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Article

Evaluation on the prevention and treatment of sports injuries in physical education from a biomechanical perspective

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Abstract: The prevention and treatment of sports injuries have always been a hot topic in the field of sports medicine. Through the analysis of more than 20 factors, the direct or indirect factors can lead to sports injuries. Based on the related factors of sports injuries of athletes, the early warning mode of sports injuries was studied by using the Radial Basis Function (RBF) neural network. This article discussed the prevention and treatment of sports injuries from three aspects: investigation, treatment, and prevention of sports injuries. According to a questionnaire survey of 482 people from 5 colleges and universities, it was found that 89.63% of college students believed that their sports injuries were acute injuries, and only 10.37% considered them to be chronic injuries. Sports injuries would not only have a certain negative impact on physical education, but also have a great impact on the physical and mental health of students. Sports injuries are the most common injuries, followed by track and field. Among them, 80.29% were injured in basketball and 73.03% in football. Due to frequent physical contact, the injuries were relatively more, but in the net training game, their injuries were relatively small.

Keywords: sports injuries; physical education; RBF neural network; prevention and treatment

1. Introduction

As a special sports activity in school, sports injuries would inevitably occur in physical education [1,2]. Therefore, how to effectively reduce sports injuries to athletes is a problem that college physical education teachers should pay attention to. Sports injuries are physical and mental injuries suffered by athletes during sports. They are classified into acute and chronic according to the degree of injury [3,4]. This article analyzed the factors of students' own factors, teachers' factors, venue equipment factors, etc., found out the factors that affect the injury of college students' sports activities, and formulated effective preventive measures according to the causes of injury.

High-quality sports injury research has played a very helpful role in the prevention and treatment of sports injuries. The motivation behind An KO's research was to propose another practical injury counteraction worldview in view of the examination of the impacts of sports injury avoidance and utilitarian preparation [5]. Nielsen examined significant epidemiological and factual points inside the field of sports injury research. Complex frameworks were examined to delineate how potential gambling factors were connected in a non-straight style [6]. Based on the dynamic recursive model of sports injury, Schneider discussed the application of the model, and discussed the prevention and treatment of concussion [7]. The purpose of Morris S was to update the National Sports Treatment, Injuries, and Outcomes for the 2014–2015 to 2018–2019 school years, with the results accompanying part of the results used to monitor patient-reported outcomes following sports injuries [8]. Doherty conducted a systematic review to evaluate treatment strategies for acute ankle sprains and chronic ankle instability based on the background of high incidence of ankle sprains and high risk of recurrence [9]. However, the prevention and treatment of sports injuries need to be combined with the actual situation and start from many aspects.

Neural networks have facilitated the development of many fields. Ge concentrated on the impacting elements of ball injury in actual training in view of counterfeit brain organization. The reason for knee joint injury in ball preparation in normal schools and colleges was broken down by utilizing the strategy for sports factor examination [10]. Wang took neural network as a predictive network modeling method, and with the support of MATLAB neural toolbox, he realized the prediction based on the prediction of sports injury [11]. Zhang proposed a brain network model joined with insect settlement calculation for practice load expectation. The worldwide hunt capacity of the subterranean insect calculation is utilized to decide the underlying load of the brain organization, and the weight is additionally changed in view of the slope plunge of the brain organization to find the worldwide ideal point [12]. However, these algorithms need to be specific to the design of each layer to make the results more accurate. The hybrid model composed of RBF and Kriging was used to optimize the design of UAV wing guardrails to reduce rolling torque, which provides important insights for the field of biomechanics in evaluating sports injury prevention and treatment, especially in the design and optimization of protective facilities to maximize effects and performance. It can be seen that the application of the RBF neural network in this article is feasible [13].

In the physical education teaching of colleges and universities, the vast majority of college students have sports injuries of varying degrees, and most of them are male. The injuries of college students are mostly acute injuries, with ankle, thigh, and waist injuries being the most common. Sports injuries are dominated by after-school physical exercise, while the incidence of physical education classes is relatively low, and the injuries are dominated by high-intensity sports such as basketball and football. The innovation of this article is that the RBF neural network is applied to the early warning of sports injury, and a sports injury assessment model based on neural networks is established.

The overall flow chart is shown in **Figure 1**.

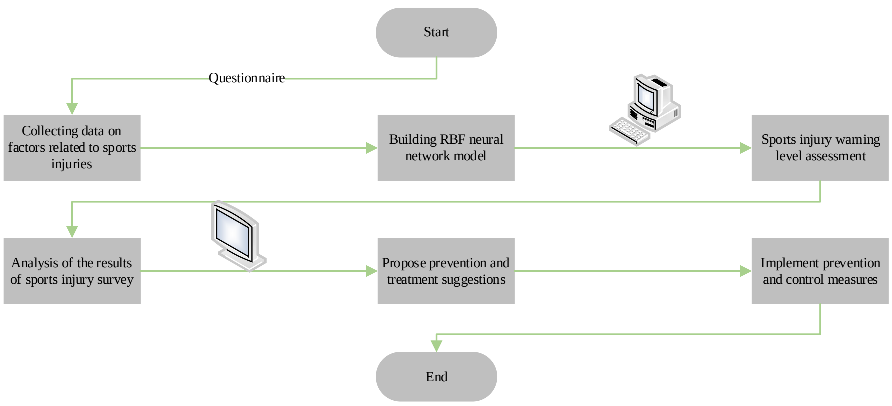

Figure 1. Overall flow chart.

2. Evaluation method of sports injury early warning level

2.1. Motion loss identification risk factors

Because the neural network has good pattern classification ability, it can identify sports injuries. It is a physical quantity that obtains some properties of a structure by means of measurement and numerical calculation. Using the specific relationship between feature parameters and sports injuries, a neural network is constructed with feature parameters as network input and sports injuries as output. In the sample set, a certain sample is selected as the training input, and then the network learns. In this way, the nonlinear mapping between the input variable (physical quantity of sports characteristics) and the output variable (sports injury) is obtained, so that the network has the ability of model classification, and the test samples on the sample set are used to judge whether the mapping relationship is correct, so as to realize identification of structural damage [14,15].

Using neural networks to identify sports injuries can be divided into two stages: learning and simulation. Learning involves training to build a network that simulates real predictions [16]. The overall recognition of sports injuries can be described with a flow chart, as shown in **Figure 2**.

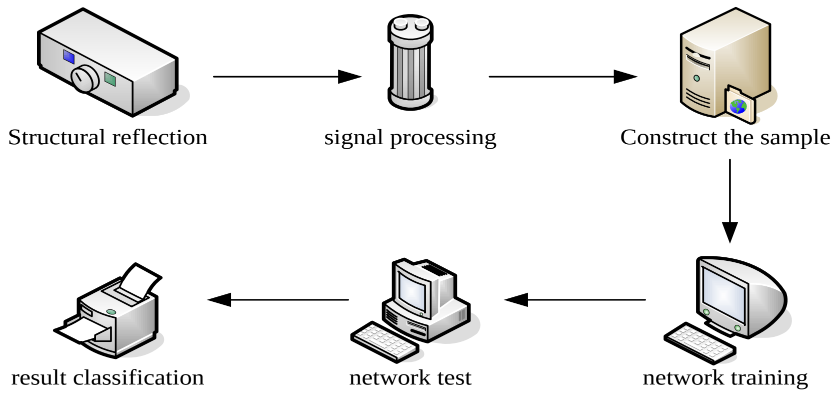

Figure 2. Flow chart of neural network sports injury recognition.

The information processing of Artificial Neural Networks (ANN) mainly relies on a single neuron. By simulating human brain neurons, ANN can obtain neurons [17]. Its specific model is shown in **Figure 3**.

In this model, a vector $c = (c_1, c_2, \dots, c_n)$ is input, and u and a weight factor v_o are output; the mathematical relationship between input and output is as follows:

$$u = f(\sum_{o=0}^{n} v_o c_o - q_l) \quad (1)$$

q_l is the threshold and $f(c)$ is the excitation function, which can be a linear or non-linear one.

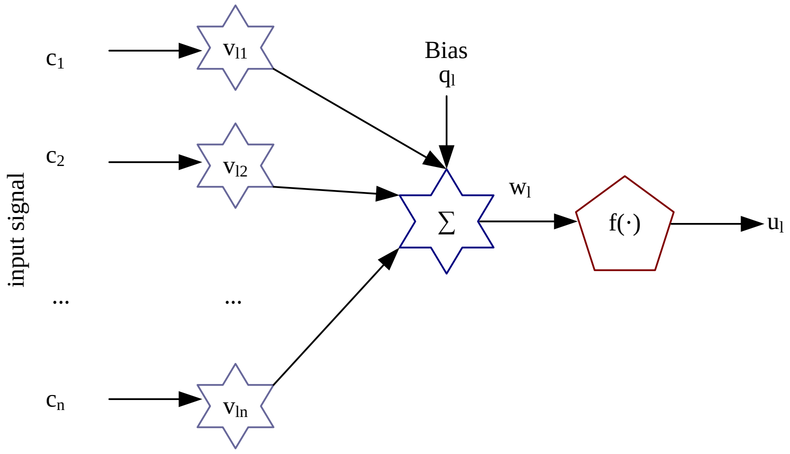

Figure 3. Nonlinear model of neurons.

Sports injury risk source is the reason for deciding gambling factors. According to a solitary perspective to assess the game injury hazard of competitors, the assessment results are frequently one-sided. Hence, to really keep away from this present circumstance, it is important to recognize the wellspring of risk prior to performing a sports injury assessment [18,19]. The connection between each sub and the wellspring of injury risk is displayed in **Figure 4**.

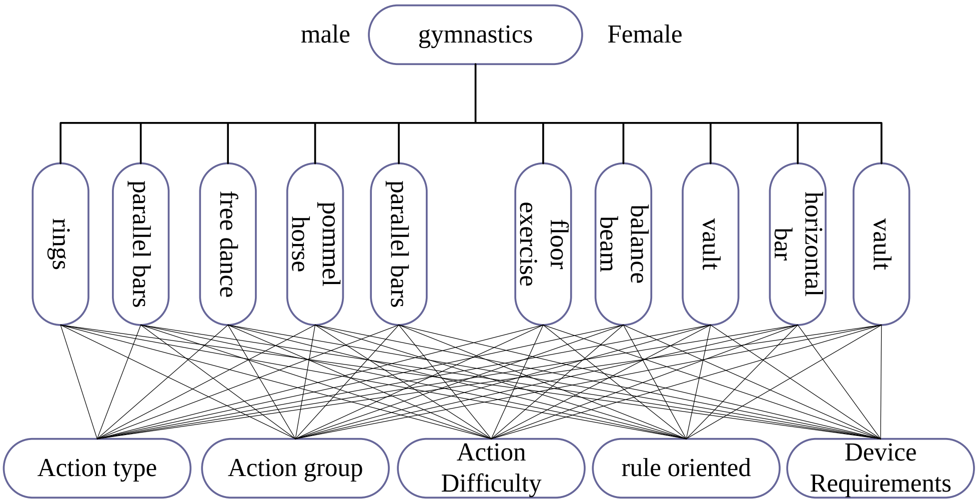

Figure 4. Schematic diagram of the origin of sports injury risk (taking gymnastics as an example).

Determination of risk sources for sports injuries is completed. Sports injury risk factor identification refers to the use of specific hazard sources and special calculation methods to evaluate sports injury risk factors, so as to determine the injury factors of sports injuries [20]. Assuming that d is used to represent the identified source of risk, then under this source of risk, the following formula can be used to express the risk factor for sports injuries:

$$\mu(d) = \frac{1}{2}\sum_{m=0}^{m}[\theta d(z)^m] \tag{2}$$

In the formula: m is an uncertain variable that changes with the value of *d*; θ represents a special algorithm to complete the risk identification of sports injuries; *z* represents the specific parameters that determine the generation of sports injury risk factors under the *d* hazard source.

Generally, data sources are divided into three categories: single, multiple, and mixed precision. Among them, a single-precision data source can predict sports injuries based on specific numerical results without any processing. For multiple high-precision data sources, they must be reduced in precision first and then decomposed into single-precision data before pre-evaluation of sports injuries can be performed. For the mixed precision of the data source, it must be differentiated first, and the single-precision data source and the multi-precision data source are divided into two parts. Then the above processing is performed on the two data sources respectively [21,22]. Through the pre-assessment of sports injuries, the entire assessment can be carried out.

Single-precision data sources are data sources with single-precision floating-point data precision. Single-precision floating-point numbers are usually represented by 32 bits, including a sign bit, an 8-bit exponent, and a 23-bit mantissa. Single-precision data sources can be used to predict sports injuries without additional processing because their accuracy is sufficient to meet the needs of most applications.

Multiple high-precision data sources are data sources with higher accuracy than single-precision data sources, which use more bits to represent numbers, including double-precision floating-point numbers (64 bits) or even higher-precision data types. When performing pre-assessment of sports injuries, these high-precision data sources need to be converted or reduced in precision to facilitate comparison or integration with single-precision data sources, ensuring that data of different precisions can be effectively compared under the same assessment framework.

2.2. Early warning level assessment

The specific structure of the RBF neural network is shown in **Figure 5**.

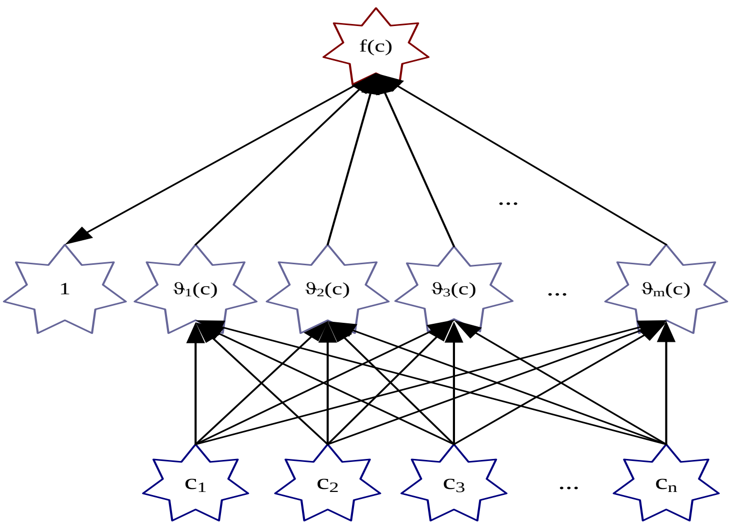

Figure 5. RBF neural network structure diagram.

The output of an RBF neural network can be described as:

$$u = \sum_{l=1}^{L} \beta_l \vartheta_l(c) \tag{3}$$

Among them, L represents the number of hidden layer neurons, and $c =$

$(c_1, c_2, \ldots, c_n)$ represents the output vector; β_l describes the connection weighting between the lth hidden layer neuron and the output layer neuron; ϑ_l describes the output of the lth hidden neuron.

In this article, the RBF neural network is used to divide the sports injury risk level of athletes into three levels: high, medium, and low. That is to say, according to the degree of danger of sports injuries, it is divided into three levels, as shown in **Table 1** [23].

Table 1. RBF output and risk level comparison table.

RBF output	Early warning level of sports injury risk
1	Low risk level
2	Medium risk level
3	High risk level

That is to say, a classification system is constructed using an RBF neural network. Using the gradient descent method, the center, width, and weights of the output layer of the neural network are calculated [24,25].

The RBF input parameters are shown in **Table 2**.

Table 2. RBP input parameters.

Parameters	Value	Parameters	Value
Number of neurons in the input layer	10	Number of radial basis functions	10
Number of neurons in the hidden layer	50	Width parameter of radial basis functions	1.0
Learning rate	0.01	Number of iterations	100
Regularization parameter	0.01	Convergence tolerance	10^{-6}

Different sports have different optimal parameter choices for the input parameters of the RBF network. When processing motion data, different types of feature extraction and data preprocessing are involved, which seriously affects the selection of parameters such as the number of neurons in the input layer of the RBF network, the number and type of radial basis functions, and the width parameter of the radial basis function. If complex motion patterns or high-dimensional motion data, running, passing, shooting, etc., are being handled, more hidden layer neurons or more radial basis functions are needed to capture the complex features of the data.

1) Selection of basis functions

In the hidden layer unit, the Gaussian function is selected as the activation function:

$$R_k(c) = e^{-\frac{\|c-v_k\|^2}{2\delta_k^2}} \quad (4)$$

Among them, the output of the kth hidden node is $R_k(c)$; c is the m-dimensional input vector; v_k is the center vector of the kernel function of the kth hidden layer node and the output of the network.

$$u_k(c) = \sum_{k=1}^{l} \varpi_{ok} R_k(c) \quad (5)$$

Among them, $o = 1,2,\ldots,n$; u_k is the output for the o-th output layer node, and ϖ_{ok} is the connection authority for the *k*-th hidden layer node to the *o*-th output layer node.

2) Design of hidden layers

Since the training type involved in this article is the sports injury risk warning level, it can be solved by a simple method, that is, each risk level has a Gaussian function, namely $l = 3$. The average distance of the three samples is taken as the width parameter of the Gaussian function, and the average of the three samples is taken as its core.

3) Update of the weights of the RBF function

The RBF center and other parameters are learned. The learning method of error correction is generally used, and the gradient descent method is adopted.

Assuming that there are M sample outputs, an error function is defined:

$$\theta = \frac{1}{2}\sum_{w=1}^{M} e_w^2 \tag{6}$$

Among these errors of e_w, there are the following definitions:

$$e_w = h_w - u(c_w) = h_w - \sum_{k=1}^{3} \varpi_{1k} R_k(c_w) = h_w - \sum_{k=1}^{3} \varpi_{1k} e^{-\frac{\|c_w - v_k\|^2}{2\delta_k^2}} \tag{7}$$

Among them, h_w is the value of the required type of sample c_w, which corresponds to the high-risk level sample $h_w = 3$ in this article.

Iterative processing of each free parameter is as follows:

(1) The weight of the output unit

$$\frac{\partial\theta(m)}{\partial\varpi_{1k}(m)} = -\sum_{w=1}^{m} e_w(m)\, R_k(c_w) = -\sum_{w=1}^{m} e_w e^{-\frac{\|c_w - v_k\|^2}{2\delta_k^2}} \tag{8}$$

$$\varpi_{1k}(m+1) = \varpi_{1k}(m) - \mu_1 \frac{\partial\theta(m)}{\partial\varpi_{1k}} \tag{9}$$

Here, *m* is the current variable, and *m* + 1 is the iteratively modified value.

(2) Hidden unit center

$$\frac{\partial\theta(m)}{\partial c_k(m)} = -\sum_{w=1}^{m} e_w(m)\, R_k(c_w) = -\sum_{w=1}^{m} e_w \frac{\varpi_{1k}(m)}{\delta_k^2} e^{-\frac{\|c_w - v_k\|^2}{2\delta_k^2}} (c_w - v_k(m)) \tag{10}$$

$$v_k(m+1) = v_k(m) - \mu_2 \frac{\partial\mu(m)}{\partial v_k} \tag{11}$$

(3) Function width

$$\frac{\partial\theta(m)}{\partial\delta_k(m)} = -\sum_{w=1}^{m} e_w(m) \frac{\varpi_{1k}(m)}{\delta_k^3(m)} \|c_w - v_k\|^2 R_k(c_w) \tag{12}$$

$$\delta_k(m+1) = \delta_k(m) - \mu_3 \frac{\partial\theta(m)}{\partial\delta_k(m)} \tag{13}$$

Among them, for the efficiency of μ_1, μ_2, and μ_3 learning, it can be a constant or a variable.

The specific learning algorithm is processed as follows:

Step 1: According to the existing classification, the average value of the output vectors of each type is found as the initial value $v_k(1)$ of the center of the class, and the average value of the input vector and the center distance of each type is used as the initial value of its width $\delta_k(1)$. Each class outputs one sample, and then calculates the initial value $\varpi_{1k}(1)$ and sets the error tolerance value ϑ. Assuming learning efficiency:

$$\mu_1 = \mu_2 = \mu_3 = \frac{1}{t} \tag{14}$$

t is a repeating periodic variable. The period variable t is set to be 1 initially, and the maximum is $MaxT$.

Step 2: The *t*-th training sample is input, and the real network output $u(t)$ is obtained.

Step 3: The difference $\theta(t)$ between the actual output and the expected output is calculated. If there is an error of $\theta(t) < \vartheta$, there is no need to adjust the network parameters and skip directly to the sixth or next step.

Step 4: Equation (8)-(13) are calculated.

Step 5: The parameters of the network are updated $\varpi_{1k}(t+1)$, $v_k(t+1)$, $\delta_k(t+1)$, $t = t + 1$; if $t > MaxT$, the display does not converge, go to the sixth step, or go to the second step.

Step 6: The learning process is completed, and all parameters of the current network are saved.

3. Experiments on the prevention and treatment of sports injuries

3.1. Evaluation objects and methods

From April 2022 to June 2022, a questionnaire survey was conducted in 5 general universities, and a random sample of 500 students was conducted.

In order to ensure the validity and scientificity of the questionnaire, this article sends the specific content of the questions to 10 teachers and vice-principals, hoping that they would give corresponding solutions. In the first question, experts put forward suggestions for improvement and replacement of some questions in the questionnaire, and the questionnaire was obtained after modification, as shown in **Table 3**.

Table 3. Questionnaire validity check.

title	Number of people	reasonable	Relatively reasonable	unreasonable
professor	3	2	1	0
associate professor	7	7	1	0
total	10	9	2	0

After collecting a large amount of sports injury-related data, a questionnaire survey was conducted on college students from 5 colleges and universities. A total of 500 copies were distributed and 486 copies were recovered. Among them, 482 were valid, and the recovered and valid questionnaires reached more than 95%. It can be seen that this questionnaire has high reliability and can be used in this article.

The questionnaire is as follows.

Q1: What are the main sports activities you participate in? Please list them.

Q2: Have you ever suffered sports injuries in the sports activities you participate in? If so, please describe your most recent injury (including the site and type of injury).

Q3: Do you think the sports venues and facilities provided by your school are sufficient to meet the needs of students? Please explain briefly.

Q4: How well do you know about the prevention measures for sports injuries in physical education courses? Please rate from "completely unknown" to "very well aware".

Q5: What factors do you think may cause you to be injured in physical education courses or extracurricular sports? (such as equipment problems, irregular technical movements, etc.)

Q6: Do you think that teachers have provided sufficient education on the prevention of sports injuries in physical education courses? Please briefly describe your views.

Q7: Which sports do you think are more likely to cause sports injuries? Please list the top three sports that you think are most likely to cause injuries.

Q8: How well do you know about the treatment methods and knowledge of sports injuries? What methods do you usually take to deal with sports injuries?

Q9: Do you think your sports injuries may be related to your personal physical fitness or technical level? Please explain briefly.

Q10: What improvements do you think schools can make in providing sports injury prevention? Please give your suggestions.

RBF is closely related to questionnaire surveys. As a data analysis tool in questionnaire surveys, RBF helps process and analyze complex data structures, reveal potential patterns and associations in the data, and improve the understanding and prediction of survey results. When conducting a questionnaire survey, the collected data has a certain amount of noise or uneven distribution. RBF can interpolate these data, fill in missing values, or smooth them to more accurately reflect the survey results.

3.2. Sports injury investigation

As can be seen from **Figure 6**, University C has more sports venues than other schools, and schools A and B have fewer venues than other schools.

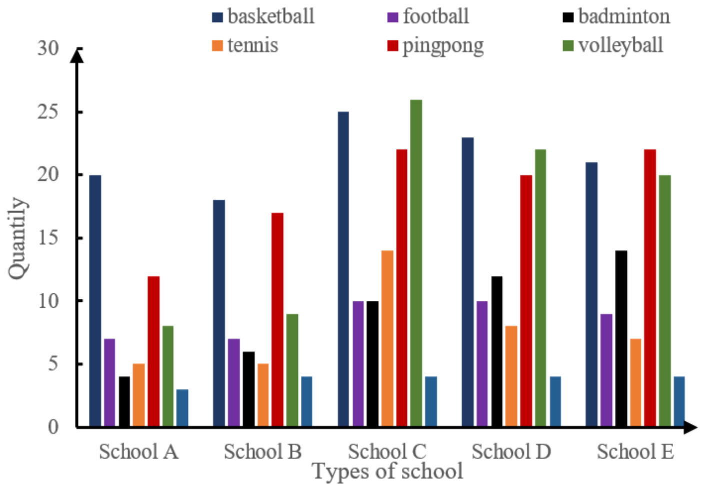

Figure 6. List of sports venues for each school.

As shown in **Figure 7**, various degrees of injury occurred in sports training courses of various majors, mainly in ball games, followed by track and field courses. Basketball injuries accounted for 80.29%, and football injuries accounted for 73.03%. Because of the high number of physical contact, the injury caused is relatively more, while the injury of net training is relatively low. This shows that the distribution of sports injuries is relatively stable, and the performance of ice and snow is better, but it also accounts for 29.25%.

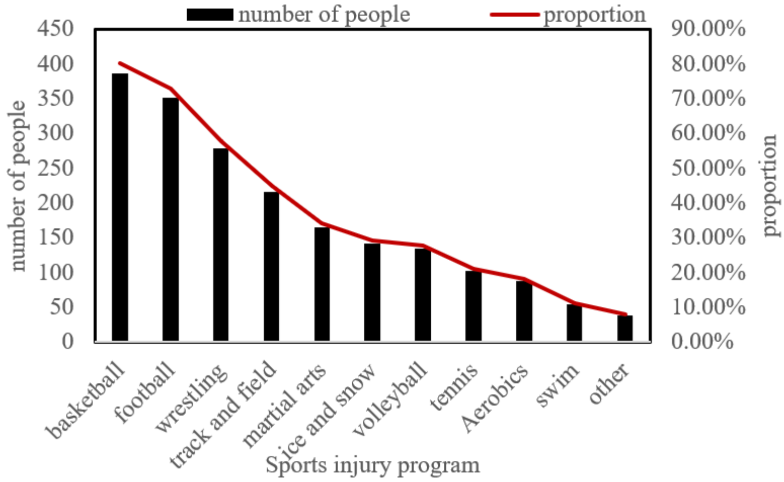

Figure 7. Distribution of sports injuries.

As can be seen from **Table 4**, the injury rate of males is significantly higher than that of females, 29.05% of females and 70.95% of males. This is because most males like sports, such as basketball, football, wrestling, etc.; most females prefer non-contact sports such as badminton and table tennis. Males are significantly more enthusiastic about sports than females, and especially males are more competitive. In physical education, if male and female students are taught at the same time, because male students have a higher physical fitness level than female students, under the same teaching intensity, female students have a greater load than male students, and the proportion of female students injured would be higher than that of male students.

Table 4. Sports injuries of males and females.

	number of people	**proportion**
male	342	70.95%
female	140	29.05%
total	482	100.00%

It can be seen from **Table 5** that in the lower grades, the incidence of sports injuries is higher than that in the upper grades. Some college students lack sufficient awareness in physical education classes and extracurricular sports activities, and at the same time are restricted by venues and equipment, resulting in insufficient development and improvement of their physical fitness and technical level. The physical fitness test scores of the freshmen were lower than those of the second grade, which showed a decrease in aerobic endurance and physical flexibility. In addition, in the ball game teaching competition for freshmen, it was found that the freshmen were vague about the concept of rules, had many foul actions, and could not use self-defense actions correctly. The above factors are the main factors that cause sports injuries in lower-grade students. Junior and senior students have relatively more extracurricular activities, and the forms of activities are also varied. The mood of graduates is also very low, and various factors can cause harm.

Table 5. Distribution of injured students by grade.

	number of people	**Number of injured**	**proportion**
freshman	167	150	89.82%
sophomore	146	106	72.60%
junior year	125	80	64.00%
senior	44	28	63.64%

The results showed that most of the students had very low awareness of sports injury prevention in physical education classes. Regarding whether they should strengthen their sports injuries, more students chose indifferent students than those who needed strengthening. It reflects that students' awareness of sports injuries is not enough, or that mental relaxation is also the main factor leading to sports injuries. The causes of various sports injuries are shown in **Figure 8**:

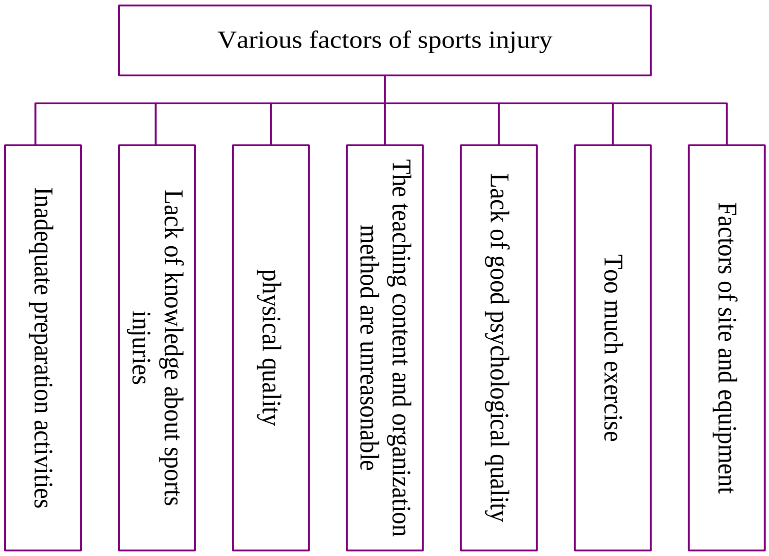

Figure 8. Various factors for sports injuries.

Preparation activities play a pivotal role in teachers' classroom teaching. College students' understanding of sports injuries is not enough, which leads to the occurrence of sports injuries. When physical fitness does not meet the requirements, physical fitness would change, resulting in sports injuries. If athletes are not given enough time to practice, it is difficult to fully grasp the essentials and essence of skills, and it is easy to cause sports injuries.

Figure 9 shows the causes and types of sports injuries. As shown in **Figure 9a**, in the basic physical education courses, the cause of the largest number of injuries is the lack of preparation activities of students (80.29%). The second is inattention (65.98%), both of which are related to the students themselves. Among them, 318 cases were injured due to inattention, accounting for 65.98% of the total number of injuries. The content of basic courses or the teaching methods of teachers could not attract students well.

As can be seen from **Figure 9b**, students in general physical education can prevent some serious injuries, such as 2.90% of fractures and 1.87% of bone fractures. However, less attention was paid to minor injuries such as muscle strains (76.76%)

and skin abrasions (59.75%), so more people were injured. The types of injuries caused by factors such as limited understanding of the course, inadequate on-site equipment, unprofessional teachers, average teaching level, inadequate injury prevention measures, and weak prevention awareness among students vary.

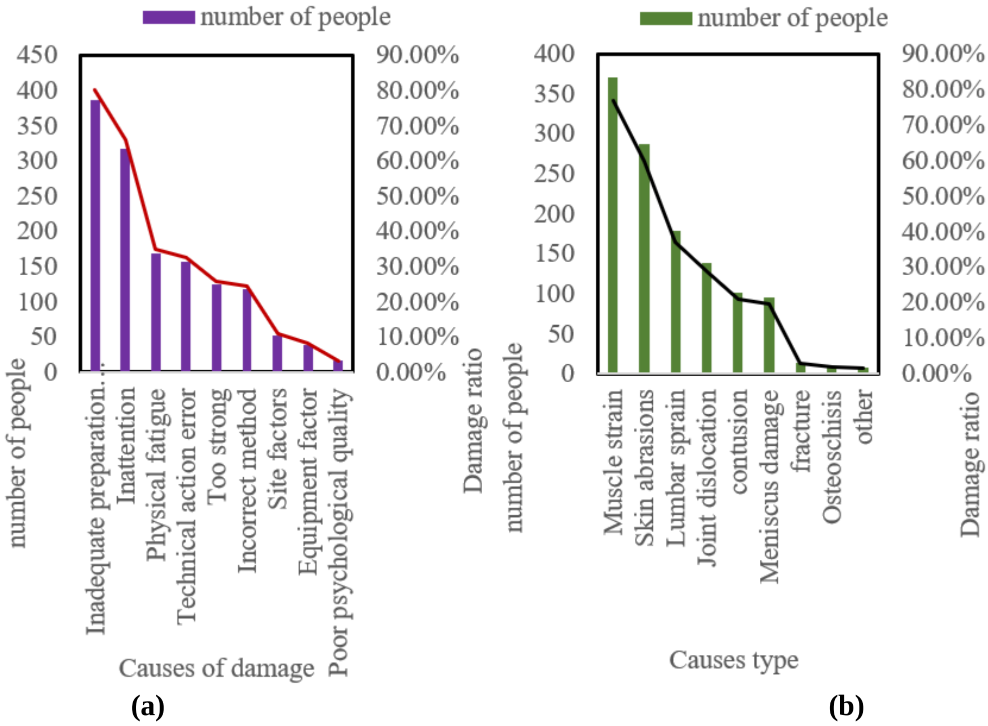

Figure 9. Causes and types of sports injuries: **(a)** Number of people and damage rates due to different injury causes; **(b)** Number of people and damage rates due to different injury causes.

Sports injuries can be divided into two categories: acute and chronic. Due to the constraints of venues, equipment and other conditions, college students are mainly injured by acute injuries, such as contusions, fractures, etc. Due to the influence of the family environment, some students were not treated in time after the injury, resulting in serious diseases such as Achilles tendon rupture. In order to understand the nature of sports injuries that occur to college students in physical education, the subjects were informed of their definitions when the questionnaires were distributed, and according to the investigators’ understanding of the problem, many problems were found, such as long injury duration, unclear student memory, and difficulty in distinguishing the nature of chronic and acute injuries. However, certain trends can also be found through the survey. **Table 6** shows the statistics of acute and chronic injuries of students.

Table 6. Nature of sports injuries.

nature of damage	number of people	proportion
chronic injury	50	10.37%
acute injury	432	89.63%
total	482	100.00%

As can be seen from **Table 6**, 89.63% of college students classified their sports injuries as acute injuries, and only 10.37% classified their sports injuries as chronic injuries.

According to the number of injured people, it is possible to find out the easily injured parts of athletes in various sports, and according to the different injured parts, it guides students to pay attention when practicing and studying, so as to reduce sports injuries. According to the statistical results of the survey data in **Figure 10**, ankle, thigh, and waist injuries are the most common injuries; abdomen, chest, and ribs are relatively rare. Through the above research, it is believed that there are certain rules in the parts of sports injuries, so according to these rules, corresponding preventive measures can be formulated to prevent sports injuries. The location of sports injuries varies with various sports. For example, in football games, the incidence of ankle joint injuries is high; in badminton players, the wrists, knees, and ankles are the main ones.

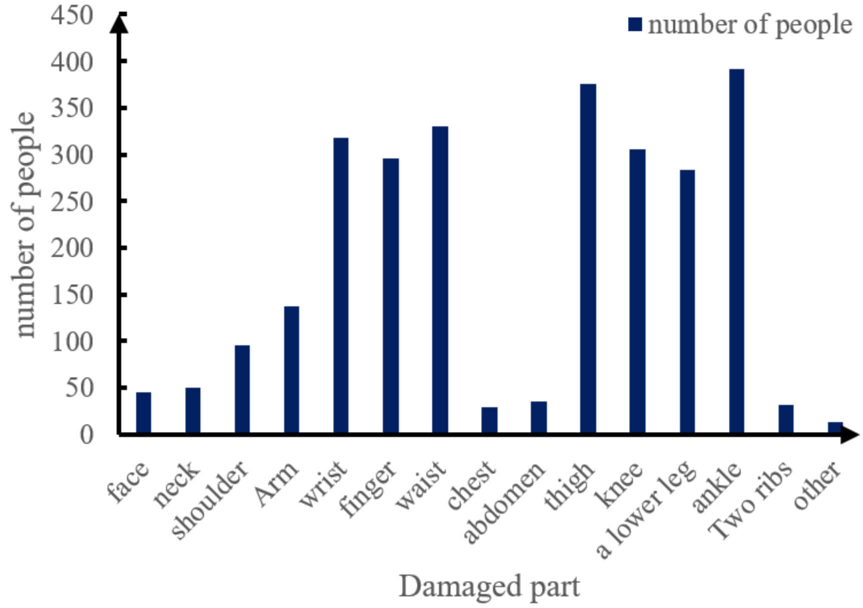

Figure 10. Number of people with different injury sites.

3.3. Treatment of sports injuries

Figure 11 shows the way for students to learn about sports injury handling and knowledge acquisition. In **Figure 11a**, due to a series of factors such as the location, type, and nature of the injury, most of the treatment methods are based on cold compresses and hot compresses. Students are not very familiar with injuries and do not know how to handle them. Due to economic reasons, not many students choose to seek medical treatment after injury. Most students choose to recover naturally and reduce exercise.

As can be seen from **Figure 11b**, the five universities conducted surveys on college students' knowledge about sports injuries, mainly through school education, doctor's explanation, extracurricular reading, teacher's explanation, and network acquisition. Studies have found that very few people learn about sports injuries by looking up information after training.

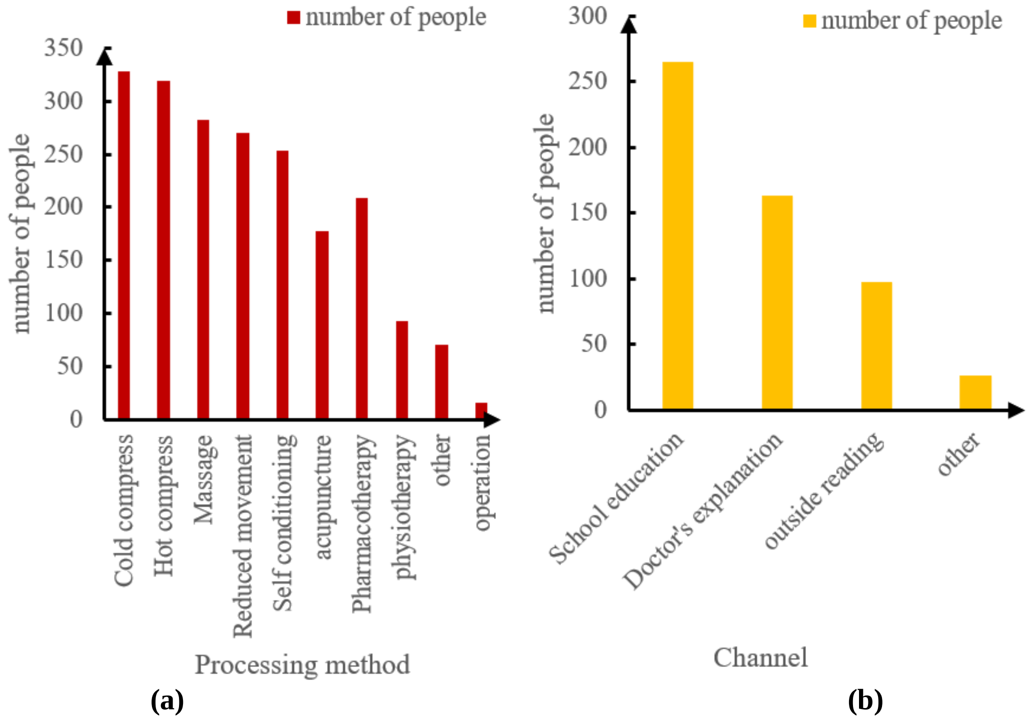

Figure 11. Number of people using different sports injury treatment methods and knowledge acquisition channels: **(a)** Processing method; **(b)** Access to knowledge.

From this, it can be seen that although teachers impart some knowledge about sports injuries to students in class, not many people actually learn it. Most people do not pay attention to the teacher's course but learn some knowledge about sports injuries from the doctor's explanation and extracurricular reading.

3.4. Prevention of sports injuries

China's vigorous development of physical education is not just to obtain a good ranking, but more importantly, the quality of Chinese students in sports. Good physical exercise can improve students' physical fitness, reduce the risk of disease, improve their psychological quality, and no longer endure physical pain. At the same time, in sports training, it is necessary to ensure that the trainees would not be injured, which is not only related to the ranking of the athletes but also related to the health of the athletes. China has issued some relevant policies to promote the improvement of college students' physical fitness to a certain extent. The measures to prevent sports injuries are shown in **Figure 12**.

Physical exercise to enhance the fitness of the body is strengthened. In daily life, training should be carried out on the vulnerable parts of the human body, and some specific exercises should be carried out in a targeted manner to enhance the adaptability of the body, so as to achieve the effect of prevention; preview activities should be scientifically organized, which are targeted and closely related to teaching content.

Self-protection of sports injuries is an effective preventive measure. Correct sports protection and assistance can help students build self-confidence, enable them to complete the movements better, and naturally reduce sports injuries with technical movement specifications. Therefore, while teaching technical movements, the methods and measures of protection should be taught to students; students not only know how to protect themselves but also enhance the correctness of movements and reduce sports injuries.

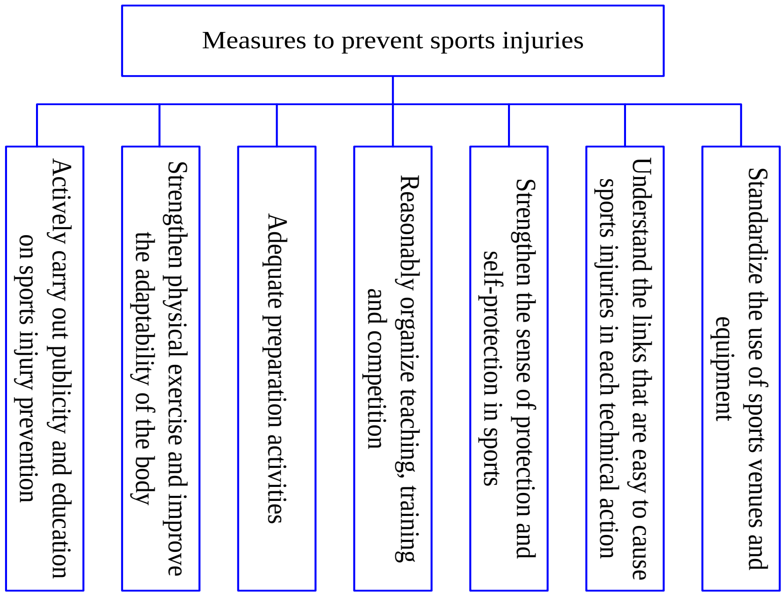

Figure 12. Measures for sports injury prevention.

Due to the diversity of sports, it is affected by many factors in the process of exercise. Therefore, students have different understandings and mastery of technical movements, and the parts that cause sports injuries are also different. For example, when the knee joint is taking off, the flexion of the knee would be under great pressure, which may cause sports injuries; therefore, when explaining technical movements to students, it is necessary to remind them of some movements that are prone to injury, in order to achieve the purpose of preventing injuries.

4. Conclusions

Teachers and students in colleges and universities do not have a comprehensive understanding of sports injuries and lack effective training methods, which leads to their low attention to the prevention of sports injuries. At present, college students have a certain understanding of the prevention and treatment of sports injuries, which has accumulated basic knowledge and skills for their future sports training, but physical education teachers' understanding and prevention and treatment methods of sports injuries still need to be improved, which is also one of the important reasons for the occurrence of sports injuries. The experiment uses RBF neural network to study the early warning mode of sports injuries, combines reflection and summary of sports injury cases, and discusses the prevention and treatment of sports injuries from three aspects: investigation, treatment and prevention of sports injuries, to help students understand the nature of sports injuries more deeply and improve their sports ability and prevention awareness. In future research, special attention can be paid to how to organically combine sports injury prevention and treatment education with physical education teaching, adopt effective teaching models, methods, and means, and improve college students' practical operation ability, so as to effectively prevent and control the occurrence of sports injuries.

Future research directions:

1) The integration of education and sports can be studied. Specialized courses or modules to teach students how to identify, prevent, and handle common sports injuries can be designed. Practical training on sports injuries can also be added in physical education courses, allowing students to learn first aid and primary healthcare skills in simulated scenarios.
2) An in-depth study on the significance of different teaching models in improving college students' understanding of sports injury prevention and treatment can be conducted. In the future, case analysis, simulation exercises, role-playing and other activities can be used to allow students to understand the prevention and treatment strategies of sports injuries in actual operations.
3) Interdisciplinary collaborative research can be promoted. By combining professional knowledge in sports medicine, physical education, rehabilitation therapy, and other fields, the best practices for preventing and treating sports injuries can be explored, and the comprehensive understanding and ability to solve sports injury problems can be enhanced.

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