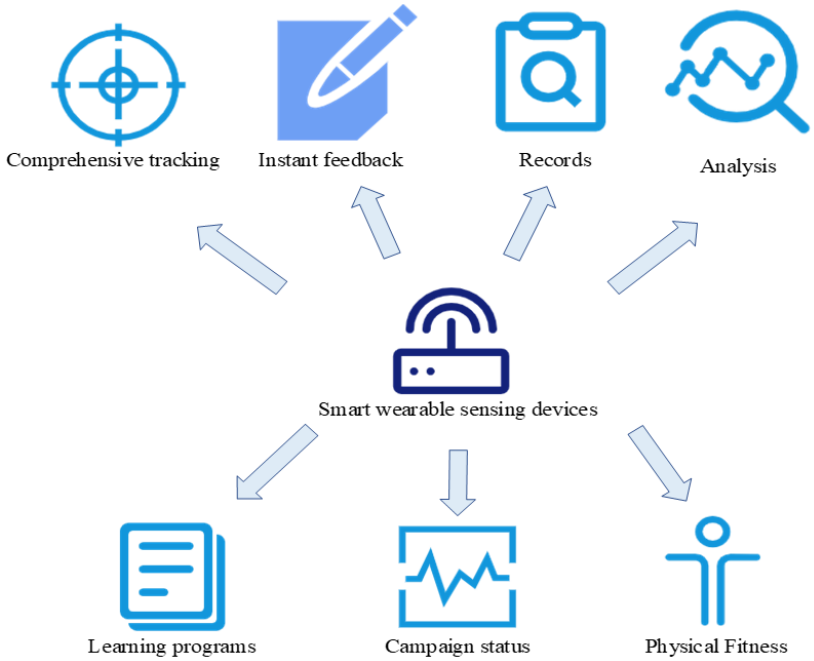

Figure 4. Intelligent sensor device sports injury rehabilitation training.

The application of wearable technology in physical education teaching can not only enhance students' interest and enthusiasm in learning but also enable students to better master sports skills. Wearable technology can enable people to track their personal body and living conditions in an all-around way, integrate personalized learning materials and immediate feedback on formative assessment, and then consciously adjust their behaviors. Intelligent wearable technology has mobility, so it can monitor the athletes in daily life. It can not only help users to record their daily exercise, but also analyze the use and heat consumption of each technical action, clearly inform users of the intensity of exercise and the status of completing the target

tasks, so that users can have more knowledge of their technical level and the size of the amount of exercise, and achieve the goal of human-computer interaction.

For teachers, they can understand the situation of students according to the information provided by wearable technology, to develop personalized learning programs for students. If students want to grow stronger, they must have proper exercise. Moderate physical exercise can achieve good fitness and psychological effects, but if the exercise intensity is too high or too low, it would cause harm to the human body, which would lead to decreased immune function. Insufficient exercise intensity would not only hurt the health of the body but also cause unnecessary damage to various organs of the human body. Therefore, teachers can use intelligent wearable technology to understand students' sports in the classroom and analyze and guide them to improve students' physical quality. In the extracurricular evaluation of physical education, the traditional evaluation of physical education teaching results is mainly a summative evaluation, which is often not comprehensive and objective. Based on wearable technology, students' movements are monitored in real-time, their movements are monitored using wearable technology, and their movements are tracked, which has a certain guiding significance for the evaluation of athletes' sports ability [14].

4. Frequency measurement and calculation of intelligent wearable sensing device

4.1. Selection of indicator signal

The selection of wearable device indicators is based on the signal demand analysis, and the qualitative and quantitative analysis is carried out to obtain a quantitative evaluation dimension. From the point of view of steady-state analysis, the reliability of signal quality data of wearable devices is determined by the total semaphore.

Set s to represent the total number of signal data of wearable devices, which can be represented by the reliability of signal quality data according to the steady state effective analysis rule:

$$\omega_1 = 1 - \int_{e'}^{e} f(s)\, ds \tag{1}$$

Among them, $f(s)$ represents the definition Equation related to the total amount of wearable device signal data.

According to the operating characteristics of the device itself, the verification coefficient of wearable device signal quality data is comprehensively affected by the signal acquisition cycle t and the signal type vector p. If the operating environment does not change, the relationship between the verification factor and p can be expressed as follows:

$$\omega_2 = (1 + p) b^{t-\alpha} \tag{2}$$

b is the inspection status of the signal quality data of the intelligent wearable sensing device, and α is the minimum value of the signal data acquisition period under ideal conditions.

Based on the validity function, the indicator signals of wearable devices can be filtered under the assumption that they do not deviate from the validation factor. ω_1, ω_2 can be used to express the results of selecting indicator signals in signal demand analysis as follows:

$$U = 1 - \frac{|\omega_1 - \omega_2|}{\frac{-(InE)}{a} + \lambda} \tag{3}$$

The Equation InE represents the total demand of wearable device signal with 10 as the base and λ represents the selected planning constant.

4.2. Calculation of quality evaluation operator

The quality evaluation operator of wearable device indicator signal has certain data normalization processing capability and can determine whether its basic working frequency meets the measurement requirements by selecting the weight of various signals.

Set χ as the index membership and μ as the index weight. The simultaneous Equation (3) can express the wearable device signal quality evaluation operator as:

$$k = dx - \sum_{\chi=1}^{\infty} \frac{U}{\mu} \hat{l} \tag{4}$$

Assuming that the signal quality evaluation operator of the wearable device does not change with the measurement time and remains within k, the transverse wave polarization modulation y_1 and longitudinal wave polarization modulation y_2 in the sensor signal would always be independent of each other. The signal frequency measurement standard of wearable devices can be represented by physical quantities:

$$q = \frac{k|\sum_c^z f_{\bar{w}}|^{-1}}{(y_1 + y_2)^2} \tag{5}$$

The Equation, z c respectively represents the upper and lower limit integral parameters measured by the etalon, $f_{\bar{w}}$ represents the transmission consumption of wearable device signal, and $\bar{w}$ represents the average duration of the transmission consumption cycle.

5. Impact of intelligent wearable sensing devices on aerobics injuries

Based on the background of intelligent wearable sensor devices, to study the effect of prevention and rehabilitation training of aerobics sports injuries, this paper selects 30 patients with aerobics sports injuries diagnosed by the hospital in X Hospital, who meet the criteria for sports injury diagnosis, as the research object. In this paper, 30 cases of aerobics sports injuries were divided into two groups, A and B, each with 15 people. The patients in group A were treated with traditional rehabilitation therapy, while the patients in group B were treated with rehabilitation training with intelligent wearable sensing devices. This paper conducts a 5-week study from four aspects: the factors that cause injuries in aerobics, the effect of injury treatment, the time of

rehabilitation, and the satisfaction of injury treatment, and compares the effects of rehabilitation training on sports function of aerobics sports injuries under the two treatment methods.

5.1. Factors leading to damage

In aerobics, many factors can cause injuries to athletes. This paper analyzes the causes of injuries in aerobics from the following aspects: inattention, injured training, improper training methods, substandard physical quality, inadequate professional standards of coaches, and other aspects, as shown in **Table 1**.

Table 1. Factors leading to injury.

Factors	Proportion
Inattentiveness	25.73%
Training with injury	13.10%
Inappropriate training methods	24.27%
Physical fitness is not up to standard	21.96%
Coaching professionalism is not enough	3.37%
Other	11.57%

Among the factors that lead to injury, athletes' inattention, improper training methods, and substandard physical fitness account for a relatively large proportion of injury causes. The percentage of coaches who are not professional enough is relatively small. Given the main causes of injury in aerobics, teachers should strengthen the training of athletes, enhance their training safety awareness, improve the quality of technical movements and teaching skills, and master correct and effective teaching methods and means. Take corresponding preventive measures according to different types of injury factors, which enables students to learn self-protection and reduce the probability of injury, and also lays a solid foundation for participating in professional competitions in the future.

5.2. Injury treatment effect

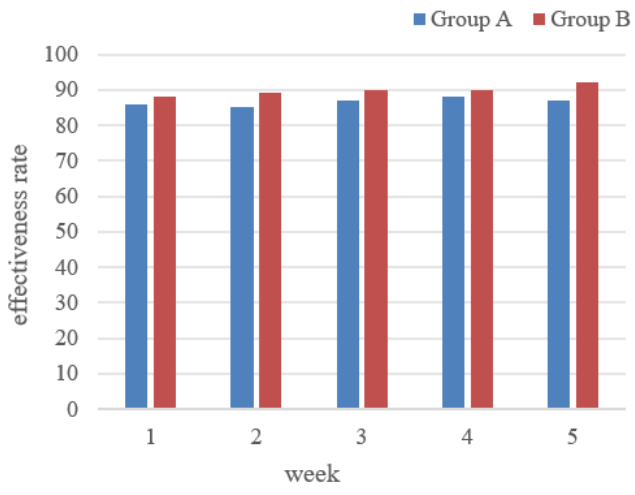

Figure 5. Comparison of injury treatment results.

The treatment effect of aerobics injury affects the health level of athletes and has an important impact on their training and development. The research content is the treatment effect of aerobics injury, and the results are shown in **Figure 5**.

In the treatment effect of aerobics sports injury, the treatment effect of group A was significantly lower than that of group B, and the treatment effect of group A showed an unstable trend. Based on the intelligent wearable sensor device, the user's physical condition data can be collected by wireless network and uploaded to the cloud server to analyze the physical condition of athletes, provide appropriate treatment methods for athletes, and improve the effect of injury treatment.

5.3. Recovery time

The long recovery time from aerobics injury would affect the physical and mental health and training quality of athletes. The comparison of the recovery time of the two groups is shown in **Figure 6**.

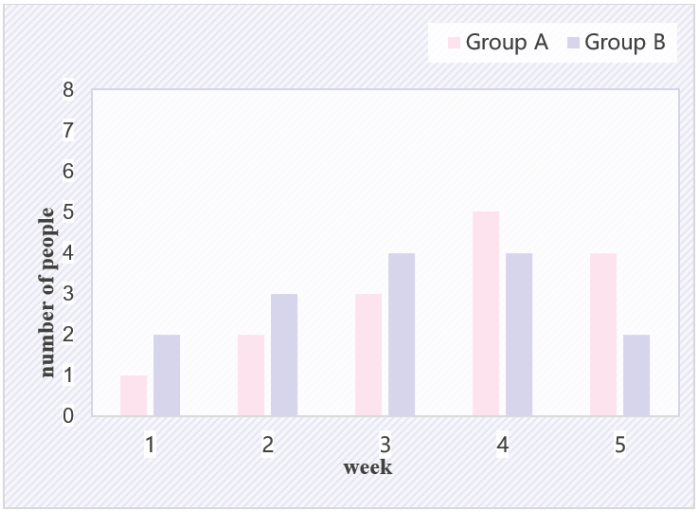

Figure 6. Recovery time comparison.

In the rehabilitation time of the two groups, the number of patients in group A is about 6, and that in group B is about 9 in the first three weeks. During the 4-5th week, the number of patients in group A was about 9, and that in group B was about 6. The overall recovery time of patients in group A was higher than that of patients in group B. Traditional physiological signal detection technology can not accurately predict whether the human body would be injured in different environments, and can not achieve timely and effective treatment of injured parts. The intelligent wearable sensor device based on biometric recognition can conduct motion analysis and evaluation, and monitor the physical condition of athletes in real time.

5.4. Satisfaction with injury treatment

The main body of the study is the satisfaction of patients with the treatment of aerobics injuries, and the results are shown in **Figure 7**.

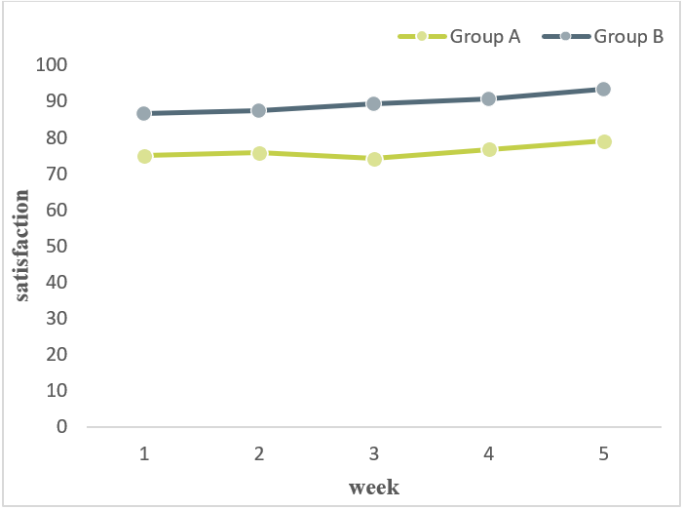

Figure 7. Comparison of injury treatment satisfaction.

Among the patients' satisfaction with the treatment of aerobics injuries, the satisfaction of patients in group B is always higher than that of patients in group A. Among them, the satisfaction of group B patients with injury treatment was about 86.49% in the first week and 93.33% in the fifth week, with an increase of 6.84%. Intelligent wearable sensor devices can monitor in real-time and help students understand the risk factors in sports and intervene in time. This can not only analyze and evaluate the occurrence of sports injuries in the training process of athletes but also design intelligent training programs based on the ability to obtain and process human motion information, enhancing patients' satisfaction with the application of intelligent sensor devices in aerobics injury rehabilitation training.

In aerobic sports injury prevention and rehabilitation training, smart wearable devices evaluate athletes' exercise intensity and exercise posture by real-time monitoring of key physiological and exercise indicators (such as heart rate, cadence, exercise speed, acceleration, and muscle load). Calculated indicators such as heart rate variability (HRV), exercise load, and posture stability can help determine whether the athlete's exercise intensity is within an appropriate range to avoid fatigue accumulation or injury caused by overtraining. In addition, the device can also timely detect potential posture problems and reduce the risk of sports injuries by analyzing deviations in exercise posture (such as irregular gait or abnormal joint angles). Based on these data, the training system can provide athletes with personalized training suggestions, such as adjusting exercise intensity, improving posture, or reminding rest and recovery, to achieve precise injury prevention and rehabilitation goals. With scientific data support, athletes can train at a safe intensity, effectively reduce sports injuries, and improve sports performance.

6. Conclusions

The wearable device is a scientific and effective device that can collect data in a large range. Shortly, with the further maturity of related technologies and cost reduction, its application field would gradually expand. From the perspective of intelligent wearable sensing technology, it can first be used as a quantifiable tool to make people move more scientifically and reasonably. Secondly, wearable technology

can cultivate students' creativity and can be more easily and naturally integrated into people's surroundings, changing the traditional way of learning. At the same time, it can also play a role of supervision and urge athletes to achieve the purpose of exercise. Intelligent sports wearable devices can not only be used for motion detection but also have been widely used in many aspects. In addition, with the continuous innovation and increase of aerobics types, the difficulty is also growing. Therefore, when learning aerobics, people should follow the rules of action and correctly grasp each action. According to the actual sports ability and physical condition, people can learn step by step, pay attention to the preparation before the competition, relax after the sports, enhance safety awareness, take effective measures to prevent sports injuries, and achieve the purpose of the sport.

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