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Retraction

Retracted: Visual Sensor-Based Image Analysis of the Relationship between Nutritional Diet and Athletic Ability of Sports Dance Athletes

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] W. Liu, "Visual Sensor-Based Image Analysis of the Relationship between Nutritional Diet and Athletic Ability of Sports Dance Athletes," *Journal of Sensors*, vol. 2021, Article ID 7669449, 15 pages, 2021.

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Research Article

Visual Sensor-Based Image Analysis of the Relationship between Nutritional Diet and Athletic Ability of Sports Dance Athletes

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Sports dance originated from the international standard national standard dance. Since China formally established the "China International Ballroom Dance Association" in 1986, it has developed rapidly. At the same time, related research on sports dancers has become a hot spot. However, most of the current researches are limited to athletes' physical training and competitive skills, and the research on athletes' dietary nutrition and athletic ability is still blank. In response to this situation, this paper presents a study on the relationship between nutritional diet and athletic ability of sports dancers based on image analysis of visual sensors. This article is mainly divided into three parts. The first part is the basic theories and core concepts of related research. This part introduces the modes and algorithms of visual sensors, analyzes the specific problems of current sports dance athletes in my country in terms of dietary nutrition, and continues with the adverse effects. It affects the athlete's athletic ability and even threatens the athlete's health. Improving the diet of athletes and establishing healthy dietary standards are of great significance to the development of this field. The second part is the establishment method of the nutritional intervention experiment model, which gives the principle and specific operation steps of the experiment design in detail. The third part is a comparative test. To further confirm the influence of nutrition on dance performance in athletes, this article conducted a number of comparative studies such as immunoglobulin conversion after intervention, changes in the indicators of lipid metabolism after intervention, and dietary mineral intake. Through the analysis of experimental data, it can be seen that reasonable dietary supplementation has a positive effect on the recovery of athletes' physical fitness, which can enhance the body's immunity while improving athletic ability.

1. Introduction

Sports dance is a kind of sports between the intermediate continuous activity stage and the short recovery period. It is difficult to define the routine training of sports dancers, but it usually includes multiple stages of training, including technical courses, rehearsal, and/or performance. The intensity and amount of exercise reported in the past are often comparable to those of many excellent athletes. At the same time, athletic dance is also an art form, requiring artistic expression and the application of physical skills. Like many exercise-like exercises, low weight and low fat levels are often considered helpful in using the results and performance of art, although very low weight and low fat levels can negatively affect energy performance. In fact, keeping slim is an important aspect of dance fitness and a prerequisite for career success. Therefore, there is a difficult choice in sports dance. It may be a contradictory part to achieve the ideal physical state while pursuing the best performance.

Since sports dance became an official event of the Asian Games in 2010, China's promotion force has grown rapidly. In the 21st century, with the vigorous development of China's foreign cultural exchanges, the development of Chinese sports dance has entered a new era and has made outstanding achievements in the exchange and competition with the world. At present, China has a large number of sports dance practitioners; in addition to occasional participation, there are many professional competitive dancers, and they carry out strict training and participate in competitive activities. These people show a high level of energy consumption during the whole process of competitive dance. Many athletes engaged in aesthetic or weight-related sports

cannot make up for the high energy demand by consuming enough energy, and there are many health and sports injury risks associated with energy imbalance.

Reasonable diet and nutrition are the material basis for sports dancers to maintain a good competitive state, which plays an important role in athletes' physical function, physical strength in the process of training adaptation, recovery after exercise, and prevention and treatment of sports diseases. What athletes eat and how much and when they eat will have an impact on training and competition. Although nutrition cannot replace training, whether it is training or during the competition, reasonable diet nutrition will bring benefits rather than harm to athletes. Reasonable diet can help athletes get strong body, help them adapt to heavy training and competition, help them delay the occurrence of sports fatigue, help athletes recover faster, and even help athletes prevent some sports diseases. In addition, some athletes also participate in weight loss; reasonable diet can help athletes lose weight and at the same time ensure the adequate supply of various nutrients and maintain the original athletic ability of athletes. At present, there is little research on the effect of dietary nutrition on sports function of sports dance athletes in China. In view of this, this paper puts forward the research on the relationship between nutrition diet and sports ability of sports dance athletes.

First of all, the core concept of sports and diet is studied. Through the research, this paper believes that sports dance, as a sport with both competitive and aesthetic feeling, has higher requirements for athletes' physical quality [1]. If we blindly pursue the aesthetic feeling of body shape and neglect nutrition supplement, it will have a negative impact on their sports ability and even damage the body. Then, on the basis of theoretical research, this paper establishes the physical fitness test model of sports dance athletes with dietary nutrition intervention. Through the investigation of diet and eating habits, the basic dietary information of athletes was mastered, and the participants were randomly divided into two groups. The intervention group received the dietary improvement for four weeks, and the members of the two groups were sampled and tested. In the third chapter, the experimental principle and operation steps are given in detail [2]. Finally, in order to verify the actual effect of this method, a number of comparative tests including the changes of blood biochemical indexes and body composition indexes of the two groups before and after the intervention were carried out. Through the analysis of experimental data, it can be seen that during the four-week experimental process, the sports ability of the participants changed, especially after the final peak torque test and anaerobic work test. However, there was little difference in the intervention group. The analysis showed that the nutrition supplement played a role in repairing the athletes' body, while the control group showed slow recovery. In the subsequent detection of various indicators, the correctness of the analysis in this paper is further verified [3, 4].

2. Sports Dance and the Core Concept of Nutritional Diet

2.1. Visual Sensor. The visual sensor network is composed of multiple visual sensor nodes, among which the nodes are randomly distributed. The node system block diagram is shown in Figure 1. Among them, the hardware system is composed of a microprocessor, a power supply, a visual information acquisition module, and a wireless transceiver module. The software system consists of an application layer and a Linux application layer. The Linux application layer includes applications corresponding to the hardware system: camera driver, wireless Wi-Fi driver, and ADC driver [5–7].

The visual sensor is generally composed of the image acquisition unit, image processing unit, image processing software, network communication device, and I/O interface. The functions of each part are as follows. (1) The image acquisition unit includes an image sensor and an image acquisition card. (2) The image processing unit includes a processor and a memory, and its function is to preprocess and store the image information transmitted from the acquisition unit. (3) The image processing software includes the bottom layer image processing function library and the upper layer image processing and analysis programs for specific applications. Its function is to provide software and algorithm support for the image processing unit. (4) Visual communication connector is an important means of visual sensation to communicate with the outside world. In particular, it eliminates image data transmission and controls the exchange of information between the sensor and the computer or other computer control equipment. (5) The I/O interface is mainly used for the input and output of control signals to facilitate the connection of vision sensors and other automation equipment [8, 9]. The schematic diagram of the working principle of each part of the visual sensor is shown in Figure 2.

With the rapid development of visual sensor networks, the applications of visual sensor networks have become more and more extensive, such as surveillance, environmental monitoring, smart homes, smart conference rooms, and remote monitoring systems [10, 11]. Since the camera usually provides the original video stream, obtaining important information from the collected image data requires a lot of processing and human resources, so it is time-consuming and error-prone. The current research in visual sensor networks is mainly focused on using intelligent methods to extract information from the local image data on the camera node to improve the existing surveillance technology, thereby reducing the data flow. Therefore, the sensor detection network can be considered as an upcoming monitoring system, which is not restricted by infrastructure and does not require large-scale inventory in the central processing unit. With the use of smart home, the sensory network can continue to monitor nursing staff. With the help of smart algorithms, the network can provide relevant information to nursing staff, such as unusual behavior or emergency information [12, 13].

Visual sensor networks (VSNs) extend the application fields of traditional wireless sensor networks, which can acquire and process multimedia signals, such as still images and videos. Due to the mismatch between transmission and computing resources and the complexity of analysis tasks, VSNs have a very important impact in scenarios where visual analysis tasks are currently not feasible. For example,

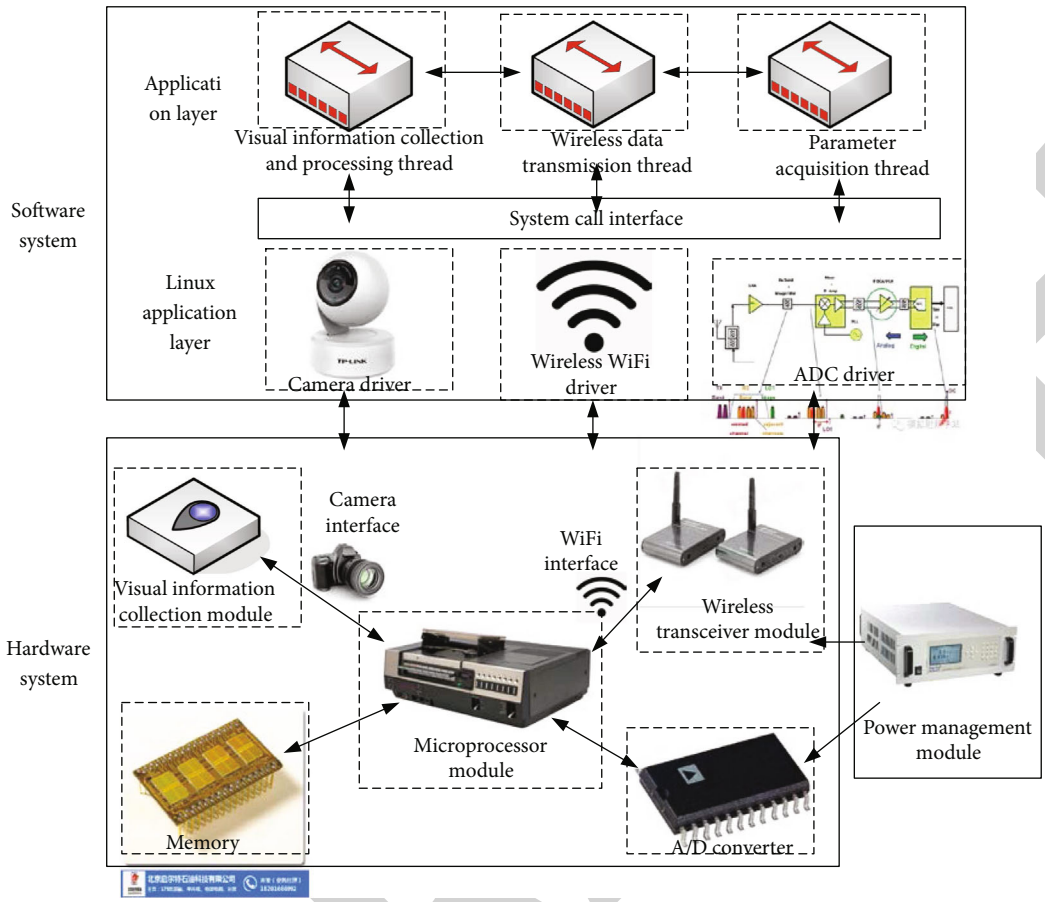

Figure 1: Block diagram of wireless vision sensor node system (pictures from Baidu picture).

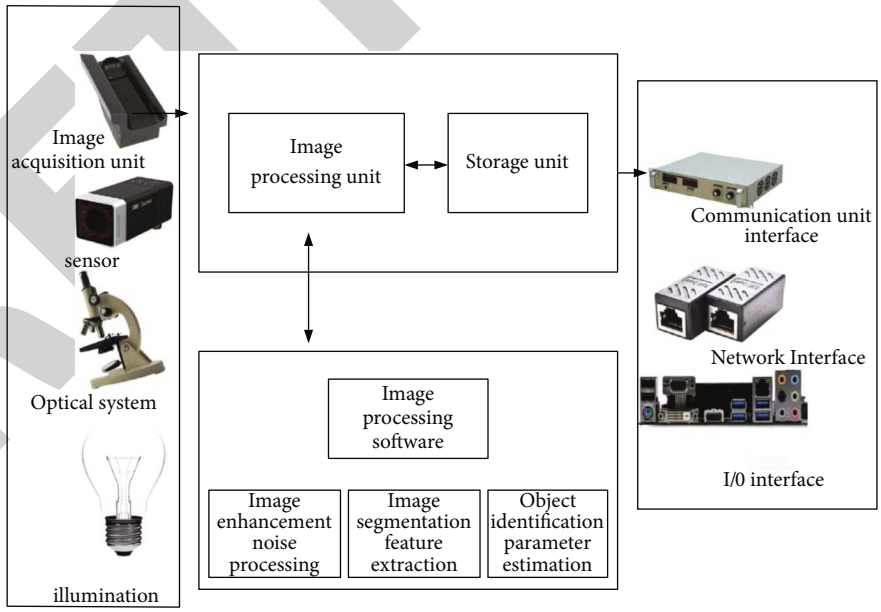

Figure 2: Schematic diagram of the working principle of the vision sensor (pictures from Baidu picture).

in the context of smart cities, the availability of cheap visual nodes can make the urban landscape more comprehensive, reach a wider range, and reduce the cost of the required infrastructure to support traffic monitoring and smart parking metering, environmental monitoring, hazardous scene detection, and other applications [14, 15].

2.1.1. Vision Sensor Model. There are two coordinate systems in the sensor measurement, namely, the coordinate system *mn*-Oa of the light projection plane and the coordinate system *ij*-Ob of the camera, as shown in Figure 3. The image pixel coordinate system is a flat rectangular coordinate system in pixels, where the m axis is parallel to the i axis and the n axis is parallel to the j axis. There is a point (m_1, n_1) in the coordinate system *mn*-Oa, and li and lj are, respectively, denoted the actual size of each pixel on the i axis and j axis on the image level, and then, the following mapping exists between the coordinate system *mn*-Oa and the coordinate system *ij*-Ob:

$$\begin{cases} \mathrm{m} = \dfrac{i}{li} + m_1, \\ n = \dfrac{j}{lj} + n_1, \end{cases} \tag{1}$$

expressed in the form of a matrix with the secondary coordinates:

$$\begin{bmatrix} \mathrm{m} \\ n \\ 1 \end{bmatrix} = \begin{bmatrix} \dfrac{1}{li} & 0 & m_1 \\ 0 & \dfrac{1}{lj} & n_1 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} i \\ j \\ 1 \end{bmatrix}. \tag{2}$$

Perform the inverse transformation to get

$$\begin{bmatrix} i \\ j \\ 1 \end{bmatrix} = \begin{bmatrix} li & 0 & -m_1 li \\ 0 & lj & -n_1 lj \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} m \\ n \\ 1 \end{bmatrix}. \tag{3}$$

Suppose the coordinates of any point G in the three-dimensional space in the camera coordinate system are (o, p, q), and the coordinates in the world coordinate system are (o_k, p_k, q_k). At present, the changing relationship between the camera system and the ground connection system is due to other measurements, these measurements are called external camera boundaries, and the switching relationship is

$$\begin{bmatrix} o \\ p \\ q \end{bmatrix} = Tb \times \begin{bmatrix} o_k \\ p_k \\ q_k \end{bmatrix} + Lb. \tag{4}$$

Among them,

$$Tb = \begin{bmatrix} t_1 & t_2 & t_3 \\ t_4 & t_5 & t_6 \\ t_7 & t_8 & t_9 \end{bmatrix} \tag{5}$$

is the rotation direction vector of the camera coordinate system in the world coordinate system, represented by a 3×3 dimensional matrix.

$$Lb = \begin{bmatrix} L_o \\ L_p \\ L_q \end{bmatrix} \tag{6}$$

is the position translation direction vector of the camera coordinate system in the world coordinate system, which can be obtained from these two:

$$\ell \begin{bmatrix} O \\ P \\ 1 \end{bmatrix} = H \cdot R \cdot \begin{bmatrix} o_k \\ p_k \\ q_k \end{bmatrix} = \begin{bmatrix} d & 0 & 0 \\ 0 & d & 0 \\ 0 & 0 & d \end{bmatrix} \cdot \begin{bmatrix} t_1 & t_2 & t_3 & L_o \\ t_4 & t_5 & t_6 & L_p \\ t_7 & t_8 & t_9 & L_q \end{bmatrix} \cdot \begin{bmatrix} o_k \\ p_k \\ q_k \\ 1 \end{bmatrix}, \tag{7}$$

where R represents the spatial position relationship between the camera coordinate system and the world coordinate system.

In the case of considering radial distortion, the model relationship of the camera can be changed to

$$\begin{bmatrix} o \\ p \\ 1 \end{bmatrix} = \frac{1}{q_b} \begin{bmatrix} 1/\nu \\ 1/\nu \\ 1/\nu \end{bmatrix} ab \begin{bmatrix} o_k \\ p_k \\ q_k \\ 1 \end{bmatrix}, \tag{8}$$

where $\nu = \sum_x t_x w^{2x}$, t_x is the distortion parameter and $w^2 = o^2 + p^2$.

In the case of considering the radial distortion, the calibration error can generally be smaller by an order of magnitude, but when too many considerations are taken, the effect is not obvious, and the solution process is much more complicated [16]. Therefore, this article only considers a camera projection imaging model with first-order radial distortion. So only consider the first-order radial distortion to

$$\begin{bmatrix} o \\ p \\ 1 \end{bmatrix} = \frac{1}{q_b} \begin{bmatrix} 1/\left(1 + t_1 w^2\right) \\ 1/\left(1 + t_1 w^2\right) \\ 1/\left(1 + t_1 w^2\right) \end{bmatrix} ab \begin{bmatrix} o_k \\ p_k \\ q_k \\ 1 \end{bmatrix}, \tag{9}$$

where $w^2 = o^2 + p^2$ is the square of the radial radius and t_1 is the first-order radial distortion coefficient.

The correction formula of radial distortion can be expressed as

$$\begin{cases} m_{\text{corrected}} = m\left(1 + w_1 t^2 + w_2 t^4 + w_3 t^6\right), \\ n_{\text{corrected}} = n\left(1 + w_1 t^2 + w_2 t^4 + w_3 t^6\right). \end{cases} \tag{10}$$

Similarly, the correction formula for tangential

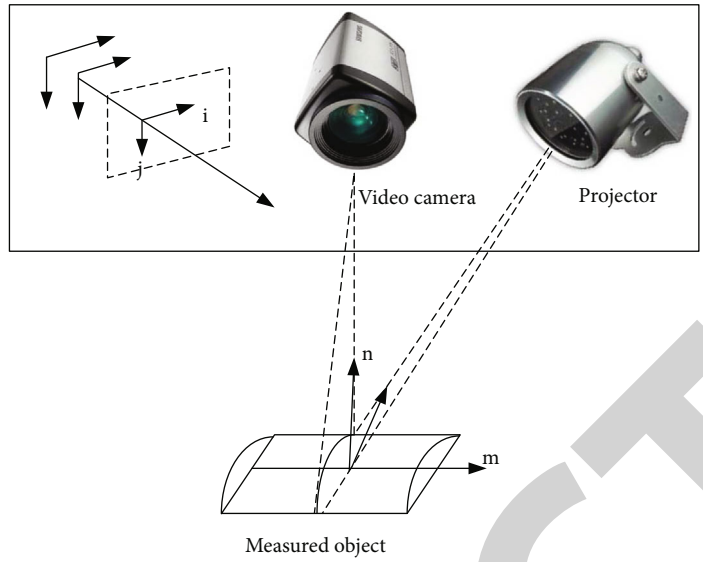

Figure 3: Sensor coordinate system (pictures from Baidu picture).

distortion can be expressed as

$$\begin{cases} m_{\text{corrected}} = m + \left[2k_1 mn + k_2\left(t^2 + 2m^2\right)\right], \\ n_{\text{corrected}} = n + \left[k_1\left(t^2 + 2n^2\right) + 2k_2 mn\right]. \end{cases} \tag{11}$$

Combining the correction formulas for radial distortion and tangential distortion, you can get a formula that can correct both distortions at the same time:

$$\begin{bmatrix} m_k \\ n_k \end{bmatrix} = \left(1 + w_1 t^2 + w_2 t^4 + w_3 t^6\right)\begin{bmatrix} m_f \\ n_f \end{bmatrix} + \begin{bmatrix} 2k_1 mn + k_2\left(t^2 + 2m^2\right) \\ k_1\left(t^2 + 2n^2\right) + 2k_2 mn \end{bmatrix}. \tag{12}$$

The coordinate transformation relationship of the plane image projected to the image sensor plane is

$$\tilde{u} = hD\tilde{U}. \tag{13}$$

$\tilde{U}$ represents the homogeneous coordinates of a point U on the plane image.

If the MON plane of the target object coordinate system is defined on the plane where the plane image is located, the following simplifications can be made:

$$\begin{bmatrix} m \\ n \\ 1 \end{bmatrix} = hQ\begin{bmatrix} t_1 & t_2 & t_3 & r \end{bmatrix}\begin{bmatrix} M \\ N \\ 0 \\ 1 \end{bmatrix} = h\begin{bmatrix} t_1 & t_2 & r \end{bmatrix}\begin{bmatrix} M \\ N \\ 1 \end{bmatrix}. \tag{14}$$

2.1.2. Harris Corner Detection Algorithm. The traditional Harris corner detection algorithm is to directly operate on the gray image, taking the maximum curvature point of the gray distribution as the corner point [17, 18]. Because of the corner points, the offset of the image window will cause a significant change in the gray level of the image. Therefore, if the processed image window k moves in any direction by a slight displacement (m, n), the gray level change of the image is $F(m, n)$, and its calculation formula is

$$F(m, n) = \sum_{i,j} k_{i,j}\left|D_{m+i,n+j} - D_{i,j}\right|^2. \tag{15}$$

Among them, D represents the gray scale of the image. Expanding it at the pixel point (i, j), it can be expressed in the form of a first-order Taylor polynomial:

$$F(m, n) = \sum_{i,j} k_{i,j}\left[m \cdot M + n \cdot N + p\left(m^2, n^2\right)\right]^2. \tag{16}$$

Among them, M and N are the first-order directional differentiation, which can be approximated by the difference in the corresponding derivation direction, and $p(m, n)$ is the infinitesimal amount of the moving distance.

$$\begin{cases} M = \dfrac{\ell D}{\ell \mathrm{m}} \approx D \otimes \begin{bmatrix} 1 & 0 & -1 \end{bmatrix}, \\ N = \dfrac{\ell D}{\ell n} \approx D \otimes \begin{bmatrix} 1 & 0 & -1 \end{bmatrix}^R. \end{cases} \tag{17}$$

In order to improve the antinoise ability, the following Gaussian template is used for noise reduction:

$$k_{i,j} = \exp\left(-\frac{i^2 + j^2}{2\rho^2}\right). \tag{18}$$

Perform convolution operations on M^2, N^2, and MN,

respectively, on Gaussian templates:

$$\begin{cases} O = M^2 \otimes k, \\ P = N^2 \otimes k, \\ Q = (MN) \otimes k. \end{cases} \tag{19}$$

Then, we have

$$F(m,n) = \sum_{i,j} k_{i,j} \left[m \cdot M + n \cdot n + p\left(m^2, n^2\right) \right]^2 = \begin{bmatrix} m & n \end{bmatrix} Q(m,n) \begin{bmatrix} m \\ n \end{bmatrix}. \tag{20}$$

Note that the extreme curvature of the image gray-level autocorrelation function $F(m,n)$ at a point can be approximated by the eigenvalues of the matrix Q. The value of the matrix Q determinant is proportional to the product of the extreme curvatures in the two orthogonal directions. Therefore, the Harris corner detector is given by

$$T(m,N) = \det\left[Q(m,n)\right] - r \cdot \mathrm{cv}^2\left[Q(m,n)\right]. \tag{21}$$

Among them, the determinant value of matrix Q is $\det[Q] = xy - z^2$, the trace of matrix Q is $\mathrm{cv}[Q] = x + y$, and the value of r is 0.03.

2.2. Sports Dance. Sports dance, formerly known as international standard dance, takes human body movements as material means and expresses people's inner feelings through energetic rhythm. It has the value of fitness, economy, entertainment, and aesthetic culture. At the same time, it is also a kind of world language and body language, used to exchange the feelings of the nation and the individual. It is irreplaceable by any form of sports or art [19].

Sports dance can be divided into modern dance and Latin dance according to its style and technical structure. It can be divided into waltz, tango, foxtrot, Vienna waltz, and trot, which originated in Germany, Argentina, the United States, and Austria, respectively. Latin dance can be divided into five types: samba, chacha, rumba, bullfight, and cowboy. They originated from Brazil, Mexico, Cuba (Latin America), Spain, and the United States. In the current stage of sports dance development, a large number of excellent standard dancers have emerged at home and abroad. At present, there are two international sports dance organizations, one is the International Sports Dance Federation (SF) and the other is the World Dance and Sports Dance Council (WDDSC). The main top competition associations in China are CBDF, China International Standard Dance Association, and CDSF China Sports Dance Federation. In 1986, the launch of "Chinese International Standard Dance" was introduced from overseas sports to Chinese sports dance. As a significant milestone in just a few decades, sports dance has developed rapidly and steadily in China, attracting more dance enthusiasts, dance academics, and research project experts [20–22].

2.3. Development Trend of Sports Dance. The excellent performance of professional athletes promotes the development of mass sports. Sports dance is a typical sport combining "health" and "beauty." Its new forms of activities, rich cultural connotation, and strong appeal are deeply loved by the masses. For example, sports dance was first introduced into Guangzhou and Shanghai in China. Under the background of the national fitness spirit, the masses began to learn sports dance, and excellent professional athletes emerged in an endless stream. As a sports competitive sport, sports dance has become the establishment of Olympic performance and Asian Games, but also led to the high attention of the General Administration of Sport of China, increasing government investment and support from more levels, greatly promoting the development of sports dance in China [23].

The increase of technical difficulty requires the improvement of athletes' ability. At present, the scoring standard of sports dance is divided into six aspects: basic technology, expressive power of music, embodiment of sports dance style, dance arrangement, impromptu performance, and competition effect. With the development of society, after decades of development, sports dance competitive sports continue to absorb fresh blood, dance and performance of the constantly changing new mode, small to a rotation angle precision, large conception and layout of the whole dance works, from standard movements to in place, difficulties and technical innovation. Professional athletes must constantly improve their work, with technical difficulties forming a unique dance style, which in the game has made brilliant achievements.

The progress of technology has put forward higher and higher requirements on the physical quality of athletes. Sports dancers compete in the competition, the rest time between each dance is only 25-35 seconds, and the rules and regulations are 1-1.5 minutes in each dance time. Each group of athletes usually participates in the competition and dances several times in a row. Professional ability will enter the semifinals; in order to highlight in many players, dance works must strengthen the technical difficulties, mainly to increase the exercise load, intensity, and time. This fully shows that only good physical fitness can meet the needs of the rapid development of dance, which is also the inevitable trend of the development of competitive sports [24].

2.4. Current Situation of Sports Dance Athletes' Training. With the rapid development of national consciousness in China, people's understanding of sports dance is also improving. More and more people like sports dance, and the competitive state is gradually improving. Although the popularity of sports dance in our country is higher and higher and more and more athletes participate in the competition, at present, the domestic players are still unable to reach the level of foreign first-class players and there are still many problems to be solved.

Sports dance is rich in connotation and integrates art, sports, music, dance, and clothing. It covers a wide range, including dance, musicology, physiology, psychology,

anatomy, mechanics, aesthetics, clothing, and sports training. It is a combination of healthy and beautiful sports mode. Through talking with coaches and athletes, I learned that the daily training of Chinese sports dance athletes includes not only technical training but also special sports training. The dance program content of special physical training includes two main elements. (1) The main features that affect special fitness include special strength, special endurance, special speed, special flexibility, and special communication. (2) Other factors that affect the strength of a particular body include control, coordination, and expression. Use a variety of traditional training methods, such as squats and push-ups, to develop the athletes' basic strengths and to train athletes with vital strengths such as sitting and sitting.

As a sports project with obvious technical and strength requirements, the effective application of special strength training measures is of great significance to classroom teaching and teacher training. Therefore, in order to better promote the realization of the teaching objectives of sports dance and promote the improvement of college students' sports dance skills and participation interest, it is necessary to increase the research on the technical characteristics and strength training measures of college sports dance. Sports dance is not only a kind of communication dance but also a kind of entertainment and fitness dance. It contains many modern civilization etiquettes. Through sports dance training, students can not only form correct body posture, make up for their own defects and deficiencies, and cultivate elegant temperament. It can also strengthen physical health, improve students' cultural quality and moral quality, lay a good foundation for sports dance training more smoothly, and improve their performance level [25].

2.5. Nutrition Overview. Nutrition refers to the whole process in which the body absorbs, digests, and utilizes nutrients in food to maintain normal physiological, biochemical, and immune functions, as well as life activities such as growth and metabolism. Nutrients refer to the beneficial substances in the diet that can maintain life and promote the growth and development of the body and health. For example, the human body needs seven kinds of nutrients: protein, fat, sugar, vitamins, minerals, dietary fiber, and water. The science of nutrition studies the body's nutrition and improvement measures of the law, that is, learning the beneficial ingredients of food intake and human laws and mechanisms and using these ingredients to maintain and improve health and to take various measures to improve human health and quality of life on this basis.

Nutrition and diet are closely related to people's daily life. People must eat a certain amount of food every day to meet the nutritional needs of the body and maintain physical activity and health.

2.6. Importance of Nutrition to Sports. Nutrition is the material basis of human life activities. In order to maintain life and health, human beings must take all kinds of necessary nutrients from food every day. Nutrition should neither be lacking nor excess, only with reasonable nutrition can the body's physiological activities be healthy and orderly.

As a special team of athletes, their diet and nutrition are crucial to their athletic ability. Trained athletic athletes have extremely high physical needs. On the other hand, athletes use a lot of energy during training, which requires adequate energy supply through food. On the other hand, improving the physical performance of athletes also requires adequate nutritional supplements to ensure athletes' athletic ability and competitiveness, and they will continue to improve during athletic training. Scientific experiments have proved that nutrients regulate the functions of organs, tissues, and cells, which is conducive to the smooth progress of exercise metabolism and intermediate reaction process, so as to improve the function of the human body during exercise and promote the recovery after exercise [26, 27]. A reasonable nutrition support sports training is the material basis for athletes to maintain good health and sports ability. Its functions are as follows:

(1) Reasonable nutrition can provide athletes with proper energy, make them have proper body weight and body fat composition, and ensure that energy materials are well utilized in sports

(2) Reasonable nutrition can make muscle fiber have sufficient energy material reserve, and the level of energy material in muscle fiber is directly related to the occurrence of sports injury. Reasonable nutrition is conducive to the prevention of sports injury

(3) Proper nutrition is helpful to the recovery after strenuous exercise. The key to the recovery of exercise ability lies in the supply and reserve of energy, the balance of body fluid and elements, and the integrity of cell membrane. The recovery of metabolic ability mainly depends on reasonable nutritional measures

(4) Reasonable nutrition can delay the occurrence of sports fatigue or reduce the degree of fatigue and promote the elimination of sports fatigue after exercise

(5) Reasonable nutrition is helpful to solve weight control and some special medical problems. For weight control events, athletes use hunger or semihunger, limiting drinking water, high temperature, sweating, increasing exercise amount, leading to sweating, and even drug abuse. But these measures can lead to problems, such as lack of nutrition, dehydration, and other metabolic disorders, such as medical problems, so you must ensure reasonable nutrition and control the weight of athletes for their own health

Therefore, reasonable nutrition is the basis and guarantee for athletes to engage in sports training. Only when nutrition is in place and combined with scientific sports training can the athletic ability and competitive level of athletes be effectively improved.

3. Establishment of Nutrient Dry Test Model

3.1. Research Object. The object of this study is the energy consumption and dietary intake of sports dancers. The team members from the school of sports dance of a sports university in Beijing are selected and meet the standards of sports dancers: (1) more than 5 years of professional training experience; (2) more than 4 times of competition experience each year. Ten dancers were recruited from the school team. A total of 18 athletes were investigated and randomly divided into two groups, 9 in the intervention group and 9 in the control group. From October 5 to November 5, they received a four-week energy intake and consumption test. During the recruitment, the subjects were briefed on the process and signed the informed consent. All subjects were healthy, without metabolic diseases, participated in training and competition normally, and had no bad habits such as smoking and drinking. Throughout the study, the subjects were asked to maintain their typical diet and physical activity behaviors. Table 1 shows the basic situation of each group of experimental subjects.

3.2. Dietary Survey. The diet survey was conducted by weighing method and 24-hour retrospective method. The duration of each survey was one week. During the investigation, the food intake of each meal was weighed (including raw food, cooked food, surplus, and food residue), and the sports drinks, snacks, and nutritional supplements were recorded. Calculate the ratio of individual foods, foods with different nutrients, calories, nutrients, proteins, and fats with the software Athlete's Dietary Nutrition Analysis and Management System developed by the General Administration of Sport of China and the accounting data of the Institute of Popular Sports Medicine, measurement of spring formation, distribution of food temperature. The results were compared with the "Dietary Guidelines for Athletes," "Adequate Recommendations for Dietary Diet for Various Athletes," "Recommended Energy and Nutrition Levels for Other Athletes' Day Food," and related healthy food indicators.

3.3. A Survey of Eating Habits. The questionnaire design of this study is based on the recommended appropriate intakes of dietary nutrients and food for Chinese athletes, dietary guidelines for athletes, and the nutritional principles promulgated by the General Administration of Sport of China in 2002. After testing, the questionnaire has high validity and reliability. The survey was conducted twice, 18 questionnaires were sent out each time, and 18 valid questionnaires were recovered. The recovery rate was 100%. In the process of the investigation, one-to-one form was adopted, and the investigators asked individual questions and investigated the athletes one by one.

3.4. Diet Intervention and Quality Control. Before the intervention, athletes choose food according to their own preferences, so as to obtain data closer to the status quo of athletes' diet. During the four-week intervention period, the athletes received nutrition basic knowledge training twice a week, one hour on Monday night and Friday night, respectively, and chefs were invited to participate. In the second week of the intervention, the amount of staple food that each athlete should eat was prescribed. During the intervention process, the researchers ate with the athletes and monitored it. All the athletes ate in the same restaurant, the training time remained the same during the intervention, and they did not participate in any competitions.

3.5. Blood Sample Processing and Preservation. In this study, blood was drawn twice, that is, the beginning and the end of the experiment, lasting for four weeks. Between 7:30 and 8:00 in the morning, the athletes prepared EDTA and ordinary vacuum vessels on an empty stomach. 5 ml of whole blood was drawn with EDTA tube, and 5 ml of blood was drawn with ordinary vacuum tube. EDTA tube was immediately used for three categories of blood cell count.

3.6. Biochemical Index Detection Method. Blood biochemical indexes were measured at 8:00 a.m. Athletes were asked to complete the test on an empty stomach. The test indexes included blood lipid metabolism index, trace element content, and blood glucose. It should be noted that when measuring blood glucose before and after the intervention, it is necessary to ensure that the training intensity of athletes is the same, and body composition is measured one day before and four weeks after dietary intervention.

3.7. Comparative Evaluation Method. Athletes' intakes will be recorded and measured by the software "Athlete's Dietary Nutrition Analysis and Management System" developed by the General Administration of Sport of China. The results are compared with "dietary guidelines and balanced diet pagoda for Chinese residents" and "recommended dietary nutrition and food needs of Chinese athletes" by the Chinese Nutrition Society, and find out the athletes' diet and nutrition habits and structural problems.

3.8. Peak Torque Test. In the morning of the test day, the athletes enter the laboratory for 10-15 minutes of full-body stretching, warm-up on the bicycle power meter, enter the isometric force measurement program, and operate in strict accordance with the instructions.

The athlete stays upright, the elbow joint movement axis is aligned with the axis rotation axis, the abdomen and chest are fixed with nylon belts, and the upper arm is adjusted with another belt. The maximum bending times are 65°/s and 175°/s, respectively. A total of 3 times, with an interval of 35 seconds, CV% is less than 15%, and higher torque is expressed in N.

The athlete sits upright on the seat, the legs are in a natural state, the dominant leg is perpendicular to the frontal plane, and the joint movement interface of the knee joint is consistent with the rotation axis of the connecting rod. At 3 cm, the lower edge of the binding attachment of the movable connecting rod coincides with the upper edge of the inner tread, and the peak torque of knee joint flexion and extension is 65°/s and 175°/s, respectively. Four times, the CV% was less than 15% in 35 s interval.

Table 1: List of sports dancers.

Number	Project	Gender	Height	Weight	Level	Training years
1	Modern	Female	168	49	Master	5
2	Modern	Male	181	72	Master	6
3	Waltz	Female	170	51	Master	6
4	Waltz	Male	184	74	Lv1	4
5	Waltz	Male	182	71	Lv1	5
6	Latin	Female	166	46	Lv1	4
7	Latin	Male	181	70	International master	8
8	Tango	Female	165	45	International master	9
9	Tango	Male	180	69	Lv1	5

3.9. Anaerobic Work Test. The subjects prepared on the bicycle power meter for 10-15 minutes and switched to Monark 894E anaerobic bicycle after heart rate reached 148 bpm. The system automatically calculates the resistance load. The subjects step on the pedal at the fastest speed, adjust to the specified resistance load within 3-4 seconds, and start timing for 35 seconds. The system automatically records 35 s average power, 10 s maximum output power, and 10 s minimum output power and turns per minute.

The fatigue index is calculated as follows:

$$\text{Fatigue index} = \frac{\text{Maximum power (5 seconds)} - \text{Minimum power (5 seconds)}}{\text{Maximum power (5 seconds)}} \times 100\%. \quad (22)$$

3.10. Mathematical Statistics. SPSS is used to define statistics in terms of definition ± standard deviation (). Integration analysis was performed on the data on healthy eating information, eating attitudes, and nutritional behaviors in the KAP questionnaire. Calculate equity ratio, $P < 0.05$ is statistically significant, and $P < 0.01$ is statistically significant. A sample t-test and a two-way analysis of variance were used for pre- and postimplantation and health nutrition education in the first and fourth weeks. $*$ means $P < 0.05$ is statistically significant, and $**$ means $P < 0.01$, which is statistically significant.

4. Test Results and Analysis of Various Indexes before and after Nutrition Intervention

4.1. Knowledge about Nutritious Diets. It can be seen from Table 2 that 10 of the 18 athletes answered correctly about the nutrients contained in various grains, and 8 of them answered incorrectly, accounting for 44.4%. The reason may be that the dancers are biased. They pay attention to the intake of protein and ignore the carbohydrates rich in other grains. Regarding the cognition of adults' daily intake of water, only 7 people answered correctly, accounting for 38.9%, and 11 people answered incorrectly. As for the correct method of timely rehydration after training, 61.1% of the athletes answered correctly. In terms of dietary combination, only 44.4% of the athletes knew the correct dietary combination.

4.2. Average Energy Intake of Athletes. Figure 4 shows that most athletes' daily intake of protein and fat has reached the recommended standard for appropriate intake. Among them, the protein intake of two athletes did not meet the standard, and the fat intake of all athletes was equal. It meets the standard, but the fat intake of most athletes exceeds the standard value by 1-9 times. In terms of carbohydrate diets, three athletes did not meet the standard. Carbohydrates play a major role in physical activity. Because dance is a very challenging exercise, eating enough sugar before training can cause athlete fatigue and affect the results of training. Therefore, athletes should eat more sugary foods during training.

4.3. Changes in Vitamin Intake. As shown in Table 3, the average intake of vitamin A, vitamin B2, vitamin PP, and vitamin E of dancers has reached the recommended intake standard of Chinese athletes, and the average intake of vitamin A, vitamin PP, and vitamin E all far exceeds the recommended value; the intake of vitamin A is twice the recommended value, the intake of vitamin PP is three times the recommended value, and vitamin E intake even reached about 9 times the recommended value. The intake of vitamin B1 is close to the recommended value, and the difference is not particularly large, while the average intake of vitamin C is about 30 mg lower than the recommended value, which is obviously insufficient.

4.4. Changes of Blood Biochemical Indexes. According to the analysis results in Figure 5, the blood biochemical indexes, urea, hemoglobin, red blood cell, and red blood cell

Table 2: Sports dance athletes' awareness of other nutritional knowledge.

Investigation	Correct number	Percentage	Number of errors	Percentage
Awareness of cereal nutrients	10	55.6%	8	44.4%
Cognition of normal daily intake of water in adults	7	38.9%	11	61.1%
Commonly used rehydration methods after training	11	61.1%	7	38.9%
Food awareness that can prevent iron deficiency anemia	9	50%	9	50%
Food awareness that can prevent calcium deficiency	13	72.2%	5	27.8%
Ways to match the diet	8	44.4%	10	55.6%

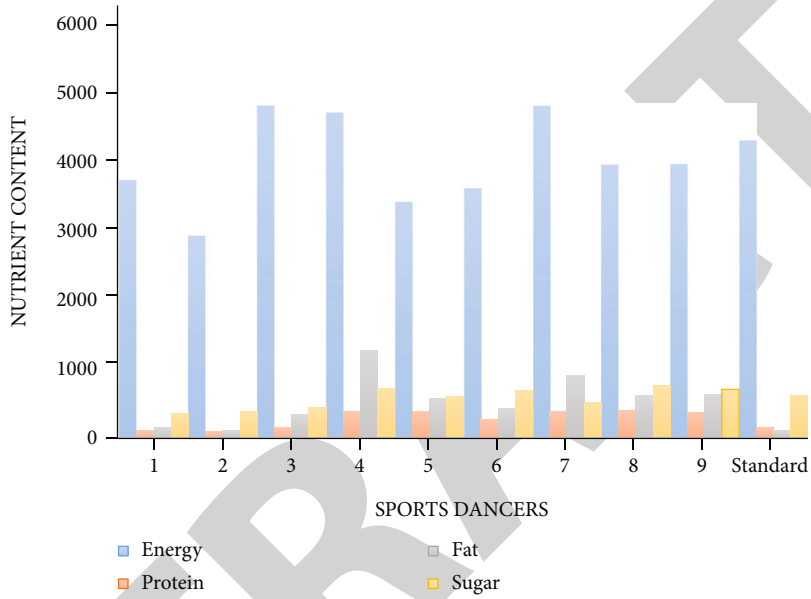

Figure 4: Average intake of energy substances by athletes.

Table 3: Comparison of athlete's vitamin intake and recommended value.

Items	Vitamin A	Vitamin B1	Vitamin B2	Vitamin PP	Vitamin C	Vitamin E
Average intake	3196.4 ± 1028.5	2.5 ± 1.9	2.1 ± 1.4	56.4 ± 14.3	109.8 ± 29.7	259.5 ± 79.4
Recommended value	1480.0	3.1~5.2	2.1~2.6	19.0	135.0	28.0
Difference	1734.4 ± 1023.3	−2.7 ± 1.9	−0.5 ± 1.4	37.4 ± 14.3	−25.2 ± 29.7	231.5 ± 79.4
T	6.983	-8.92	0.892	11.984	-4.763	14.787
P	0	0	0.298	0	0	0

overstock index of athletes in the intervention group and the control group. By paired sample t-test, $P > 0.05$, the difference was not statistically significant. The change of blood urea index in the control group was measured by paired sample t-test, $P < 0.05$; the difference was statistically significant. The changes of hemoglobin, red blood cell, and red blood cell backlog index were analyzed by paired sample t-test, $P > 0.05$, and the difference was not statistically significant. In terms of urea, the intervention group was 6.05 ± 0.41 lower than the control group 6.68 ± 1.24, indicating that under the same load training, the recovery effect of the intervention group was slightly better than that of the control group. From a hemoglobin point of view, the hemoglobin content of the intervention group was slightly higher than that of male athletes in the control group adapting to body fat levels. Compared with the control group, the hemoglobin level of the athletes in the intervention group changes slightly, and the hemoglobin level of each male athlete has a significant decrease, and the body cannot withstand the intensity of the training load. Before mixing foods, immediately remind them to increase the intake of foods and add blood nutrients if necessary.

4.5. Changes of Body Composition Indexes. As shown in Figure 6, the body composition indexes of the intervention group and the control group were observed, and the changes

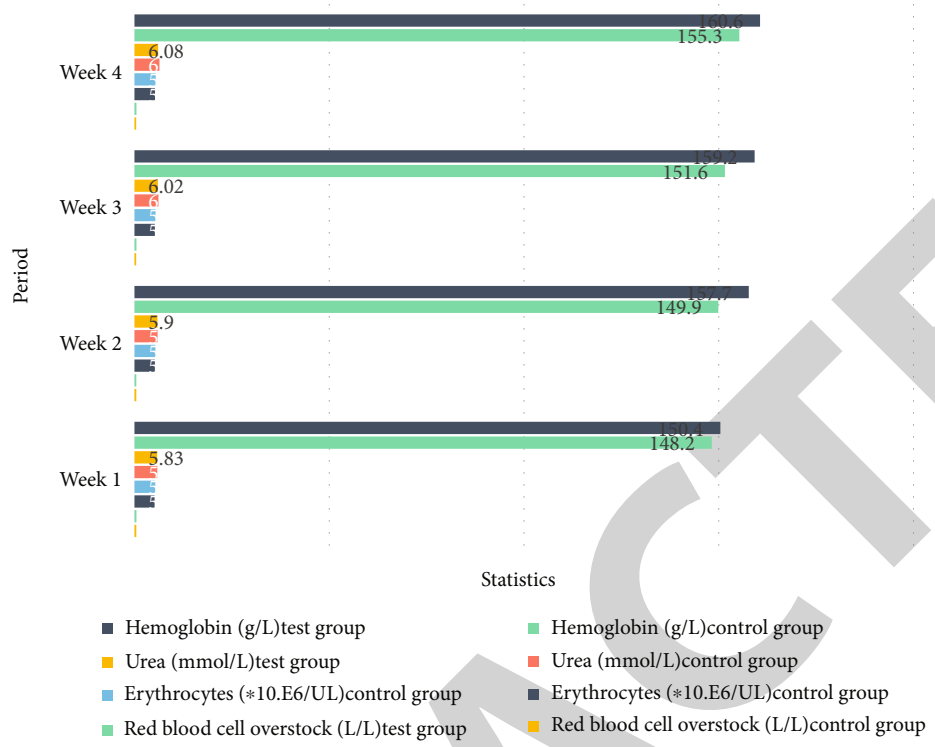

Figure 5: Statistical chart of changes in blood biochemical indexes of two groups of athletes after intervention.

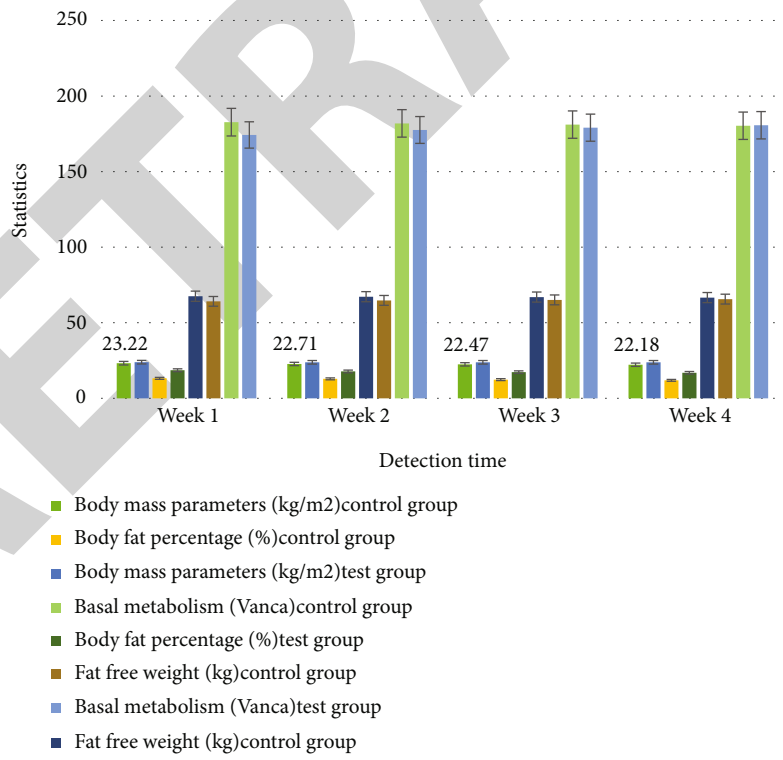

Figure 6: Statistical chart of body composition changes of two groups of athletes after intervention.

of body mass parameters, body fat percentage, defatted weight, and basic metabolism were detected by paired sample t test, $P > 0.05$; the difference was not statistically significant. In terms of weight loss, the indexes of the intervention group in the fourth week were higher than those in the first week, while those in the control group were lower than those

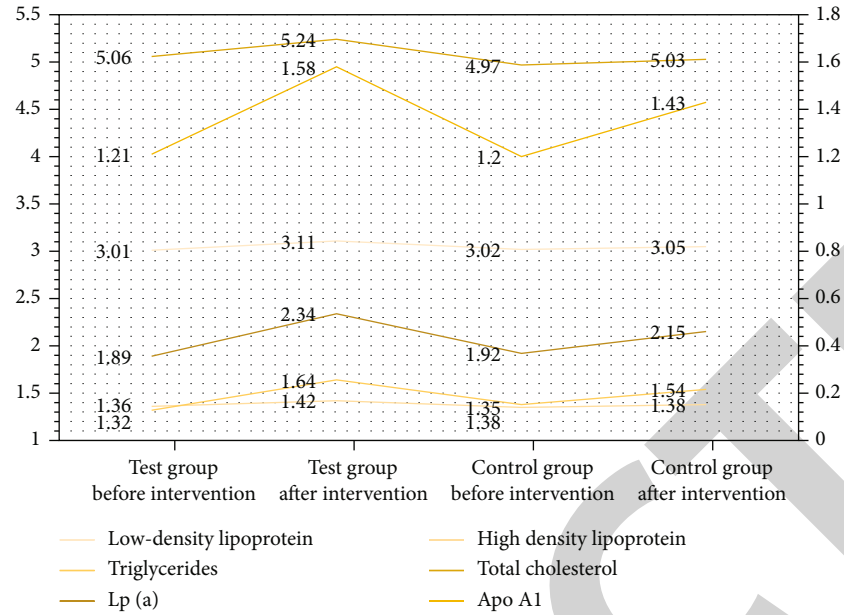

Figure 7: Analysis of the changes of lipid metabolism-related indexes in the intervention group after the intervention.

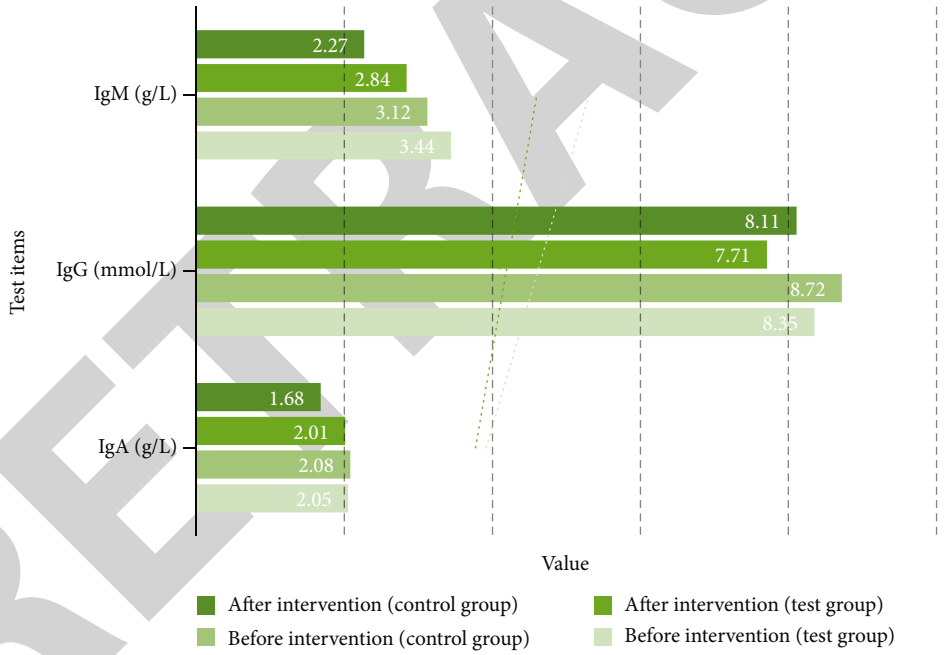

Figure 8: Statistical chart of changes of immunoglobulin in two groups of athletes after intervention.

in the first week, indicating that the weight of the intervention group was improved after four weeks of intervention. Although the intervention effect is not obvious, considering the short intervention time, the late intervention time can be extended. In terms of body fat percentage, the decrease of body fat percentage in the intervention group was greater than that in the control group; although there was no significant difference, the intervention was effective. From a hemoglobin point of view, the hemoglobin content of the intervention group was slightly higher than that of male athletes in the control group adapting to body fat levels. Compared with the control group, the hemoglobin level of the athletes in the intervention group changes slightly, the hemoglobin level of each male athlete has a significant decrease, and the body cannot withstand the intensity of the training load. Before mixing foods, immediately remind them to increase the intake of foods and add blood nutrients if necessary.

4.6. Changes of Lipid Metabolism-Related Indexes. According to the statistical results in Figure 7, the related indexes of lipid metabolism were in the normal range before the intervention, the total cholesterol was slightly higher than the recommended value, and the low-density lipoprotein was

Table 4: Balance ability of two groups of sports dancers after nutritional intervention.

	Groups	Jumping, turning, or tossing	60-second push-ups	Hold legs and balance the control for 10 seconds each	Special balance ability total score
Before intervention	Test	26.87 ± 1.12	34.3 ± 1.35	14.99 ± 0.89	78.57 ± 1.87
	Control	26.54 ± 1.45	33.9 ± 1.87	14.75 ± 0.66	77.12 ± 1.53
After intervention	Test	33.21 ± 0.53	38.2 ± 0.98	18.7 ± 0.83	88.47 ± 0.95
	Control	31.62 ± 0.68	34.1 ± 1.21	16.87 ± 0.92	82.87 ± 1.64
P	Test	0	0.008	0	0
	Control	0.001	0.682	0.051	0.001

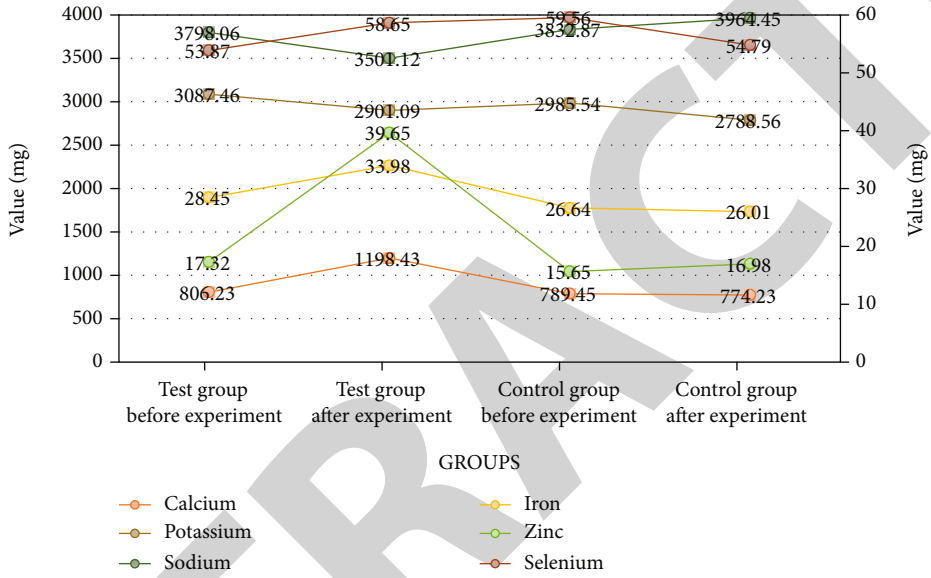

Figure 9: Changes in mineral intake.

slightly higher than the recommended value. After the intervention, there were some changes in various indicators; total cholesterol decreased to a certain extent, low-density lipoprotein decreased to a certain extent, the difference was statistically significant, diglyceride also significantly decreased, and HDL increased significantly.

4.7. Changes of Immunoglobulin. It can be seen from Figure 8 that during the whole observation period, the immunoglobulin IgA and IgG indexes of the intervention group and the control group decreased compared with those before the nutritional intervention, the difference was statistically significant ($P < 0.05$), and the IgM also decreased compared with that before the nutritional intervention, but there was no significant difference. There was no significant difference between the intervention group and the control group ($P < 0.05$). It shows that nutrition intervention can improve the immunity of athletes in high-intensity training, and immunoglobulin is the standard of judgment. The control group without nutrition intervention recovered slowly, which would affect the athletic ability of athletes.

4.8. Balance Ability Analysis. As shown in Table 4, after nutritional intervention, the balance ability of 18 athletes has been strengthened in all aspects, and the indicators of specific balance ability have also been improved to varying degrees. In the special training of 60-second push-ups, the *P* value of the control group was $0.682 > 0.05$, indicating that there was no significant difference before, and the athletes of the control group did not have a significant improvement in this aspect of athletic ability. In the balance training of athletes holding their legs for 10 seconds, $P = 0.051 > 0.05$; there is no significant difference, indicating that nutritional intervention cannot improve the athlete's specific balance ability. In general, nutritional interventions have a positive and responsible effect on the specific skills of the control team players, but they cannot be completely improved. For athletes in the experimental team, the *P* values of the three training sessions are all less than 0.05, indicating that impactful dietary interventions have a significant impact on athletes in the experimental group and have a significant impact on athletes' development of a certain balance.

4.9. Changes in Mineral Intake. Figure 9 shows the changes in the mineral content of the two experiments before and after the experiment. Comparing the experimental group before and after the experiment, it can be seen that the intake of mineral calcium and zinc is significantly increased, and there is a significant difference. Before the experiment,

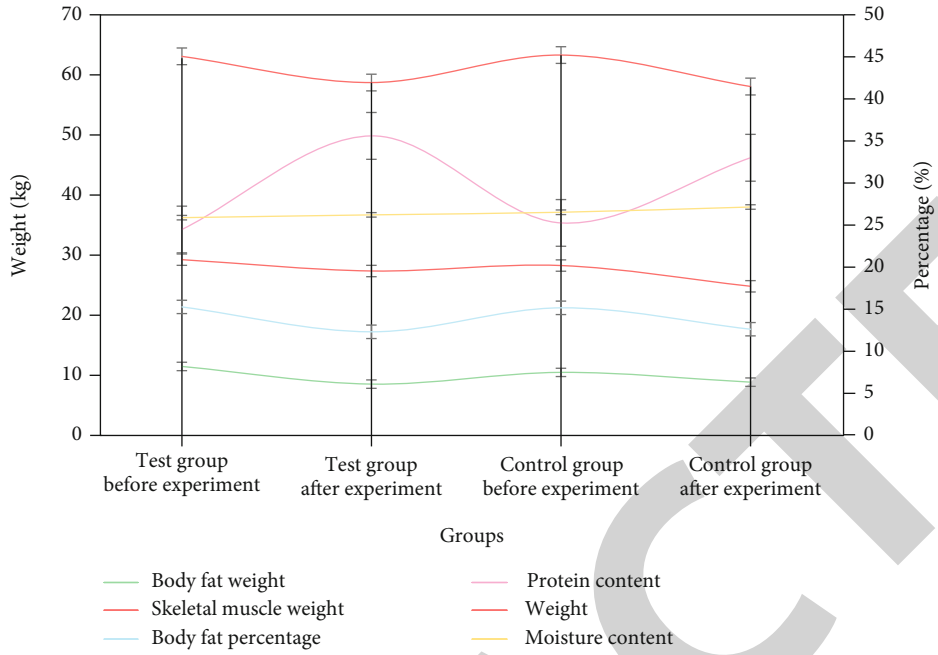

Figure 10: Body composition changes.

the calcium content of the experimental group was 806.23 mg, and after the experiment, the calcium content increased to 1198.43 mg. However, there was no significant difference in various mineral indicators before and after the experiment in the control group. Except for the slight increase in sodium content, there was no significant difference in other elements.

4.10. Body Composition Changes. Figure 10 shows the body composition change data of the experimental group and the control group before and after the experiment. It can be seen that for the athletes who received nutritional diet intervention, the weight of the two groups of experimental subjects decreased significantly during the experiment, and there was a significant difference. At the same time, the percentage of body fat has also decreased significantly, and there is a significant difference. The body fat weight of the two groups of experimental subjects decreased slightly, and there was no significant difference. Comparing the study group and the control group, it can be seen that body fat content and protein content affect nutritional activities. The body fat content of the experimental group was lower than that of the control group, and the protein content was higher than that of the control group.

5. Conclusions

Sports dance is a medium- and high-intensity competitive sport, which has high requirements for athletes' physical fitness. It needs to meet the high-intensity training load and takes into account the beauty of the body. However, through the investigation, it is found that there are many unreasonable phenomena in the dietary nutrition of sports dance athletes in China, which will have a certain impact on the sports ability of athletes and threaten the health and safety of athletes. However, the research on this aspect in China is still in the blank. The research on the relationship between nutrition diet and sports ability of sports dance athletes proposed in this paper just makes up for the deficiency in this aspect. The core of this study is to establish a nutrition dry test model, which uses questionnaire survey to conduct in-depth investigation on athletes' diet, and through the way of group study establish experimental comparison. In order to ensure the effectiveness of the experiment, the quality monitoring measures are formulated, and the whole process of data acquisition is tracked and investigated. In the third chapter, the specific operation steps are given. At the end of this paper, we tested the indexes of the two groups of athletes before and after the nutrition intervention. The analysis of the test results shows that the overall energy intake of sports dance athletes is in a state of negative balance, the energy consumption is too much in the working day, and the supplement is less, which often makes the body overdraft. And in the rest day, the way of eating did not change so that there is formation of bad eating habits. After the nutritional intervention, the test results of the two groups were significantly different. The intervention group showed stronger recovery ability and immunity, which effectively improved the exercise ability.

Data Availability

No data were used to support this study.

Conflicts of Interest

There are no potential competing interests in our paper.

Authors' Contributions

All authors have seen the manuscript and approved to submit to your journal.

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