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Article

Relief and improvement of traditional Chinese medicine combined with exercise therapy in sports dance sports injury disorder from a biomechanical perspective

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Abstract: Among all kinds of sports, competitive sports with graceful movements as the main content are deeply loved by athletes. However, in the practice of sports dance, due to insufficient skills, incorrect movements, inattention and other factors, it is easy to cause sports injuries, which affects the effect of sports dance teaching. Therefore, the research and application of the alleviation and improvement of sports injury disorders are becoming more and more important. Although there are many researches and applied studies on the mitigation and improvement of sports injury disorders in sports dance, the existing research still needs to be supplemented. In this paper, a combination of traditional Chinese medicine and exercise therapy has been discussed. First, the relevant theoretical overview and related work were organized, and the sports dance movement was introduced. Then, based on the modeling of sports injury disorder, related algorithms were written, and the elements of mitigation and improvement of sports injury disorder, sports injury elements of sports dance, and elements of traditional Chinese medicine combined with exercise therapy were introduced. In the fourth part, a study on the improvement of alleviation and improvement of sports injury disorder in sports dance was carried out. In this paper, various algorithms were used to study the topic of Chinese medicine combined with exercise therapy in the mitigation and improvement of sports dance injury disorders, and the experiments were summarized and discussed. The results of the study showed that the mitigation improvement and application study of sports injury impairment in sports dance constructed in this paper can reduce the incidence of sports injury by 4.62%.

Keywords: traditional Chinese medicine combination; sports therapy; sports dance sports; injury disorders; injury disorders

1. Introduction

With the continuous development of modern medicine, the combination of traditional Chinese medicine and exercise therapy has become a non-drug, non-invasive, independent disease prevention and treatment method. Sports dance injuries are caused by factors such as unreasonable training plan, technical difficulty, training load, and poor physical condition. Athletes are prone to serious sports injuries during sports, which endanger their personal, property and health. The causes of sports dance injuries are analyzed, and corresponding preventive measures are put forward to improve its safety level.

Sports injuries are potentially harmful to the human body and are easily overlooked. In recent years, traditional Chinese medicine has been widely used in the

treatment of sports injuries. Based on this, many scholars have carried out research on sports injury disorders. Hsu [1] emphasized that sports-related stress disorders may be the greatest challenge for injured athletes to return to competition, demonstrating the importance of systematically diagnosing sports-related stress disorders and improving current systems of diagnosis and treatment. Raza et al. [2] believed that sports injuries mostly occur in athletes during competitive activities and routine training, and the reasons include accumulated fatigue caused by repetitive training, lack of warm-up exercises, and lack of motivation during competition. When Avinash et al. [3] assessed the severity of sports-related injuries, time lost was calculated as days lost to injury and analyzed using ordinal cut points. Wang et al. [4] believed that sports injuries are injuries that occur to the body during exercise. When sports injuries occur, it is easy to cause some psychological problems, such as stress disorders. Cook et al. [5] explored the effect of joint mobilization combined with extracorporeal shock wave on pain and shoulder joint function in patients with shoulder sports injury. Djaali and Fajriah [6] conducted an in-depth analysis of the causes of ankle sports injuries based on the situation of real basketball fans, and put forward corresponding preventive measures on this basis. The purpose of Wang's et al. [7] research was to identify and respond to sports injury risks and reduce physical and mental injuries caused by sports injury risks, which is of great significance for promoting better and faster development of sports dance. Sports injury disorders are hotly discussed in life, but also attract attention in academia.

With the continuous development of the current economic level and the continuous development of the medical system, people's quality of life has been greatly improved, and there are also requirements for the quality of medical care. Scholars have put forward rich insights into the research and application of traditional Chinese medicine combined with exercise therapy. Ren [8] randomly divided patients with ankle fractures into a control group and an observation group to explore the clinical efficacy of traditional Chinese medicine fumigation combined with exercise in the treatment of ankle fractures. Kang et al. [9] studied the common methods of traditional Chinese medicine combined with exercise therapy in the field of postoperative complications of fractures in recent years by retrieving relevant experimental research and clinical application literature. Wang et al. [10] explored the effect of sodium hyaluronate joint filler combined with exercise therapy on pain, motor function and the level of synovial inflammatory factors in patients with post-traumatic knee arthritis. Sun et al. [11] discussed the efficacy of acupuncture combined with exercise therapy in the treatment of post-stroke dyskinesia and its effect on brain function. Zhu et al. [12] believed that exercise therapy combined with traditional Chinese medicine has a significant effect in the treatment of patients with traumatic arthritis, which can effectively reduce the pain degree of patients, improve ankle function, and improve the treatment effect, which has great clinical value. Zhang [13] discussed the clinical efficacy of acupuncture combined with exercise training in the treatment of acute lumbar sprain. The combination of traditional Chinese medicine and exercise therapy used by Zhao and Zheng [14] had certain advantages in the treatment of postoperative complications of fractures, but the optimal treatment plan or treatment level has not yet been determined; the concept of

adjuvant therapy exercise prescription design is still in the research stage and needs further research. Based on the combination of traditional Chinese medicine and exercise therapy, this paper studied the combined application of sports dance and sports injury disorders.

This paper first established an algorithm model for sports injury disorder, then described the factors analysis of Chinese medicine combined with exercise therapy, sports dance sports injury, and the mitigation and improvement of sports injury disorder, and analyzed the possible causes of sports injury. Finally, the preventive measures for sports dance sports injury were listed for experimental analysis, and it was finally proved that the establishment of a safe and effective dance sports system can reduce the incidence of sports injuries.

2. Establishment of the algorithm model of sports injury disorder

2.1. RBF neural network algorithm

This paper mainly uses the RBF (Radial Base Function) neural network to judge whether the sports injury risk warning level of athletes is high, medium or low according to the input information, that is, the athletes are divided into three types of sports injuries according to the risk [15]. The details are shown in **Table 1**:

Table 1. RBF output and risk level comparison table.

RBF neural network output value	Sports injury risk warning level
A	low risk level
B	medium risk
C	high risk level

That is to say, the RBF network is used to construct a classification system. Its contents include the selection of basic functions, the design of hidden layers, the setting of the center of radiation basic functions, and the adjustment of weight and width. In this network, the mean, width, and weight of the hidden layer and the output layer are determined by gradient descent.

1) Selection of basis functions

A Gaussian function is chosen as the starting function for the hidden layer units:

$$R_m(x) = e_m^{-\frac{||x-c_m||^2}{2\sigma^2}} \tag{1}$$

among them, $R_m(x)$ is the output of the mth hidden node, x is the n-dimensional input vector of the network, c_m is the kernel function center vector of the mth hidden layer node, and the output of the network is defined as:

$$y_m = \sum_{m=1}^{k} w_{nm} R_m(x) \tag{2}$$

2) Hidden layer design

The model adopts a type of sports injury risk warning level, so that a simple method can be used to judge its risk level, that is, a Gaussian function, that is, $k = 3$. The average of the distances between the three sample points can be used as the width parameter of the Gaussian function, and the average of the three samples is the

average of its key points [16].

3) Update of RBF center, width and output layer weights

The RBF center and other parameters go through a learning process. The error correction learning process is usually used, and the gradient descent method is used, as follows:

Assuming an input of *N* samples, for each input sample, an error function is defined:

$$\xi = \frac{1}{2}\sum_{q=1}^{N} e_q^2 \tag{3}$$

among them, e_q is the error, which is defined as follows:

$$e_q = d_q - y(x_q) = d_q - \sum_{j=1}^{3} w_{1j} R_j(x_q) \tag{4}$$

The iterative process of each free parameter is as follows:

1) The weight of the output unit

$$\frac{\partial \xi(n)}{\partial w_{1m}(n)} = -\sum_{q=1}^{n} e_q e^{-\frac{||x_q - c_j||^2}{2\sigma_j^2}} \tag{5}$$

$$w_{1m}(n+1) = w_{1m}(n) - \eta_1 \frac{\partial \xi(n)}{\partial w_{1m}} \tag{6}$$

among them, *n* represents the current value of the variable, and *n* + 1 represents the value after iterative correction.

2) Hidden unit center

$$\frac{\partial \xi(n)}{\partial c_j(n)} = -\sum_{q=1}^{n} e_q(n) R_j(x_q) \tag{7}$$

$$c_m(n+1) = c_j(n) - \eta_2 \frac{\partial \eta(n)}{\partial c_j} \tag{8}$$

Function width

$$\frac{\partial \xi(n)}{\partial \sigma_j^{(n)}} = -\sum_{q=1}^{n} (n) \frac{w_{1m}(n)}{\sigma_m^3(n)} ||x_q - c_j||^2 R_j(x_q) \tag{9}$$

$$\sigma_j(n+1) = \sigma_m(n) - \eta_3 \frac{\partial \xi(n)}{\partial \sigma_m(n)} \tag{10}$$

among them, η_1, η_2, and η_3 are the learning efficiency, which can be constants or variables.

2.2. Establishment of the relationship between joint change angle and exercise intensity

Selecting an appropriate relationship model to describe the relationship between joint deformation angle and motion intensity is an important guarantee for determining the relationship between the two.

$$\begin{Bmatrix} x = s(p,u) + d \\ y = k(p,u) + v \end{Bmatrix} \tag{11}$$

The state of motion of a joint depends on the mobility of the joint and is defined

as:

$$\mathrm{SoC} = \mathrm{SoC}_0 - \frac{1}{C_0}\int_0^4 \eta I dt \tag{12}$$

When the initial value of the articulation is SoC_0, the teleportation capability of the articulation is I and is discretized as follows:

$$\mathrm{SoC}_k = \mathrm{SoC}_{k-1} - \frac{\mu I \Delta t}{C_0} \tag{13}$$

Then, different injury-combination movement patterns are selected, and the decomposed results are recombined, and the expressions are as follows:

$$y_k = K_0 + K_1\mathrm{SoC} + K_2/\mathrm{SoC} + K_3\ln(\mathrm{SoC}) + K_4\ln(1-\mathrm{SoC}) \tag{14}$$

That is, the instantaneous displacement potential of the joint is y_k, and the five constants required to maintain the displacement state are represented by $K_0 \sim K_4$.

To maintain stability between joint angle changes and motion intensity, it is usually calculated using a matrix gain transformation, as follows:

$$P_y = \sum_{i=0}^{2n} w_i^e (\bar{y}_k - \bar{y})(\bar{y}_k - \bar{y})^T \tag{15}$$

$$P_x = \sum_{i=0}^{2n} w_i^e (\bar{y}_k - \bar{x})(\bar{y}_k - \bar{x})^T \tag{16}$$

$$L = P_x P_y^{-1} \tag{17}$$

The relationship model between exercise intensity and sports injury can be expressed as:

$$P_{x,y} = \bar{P}_{x,y} - LP_yL^T \tag{18}$$

To sum up, the limited relationship between the joint change angle and the exercise intensity can be determined, and then the relationship model between the two can be established.

In the validation process of the neural network model, the data set is first divided into a training data set (70%), a validation data set (15%), and a test data set (15%). The training data is used for model training, the validation data is used for model tuning, and the test data is used to evaluate model performance. The model training uses the Adam optimizer, the learning rate is set to 0.001, the batch size is 32, and the number of training rounds is 100.

3. Evaluation of the factors of remission and improvement of traditional Chinese medicine combined with exercise therapy in sports dance sports injury disorder

3.1. Elements of traditional Chinese medicine combined with exercise therapy

Exercise therapy is based on biomechanical principles and the development of the nervous system, through developmental, compensatory and replacement techniques to improve muscle strength, endurance, cardiorespiratory function, balance function, impairment and amelioration of impairment [17].

Medical gymnastics is one of the most common exercise therapies and can be

used depending on movement pattern, speed, range of motion, coordination, and muscle strength. Medical gymnastics can be a whole-body exercise, a partial exercise, or a combination of whole-body exercise and partial exercise [18].

When performing medical gymnastics, both equipment and hands can be used. Among them, the active action is performed by itself, and the passive action is to enhance the flexibility of the joints and the strength of the muscles with the help of external forces. External forces include unaffected limbs, bystanders or instruments. Medical gymnastics is a sports program that can prevent diseases and improve physical health. It can be used to treat diseases and diseases, and corresponding physical exercises can be carried out according to the characteristics, functional conditions and treatment purposes of patients. Training methods include: muscle strength training, joint mobility training, endurance training, relaxation training, breathing training, balance training. Exercise intensity and range of motion should be appropriately adjusted according to the patient's ability to exercise. The specific model is shown in **Figure 1**:

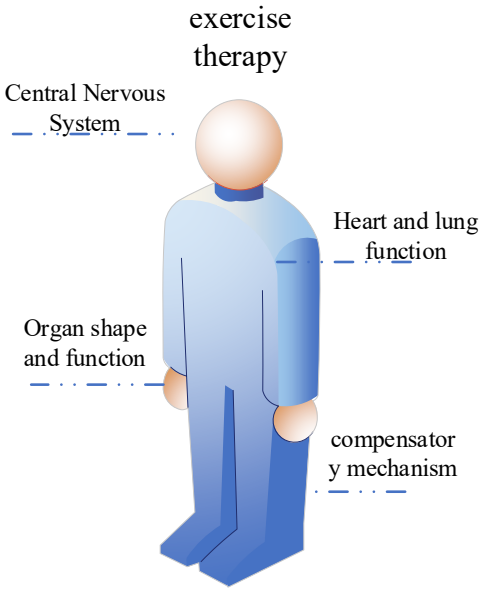

Figure 1. Elements of TCM (Traditional Chinese Medicine) combined with exercise therapy.

Exercise therapy has different characteristics, such as isometric and isotonic. There are two types of isotonic contraction, concentric and eccentric. Isotonic concentric contraction is mainly caused by white muscle fibers, while isotonic eccentric contraction is mainly caused by red muscle fibers. Alternating between the two can improve muscle strength. The function of eccentric contraction is to control the body's descending rate, and it is a traditional exercise therapy, such as Taijiquan and Baduanjin.

3.2. Injury factors of sports dance

Sports injury refers to the anatomical damage or physiological dysfunction of

body tissues or organs during exercise [19]. Sports injuries are mainly caused by the body's motor system, and some sports injuries are caused by the cardiovascular system and the nervous system. Risk factors for sports injuries are mainly caused by internal and external factors, and sometimes the interaction between the two can lead to sports injuries.

Sports injury is a potential danger. If not detected in time, it would lead to the occurrence of diseases. Sports injuries have a great impact on athletes' sports injuries, which not only affect athletes' athletic ability, but also affect athletes' sports life, specifically as shown in **Figure 2**:

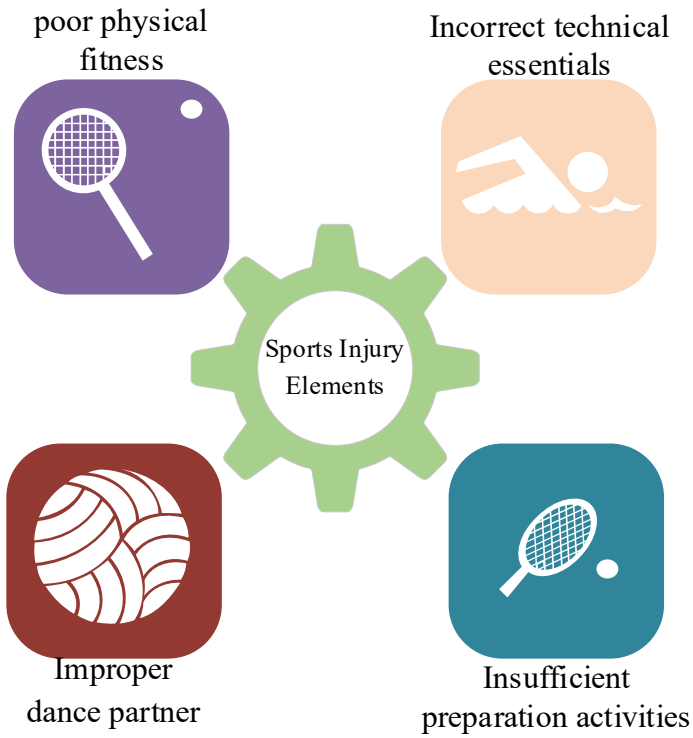

Figure 2. Elements leading to sports injury

From the figure:

1) Physical fitness is poor. The physical quality of sports dancers is very important. If the physical quality cannot be developed in a comprehensive and balanced manner, the physical strength would be unbalanced;
2) The technical essentials are incorrect. The main cause of sports dance injuries is the inaccuracy of technical essentials. First, technical misconduct violates the body's kinematic tectonic properties and laws of mechanics, resulting in damage to the body. Secondly, when the dance movements are complicated, the teacher does not know or asks the students to make music and cooperate with two people in advance, which would also cause sports injuries;
3) The coordination between dance partners is poor. Sports dance is a duet dance. Duet dance is more attractive than single dance, but there are also some uncertainties;
4) The prepared activities are insufficient. A large number of survey data show that the main reason for sports injuries is insufficient preparation. Lack of adequate preparation would lead to the excitement of the central nervous system, unable

to overcome the body's physiological inertia, and unable to exert the body's coordination, flexibility and muscle strength, thus affecting training and causing sports injuries.

3.3. Elements of alleviation and improvement of sports injury disorders

The impact of sports injuries on athletes is divided into physical barriers and psychological barriers [20].

General sports injuries do not have much impact on the professional development of athletes. Physiological indicators of athletes can also be detected, so that corresponding adjustments can be made to the physical condition of the athlete, and the physical condition of the athlete can be well reflected and adverse situations can be avoided. However, the mental state of the athlete is much less affected than the physical one. The physical characteristics of the athlete must be carefully observed, as shown in **Figure 3**:

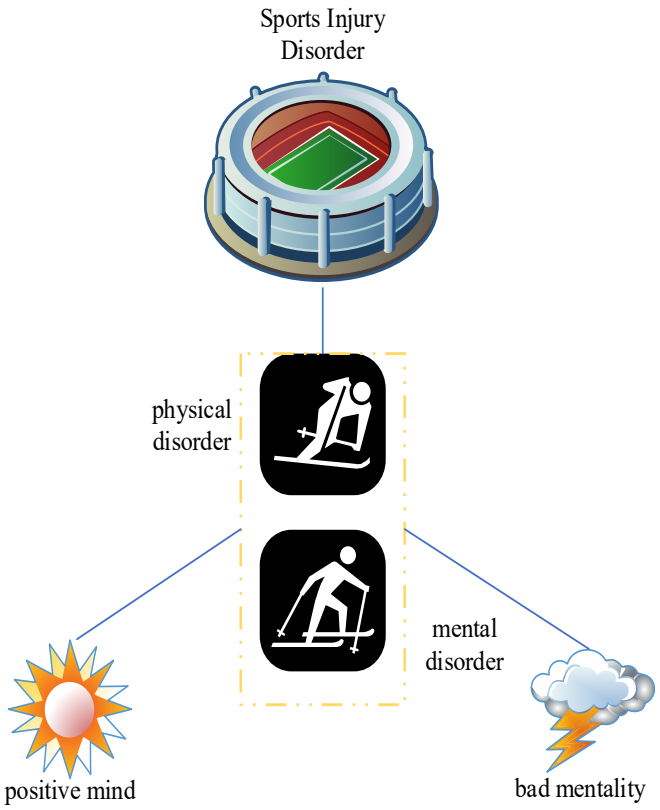

Figure 3. Elements of motor impairment.

Some athletes have better psychological qualities and are no strangers to sports injuries. After physical rehabilitation, they can quickly return to their previous state. Some athletes have relatively weak psychological qualities, and often worry about whether their competitive state can fully recover due to injuries, and whether injuries would occur again, resulting in mental ups and downs, and it is difficult to obtain good results in regular competitions.

In short, athletes should maintain a good attitude after sports injuries, avoid depression and depression, and minimize the adverse effects of sports injuries on the

body and psychology.

4. Evaluation of the simulation experiment of mitigation and improvement measures for sports injury disorders

When athletes are injured in sports, they are prone to certain psychological problems, such as stress disorders. When they perform this technical action again, some psychological changes would occur, and they may be affected by psychological emotions such as fear and anxiety, thereby rendering them incapacitated. Completing this exercise technique effectively leads to more serious sports injuries. Therefore, a safe and effective exercise system must be established. On the basis of the above reasons for the sports injuries of dancers, this paper analyzes the reasons for the losses in the elements of sports dance sports injuries, and conducts analysis and simulation experiments through the following five aspects.

Data collection was conducted before intervention (day 0), during intervention (day 30), and after intervention (day 60). A standardized questionnaire was used to investigate the injury site and pain level of the subjects, and the joint angle, electromyographic signal, and mechanical parameters during movement were recorded by a biomechanical analyzer. The joint movement was recorded using a Vicon motion capture system; the muscle activity was recorded using a surface electromyograph; and the ground reaction force was recorded using a force platform. The data were conducted in a laboratory environment with a constant temperature (22 °C), no wind, and no noise to ensure the accuracy and reliability of the data.

In this study, statistical analysis was processed using SPSS (Statistical Product and Service Solutions) software to ensure the accuracy and reliability of the data. First, descriptive statistical analysis was performed on all data, and indicators such as the mean, standard deviation, median, and quartiles were calculated to understand the basic characteristics of the data. Next, the data were tested for normality, and the Shapiro-Wilk test was used to determine whether the data conformed to the normal distribution.

If the data conformed to the normal distribution, the independent sample t test and paired sample t test were used for inter-group and intra-group comparisons to analyze the differences between different time points and different groups. If the data did not conform to the normal distribution, nonparametric tests were used for inter-group and intra-group comparisons. ANOVA (Analysis of Variance) was used to evaluate the differences between multiple groups of data, and post hoc tests were used for multiple comparisons. In order to control the influence of confounding variables, covariance analysis was used to adjust possible confounding factors. The significance level (p value) of all statistical tests was set at 0.05. The above statistical analysis methods ensured the scientificity and rigor of the data analysis, providing strong support for the research results.

4.1. Strengthening physical training

By strengthening special physical training, people can enhance the response of the human body's muscles, joints and nervous system, enhance physical fitness, and reduce sports injuries. Therefore, in order to prevent sports injury, it is necessary to

strengthen the strengthening exercise of the vulnerable area to improve its function. For example, in order to prevent the injury of the lower back muscles, it is necessary to strengthen the muscles of the waist and back. This is because in sports dance, the strength of the waist is often used to do it. **Figure 4** is a comparative analysis of the strength, speed, endurance, sensitivity and flexibility of sports dancers A and B in strengthening training.

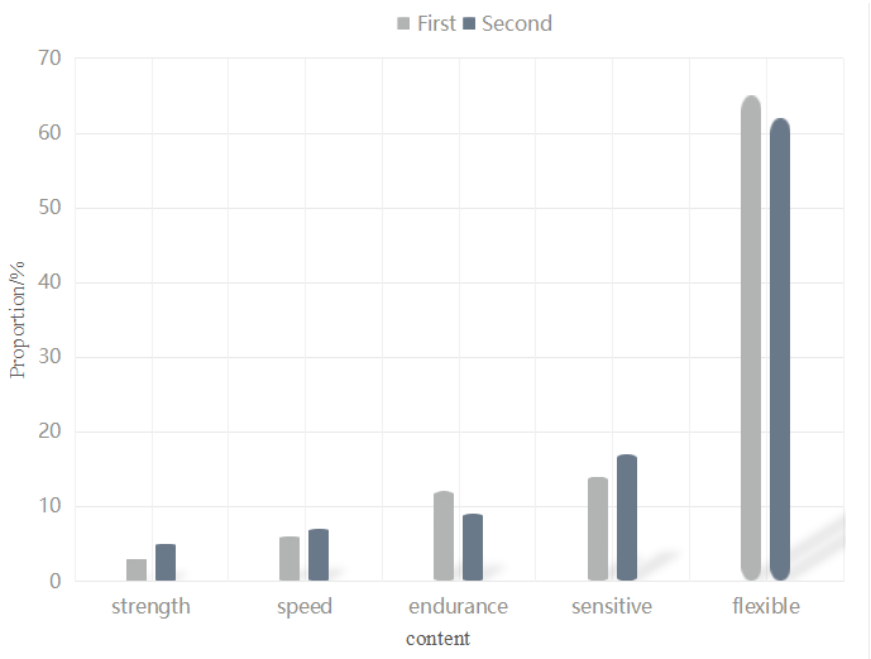

Figure 4. Sports dance students A and B pair to strengthen the training comparison.

As can be seen from the figure, the two sports dancers have a higher proportion of body flexibility training in the above five basic physical training. A is 65% and B is 62%; this is related to the frequent need to use waist strength to complete the movement. The training proportions of the other four items are different between the two athletes. Athlete A's training volume of strength, speed and agility is not as high as B's; while athlete B's endurance training volume is not as high as that of A's. However, each athlete has different physical qualities. Therefore, it is the best that suits their own development in physical training. Doing a good job in basic physical training would reduce the probability of sports injuries to a certain extent.

4.2. Strengthening the study of correct technical essentials

Possessing mature sports dance movements and using correct sports dance techniques can prevent injuries caused by technical mistakes. Therefore, technical training for athletes should be strengthened in sports dance education and training. First, for the operation of new technology, the coach should explain its theory in detail, so that the athletes understand its structure and its function and principle; secondly, the coach can let the students see a specific process by explaining the demonstration and detailed analysis; the coach should consider the potential mistakes, and help them establish the correct awareness of prevention. **Figure 5** is a comparative analysis of the basic dance steps, body stance, music rhythm, and knee joints used by sports dancers A and B in their learning of the essentials of dance

techniques.

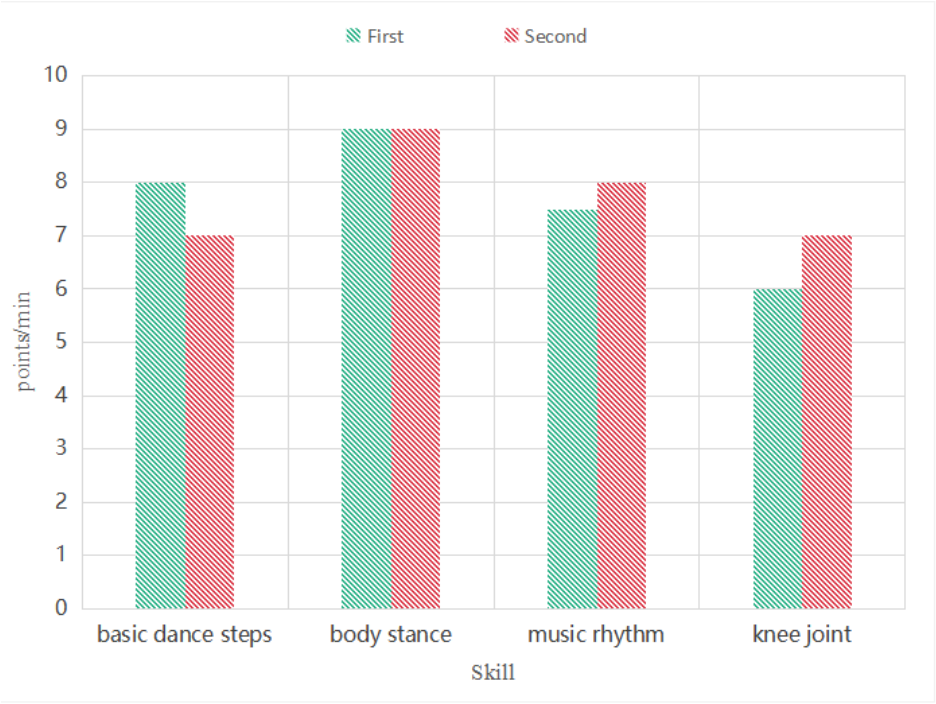

Figure 5. Study and analysis of the technical essentials of dance students A and B.

As can be seen from the figure, the standing postures of athletes A and B have the highest scores in the four technical essentials listed, all of which are 9 points. Therefore, it can be seen that dancers are very concerned about their posture and work hard; A's basic dance score is 8 points higher than B's 7 points; A's music rhythm score is 7.5 points lower than B's 8 points; A's use of the knee joint is 6 points lower than B's 7 points. Correct strengthening of technical essentials can give full play to strength, and can also avoid sports injuries with fewer mistakes during the game.

4.3. Consciously strengthening the cooperation between sports and dance partners

To improve the level of sports dance, both the lead dancer and the backup dancer must work hard and practice continuously to achieve the desired effect. Only the male partner who "leads" well can the female partner "follow" better, the cooperation between the two is better, and it is easier to prevent injury. Therefore, male partners must be proficient in dance, able to express correctly, actively guide and suggest, and convey each other's intentions and essentials in a more precise way to achieve the best cooperation. For the female partner, the flexibility and understanding of the movements are very important. It is necessary to grasp the movements and movement changes in a timely and precise manner in order to achieve a natural, relaxed and perfect coordination. **Figure 6** is a comparative analysis of the mutual satisfaction of the lead dancer and the backup dancer among the four groups of partners in sports dancers.

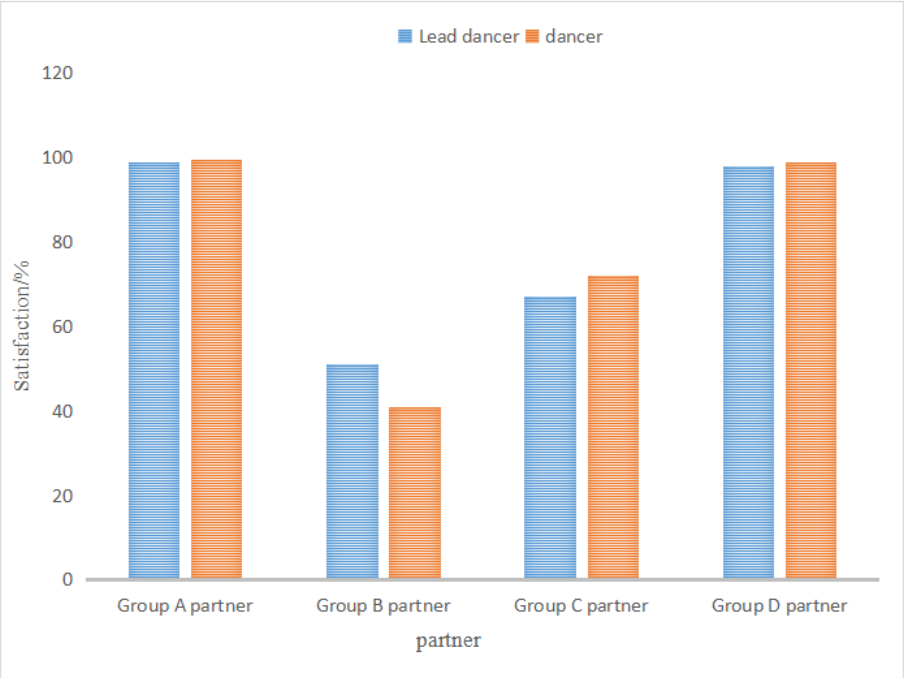

Figure 6. Comparison of mutual satisfaction between the lead dancers and the partner dancers.

As can be seen from the above, only the male partner can lead the female partner to be exciting. The higher the satisfaction of the two parties with each other, the better the tacit understanding and the less chance of sports injuries. In the figure, the partners of group A and D have high satisfaction with each other's leading and accompanying dancers; Group B and C had lower satisfaction.

4.4. Adjusting the preparation time

In the process of training, teachers should make students fully prepared for activities and do a good job of physical and mental training tasks. The number of preparatory activities must depend on the individual's working conditions, weather conditions, teaching materials and special circumstances. Regular preparatory activities include basic exercises such as walking, jogging and sit-ups. Specific preparation actions can be carried out according to the choice of different preparation tasks, such as Latin dance with gentle movements and abdominal strength exercises, but the standard dance should be carried out in the chest, waist and knee below. It is advisable to prepare with fever and slight sweating, and the best time should be controlled within 4–8 min. Proper preparation enables athletes to balance and stretch their muscles faster, coordinate the development of organs such as the central nervous system and tension, make dance movements more accurate and reduce sports injuries. **Figure 7** shows the comparative analysis of dance sport athletes A and B in each period of preparation for the activity.

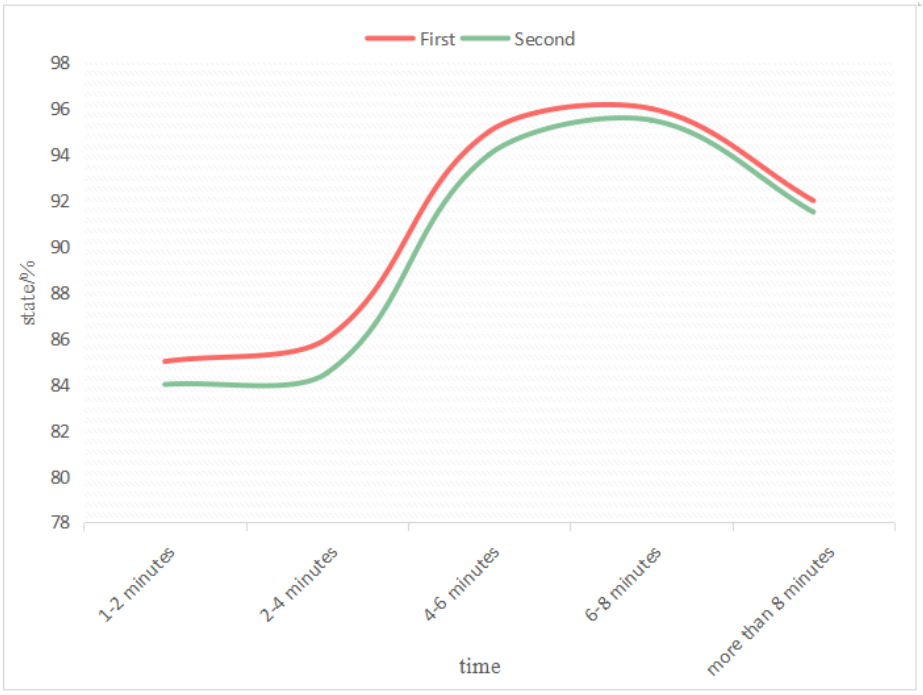

Figure 7. Comparison of sports dance athletes during preparation.

As can be seen from the figure, the trend of the graph is flat at first and then gradually rising. It remains flat for a period of time and then starts to decline. It can be seen that the state of dance sport athletes A and B in each period of preparation activity would change with the change of time. At 1–2 min, the two players were only 88 and 84 percent; at 2–4 min, the two players were only 86 percent and 84.5 percent; at 4–6 min, the two athletes' state gradually increased to 95% and 94%; at 6–8 min, the condition of the two athletes remained at 96% and 95.5%; at more than 8 minutes, the two players began to drop to 92 percent and 91.5 percent;

It can be concluded that the best time to control the warm-up preparation time in 4–8 min is appropriate. Adequate preparation can help athletes reach their best condition faster, make dance moves more accurate, and reduce the chance of sports injury.

4.5. Strengthening students' understanding of sports injury knowledge

Good rehabilitation training for athletes after learning fatigue plays an important role in preventing dance sport injury. In sports dance class, the coach can put some soothing music, organize and carry out some simple entertainment activities, or let them enjoy some artistic performances, which is to regulate the athletes' body and mind. In addition, the coach can also divide the athletes into several groups for massage, kneading, pressing and other actions, so as to improve the blood circulation of the human body, thus speeding up the metabolism. It removes substances such as lactic acid from the body's metabolism, thereby reducing muscle soreness and stiffness.

In conclusion, the improvement and application research of dance sport sports injury barrier constructed in this paper can reduce the incidence of sports injury by 4.62%.

In order to fully evaluate the long-term effects of core strength training, standardized questionnaires are essential. The participants' lifestyles (including sleep, stress, smoking, and drinking) were surveyed through questionnaires, and control and experimental groups were set up to ensure the completeness and accuracy of the data. **Table 2** shows the results of the lifestyle questionnaire survey.

Table 2. Results of the lifestyle questionnaire survey.

Variables	Control group mean ± SD	Experimental group mean ± standard deviation	*t*-value	*P*-value
Sleep quality	6.5 ± 1.2	7.8 ± 1.0	4.5	0.0001*
Stress level	5.8 ± 1.5	4.2 ± 1.3	−4	0.0005*
Frequency of smoking	8.1 ± 2.3	7.9 ± 2.1	−0.3	0.765
Frequency of drinking	3.2 ± 1.1	3.0 ± 1.0	−0.8	0.424

5. Conclusions

In the content, methods and other aspects of active exploration and practice, this paper reviewed and evaluated the improvement of the current dance sport injury, in order to establish a safe and effective sports system. In this experiment, the comparison results of reasonable preparation of activities, consciously strengthening exercise and training dance partners, strengthening the learning of correct technical essentials, and strengthening physical fitness training were obtained. The experimental results showed that the mitigation and improvement of sports injury disorder in sports dance constructed in this paper and the application research can reduce the incidence of sports injury. From the perspective of biomechanics, this paper discusses the relief and improvement of sports dance injury disorders by combining traditional Chinese medicine with exercise therapy. Through traditional Chinese medicine methods such as acupuncture, massage and herbal medicine, combined with targeted rehabilitation training, muscle tension can be effectively relieved, pain can be reduced, and tissue repair can be promoted. Combined treatment can enhance muscle toughness and joint stability in the long term and reduce the risk of reinjury. However, attention should be paid to potential side effects, such as herbal allergies and infections caused by improper acupuncture. Therefore, personalized treatment should be carried out under professional guidance to ensure safety and effectiveness. This article preliminarily evaluated the short-term effects of core strength training, and the next step of research should focus on the follow-up period of its long-term effects. In the follow-up study, the core strength, stability, flexibility and overall health of the participants were regularly evaluated for one year. Long-term follow-up can reveal the sustained effects of training on body posture, chronic pain relief and sports performance, and help identify possible training adaptations and potential injury risks. This will provide a more comprehensive scientific basis for the effectiveness and safety of core strength training.

Author contributions: Conceptualization, YL; methodology, XW; software, XW; formal analysis, XW; investigation, ZL; resources, YL; data curation, XW; writing—original draft preparation, YL; writing—review and editing, ZL; visualization, ZL;

supervision, ZL. All authors have read and agreed to the published version of the manuscript.

Ethical approval: Not applicable.

Conflict of interest: The authors declare no conflict of interest.

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