

Research Article

Application of Artificial Intelligence and Virtual Reality Technology in the Rehabilitation Training of Track and Field Athletes

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The rapid improvement of the economic level has led to the prosperity of sports, and the rehabilitation training of athletes has also developed rapidly and has attracted widespread attention from all over the world. How to make track and field athletes quickly relieve the negative impact of sports injuries on the body during rehabilitation training is the most concerned issue in the field of sports medicine today. The traditional rehabilitation training cycle is long, and the rehabilitation effect is very small, which cannot fundamentally eliminate the injury and restore the athletes' various physical functions and sports qualities to the original level. This article combines the latest artificial intelligence and virtual reality technology to analyze the causes and control strategies of athletes' injuries and to understand the reasons for the injuries of track and field athletes in daily training and the various factors that affect their rehabilitation. And it was used in rehabilitation training practice and analyzed from four aspects: body shape, physical function, sports quality, and rehabilitation effect. The experimental results show that the rehabilitation training using artificial intelligence and virtual reality technology can make the athletes' physical function recover more than 96%, and the overall average rehabilitation effect can reach 93.79 points, which is feasible to a certain extent. The application of artificial intelligence and virtual reality technology to the current stage of rehabilitation training can effectively improve the rehabilitation effect of track and field athletes.

1. Introduction

With the progress of society and the in-depth development of the times, people's pursuit of spiritual life has been continuously improved, and the sports industry has ushered in a new development opportunity in the market. While track and field sports events have become popular, higher requirements have also been placed on the physical fitness of track and field athletes. During competitions or during normal training, athletes are likely to suffer physical injuries due to accidents or excessive exercise. In the past track and field competitions, the performance of athletes depends to a large extent on their personal physical condition. If sports injuries are not effectively recovered, not only can they severely hinder training programs, but they can also damage an individual's physical health. Therefore, rehabilitation training

has become one of the indispensable means for every athlete to treat injuries. However, in the current rehabilitation training, traditional medical methods are often used, and manual observation is the main training method. Although this can alleviate certain sports injuries, the rehabilitation efficiency is often not satisfactory. Moreover, each athlete's body structure and cause of injury have individual differences. Traditional rehabilitation training has fixed methods and steps and cannot effectively treat each athlete's differences. Therefore, it is essential to combine new technologies and integrate them into traditional rehabilitation training to improve the quality and efficiency of physical recovery of track and field athletes.

The current era belongs to an era of science and technology. Artificial intelligence and virtual reality technology shine in the development process of the twenty-first century

and have exerted their own application value in many fields, for example, it can be seen in the fields of values such as computers, finance, communication, and media. It promotes the continuous transformation and upgrading of various industries and fully caters to the characteristics of the intelligent era. It not only changed the inherent way of production and life but also facilitated people's lives. Applying it to the rehabilitation training of track and field athletes can improve the effect of rehabilitation and treatment and provide scientific basis and decision-making for the physical recovery of athletes.

Based on artificial intelligence and virtual reality technology, this paper deeply studies their application in the rehabilitation training of track and field athletes. Providing targeted rehabilitation training programs according to different causes of injury has practical guiding and practical significance in improving the therapeutic effect and quality of existing rehabilitation training. It can also provide new ideas for related research on the combination of science and technology and sports medicine.

2. Related Work

In recent years, many scholars have carried out in-depth research on the rehabilitation training of athletes. Kozin developed biomechanical techniques in rock climbing for injury prevention and rehabilitation training in physical education and sports specialist training. This biomechanical technology includes three fields: theory, analysis, and practicality [1]. David and Popoli provided an approach to positive resilience training in dance classes that provides dancers with useful guidance related to key career inflection points (amateur to professional, professional to professional, and professional to retirement) to enhance their resilience [2]. Arnutu and Haniu demonstrated the importance of the use of monitoring technology tools for rehabilitation training, and based on the data analyzed, they confirmed that the use of technology to implement a monitoring training program will lead to improvements in the indicators pursued in the study [3]. Marcus examined the rehabilitation training programs of elite youth judo athletes throughout the annual training cycle, monitoring the training level of perceived exertion and the total duration of each training session [4]. Athlete's rehabilitation training has been deeply researched by countless scholars, and it has developed into a relatively mature training treatment at this stage. However, with the continuous development of sports, the requirements for the quality and efficiency of an athlete's rehabilitation training are also constantly improving. The demand for rehabilitation training systems with artificial intelligence, virtual reality technology, and other technologies as auxiliary means has been significantly increased.

To gain an in-depth understanding of artificial intelligence and virtual reality technology, this paper makes an understanding of its related application research. Babic et al., who apply artificial intelligence technology to medical-assisted treatment, suggested that regulators should better understand the relationship between consumers and medical artificial intelligence, especially the interaction

method with diagnostic applications [5]. To assess the importance of artificial intelligence technology in the modernization of TCM treatment, Feng et al. systematically reviewed the relevant literature in his article and explained the beneficial impact of artificial intelligence technology on TCM treatment outcomes [6]. Lan et al. discussed the application of virtual reality technology in clinical medicine, especially in surgical training, pain management, and psychiatric treatment. They introduced the common types of VR simulators and their working principles in the field of medical rehabilitation [7]. Lai and Zou designed a surgical system based on VR technology, which provides surgeons with a simulated environment with vivid vision, hearing, and touch. Residents and interns can repeat various operations in the system without restrictions [8]. These studies have carried out a good analysis of artificial intelligence and virtual reality technology, but due to the rapid development of the times, previous studies cannot achieve good rehabilitation effects in rehabilitation training. Therefore, the application research of artificial intelligence and virtual reality technology in the rehabilitation training of track and field athletes is urgent.

3. Artificial Intelligence and Virtual Reality Technology and Rehabilitation Training of Track and Field Athletes

3.1. Injuries and Rehabilitation Training of Track and Field Athletes

3.1.1. Definition of Sports Injury and Rehabilitation Training Concept. Sports injuries refer to muscle contusions or strains. Contusions are generally caused by the direct suppression of external forces, while strains are mainly injuries under the indirect influence of external forces [9]. In track and field, the muscle strains of athletes often occur in the back muscles of the lower extremities and the back muscles and adductor muscles of the legs. The clinical symptoms of sports injuries are usually manifested as muscle swelling and spasms at the injury site. Swelling and pain are more pronounced when the injured muscle is stretched. After local muscle injury, ice packs should be applied to the injury immediately to prevent the injury from worsening. After 24 hours, you can apply heat or medication to reduce swelling and pain. If there is a large-scale sports injury, you should go to the hospital for surgery or other professional treatment immediately after first aid work [10].

Rehabilitation training, also known as physical therapy, is an emerging frontier discipline that combines sports, health, and medicine [11]. Rehabilitation training is divided into three stages: the first stage is the diagnosis and treatment of sports injuries; the second is the physical function after diagnosis and treatment; the last is to use scientific training methods and means to restore the level of athletes to the state they can participate in competitive competitions. It is the use of various sports methods for the injured or disabled, so that they can fully recover their physical functions and spirit and enable athletes to reparticipate in sports training and competition. It has similarities to the physical

means of promoting an athlete's recovery after training; however, the two are two different concepts. Exercise therapy in rehabilitation therapy is mainly aimed at athletes who have already suffered injuries, and the main purpose is to restore the athletes' motor function, while the physical means of promoting athletes' recovery after training is aimed at all athletes. Its purpose is to help athletes eliminate fatigue as soon as possible, promote the recovery of the body, and prepare for the next training session.

3.1.2. Causes of Sports Injuries. There are three common causes of sports injuries in the daily training and competition of track and field, namely, insufficient warm-up, environmental factors, and lack of medical knowledge and awareness.

(1) Insufficient warm-up

A major cause of sports injuries among track and field athletes is that they do not adequately warm up before exercise [12]. When the human body is in a nonexercise state, all muscle groups in the body are in a dormant state. The main function of the warm-up activity is to wake up the various muscle groups of the human body, so that it can fully maintain vitality and stretch. When the ligaments, tendons, and other tissues are fully stretched, the excitation and inhibition of the central nervous system are properly coordinated, which will maximize the athletes to achieve the best physical state, thereby reducing the chance of sports injury. If a certain warm-up is not performed before exercise, the athlete's ligaments, tendons, and other tissues are not fully stretched, and the central nervous system will be between the two poles (excited state or fully inhibited state). At this time, high-intensity exercise training will easily lead to muscle damage.

(2) Environmental factors

Once a sport injury occurs, the systematic training of athletes will be broken, physical health will be affected, the training effect will be reduced, and the psychological status of athletes will be seriously affected [13]. If the psychological problems are not solved in time, there will be a great psychological shadow for the restorative training. For those athletes with more serious sports injuries, even those who affect their normal life, they will also be under enormous pressure in life. Sports injuries are more likely to occur when you are in a poor state of mind than when you are in a good state of mind. Excessive psychological tension will lead to muscle stiffness and sluggish movements; boredom will easily lead to inability to concentrate, weak movements, etc., resulting in sports injuries.

(3) Lack of medical knowledge and awareness

Accidental injuries such as muscle damage always occur in track and field athletes during training and competition [14]. The high incidence of muscle injury can be traced back to the fact that coaches lack basic medical knowledge of sports injuries and the ideology of track and field athletes. Among them, coaches lack of knowledge of rehabilitation, nutrition, physiology, etc., can cause muscle damage in track

and field athletes; athletes have poor ideology, which is mainly manifested in insufficient preparation activities, training, or competition without complete recovery, etc. The causes of physical muscle injury of track and field athletes are complex, mainly caused by the lack of medical knowledge such as physiology and biochemistry, nutrition, rehabilitation, and the weakening of track and field athletes' ideology towards training and competition.

3.1.3. Factors Affecting Rehabilitation Training. The main factors affecting rehabilitation training are methods of preventing sports injuries, physiological changes of muscle tissue, recovery methods of sports injuries, and training methods.

(1) Methods of preventing sports injuries

The prevention of sports injury should be carried out from many aspects, including physical conditions, psychological quality, and other internal factors, as well as environmental factors and method factors. Muscle strain prevention is mainly based on adequate preparation and stretching exercises for the following two reasons: first, adequate preparation and stretching exercises can increase muscle elasticity, improve muscle contraction efficiency, and widen the range of motion of muscle joints; second, adequate preparatory activities and stretching exercises can relax the mentality of athletes and prevent muscle strain. Generally speaking, preparation activities are divided into regular preparation movements and relaxation movements after strenuous exercise. From an injury prevention perspective, adequate preparation and stretching exercises are essential. Table 1 shows the injury prevention methods used in traditional rehabilitation training.

From Table 1, the injury prevention methods used in traditional rehabilitation training are relatively simple and only superficial, and it is difficult to effectively prevent sports injuries from multiple perspectives.

(2) Physiological changes of muscle tissue

There are four main categories of energy for muscle contraction, as shown in Table 2. ATP is the most important and most accessible energy for muscle contraction. When the transverse bridge of myosin and fibrillin fuse with each other, the energy released by the decomposition of ATP is used for the movement of the transverse bridge, that is, muscle contraction. The CP content in muscle is very small, and the holding time is only six to eight seconds [15]. The overall amount of ATP in muscles is small and only lasts one to three minutes during vigorous muscle contraction activity. When doing high-intensity exercise or going through a long period of time, if the oxygen supply is insufficient, other energy is needed to break down lactic acid, thereby releasing more energy. When an energy is exhausted, the energy supply of the muscle does not follow the energy consumption, because it is a dynamic, complex, and complex energy system.

When a muscle goes into a nonresting state, many tiny blood vessels become larger in size to improve blood flow to the muscle. The increase in blood flow will further lead to muscle expansion, resulting in a relative lack of oxygen

TABLE 1: Injury prevention methods used in traditional rehabilitation training.

Scope	Sequence	Classification
Injury prevention means	1	Adequate preparation
	2	Safety of sports equipment
	3	Nutritional supplement
	4	Quality training for vulnerable parts

TABLE 2: Energy classification of muscle contraction.

Scope	Sequence	Classification
Energy for muscle contraction	1	Adenosine triphosphate
	2	Creatine phosphate
	3	Muscle glycogen
	4	Fat

supply to the muscle tissue, and the cellular environment will also be affected. Lactic acid in the human body gathers, and the capillaries everywhere will continuously flow out of body fluid, which is why the muscles swell. Swelling will increase the pressure between the muscles, and the blood flow between the muscles will be blocked, which will further increase the pressure of the muscle interval and affect the blood circulation. The muscle contraction in the interval will distract the periosteum, causing inflammation of the periosteum, resulting in muscle pain. For athletes who are injured and have not recovered, training in the condition that the old injury is not healed can easily lead to the spread of sports injuries, which is also a further damage to the athlete's body. Not only the performance will not increase, but the training effect will develop in the opposite direction, affecting its recovery and causing degenerative changes in body function to the extent that it is difficult to recover. Comparing the active recovery method with the passive recovery method, the complete recovery rate of the active recovery method is higher than that of the passive recovery method.

(3) Restorative measures for sports injuries

Simple traditional strength training methods are mainly based on passive recovery methods. The rehabilitation of ordinary clinical injuries is passive rehabilitation, and the rehabilitation of competitive sports injuries is mainly active motor function exercise [16]. Generally speaking, the speed of recovery from muscle strain is related to the degree of injury, and the nature of muscle soreness after exercise is completely different from that of muscle (or ligament) injury. Muscle soreness can be relieved by rest, stretching, massage, etc., while muscle (or ligament) injury must be resolved by medical means, which requires the selection of appropriate means for recovery. Recovery methods can be roughly divided into active recovery methods and passive recovery methods.

(4) Training methods

Nowadays, it is rare for many high-level sports teams to adopt the combination of traditional strength training and

science and technology in selecting training methods. Employers also lack the strength of talent introduction and do not pay enough attention to sports scientific research. Some coaches still use the traditional training principle of three majors and one to one and blindly emphasize the relationship between a large amounts of exercise and high intensity, which does not conform to the development law of modern training.

3.2. Artificial Intelligence and Virtual Reality Technology

3.2.1. Technical Concepts and Theoretical Basis. Artificial intelligence technology is developed on the basis of the interaction and interaction of many emerging science and technologies and disciplinary theories. It is a comprehensive and highly practical technology. Its main composition is shown in Figure 1.

Its common algorithms include probabilistic neural network and support vector machine. This article mainly introduces artificial intelligence technology based on these two algorithm theories.

(1) Probabilistic neural network

Probabilistic neural network belongs to a special form of RBF neural network [17]. Taking the Bayes minimum risk criterion and the probability density function estimation method of the Parzen window as the theoretical basis, the PNN performs nonlinear classification through the linear learning algorithm. The training process is simple, the structure is simple, and the calculation speed is fast. The basic structure of the probabilistic neural network is shown in Figure 2.

(2) Support vector machine

Compared with the traditional neural network, support vector machine is a new type of artificial intelligence algorithm [18]. The SVM is designed to search for the optimal hyperplane, to maximize the classification interval of the two modes. The given sample is set to x_i , and the optimal

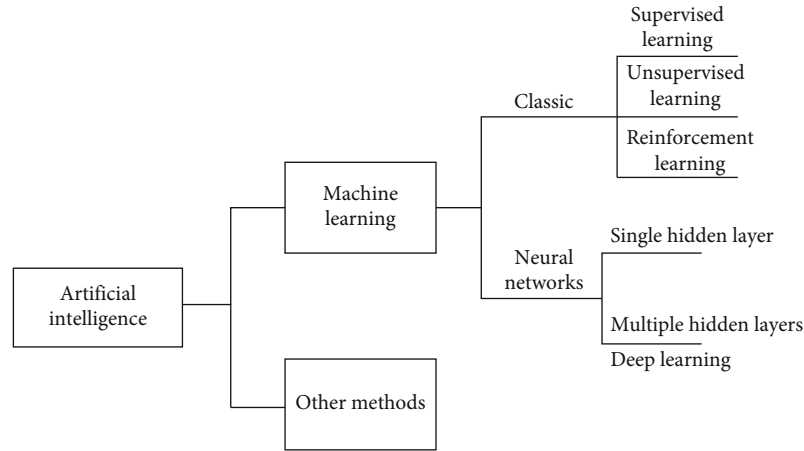


FIGURE 1: The composition of artificial intelligence technology.

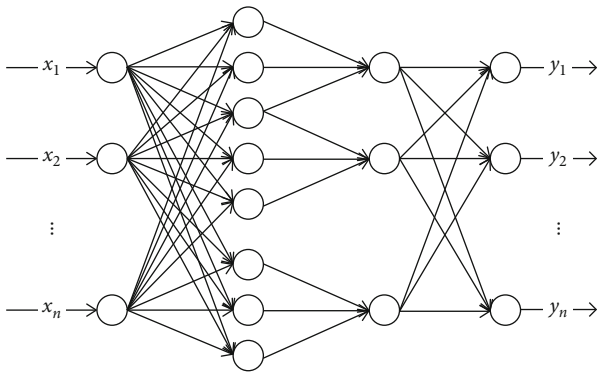


FIGURE 2: Basic structure of probabilistic neural network.

hyperplane is $wx + b$. The classification plane maximizes the classification interval between mode 1 and mode 2. The principle is shown in Figure 3.

Support vector machines can only solve the classification problem of two modes and cannot solve the classification problem of multiple modes [19]. Therefore, SVM multiclassifiers are usually constructed when solving multiclassification problems. SVM multiclassification construction methods are divided into one-to-many methods and one-to-one methods.

The one-to-many method is shown in Figure 4. $1 - a - r - SVM$, three SVMs need to be constructed to distinguish three types of samples, and the first $SVM_{D_1(x)=0}$ separates the first type of sample data from the second and third types of sample data; the second $SVM_{D_2(x)=0}$ separates the second type of sample data from the first and third types of sample data; the third $SVM_{D_3(x)=0}$ separates the third type of sample data from the first and second types of sample data. For the N classification problem, it is necessary to construct an SVM for classification. The structure of $1 - a - r - SVM$ is simple, but the computational complexity increases with the increase of samples, the classification accuracy is low, and there are inseparable regions [20].

The one-to-one method is shown in Figure 5. For the N classification problem, $N(N - 1)/2$ SVMs need to be con-

structed for classification. The structure of $1 - a - r - SVM$ is simple, but the classification speed is low, and there are inseparable regions.

Virtual reality technology relies on a multimedia platform to build an illusory or practical scene or thing, that is, an interface with a strong sense of interaction, immersion, and interaction between humans and machines with imagination as the core feature. It covers the four elements of reality, perception, interaction, and autonomy at the same time, which can create an atmosphere and environment that is free from the constraints of reality. And this paper realizes the interaction through simple and convenient means. At this stage, it has essential practical significance in the fields of aerospace, entertainment, and medicine. Its composition is shown in Figure 6.

3.2.2. Rehabilitation Training under Artificial Intelligence and Virtual Reality Technology. Based on artificial intelligence and virtual reality technology, this paper analyzes the control strategies of track and field athletes in the process of rehabilitation training. It ignores the influence of the human head and arms during the movement process and simplifies the upper body of the human body as a rigid rod. Each leg is simplified as two rigid rods connected by hinge joints perpendicular to the sagittal plane. The relationship between the two vector spaces of absolute angle θ and relative angle q can be expressed as [21]:

$$q = M_{q\theta} \cdot \theta, \quad (1)$$

$$M_{q\theta} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ -1 & 1 & 0 & 0 & 0 \\ 0 & -1 & 1 & 0 & 0 \\ 0 & 0 & -1 & 1 & 0 \\ 0 & 0 & 0 & -1 & 1 \end{bmatrix}. \quad (2)$$

In the single-leg support phase, from the support point where the support leg contacts the ground to the free movement end of the swing leg, it can be regarded as an open-

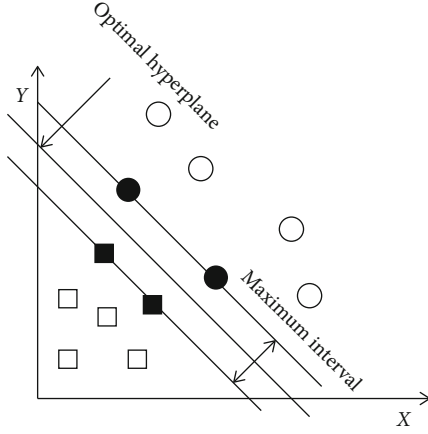


FIGURE 3: The principle of support vector machine.

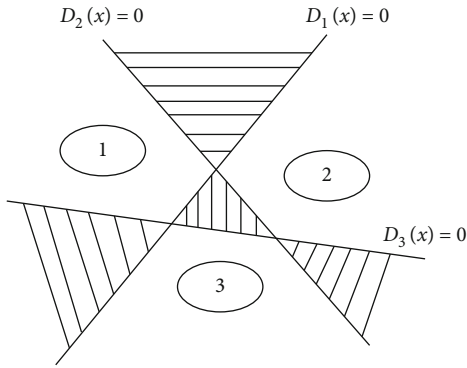


FIGURE 4: One-to-many method principle.

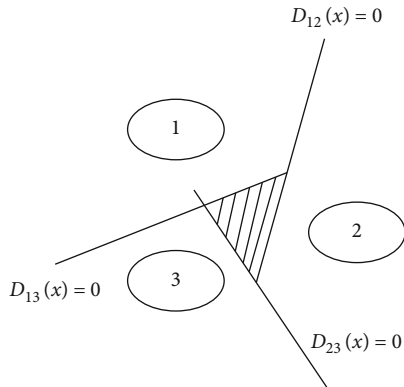


FIGURE 5: The principle of one-to-one method.

loop chain structure with multiple rigid bodies. The coordinates of the center of mass of each rigid member can be expressed as [22]:

$$x_{ci} = \sum_{j=1}^{i-1} (a_j l_j \sin \theta_j) + d_i \sin \theta_j + x_b, \quad (3)$$

$$y_{ci} = \sum_{j=1}^{i-1} (a_j l_j \cos \theta_j) + d_i \cos \theta_j + y_b. \quad (4)$$

Potential energy and kinetic energy are expressed as:

$$P = \sum_{j=1}^5 m_i g y_{ci} = \sum_{j=1}^5 \left\{ m_i g \left[\sum_{j=1}^{i-1} (a_j l_j \cos \theta_j) + d_i \cos \theta_j \right] \right\}, \quad (5)$$

$$K = \sum_{i=1}^5 \left[\frac{1}{2} m_i (\dot{x}_{ci}^2 + \dot{y}_{ci}^2) + \frac{1}{2} I_i \dot{\theta}_i^2 \right]. \quad (6)$$

According to the Lagrangian equation, the dynamic equation of the athlete during rehabilitation training can be derived from Equation (5) and Equation (6):

$$T_\theta = D(\theta) \ddot{\theta} + H(\theta, \dot{\theta}) \dot{\theta} + G(\theta) - F. \quad (7)$$

In Equation (7), $D(\theta)$ is a positive definite symmetric matrix; $H(\theta, \dot{\theta})$ is a matrix containing centrifugal and Creole terms; $G(\theta)$ is the matrix of the gravity term; $\theta, \dot{\theta}, \ddot{\theta}$ and T_θ are both matrices, representing the joint angle, angular velocity, angular acceleration, and joint moment, respectively, in the generalized coordinate system. F is the suspension force term.

In the double-leg support phase, since both legs are in contact with the ground at the same time, a closed-chain constraint equation needs to be introduced [23]:

$$\Phi(\theta) = \begin{bmatrix} f_1 \\ f_2 \end{bmatrix} = \begin{bmatrix} x_e - x_b - L \\ y_e - y_b \end{bmatrix} = 0. \quad (8)$$

According to the Lagrange equation, the dynamic equation of the two-leg support phase can be expressed as:

$$T_\theta + J^T(\theta) \lambda = D(\theta) \ddot{\theta} + H(\theta, \dot{\theta}) \dot{\theta} + G(\theta) - F, \quad (9)$$

where λ is a 2×1 matrix with a Lagrangian operator. $J = \partial \Phi / \partial \theta$ is the Jacobian of 2×5 . Then, according to Equation (8) and Equation (9), the dynamic equation of the athlete in the case of the double leg support phase can be rewritten as:

$$\begin{cases} T_\theta + J^T(\theta) \lambda = D(\theta) \ddot{\theta} + N(\theta, \dot{\theta}), \\ \Phi(\theta) = 0. \end{cases} \quad (10)$$

Among them,

$$N = H(\theta, \dot{\theta}) \dot{\theta} + G(\theta). \quad (11)$$

Assuming that p represents the position of the end of the torso and the posture of the torso, then its relationship with each joint angle, θ_i is as follows:

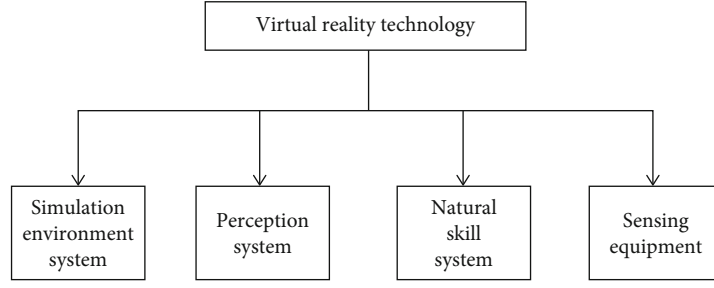


FIGURE 6: Components of virtual reality technology.

$$p(\theta) = \begin{bmatrix} l_1 \sin \theta_1 + l_2 \sin \theta_2 \\ l_1 \cos \theta_1 + l_2 \cos \theta_2 \\ \theta_3 \end{bmatrix}. \quad (12)$$

Here, a rotation matrix R can be introduced to represent the mapping relationship from p subsets to θ_i subsets, then it satisfies:

$$\begin{cases} \dot{p} = R\dot{\theta}, \\ \ddot{p} = \dot{R}\dot{\theta} + R\ddot{\theta}. \end{cases} \quad (13)$$

Combining Equation (11) and Equation (13), we get:

$$\begin{bmatrix} \ddot{p} \\ 0 \end{bmatrix} = \begin{bmatrix} \dot{R} \\ J \end{bmatrix} \begin{bmatrix} R \\ J \end{bmatrix}^{-1} \begin{bmatrix} \dot{p} \\ 0 \end{bmatrix} + \begin{bmatrix} R \\ J \end{bmatrix} D^{-1}(T_\theta - N) + \begin{bmatrix} R \\ J \end{bmatrix} D^{-1}J^T\lambda. \quad (14)$$

Equation (14) can be simplified to:

$$\begin{bmatrix} \ddot{p} \\ 0 \end{bmatrix} = S_a \begin{bmatrix} \dot{p} \\ 0 \end{bmatrix} + S_b(T_\theta - N) + S_c\lambda. \quad (15)$$

In Equation (15):

$$S_a = \begin{bmatrix} S_{a11,3 \times 3} & S_{a12,3 \times 3} \\ S_{a21,3 \times 3} & S_{a22,3 \times 3} \end{bmatrix} = \begin{bmatrix} \dot{R} \begin{bmatrix} R \\ J \end{bmatrix}^{-1} \\ \dot{J} \begin{bmatrix} R \\ J \end{bmatrix}^{-1} \end{bmatrix}, \quad (16)$$

$$S_b = \begin{bmatrix} S_{b1,3 \times 5} \\ S_{b2,2 \times 5} \end{bmatrix} = \begin{bmatrix} RD^{-1} \\ JD^{-1} \end{bmatrix}, \quad (17)$$

$$S_c = \begin{bmatrix} S_{c1,3 \times 5} \\ S_{c2,2 \times 5} \end{bmatrix} = \begin{bmatrix} RD^{-1}J^T \\ JD^{-1}J^T \end{bmatrix}. \quad (18)$$

It should be noted that S_{c2} is an irreversible matrix, so Equation (15) can be expressed as:

$$T_\theta = C^{-1}(\ddot{p} - B\dot{p}) + N. \quad (19)$$

In Equation (19):

$$B = S_{a11} - S_{c1}S_{c2}^{-1}S_{a21}, \quad (20)$$

$$C = S_{b1} - S_{c1}S_{c2}^{-1}S_{b2}. \quad (21)$$

4. Rehabilitation Training Test

In this paper, the proposed rehabilitation training method based on artificial intelligence and virtual reality technology is tested, and the test objects are 12 track and field athletes in a city track and field team. 12 athletes had suffered sports injuries due to training or competition, and they were divided into two groups. Group A was the experimental group, using the rehabilitation training method proposed in this paper; group B was the control group, using the traditional rehabilitation training method. The training and testing period is 6 weeks. After the rehabilitation training, the athletes' body shape, physical function, athletic quality, and degree of rehabilitation were evaluated to examine the effectiveness of the training method. To ensure the accuracy of the experiment, the basic situation of the athletes in group A and group B was investigated before the experiment, as shown in Table 3 and Table 4.

As can be seen from Table 3 and Table 4, there is little difference between the two groups of athletes in terms of age, length of entry into the team, and physical conditions.

(1) Body shape

The body shape test mainly examines the athlete's physical flexibility and flexibility after rehabilitation training. Taking the athlete's body shape before sports injury as a reference level, the body shape level after rehabilitation is evaluated by a score system. The full score is 10 points, and the higher the score, the better the physical recovery level. The evaluation was conducted by the track and field coaches responsible for the training of each athlete. The test results are shown in Figure 7.

It can be seen from Figure 7 that, under the rehabilitation training of artificial intelligence and virtual reality technology, the average score of the body shape flexibility test of the athletes in group A is 8.77 points, and the average score of the flexibility test is 8.58 points; under the traditional rehabilitation training method, the average body shape flexibility test of group B athletes was 8.22 points, and the

TABLE 3: Basic information of group A athletes.

Test object	Age	Entry time/years	Height/cm	Weight/kg
Athlete 1	18	2	176	60
Athlete 2	21	4	171	63
Athlete 3	16	1	176	63
Athlete 4	20	4	169	61
Athlete 5	21	6	173	65
Athlete 6	19	3	175	63

TABLE 4: Basic information of group B athletes.

Test object	Age	Entry time/years	Height/cm	Weight/kg
Athlete 1	22	4	174	64
Athlete 2	18	3	172	62
Athlete 3	23	5	174	62
Athlete 4	19	3	171	63
Athlete 5	16	2	171	61
Athlete 6	21	5	170	63

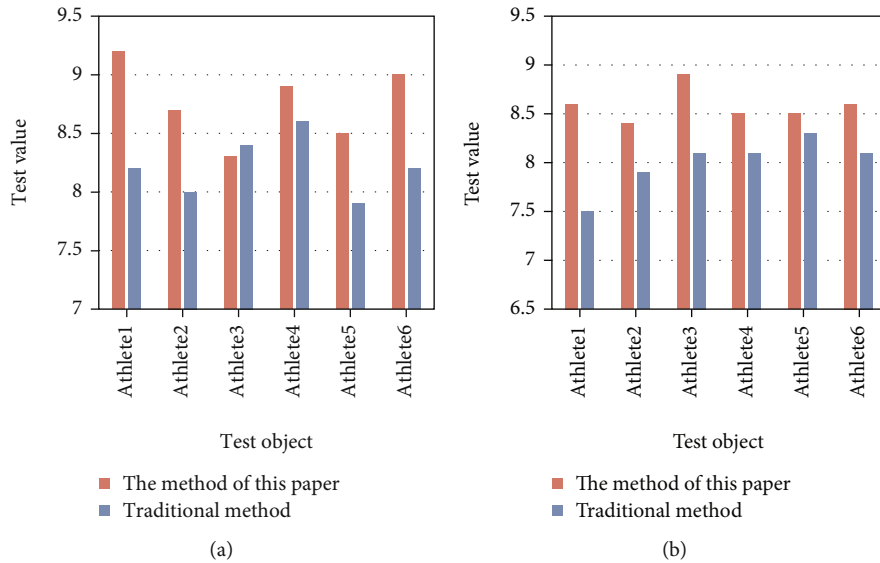


FIGURE 7: Athlete body shape test results. (a) The body shape flexibility test. (b) The body shape flexibility test 8.22.

average flexibility test was 8 points. Artificial intelligence and virtual reality technology can analyze the physical differences of each athlete in detail. It can carry out targeted training on the premise of maintaining scientificity, so the test results of flexibility and flexibility are more ideal than those of traditional methods.

(2) Physical function

Physical function is an important objective indicator to examine whether an athlete's body has recovered well in rehabilitation training and is generally evaluated based on medical test data. In this experiment, the blood pressure,

hemoglobin, serum creatine, and immunoglobulin kinase of each athlete were evaluated for comprehensive functional recovery. The results are shown in Figure 8.

It can be seen from Figure 8 that the physical function indexes of the athletes in group A are all within the normal level, and the recovery is good, all above 96%, while the comprehensive recovery degree of the athletes in group B is only 87%. This can have a great relationship with the training program and training volume developed for each athlete in rehabilitation training. If the training items and training volume set in the rehabilitation training fail to make the athlete adapt well, it will cause the athlete's physical indicators to be higher or lower than the normal value.

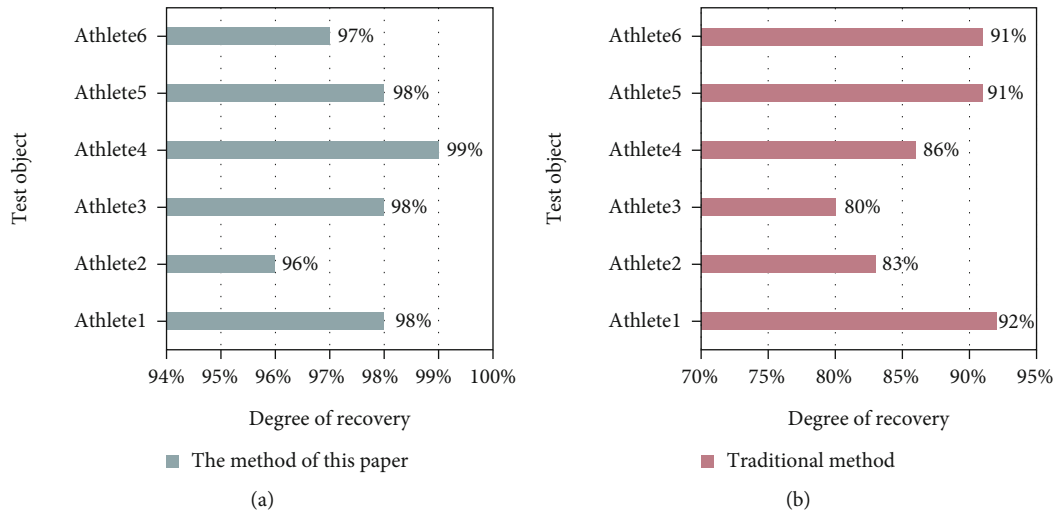


FIGURE 8: Athlete physical recovery test results. (a) The recovery of physical function of athletes in group A. (b) The recovery of physical function of athletes in group B.

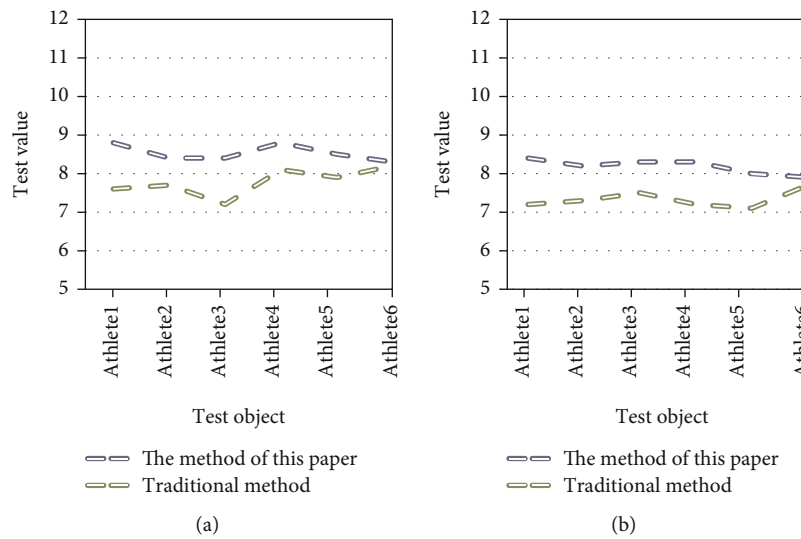


FIGURE 9: Athlete athletic recovery test results. (a) The athletic quality strength test. (b) The speed test of athletic ability.

(3) Athletic quality

The test of sports quality mainly examines the strength level and speed level of athletes after rehabilitation training and takes the sports quality of athletes before sports injury as the reference level. The postrehabilitation sports quality level was evaluated using a points system, with a full score of 10. The higher the score, the better the rehabilitation level of sports quality. The evaluation is carried out by the track and field coaches responsible for the training of each athlete. The test results are shown in Figure 9.

It can be seen from Figure 9 that the athletes in the group A under assisted rehabilitation based on artificial intelligence and virtual reality technology recovered relatively well in terms of strength. Because the rehabilitation training period is only 6 weeks, the athletes' recovery in terms of speed is relatively slow. However, on the whole, the recovery of sports

quality of the athletes in group A is clearly better than that of the athletes in group B. The overall strength level and speed level have reached more than 8 points.

(4) Rehabilitation effect

The rehabilitation effect is evaluated according to the overall condition of the athletes, and the evaluation method is a point system, with a full score of 100 points. The higher the score, the better the rehabilitation level of sports quality. The degree of rehabilitation is shown in Figure 10.

It can be seen from Figure 10 that the overall rehabilitation effect scores of the athletes in group A were 94.32, 92.11, 95.03, 97.64, 91.58, and 92.1, with an average of 93.79 points; the overall rehabilitation effect scores of the athletes in group B were 88.12, 81.33, 76.18, 83.24, 82.11, and 83.3, respectively, with a mean of 82.38 points. It shows that

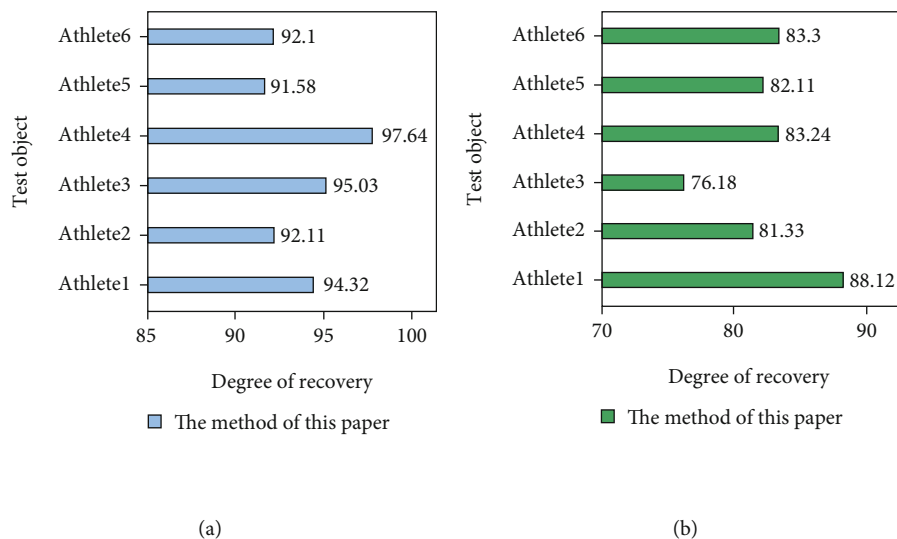


FIGURE 10: Athlete rehabilitation test results. (a) The rehabilitation effect of athletes in group A. (b) The rehabilitation effect of athletes in group B.

rehabilitation training based on artificial intelligence and virtual reality technology can improve the efficiency and quality of rehabilitation, to better help athletes recover their bodies.

5. Conclusion

Whether track and field athletes get better treatment and rehabilitation effects in rehabilitation training plays a vital role and influence on their entire sports career. To improve the quality and speed of traditional rehabilitation training, this paper integrates it into new technological means and combines it with artificial intelligence and virtual reality technology to effectively analyze the physical function of athletes and provide more suitable training methods. Although this paper has carried out in-depth research on the rehabilitation training of track and field athletes based on artificial intelligence and virtual reality technology, there are still many shortcomings: the depth and breadth of the research in this paper are not enough; in the process of this research, the selection and acquisition of experimental data are under absolutely ideal conditions, the completeness and validity are not enough, and some interference factors involved in the test process are not considered; academic level research is also limited, and the research on the application of science and technology in athletes' rehabilitation training is still in the preliminary stage. In the future work, we will analyze from more angles based on the existing technology and level and continuously improve the quality of research work.

Data Availability

The data underlying the results presented in the study are available within the manuscript.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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