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Biomechanics mechanism of sports promoting psychological benefits based on blockchain and intelligent network security

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Abstract: The application of intelligent network technology has realized the transformation of people's production and lifestyle, and also promoted the transformation of physical education teaching mode. At present, the application of intelligence in the field of sports is becoming more and more powerful. Using the advanced methods and technologies of intelligent network security, this paper aimed to realize the optimization of sports under the security of intelligent network for psychological benefits and study the sports factors that promote psychological benefits. This paper proposed a target tracking algorithm to guide the integration of intelligent network and sports that promote psychological benefits. Using the target tracking in intelligent network security for reference, the biological mechanism of movement promoting psychological benefits was studied to achieve the integration between the two. In the expert evaluation results of the research on sports and psychological benefits of adolescents, creativity and subjective well-being scored the highest and the lowest, with 97.2 and 93.6 points respectively. Therefore, it is very important to use intelligent network security to study the biological mechanism of sports promoting psychological benefits.

Keywords: psychological benefits; movement promotion; smart networks; cyber security

1. Introduction

The World Health Organization defines health as not only the absence of any disease physically, but also being in good and best condition mentally and socially. From this point, it can be seen that health is not only a person's body, but also a person's mental health. Adolescence is a critical period from childhood to adulthood. During this period, great changes have taken place in the body and spirit of adolescents. Therefore, it is necessary to carry out in-depth discussion on the psychological health of adolescents, which is of great significance to families, schools and society. With the change of the living standard and lifestyle of the Chinese people, especially the popularization of sports, the scope of sports scientific research is also gradually expanding, and sports activities are increasingly important for the physical and mental health of teenagers. Therefore, strengthening the impact of college sports activities on the psychological health of teenagers is a major issue in the current reform of college physical education in China. Therefore, this paper selects traditional and non-traditional physical education schools to conduct psychological surveys to understand the psychological effects of current physical training on students. On this basis, combined with the physical development characteristics of teenagers and the principle of sports fitness, a set of sports plan based on traditional sports is designed, and its impact on psychological effects is discussed. Corresponding evaluation indicators are formulated to provide reference for scientific fitness activities of teenagers.

This article aims to explore the impact of intelligent network security and youth sports on psychological benefits. By constructing a psychological benefit evaluation system, we quantify and analyze the promotion effect of sports on youth mental health. The research adopts questionnaire survey and data analysis methods. The steps include designing a sports psychological benefit assessment tool for youth groups, collecting feedback from participants from different regions, and applying statistical analysis methods for in-depth interpretation of the data. The results show that sports in a smart network security environment significantly improve the performance of adolescents in mental health, emotional management and social adaptability, verifying the important role of sports in promoting psychological benefits.

Article contributions:

- (1) This article is the first to design a systematic psychological benefit evaluation tool for the combination of youth sports and intelligent network security. The tool covers traditional mental health indicators and also incorporates assessment dimensions related to intelligent cybersecurity, providing a new framework for subsequent research.
- (2) This article explores how the intelligent network security environment affects adolescents' sports participation and their psychological benefits through empirical research, fills the gap in the existing literature on the relationship between intelligent network security and adolescent sports psychological benefits, and reveals the network environment Potential role in mental health promotion during physical activity.
- (3) This article puts forward specific suggestions for the promotion of youth sports, emphasizing that strengthening the organization and support of sports activities in the context of intelligent network security will help improve the mental health of teenagers, and also provide practical guidance for the formulation of relevant policies. The empirical evidence points out the direction for future research and practice.

2. Related work

Liu Jian studied the influence of physical exercise on psychological emotion and psychological benefits by means of questionnaires and referring to the laws of the elderly [1]. McIntosh Jacqueline adopted a multidisciplinary perspective, reviewed the requirements and potential of more inclusive landscape design, and recognized different rehabilitation models [2]. Tikac Gulsum's research aimed to examine the impact of regular exercise on the psychological benefits, self-esteem and physical awareness of healthy adults [3]. However, due to the lack of data sources, the above research is only at the theoretical stage and has no practical significance.

The use of intelligent network security technology can help promote the research between sports and psychological benefits. Among them, Belcher Britni R reviewed the relationship between sports and aerobic fitness and mental health and adolescent mental health problems [4]. Hayes Sandra C aimed to use the current scientific evidence, clinical experience and sports science principles to update the

position statement on cancer-specific sports prescription [5]. However, due to the definition and limitation of thinking, the two cannot be highly integrated and give full play to their advantages.

With the development of intelligent network security technology, the collection, transmission and analysis of sports activity data have become more efficient and secure. Smart devices such as wearable sensors and sports trackers can collect athletes' health and performance data in real time, including heart rate, exercise intensity and fatigue level. The data is transmitted via AES and TLS to ensure that the athlete's personal information and health data are not leaked or tampered with during network transmission. After the data is securely transmitted to the cloud, machine learning algorithms identify athletes' performance patterns and health trends based on historical data and real-time feedback, optimize training plans and recovery strategies, and help athletes improve performance and reduce the risk of injury. In this way, the study shows that intelligent network security technology improves the training effect of athletes and enhances the monitoring and management of their health status.

Since China's reform and opening up, with the rapid development of the economy, competitive sports have also developed rapidly, but the physical quality of the Chinese people, especially the physical quality of teenagers, has been declining year by year. This situation cannot but attract people's attention. In view of the current situation of the continuous decline in the psychological quality of Chinese teenagers and the increasingly prominent mental health problems, as well as the physical exercise plan of teenagers, a sports intervention experiment was carried out to study its impact on the psychological benefits of teenagers [6,7]. Nevill, Alan M and other scholars evaluated the physical fitness of young people in Brazil from 2005 to 2022 and found that the physical fitness of children and adolescents was declining and asymmetrically diverging[8]. Hanifah, Laily, Delisle Nystrom and other scholars studied the annual physical activities of children and adolescents in Indonesia and Sweden. The results showed that physical activity decreased with age and physical fitness was gradually declining [9,10]. The above scholars studied the physical health levels of different countries and found that the decline in physical fitness of adolescents is a common problem that needs to be taken seriously.

In recent years, there has been an increasing number of studies on the psychological benefits of smart cybersecurity and sports, revealing the importance of a sense of security in a digital environment to the psychological state of athletes. Smart cybersecurity can positively affect athletes' mental health by protecting the privacy and security of their personal data and enhancing their sense of trust [11,12]. Data breaches often lead to increased anxiety and stress for athletes, while strong cybersecurity measures can help reduce this risk and improve athletes' self-confidence and psychological resilience [13]. Smart cybersecurity is a technical requirement in sports management and an important factor in promoting athletes' mental health.

3. Evaluation on the promotion of psychological benefits by the movement of intelligent network security

3.1. Evaluation on target tracking motion in intelligent network security

In the field of sports, the application scenarios of intelligent network security technology are extremely wide, including smart devices. Wearable sensors, as a type of smart device, can collect athletes' physiological data in real time, such as heart rate, body temperature and movement trajectory. After data collection, it is transmitted to the cloud through a secure and encrypted network to ensure the confidentiality and integrity of the information. The data analysis platform then uses advanced algorithms to conduct real-time analysis to evaluate athletes' performance, health status and training effects, and provide personalized training suggestions and health management plans.

Target tracking is to detect and analyze the target in the video, and obtain the shape, action and other information of the target, so as to realize the automatic tracking of the target. In the video surveillance system, moving objects are usually frame sequences with obvious differences from the background motion type, so the target and background must be distinguished during the tracking process. When the camera is still, it is easy to distinguish the background from the background because the background is usually static, or because the change of light causes the change of gray level. In this case, a frame sequence with non-zero motion vector can be regarded as a moving object. **Figure 1** shows the overall flow of camera tracking when still and moving.

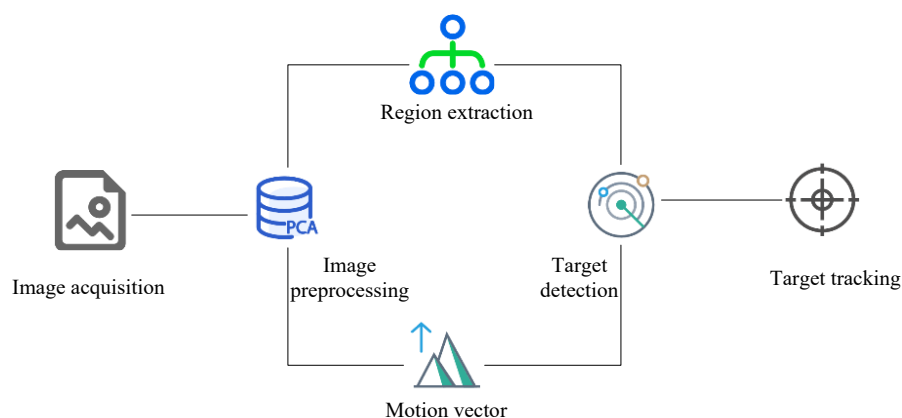


Figure 1. Target tracking process when the camera is still and moving.

As can be seen from **Figure 1**, the tracking of moving objects is more complex in the case of camera movement. Because all objects in the frame are moving and the motion vectors of each object are different, it is difficult to distinguish which is the background and which is moving. Generally, the background usually occupies a large area in the picture. Therefore, this paper assumes that in a series of pictures, all objects have the same movement mode, and they occupy the largest area, thus forming the background of a picture. At this point, the object to be tracked in this paper is different from other objects in this background set, and their movement mode is completely different. When the target moves, the camera starts to track, and

the initial difference between the target and the background can be obtained before the camera starts to move.

The image preprocessing module mainly includes image noise processing and color space transformation. Because the noise in the image has a great impact on the tracking of moving objects, if it can not be effectively removed, it would not only seriously affect the accuracy of background estimation, but also have a great impact on other detection procedures. The noise that has not been eliminated would lead to image matching error and detection and tracking error. Therefore, before moving objects are detected, they must be filtered to eliminate the impact of noise. At present, there are many noise reduction methods.

This paper proposes a new color template: Hue, Saturation and Value (HSV) color system. It can effectively distinguish different colors, so that the image can be better processed. In practical applications, this paper often converts the traditional color space into HSV color space. The region of interest extraction module is mainly used for rough segmentation of moving objects in the image, so as to separate the regions that may have moving objects from the complex background, thus achieving accurate detection and tracking operations.

Smart network security technology includes key components such as sensors, wearable devices, data analysis software, and network security protocols, which work together to support sports activities. Sensors are the core components in the equipment, mainly used to collect athletes' physiological data in real time, such as heart rate, acceleration, position, temperature, etc. For wearable devices such as smart bracelets, smart shoes, and swimming goggles, sensors are integrated to record and store data during exercise. Data analysis software uses cloud computing and machine learning technology to analyze the collected data in real time, generate feedback and reports, and help coaches and athletes optimize training plans. Network security protocols include TLS and AES encryption to prevent data leakage and tampering and protect athletes' privacy. The flowchart of key components working together to support sports activities is shown in **Figure 2**.

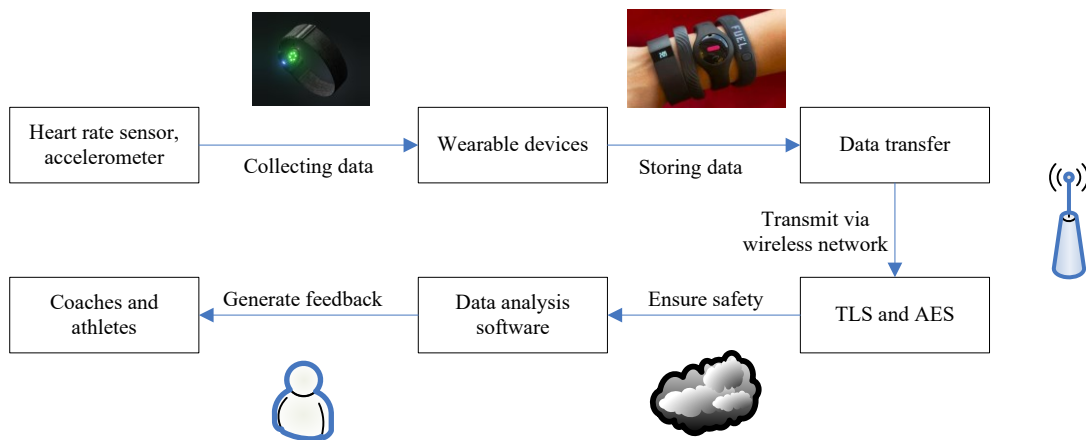


Figure 2. Flowchart of key components working together to support sports activities.

In **Figure 2**, the study first uses sensors to collect athletes' physiological data in real time and transmits it to wearable devices, which are responsible for storing this data and transmitting it through wireless networks. In the data transmission process, network security protocols, TLS and AES encryption are used to ensure that the data is not intercepted or tampered with during transmission, and combined with data analysis software to receive and analyze data in the cloud to generate feedback on athlete performance. Finally, the analysis results are fed back to coaches and athletes to help them optimize training and improve performance.

3.2. Intelligent security detection model in moving target tracking

In sports, it is crucial to protect user privacy and data security when using smart network security technologies. To ensure that the sensitive data of athletes and users is not leaked, the following measures can be taken:

- (1) When transmitting athletes' physiological data between smart devices and servers, use encryption algorithms such as AES to ensure that the data will not be intercepted or tampered with during transmission. End-to-end encryption (E2EE) technology is used during transmission to ensure that only authorized parties can decrypt and read data, and the transport layer security protocol (TLS) is used to further ensure the security of data during network transmission and prevent man-in-the-middle attacks.
- (2) In order to protect the identity privacy of athletes, data can be anonymized before storage and analysis. Sensitive information is desensitized so that it cannot be directly associated with an individual. At the same time, differential privacy technology is used to add noise when analyzing data to ensure the privacy of data. Even if a third party obtains the data, the individual identity cannot be identified.
- (3) It is crucial to comply with global or regional privacy regulations during the collection, storage and use of data. The EU's General Data Protection Regulation (GDPR) imposes strict requirements on user data protection and privacy rights, requiring data collectors to obtain explicit consent from users and ensure that users have the right to access and delete their personal data. In the United States, the use of sports-related data must follow the requirements of the Health Insurance Portability and Accountability Act (HIPAA) to ensure that athletes' health data is properly protected.

In intrusion detection, there are two types of intrusion: one is known attack type, and the other is unknown. For the former, error detection is usually used. In the latter case, an anomaly detection method is generally used. In general, misuse detection does not require intelligent technology. The detection of anomalies often requires a high degree of intelligence. This paper introduces several new methods of applying intelligent agent technology in Information Disclosure Statement (IDS). At present, most intrusion detection systems developed worldwide are host-based. The system uses a single host to collect audit data, uses a single module for data analysis, collects data through various components in the network monitoring host, and then sends the data to the central processing unit for analysis between processing units. This method is only applicable to a single target and a single detection technology,

which has great defects. When the central processing unit fails, the entire network system would lose security. A single host processing all the data would limit the size of the network, and the CPU (Central Processing Unit) cannot process all the data. It is also difficult to configure. Modifying and adding functions are often complex and often require a reboot. To solve the above problems, intelligent agent technology can be introduced into IDS (as shown in **Figure 3**).

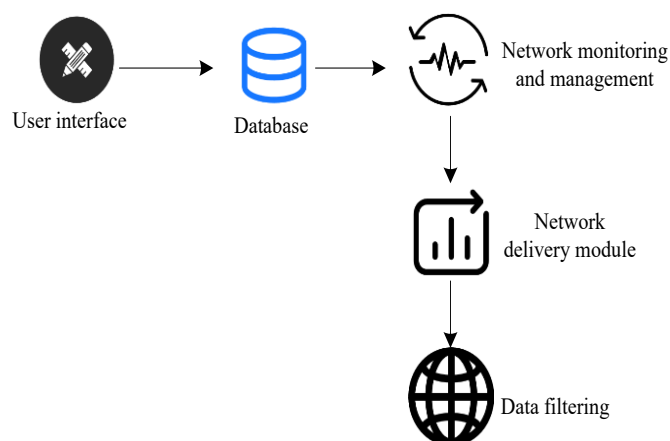


Figure 3. Agent-based security monitoring system.

Agent is a software agent with specific security monitoring and human intrusion detection functions. It can work with other agents, and also receive commands from other higher-level entities, such as start, stop, and change of operation parameters. Agents can perform some simple, specific or complex operations. Agent is the core of the whole IDS, and its efficiency and performance directly affect the overall value of IDS.

Therefore, the cooperation between Agent technology and Agent is a difficult and core issue in the Agent-based IDS system. Agent technology mainly includes host detection agent, network detection agent, communication agent, response agent and console. All agents have their own characteristics and processing capabilities, and can be configured and run freely.

In this article, the combination of blockchain technology and intelligent network security provides an innovative management solution for sports activities. The decentralized nature of blockchain ensures the security and privacy of athlete data, and updates training and competition data in real time through smart contracts to ensure that data cannot be tampered with and is transparent. At the same time, intelligent network security technology implements multi-level protection, encrypted communications and identity authentication to prevent data leakage. In practice, athletes collect physiological data through wearable devices and upload them to the blockchain in encrypted form, so that relevant parties can make scientific decisions based on reliable data. The combination of blockchain technology and intelligent network security technology improves management efficiency, enhances athletes' sense of security and trust, and promotes digital transformation in the sports field.

3.3. Prevention and monitoring methods under safety monitoring system

3.3.1. Using a dedicated firewall to build a dedicated intrusion detection system

Using a special firewall can effectively shield a large amount of junk information, and also effectively prevent spam and spam intrusion in the network. IDS needs powerful computing power, storage power and network processing power. For the offensive scanning based on Disk Operating System (DOS), the most commonly used method is to use high-performance detection instruments and software. For small and medium-sized networks, special computers should be used to build the system as much as possible.

3.3.2. Building a distributed intrusion detection system

With the rapid development of computers, network scanning technology and other network attack methods are becoming increasingly dispersed. At the same time, the distributed IDS technology has also been further developed and improved. Distributed intrusion detection includes both distributed intrusion detection and distributed and multi-agent distributed IDS.

At the same time, this is consistent with the previously proposed method of building an intrusion detection system, because distributed IDS does not distribute all functions equally to each node, but is distributed to each node in the network, and the integrated data processing needs to be carried out on a special host.

3.3.3. Improving the security of the network security system itself

In general, the security monitoring system of network security is a part of the whole system and an important link in the whole security chain. Once the firewall and intrusion detection system are broken, the whole system would be exposed. The less aggressive port scanning would not cause serious damage to the network security protection and monitoring system, but if the aggressive part, such as DOS, is added to the network security system, it would cause huge damage. In order to ensure the security system such as firewall intrusion detection, special protocols, encryption and other methods can be used to ensure their own security.

3.3.4. Source tracking technology

In a broad sense, network scanning can also be regarded as intrusion. If the scanning source can be determined, network intrusion can be effectively suppressed. Most of the previously adopted methods require the installation of specific software on the router and the strong cooperation between Internet Service Providers (ISPs). Due to the heterogeneity of the network, this method has little effect. At present, tracking technology that does not rely on network service providers is being developed. For a single intruder to scan on a single host, even if the Internet Protocol (IP) address is camouflaged, it can find its real location through certain methods. This would undoubtedly greatly deter network intruders and effectively ensure network security.

3.3.5. Intelligent intrusion detection technology

By introducing the method into intrusion detection and replacing the simple matching strategy with intelligent reasoning technology, people can find potential links in a large number of data packets and reduce the rate of false positives. This is also one of the development directions of current intrusion detection systems.

3.4. Differential image method under target tracking

The image difference method is mainly used to distinguish the difference between two images, so as to analyze the motion of moving objects. The method is to add (difference) the two images one by one, and then detect the moving object from the subtracted difference image. This method has the advantages of less computation, easy software implementation and good practical effect, and is suitable for detecting people and large objects in image sequences. In video surveillance, the commonly used detection methods include two methods based on neighborhood frame difference and the current frame and background difference.

3.4.1. Background difference method

This method uses the image obtained after the difference between the background image and the current frame to detect moving objects, mainly involving the estimation of the background image and the target detection using the difference image. It is assumed that $d(x, y)$ represents the image after the difference; $f(x, y)$ represents the current frame image, and $b(x, y)$ represents the background image. The calculation formula of the difference method is expressed as follows:

$$d(x, y) = f(x, y) - b(x, y) \quad (1)$$

The difference method has the characteristics of accurate position and fast speed. Because this method only needs to collect the current image, and subtract the existing frame image and the known background frame, the resulting difference image only contains the moving target in the current frame. Therefore, the position of the detection object is accurate. In addition, this method is not suitable when the camera is moving.

3.4.2. Continuous frame difference method

The continuous frame difference method, also known as the adjacent frame difference method, is the most common gray level segmentation algorithm for moving objects. By subtracting the video images of two adjacent frames, a differential image is obtained, and then the motion change region in the differential image is used. The gray level information of the region is used to restore the original moving object. $f_{k+1}(x, y)$ is the previous frame of the current frame image, so the calculation formula of these two differentials can be expressed as:

$$d(x, y) = f_{k+1}(x, y) - f_k(x, y) \quad (2)$$

The advantage of continuous image difference method is that it is only sensitive to moving objects, and because the interval between two images is very short, the difference image would not be affected by light, and can be well detected. Its disadvantage is that the position of the detected object is inaccurate, and its outer edge rectangle extends along the moving direction. This is because the differential image obtained by subtracting two adjacent consecutive pictures contains not only the moving object, but also the change of the background area caused by the moving of the object in the front and rear two pictures. In other words, the detected object is much larger than the real object.

3.4.3. Extraction of target motion trajectory

The target tracking described in this paper, unless otherwise specified, usually extracts the target's motion track from a frame sequence. After the region of the moving object is obtained, the center of gravity of the object is calculated using the coordinates in the region, and their centers of gravity are connected with a straight line respectively, thus forming a motion trajectory of the object. The centroid of an object is generally calculated using the following formulas:

$$c_x = \frac{\sum_{(i,j) \in D} i}{n} \quad (3)$$

$$c_y = \frac{\sum_{(i,j) \in D} j}{n} \quad (4)$$

Among them, n is the number of pixels on the contour. c_x means that the abscissa of the centroid is the average of the abscissa of all pixels on the object contour, and the ordinate of the centroid c_y is the average of the ordinates of all pixels on the object contour. Although the displacement of the object between adjacent frames is very small, this paper finds that the contour of the object would generally have greater changes (especially the contour changes caused by the motion of human limbs when the tracking object is a human), which makes the effect of using the centroid method to track the object not very good. Therefore, in this paper, the median point (m_x, m_y) is used to replace the object, namely:

$$m_x = \text{media}\{i(i, j) \in D\} \quad (5)$$

$$m_y = \text{media}\{j(i, j) \in D\} \quad (6)$$

4. Evaluation of the impact of sports on psychological benefits under intelligent network security

4.1. Evaluation system of psychological benefits of physical exercise under the intelligent sports of teenagers

In order to ensure the scientificity of the test and the correctness of the dimension value and the type of the test, this paper consulted experts in this field. The expert questionnaire survey method was used to investigate the physical education teachers with certain teaching practice experience in order to more scientifically and concretely understand the effect of teenagers' physical exercise, and provide scientific reference for formulating the corresponding test indicators. A questionnaire survey was conducted on 25 experts, including 14 experts in psychology and 11 teachers in sports.

By using literature analysis and an open questionnaire survey of teenagers in a province, people can understand the impact of physical exercise on human body in the past, and conclude the positive and psychological effects of sports on human body. On this basis, an expert questionnaire was prepared and analyzed. The expert evaluation results are shown in **Figure 4**:

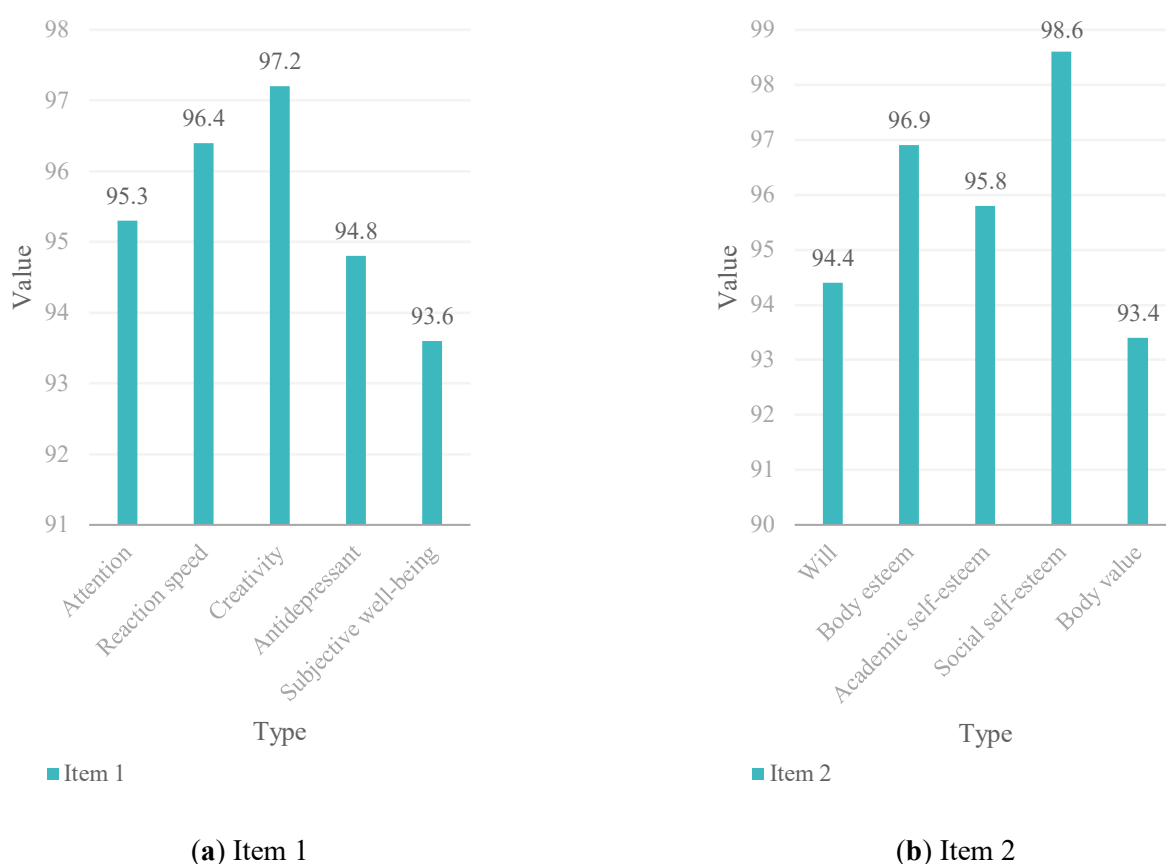


Figure 4. Statistical chart of expert evaluation results.

It can be seen from **Figure 4** that in Item 1 of **Figure 4a**, the highest score was creativity, which was 97.2 points. The lowest score was subjective well-being, which was 93.6 points. In Item 2 of **Figure 4b**, the highest score was social self-esteem, with a value of 98.6 points, and the lowest score was body value, with a value of 93.4 points. According to the results of expert evaluation, due to the role of improving negative emotions and subjective well-being, it mainly reflects the subjective feelings of athletes after sports. On the basis of psychology, negative emotions and subjective well-being were combined to form a subjective experience. Since this paper focuses on the positive psychological effects of youth sports activities, the benefits it brings are mainly changes in flexibility, so the result of its evaluation is defined as flexibility of thinking.

Through the expert evaluation and preliminary investigation of teenagers in a province, a theoretical model of the evaluation content system of psychological benefits of physical fitness for teenagers at the provincial level has been established, as shown in **Figure 5** [14,15].

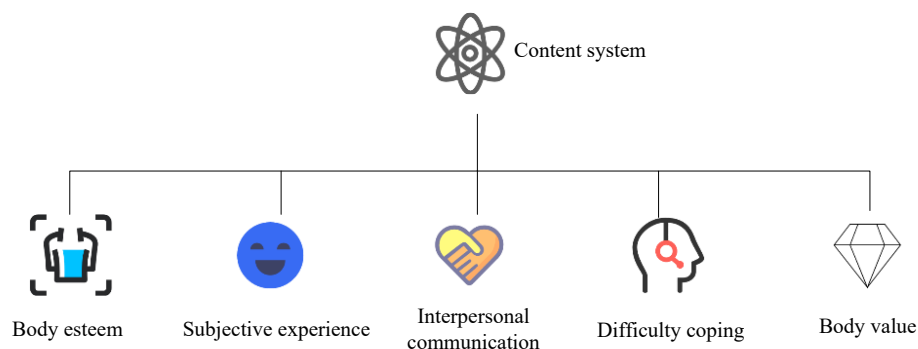


Figure 5. Theoretical model diagram.

4.2. Feeling and evaluation of psychological benefits of teenagers after sports

According to the psychological feelings and psychological changes of 200 randomly selected adolescents after physical exercise, the statistical table of the number of pre-surveyors is shown in **Table 1**:

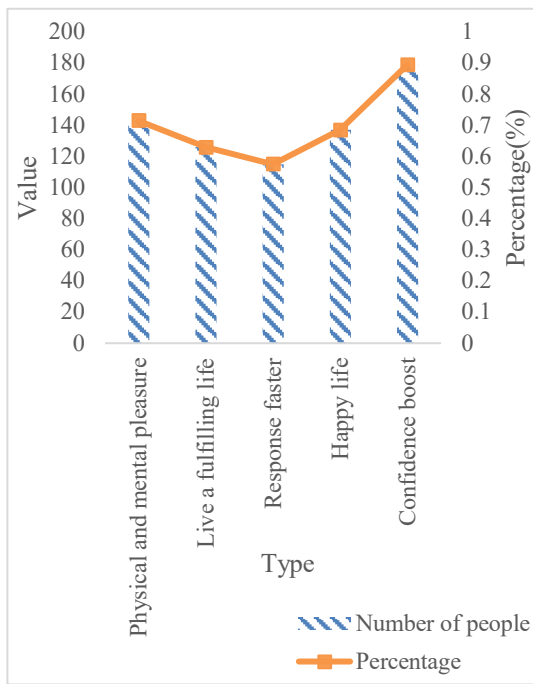
Table 1. Statistics of the number of people in the pre-survey.

Gender	Male	Female
Junior High School	43	67
High School	45	45
Total	88	112

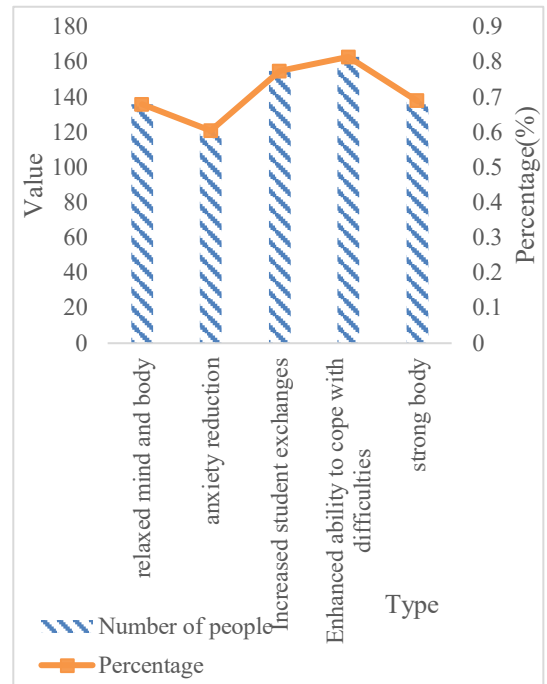
As can be seen from **Table 1**, among junior high school students, 43 were boys and 67 were girls. Among high school students, 45 were boys and 45 were girls. Through investigation and analysis, it was found that the psychological feeling and psychological changes of students after sports were as follows: physical and mental pleasure, life enrichment, stress reduction, life happiness, physical and mental relaxation, self-confidence enhancement, anxiety reduction, increased communication with classmates, enhanced ability to cope with difficulties, and physical fitness enhancement.

It can be seen from **Figure 6** that in terms of psychological feelings in **Figure 6a**, the confidence enhancement option was the one with the largest number of people and the highest proportion. There were 179 people, accounting for 89.5%. The lowest proportion of people was the responsive option. There were 115 people, accounting for 57.5%. In the aspect of psychological changes in **Figure 6b**, the option of improving coping ability was the one with the largest number of people and the highest proportion. There were 163 people, accounting for 81.5%. Among them, the number of people with the lowest proportion was the anxiety reduction option. The number of them was 121, accounting for 60.5%.

Through the survey of teenagers' attitude towards physical exercise, it was found that teenagers' motivation for physical exercise is mostly to improve their sports ability, strengthen their body and relax their body and mind. The motivation to participate in physical exercise varies with gender, school age and family residence, as shown in **Figure 7**.

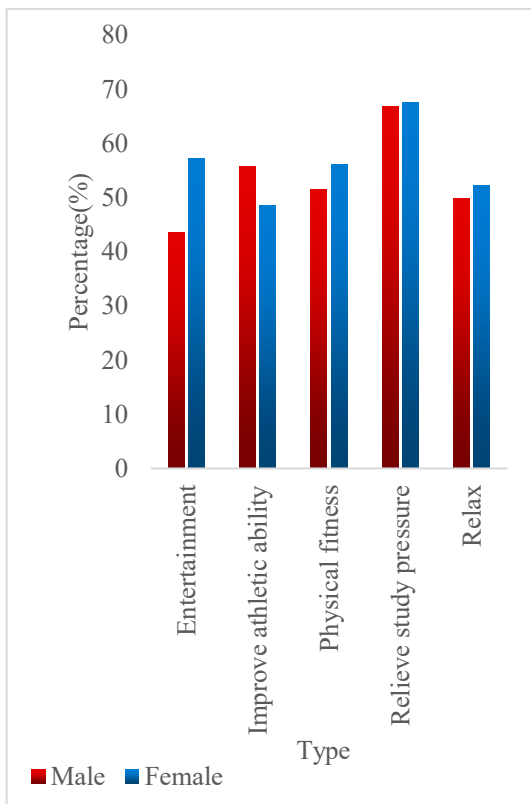


(a) Psychological feelings

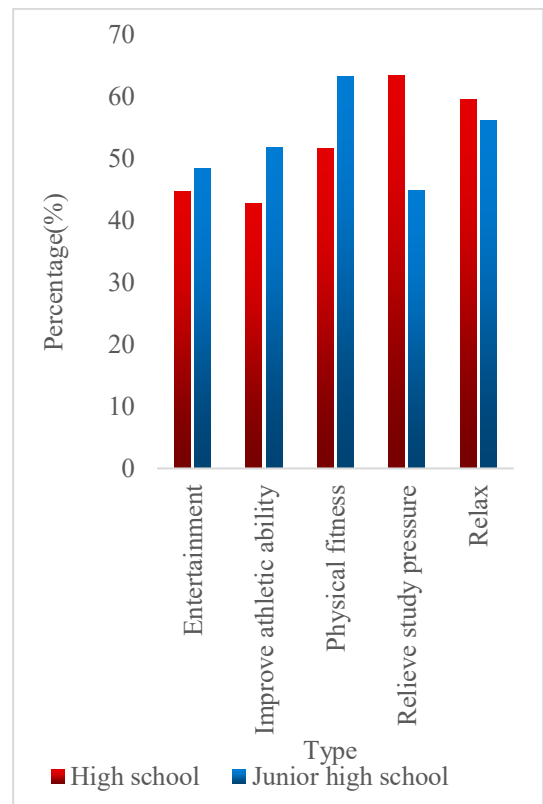


(b) Psychological changes

Figure 6. Statistical chart of psychological feelings and changes of adolescents after physical exercise (multiple choice).



(a) Gender



(b) Aspects of the learning period

Figure 7. Statistical table of the top five teenagers' motivation for physical exercise.

It can be seen from **Figure 7** that in **Figure 7a**, boys accounted for the largest proportion of learning stress relief options, with a value of 66.8%, while the proportion of recreation was the smallest, with a value of 43.6%. The proportion of female students in the option of relieving learning pressure was the largest, with a value of 67.6%. Its proportion in improving sports ability was the smallest, with a value of 48.6%. In **Figure 7b**, the proportion of senior high school students in the option of relieving learning pressure was the highest, with a value of 63.4%, while the proportion of improving sports ability was the lowest, with a value of 42.8%. The proportion of junior high school students in the fitness option was the highest, with a value of 63.3%, while the proportion in relieving learning pressure was the lowest, with a value of 44.9%. Therefore, it can be seen from **Figure 7** that the exercise motivation of male and female students in high school was mostly to relieve learning pressure. Junior high school students were more inclined to keep fit.

As far as the content is concerned, this paper involves psychology, sports and other fields. From the perspective of psychology and sports science, the psychological effect of sports training is a very meaningful issue. Through the methods of literature, pre-investigation, expert opinion solicitation, etc., the theoretical framework of the psychological benefits of youth physical fitness has been initially constructed, and on this basis, a set of content evaluation system has been prepared. Its predictive correction has been made, and its detailed evaluation has been carried out [16,17].

In terms of structure, a stable, reliable and effective structural model has been constructed, which can fully reflect the psychological effects of youth sports activities in a province. This paper analyzes from six aspects: “physical and mental relaxation”, “reducing anxiety”, “increasing student communication”, “enhancing ability to cope with difficulties” and “strengthening body”. Based on the above analysis, a targeted psychological benefit evaluation tool has been developed, and a psychological benefit evaluation index for the physical fitness of adolescents in a province has been developed, in order to promote the healthy development of adolescents in a province. Of course, in the continuous development of social development, whether the existing theoretical model can be applied to the evaluation of psychological benefits of sports training in the future needs to be further tested and revised according to the actual situation [18,19].

4.3. Implementation plan of the psychological health benefit assessment tool

4.3.1. Assessment frequency and required resources

In order to ensure the reliability of the data and the effectiveness of the assessment tool, the experiment will conduct regular monthly assessments over a one-year period to track the short-term and medium-term effects of adolescent physical exercise on psychological benefits.

The resources required for the study are as follows:

- (1) The person in charge of the assessment, who is a physical education teacher or a psychology expert, is responsible for organizing and supervising the entire

assessment process. Data collectors are trained assistants to assist in collecting and entering data.

- (2) Develop electronic and paper versions of the psychological health benefit questionnaire, data collection equipment, including tablets, laptops, and mobile phones. Data analysis software SPSS.
- (3) The venue is a quiet and spacious classroom. Each assessment lasts 30 to 45 minutes. It is selected to be conducted within 24 hours after the end of physical exercise to avoid interfering with students' daily study arrangements.

4.3.2. Participant preparation

For participants, the following preparations are required:

- (1) Before the formal assessment, introduce the purpose and importance of the assessment to students through class meetings to ensure that they participate in the assessment with a positive and relaxed attitude.
- (2) The assessment was arranged after the physical activity so that participants could give timely feedback on their psychological feelings after the exercise. It is recommended to complete the questionnaire within 24 hours after physical education class or extracurricular exercise.
- (3) Professional training was provided to the assessment leaders and data collectors in advance to ensure that they were familiar with the use of the tool and the assessment process.

4.3.3. Data collection and analysis methods

The experiment used the electronic platform WJX for online data collection. In addition, to ensure smooth operation when the network is not smooth, paper questionnaires were used as a backup method to ensure that the assessment was not affected by external conditions. For paper data, data was manually entered into a spreadsheet and ensured to be accurate. Electronic questionnaires directly exported data files.

In the data analysis, the experimental results mainly focus on the applicability of the assessment tool in different settings (such as school, community, and home), and any necessary adjustments are discussed.

4.3.4. Applicability of the assessment tool in different environments

To verify the effectiveness of the mental health benefit assessment tool in different environments, the experiment was tested in three environments: school, community and family. The quantitative results of the mental health benefit assessment tool in different environments are shown in **Table 2**. **Table 2** includes the applicability score of the assessment tool in different environments (full score 100), key indicators such as the effectiveness of the assessment in each environment, data integrity, feedback authenticity and sustainability.

Table 2. Quantitative results of the mental health benefit assessment tool in different environments.

Environment	Effectiveness (%)	Data completeness (%)	Feedback authenticity (%)	Sustainability (%)	Suitability score
School	93.5	95.2	91.6	89.5	92
Community	87.3	85.4	89.2	80.1	85
Family	81.5	78.6	84.7	76.3	80

In **Table 2**, in the school environment, in the mid-term, final and other time-intensive stages, the frequency of assessment should be appropriately reduced, or a reasonable assessment schedule should be arranged in advance to avoid affecting students' learning; and the assessment can be arranged after school. In the community environment, in order to deal with the problem of unstable participants, regular physical exercise programs can be carried out in the community with the help of community activity organizers, and assessments can be carried out immediately after the activities to ensure data integrity. When evaluating in the family environment, it is necessary to strengthen the participation of parents and set up a simple questionnaire form to improve the sustainability and accuracy of data collection. At the same time, additional questions related to the amount of student exercise in the family environment are added to better evaluate the actual situation of the environment.

The data in **Table 2** correspond to the following three cases in turn:

In a middle school, the mental health benefit assessment tool has been widely used. The school regularly organizes mental health assessments after physical education classes every month. The data collection personnel are the class teacher and the physical education teacher. The use of the assessment tool is smooth and the students have positive feedback. In the case, through regular data analysis, the school understands the positive impact of physical exercise on students' mental health under high-intensity academic pressure, and then adjusts the physical education curriculum, adds relaxing sports projects, and significantly reduces students' anxiety levels.

In the community environment, there are some challenges. A community activity center organized youth sports activities on weekends and tried to use the assessment tool for mental health assessment. However, due to the unstable participation rate of community activities, some students failed to participate in all activities, resulting in incomplete data. To meet this challenge, the community activity organizers set up a participation incentive mechanism to increase the participation rate of students and reminded students to take the assessment after the event through a mobile phone application.

In the family environment, the implementation of the assessment tool encountered additional challenges. Due to lack of supervision and organization, many students failed to complete the assessment questionnaire within the specified time. In addition, some families failed to provide a quiet environment, which affected the quality of students' answers. Some parents were willing to assist, but lacked understanding of the content of the questionnaire, resulting in a less than smooth assessment process.

4.4. Experimental analysis of relevant data on the physique of adolescents in other regions

This article introduces relevant data on the physique of adolescents in Guangdong Province, Beijing, Shandong Province, and Zhejiang Province for horizontal comparison. This experiment is based on the relevant data of Jiangxi Province, and now compares it with the physique data of adolescents in other regions

to further explore the sports development policies, cultural background and physique trends behind it. The results are shown in **Table 3**.

Table 3. Horizontal comparison of the physique and psychological benefits of adolescents in Jiangxi Province and other provinces.

Provinces	Physical exercise participation rate (%)	Physical fitness pass rate (%)	Physical and mental happiness (%)	Stress reduction (%)
Jiangxi province	75.40	68.30%	87.40%	81.50%
Guangdong province	82.10	73.50%	90.10%	84.70%
Zhejiang province	78.60	70.40%	88.90%	80.20%
Beijing city	84.20	75.80%	91.50%	86.30%
Shandong province	76.90	69.20%	89.00%	82.00%

In **Table 3**, it can be seen that there are certain differences in the participation rate, physical fitness and psychological benefits of physical exercise among young people in various provinces. Guangdong Province and Beijing City have outstanding performance in sports participation rate and psychological benefits, especially the proportion of physical and mental pleasure and stress reduction. Guangdong Province and Beijing City focus on policy support for extracurricular training and quality education, while Jiangxi Province is more inclined to traditional sports activities in school, with better physical fitness, but compared with provinces such as Guangdong and Beijing, the psychological benefits of young people are slightly inferior.

With the development of future sports policies, Jiangxi Province can learn from the experience of other regions, strengthen sports projects related to psychological benefits, and further enhance the positive psychological feelings of young people in sports.

5. Evaluation and discussion

5.1. Evaluation on the characteristics of physical exercise of teenagers

Through the questionnaire survey of teenagers, it is found that the fitness motivation of teenagers in a province is relatively clear, reflecting that they have a certain understanding of the basic functions of sports. Therefore, classified guidance should be provided according to the different needs and problems faced by teenagers to deepen the understanding of many functions. In terms of the number and time of exercise, the American Association of Sports Medicine recommends that the system and health come from regular physical exercise and physical exercise. It is suggested to take simple exercise three times a week, 30 minutes each time, with moderate intensity. Because the sports items and venues are limited by geography and other factors, mainly some common traditional sports, such as running, walking, basketball, etc., are mainly carried out in schools. Adolescence is an active and competitive age. People should seize the opportunity, develop good exercise habits,

and let children find the meaning of sports and experience the joy of challenges. In terms of peer selection, young people are more willing to exercise with their classmates. Young people need to contact their peers and should be provided with more opportunities for participation and participation.

The funds for teenagers' physical training mainly come from their parents' love of sports, parents' attitude towards their children's exercise, family economic conditions, etc. These would affect their physical training, and most of the expenses are concentrated on sports clothes, with few places for training and exercise. In addition, the sports atmosphere created by schools and society would also have a certain impact on the physical health of teenagers. For example, the school sports and the perfection of sports venues would have a certain impact on the physical quality of teenagers.

Through an open questionnaire survey on the psychological feelings and psychological changes of teenagers after physical exercise, it is found that the psychological feelings and psychological changes of teenagers after physical activities are as follows: physical and mental pleasure, life enrichment, stress reduction, life happiness, physical and mental relaxation, self-confidence enhancement, anxiety reduction, increased communication with classmates, increased ability to cope with difficulties, and physical strength. At the same time, because the main task of teenagers is to learn, the study of cultural courses has become a major part of their lives, and it is the pressure of cultural courses that has led to their mental health problems, which has led to changes in their mental state.

5.2. Theoretical construction process of psychological benefit evaluation system of physical training

The establishment and improvement of the psychological benefit evaluation index system of youth sports activities is a systematic project [20,21]. The psychological benefit evaluation is studied through five stages: defining the evaluation objectives, determining the project, determining the structure of the index system, screening the evaluation index system, screening the evaluation index and building the evaluation system. The results showed that the short-term effect on the psychological interests of the subjects was not significant. Therefore, in daily life and study, people should appropriately increase the frequency of physical exercise, increase the intensity of exercise in each exercise, make it last longer, and maintain such fitness mode for a long time. The score of the final result is generally in the upstream, indicating that the psychological benefits of exercise on the subjects are moderate [22]. Therefore, in daily life, the frequency of physical exercise should be appropriately increased. The exercise intensity should be appropriately increased in each exercise, and the exercise time should be appropriately extended.

The scores of different dimensions are at a low level, indicating that sports have a direct impact on the psychological benefits of this dimension. It is recommended to add the motion mode related to this size when moving. At the overall level, the score of the dimension shows that exercise has a moderate effect on the psychological benefits of this dimension. It is suggested that fitness personnel should appropriately increase the exercise mode related to this dimension during training: the total score is

in a good range, indicating that exercise has a significant impact on the psychological benefits of this dimension. It is recommended that the exerciser maintain the exercise mode related to this size and form a good exercise habit.

5.3. Discussion

The application of intelligent network security technology in sports has significant potential benefits, including improving sports performance, preventing injuries, and improving athlete experience. The research uses real-time collection and analysis of athletes' physiological data, so coaches and athletes can obtain accurate training feedback, optimize training plans, and improve sports performance. Smart devices can monitor athletes' health conditions, provide timely warnings of potential injury risks, and promote athlete safety. The application of intelligent network security technology also faces challenges, including security risks during data transmission and storage, data leaks and hacker attacks. Technical limitations such as device battery life, data processing capabilities, and network coverage also affect the effectiveness of real-time data analysis. While enjoying the convenience brought by intelligent network technology, security and privacy protection must be fully considered to ensure the trust of athletes and the sustainable development of technology.

In the future, the further integration of intelligent cybersecurity technology in sports activities can develop in multiple directions, including more efficient data collection and analysis technology, personalized training programs driven by artificial intelligence, and the application of augmented reality (AR) and virtual reality (VR) technology. The research area will focus on innovative technologies to enhance data security and privacy protection, using blockchain technology to ensure the immutability and transparency of data. Predictive models based on big data analysis will also help athletes identify and prevent injuries and optimize competition performance. The above development directions will help improve the overall performance and safety of athletes, while promoting the widespread application of intelligent cybersecurity technology in the field of sports.

6. Case analysis

6.1. Application of smart wearable devices in football training

In modern football training, smart wearable devices have become an important tool to improve athletes' performance. Smart football shoes and sports bracelets are equipped with a variety of sensors that can collect athletes' running distance, acceleration, heart rate, energy consumption and other physiological data in real time. The data is securely transmitted to the coaching team's equipment using wireless networks and encrypted transmission technology. During the transmission process, AES encryption technology is used to ensure that the data is not intercepted or tampered with during the transmission process. The received data is analyzed in real time by machine learning algorithms in the cloud, providing feedback on key indicators such as athletes' physical state, speed changes, and fatigue levels. Based on these analysis results, coaches can quickly adjust training plans, such as

increasing recovery time or changing training intensity, effectively reducing athletes' risk of injury and improving their overall performance.

6.2. Application of smart goggles in swimming training

Swimming is a sport that requires extremely high endurance and technology. In order to improve athletes' performance, smart goggles have been used in daily training. Smart goggles can track key data such as athletes' stroke frequency, heart rate, swimming speed, breathing rhythm, etc. The data is transmitted to the remote server using Bluetooth and Wi-Fi connections, and the TLS encryption protocol is used to ensure the security of the data during network transmission. Case Study Through the analysis of data using machine learning technology, the system can generate personalized feedback reports to help athletes identify their own technical defects and physical shortcomings. The analysis shows that the athletes' stroke efficiency decreases in the second half of the swim, suggesting that they need to increase endurance and muscle strength training in later training. Data analysis can also help athletes develop the best training plan before the competition to ensure that they are in the best condition during the competition.

7. Conclusions

The emergence and application of intelligent network has a history of decades. With the continuous development of information technology, more and more information technology has been widely used in today's sports industry to meet the needs of production and life. Based on the target tracking technology in intelligent network, this paper discussed the biological mechanism of sports promoting psychological effects. In short, based on the psychological development characteristics of teenagers in a province, this paper established a targeted psychological benefit evaluation system, and developed the psychological benefit evaluation indicators of teenagers' sports activities in a province, so as to enrich the theoretical results of the evaluation of psychological benefits of physical fitness. It can be applied to the evaluation of the effect of physical fitness of junior and senior high school students, so as to understand the positive psychological benefits of adolescent physical fitness in a timely and effective manner. Guangdong Province and Beijing are located in the southern coastal area and the northern capital city. Due to their economic development and abundant sports facilities, young people are more likely to participate in a variety of sports activities and perform better in physical and psychological benefits. Jiangxi Province is located in the middle and relies more on traditional school sports activities, resulting in relatively low psychological benefits. This paper has made some achievements, but there are some shortcomings. The comparative study in the experiment is not comprehensive enough, and is limited to different provinces. It fails to explore the physical health of different countries, which hinders a comprehensive understanding of the reasons for the decline in physical fitness of Chinese teenagers. Future research will focus on international comparisons.

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