Mobile Terminal-Oriented Real-Time Monitoring Method for Athletes' Special Training Load

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Abstract. Aiming at the problem of inaccurate training load monitoring results due to the large individual differences of athletes' special training, a real-time monitoring method for athletes' special training load for mobile terminals is proposed. Use sensors as data collection devices to establish sports scenarios for mobile terminals, and use smart wearable devices to collect real-time data generated by special sports measured by sensors embedded in watches. Select the index reflecting the intensity of training load to find the regularity of athletes' training growth. By recording the time ratios of different heart rate intervals for each exercise, the distribution and variation of the load intensity during the training were analyzed. Capture complete training load data during the movement. Through the real-time monitoring and early warning of special training load, the training status and training load of athletes can be adjusted, which is beneficial to improve the training quality of athletes. The test results show that the proposed method can improve the monitoring accuracy and provide a reference for improving the project training program.

Keywords: Mobile terminal · Athletes · Special training · Load monitoring · Real-time monitoring · Exercise load

1 Introduction

With the continuous progress of science and technology, the special training of athletes in our country has begun to develop and reform in a scientific way. Special training must meet the actual combat requirements, show the distinctive characteristics of sports, and reflect the rich content of special competitive competitions. How to use the existing theoretical support and advanced scientific and technological means to guide training and improve the performance of athletes training, achieve excellent results, and improve the dominant position in the competitive level. "Starting from actual combat" is the fundamental guarantee of scientific training and training, and it is also the basis and premise of the essential characteristics of special sports. With the development of science

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and technology in the past few years, especially the widespread use of accelerometer, GPS and other technologies, the research on the characteristics of sports activities and events is more scientific and in-depth [1]. Only on this basis can we grasp the intensity and measurement of the training load. Therefore, the training load should be close to the competition load in form and intensity to achieve good results.

A few years ago, as the technology of accelerometer and GPS became more and more mature and accurate, professional clubs in Europe and the United States took the lead in the emergence of wearable real-time monitoring devices, which were mainly used to detect the physical condition of athletes during competition and training, and also detect the physical condition of athletes during competition and training. Some technical indicators of athletes. Although there have been in-depth studies on the field of special training for athletes at home and abroad, on the one hand, the physiological functions of foreign and Chinese athletes are not the same, and their data can only be used as a reference; on the other hand, domestic research is still in qualitative At this stage, there are relatively few detailed quantitative data. Therefore, under the current environment of vigorously developing sports in my country, quantitative data on training load is urgently needed for the reference of coaches. In recent years, a series of professional sports real-time monitoring equipment companies have emerged in China, which have made significant contributions to the popularization of intelligent real-time sports monitoring equipment. And with the improvement and increase of domestic professional events, amateur events, youth events and campus events, it provides a good platform and feasibility for us to use scientific equipment to study the load characteristics of football events.

With the continuous development and deepening of modern sports, special sports have put forward higher requirements for the accuracy of scientific training. Therefore, scientific quantitative data of exercise load is needed to reflect the physical state of athletes during training and improve the physical quality of long-distance mobilization. This paper proposes a real-time monitoring method of athletes' special training load for mobile terminals. Based on the analysis of the collected data, this paper explores the characteristics and laws of the external load of data. According to the competition load of high-level athletes, the scheme of training to improve the level of athletes is designed.

2 Mobile Terminal-Oriented Real-Time Monitoring Method for Athletes' Special Training Load

2.1 Establish a Mobile Terminal-Oriented Sports Scene

Using sensors as data acquisition devices, sports scenes are built on the basis of sensors as perception devices, and intelligent mobile terminal devices as "bridges". Sensors such as temperature, pulse and blood pressure are integrated on the wearable device to monitor the physiological characteristics of the user in real time. A device that provides data is called a GATT server, and a device that accesses the GATT server and obtains data is called a GATT client. A device can act as both a server and a client. Because of the concise definition of the GATT specification, the amount of code required to implement the function is less, which effectively reduces the non-data information generated by the

Bluetooth device communication, which is conducive to reducing power consumption. In athlete-specific training, wear a wearable device on their wrist, finger, or clothing, while keeping a smartphone on their arm or in a clothing pocket. Users can pre-set an exercise goal on the phone. In the process of exercising, users can view the completion status and the state of the body in real time through the mobile phone [2]. The host layer includes general access specification, general attribute specification, attribute protocol, security manager, logical link control and adaptation layer protocol. The general access specification is the bottom layer that the application layer can directly access the Bluetooth protocol stack. The general access specification defines all the basic functions of Bluetooth, such as transmission, protocol and access process. It also includes Bluetooth device broadcasting, discovery, connection, association model, Security authentication and service discovery, etc. Use smart wearables to collect real-time sports-specific data measured by sensors embedded in the watch. In this process, since we need to use the data of each sensor at the same time for the next modules, we need to align the data of each sensor that collects data in time.

During the whole process of exercise, the wearable device collects various physiological characteristic parameters of the user, and sends the data to the mobile phone through Bluetooth transmission technology for processing, analysis and presentation of the results to the user. The general attribute specification is the layer where the real data transmission is located. It includes basic operations such as a data transmission and storage framework, and defines two types of roles: server and client. At the same time, these data can be sent to the remote server through the mobile phone for storage and backup, which can be used for users to view the staged results of the exercise and for further analysis. The interaction process between the wearable device, the smart mobile device terminal and the server is shown in Fig. 1.

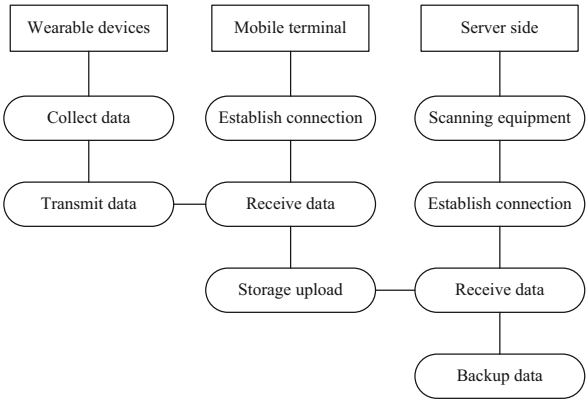

Fig. 1. Interactive process

Use wireless transmission technology as a means of data transmission. Due to the portable and mobile characteristics of wearable devices, the transmission environment is determined to be dynamic, and the use of wired transmission has great limitations. Mobile terminal devices such as smart phones are used to provide users with personal services

such as real-time data analysis, display and reminders. When collecting, it is necessary to ignore and align the small time error between the sensor data. Or the sampling rate of each sensor is not specified, but the data of all sensors are collected when the data of a certain sensor changes. The attribute protocol is an end-to-end communication protocol specially used to deal with small data packets, which connects the attribute client and the attribute server. The principle is that the ATT server and the ATT client transmit data through a fixed L2CAP channel. The security manager assigns keys to paired devices. At present, the intelligent mobile terminal device already has a strong processing capability, which can perform preliminary processing and analysis on the data. At the same time, almost all mobile phones are equipped with a Bluetooth module and a wireless network card, which can realize the functions of data reception and upload, as a bridge between the wearable device and the server, and play the role of relay.

2.2 Select the Index Reflecting the Training Load Intensity

Load is the central part of sports training, and it is also the most core factor. The ultimate goal of sports training is to stimulate the body through appropriate load, thereby producing adaptive changes, that is, the process of "adaptation-improvement", so as to continuously develop special athletic ability. Exercise load applies training stimulation by means of physical exercise, so that the body produces functional changes physiologically with a certain load stimulation, which is reflected in the movement rhythm, number of exercises, and degree of exertion in sports training, sports competition, physical education and fitness exercise, range of motion and other aspects of the changes and regulation [3]. Therefore, it can be said that in the process of sports training, the control of exercise load is the most important criterion for evaluating scientific training. The load and intensity together constitute the main part of the exercise load. The two influence each other and are interdependent and inseparable. In the exercise, they exert influence on the difference in the performance of the two. Although the current domestic and foreign reference does not have a completely unified definition standard for the definition of exercise load, the basic point of view is the same: exercise load is a stimulus to the body; the body has a physiological stress response to this stimulus. The load is the basis of the load intensity. Increasing the load intensity within a certain range of the load can effectively stimulate the body level [4]. The selection of athletes' competition load indicators needs to take into account the reliability, relevance, scientificity and rationality of the research, and also needs to refer to the simplicity and operability of the collection, as well as the non-invasive and sustainable principles for athletes. The indicators selected in this paper to reflect the training load intensity are shown in Fig. 2.

The game load data in this study were obtained by real-time monitoring during the game. The equipment worn by the test athletes included a GPS activity acquisition unit and a heart rate acquisition unit to monitor and measure the relevant data of the athlete's game load in real time, using wireless transmission. Modules are sent to researcher and coach terminals. Heart rate is a reliable indicator of the state of human functioning and is easy to measure. In special sports, different intensity of exercise occurs intermittently, and heart rate is more sensitive to changes in intensity, which can more accurately reflect its real-time load characteristics. Moreover, the operation of collecting heart rate with the help of the instrument is relatively simple and convenient. Therefore, it can be said

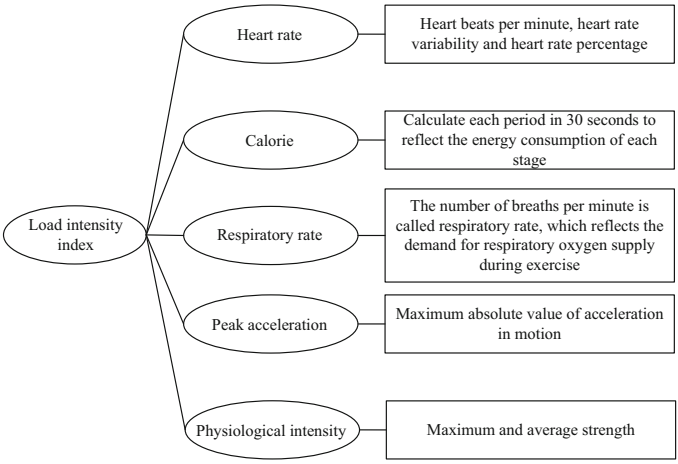

Fig. 2. Training load intensity index

that heart rate is a simple and effective physiological indicator for quantifying special exercise load. At present, there are two main methods for evaluating exercise intensity, and they are both evaluated by methods related to heart rate. The first is to evaluate the exercise time and proportion of athletes in different heart rate ranges. The second is to use the maximum heart rate and average heart rate of different athletes to measure and evaluate sports goals [5]. For this study, we need to reflect the average load intensity and maximum load intensity of athletes through a large number of personal situations, so as to reflect the characteristics of the overall load intensity, so the second method is selected to evaluate with less error. The formula for calculating the average exercise intensity of special training is as follows:

$$A_1 = \frac{B_1}{B_{\max}} \times 100\% \tag{1}$$

In formula (1), A_1 is the average exercise intensity of special training; B_1 is the average heart rate of special training; $B_{\max}$ is the maximum heart rate. The formula for calculating the maximum exercise intensity of special training is as follows:

$$A_2 = \frac{B_2}{B_{\max}} \times 100\% \tag{2}$$

In formula (2), A_2 represents the highest exercise intensity of special training; B_2 represents the highest heart rate of special training. Exercise load includes load intensity and load amount. The load and strength constitute the whole of the load, and the two depend on and influence each other. The strength of any load is based on a certain amount, and any load is based on a certain strength. Changes on the one hand inevitably lead to changes on the other. However, only in the increase of the load, the response of the body is relatively stable; the adaptation process affecting the individual is mainly determined by the size and nature of the load intensity. Different combinations present different load structures and the response to the body is also different [6]. Therefore, the

factors that can affect the load intensity must also affect the load amount, and vice versa. The two are interrelated and inseparable unified wholes. In sports training, the so-called arrangement of the load is the arrangement of the amount and intensity of the load. The important guarantee of scientific training is also based on the correct relationship between scientific arrangement of load and load intensity.

2.3 Distribution Characteristics of Special Training Load Intensity

It is self-evident that the method of digital monitoring training plays an important role in improving the effect of training. The use of scientific monitoring methods can reflect the different effects of different training methods; explore suitable training methods and recovery time for athletes; improve the training quality of athletes; clarify the actual level of athletes. The principle of periodic arrangement is one of the basic principles of sports training, which refers to the periodic arrangement of training load and training content in training. As the most important basic unit in the training plan, weekly training also needs to follow the principle of periodicity. Predict the highest level an athlete can reach and avoid undertraining or overtraining during training. Monitoring training is to monitor and control the athletes' physiological indicators, competitive performance, training status, daily diet, etc. within a period of time, so as to adjust the sports training program. Weekly training load and load intensity statistics in this study were monitored by randomly sampling one week of training from the entire training session. Weekly training load monitoring mainly monitors and records the training load value of each training session in a week. By calculating the load of each session, the total training load for a week can be calculated. In the process of sports training, it is mainly to ensure the rationality of training content, training intensity, duration and training density in order to achieve the ideal training effect. The monitoring training can provide a basis for the formulation and adjustment of training programs. In the process of sports training, monitoring training has been paid more and more attention. At the same time, by recording the time ratio of different heart rate intervals in each class to analyze the distribution and variation of the load intensity during training [7]. The content of special training needs to be more comprehensive, and various training contents are scientifically combined.

Since the specific content of monitoring training is relatively complex and the information is generated quickly, it is necessary to grasp it in time and carry out centralized analysis. Through the use of big data, data mining and other technical means, more valuable monitoring data can be obtained. By arranging different training contents, the athletes' physical fitness, technique and coordination ability can be continuously improved, so as to achieve the purpose of training. Based on this feature, in the process of monitoring and training, information technology has been widely used. Monitoring the development of training trends has a profound impact on the habits of coaches when formulating training programs, gradually transitioning from the initial method of personal memory, experience and subjective judgment to the current method of objective analysis based on science and technology.

Monitor training and non-training data collected daily to analyze all factors that determine success or failure. The training load of the week showed a wave-shaped trend, and the exercise load value on Friday afternoon was the highest in the week, and the load on Wednesday morning, Friday morning and Saturday afternoon was significantly lower than other training sessions. According to the one-week training plan provided by the coaches, a total of 1 high-intensity class, 5 medium-intensity classes, 1 medium-intensity class and 3 low-intensity classes are scheduled this week. Saturday morning is a high-intensity class for the actual combat training within the team. Identify the parameters with the most predictive value, integrate performance results and personal statistics along with coaching and expertise to create predictive models. Create interactive tabular content that provides daily training regimens that adapt to changing training and environmental conditions. The main content of the medium-intensity training class is personal technical training and small-scale tactical explanation and application. The low-intensity training class is usually arranged in the morning after the strength training, focusing on personal skills and positional skills. From the perspective of training time, it adopts a mode of one half day and two full days, 2 cycles, and 1 day of rest. The system includes a diagram of the entire solution, a database module, an analysis and classification module, a predictive model module and an end-user solution module. Half-day single training time is more than 100 min. Overall training time is longer. On Monday, because there is only a half-day training schedule, the training time is the shortest. Combined with the training load, there is a characteristic that the longer the training time, the greater the total training load. Using cloud storage, through long-term, multi-cycle and orderly data integration and analysis, a proprietary database is formed, combined with different athletes, different sports, and different training cycles, to find the training growth pattern of athletes, and establish an index growth change model.

2.4 Real-Time Monitoring Model of Special Training Load of Athletes

The unified sorting and analysis of the data and the comprehensive and systematic monitoring of training will help to standardize the evaluation of athletes' training results on the one hand, and help coaches to better arrange training plans on the other hand. Due to time, manpower, material resources and other reasons, the monitoring test is mainly carried out for the athletes' load-recovery system, and the shortcomings are found through practice and experience is summarized. Through the statistics of the training and competition data of the players, it is found that different players in the same position have obvious individual differences in special training and competition. In this paper, we mainly discuss the specific construction and application process of the real-time load monitoring model, give feedback on personal test results, give adjustment suggestions, and find and solve problems existing in training. The real-time monitoring model of athletes' special training load is shown in Fig. 3.

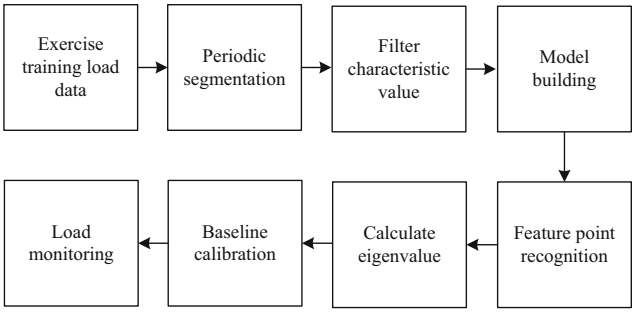

Fig. 3. Athlete special training load real-time monitoring model

The load monitoring steps shown in Fig. 3 are as follows:
Step 1: collect exercise training load data.
Step 2: divide cycle training plan.
Step 3: obtain the characteristic value of the filter.
Step 4: establish a load monitoring model.
Step 5: feature point recognition.
Step 6: calculate genetic value.
Step 7: baseline calibration.
Step 8: load monitoring.

In the real-time monitoring of sports-specific training load, wearable devices are used to collect training load data. In the morning, after the test is completed, part of the test results are fed back to the coach for reference and decide whether to adjust the training plan. Ask the athletes again in the evening to see how the amount of training that day has had on the athletes. A summary is made once a week, and the training status of the athlete for one week is fed back to the coach as a reference to formulate the training plan for the next week. If the regulation is improper or not timely, it may result in a decline in the training status and competitive level of athletes. Due to the limited computing power of the wearable device, it transmits the recorded signal to the smart mobile terminal via Bluetooth for further processing. The mobile terminal minimizes the interference of ambient noise by applying a bandpass filter to the raw data. Perform wavelet time-frequency analysis on the collected signal, and put the received signal $w(m)$ of length m into the wavelet transform with a series of filters for analysis, namely:

$$w(m) = \sum_{i=2}^{n-1} w(i-1)(2m-n)\varphi(n) \tag{3}$$

In formula (3), i represents the data serial number; n represents the total number of data; $\varphi(n)$ represents the output of the low-pass filter and the high-pass filter. Pass the signal through a bandpass filter to remove low and high frequency noise. Athletes need to break the original balance state of the body through different load stimulation, so that the body produces a certain degree of fatigue, and through excessive recovery, the body can transform to a higher level of function, and then continue to increase the load stimulation, so that the body breaks the balance again. A deeper level of fatigue

is created, followed by a higher state of balance through over-recovery, over and over again, leading to an ever-increasing level of performance. Hook the infrared pulse sensor module to the PIO 10 port of the Bluetooth module through a wire, and the Bluetooth module can directly detect the change of the high and low levels of the PIO 10 port. After power on, the Bluetooth infrared pulse collector starts to work, open the APP on the mobile terminal, and start to scan the surrounding Bluetooth devices. A finite impulse response filter is a natural choice because its phase response curve is stable and can be designed as a filter that produces a linear phase response curve. The output signal of the FIR filter is the weighted sum of the original signals, namely:

$$w'(m) = \sum_{i=1}^{n} \delta w(m-i) \tag{4}$$

In formula (4), $w'(m)$ represents the filtered output data signal; δ represents the impulse response value of the finite impulse response filter, that is, the coefficient of the filter. Click the discovered device to enter the pairing and service discovery process. When the collector establishes a connection with the mobile phone, the collector will automatically transmit the heart rate measurement value to the mobile phone. The acquisition data is sliced into sliding-window-sized slices, and the average energy of each window slice is calculated. The calculation formula can be expressed as:

$$\kappa(m) = \frac{1}{\vartheta} \sum_{m-\vartheta+1}^{m} w'(m)^2 \tag{5}$$

In formula (5), $\kappa(m)$ represents the average data energy of each window; ϑ represents the window size. The purpose of doing the above is to capture complete training load data during the movement. Through the real-time monitoring and early warning of special training load, the training status and training load of athletes can be adjusted, which is beneficial to improve the training quality of athletes. Through the load-recovery monitoring, the problems existing in the athletes' psychological stress, injury status, and fatigue recovery were found, and a personalized training plan was established. The distribution of TRIMP and heart rate zones can be used to understand the training load and intensity of athletes during special training and competition. Training is the premise of developing competitive state. With the improvement of the level of sports training, athletes can better cope with the competition by improving their adaptability to different levels of load stimulation. According to the test results, the cumulative effect of load and fatigue, the lack of recovery and the severity of fatigue symptoms can all explain the individual performance and readiness of the athlete. As can be seen from the table below, after a unified analysis and evaluation of the overall training load, training performance, and fatigue recovery of athletes, targeted monitoring status, training arrangements and suggestions are put forward for athletes. So far, the design of the mobile terminal-oriented real-time monitoring method for athletes' special training load is completed.

3 Experimental Studies

3.1 Experiment Preparation

This paper takes the athletes who participated in a football team's training camp as the research object, conducts real-time monitoring of the special training load, and analyzes the monitoring results to verify the effectiveness of the method proposed in this paper. The monitoring objects mainly include the main players participating in the special football training and the main substitute players, a total of 16 players. During the preparation of the athletes, the real-time exercise load is monitored on the training and competition of the players, and the experimental data is obtained. The data is mainly used to quantify the training load intensity of athletes and monitor the training status of athletes on the training ground at any time. Three main data of heart rate, running distance and speed can be collected. The Australian-made GPSports wearable device is used to monitor the entire training process of athletes. The GPSports device consists of a GPS module, a heart rate belt, a bra, a gyroscope and other parts. This study mainly uses the heart rate belt to collect heart rate data, and the heart rate collection frequency is 5 times/S, the data is sent to the Team AMS analysis software for comparison and analysis. Through the analysis software, the heart rate variation curve and the heart rate distribution interval of the athletes during the heart rate recording period can be read. At the same time, the refresh rate of the system and computer software is 1 Hz, which means that the data is collected once per second, and the positioning accuracy of GPS is less than 2.5 m, thus ensuring the validity of the data.

3.2 Results and Analysis

The monitoring accuracy of maximum heart rate, average heart rate, average intensity and average speed is selected as the evaluation index to measure the application effect of the real-time monitoring method for athletes' special training load for mobile terminals proposed in this paper. The accuracy results are compared with the real-time monitoring method of athletes' special training load based on big data technology in reference [1] and reference [2] based on virtual reality technology. Through real-time monitoring, it was found that the maximum heart rate appeared within 2–5 min after the start of the warm-up exercise. The reason for the analysis is that the athlete has just arrived at the training ground, and the body suddenly threw itself into the special preparation activity from a static state. The completion of special training movements of athletes requires a certain amount of muscle power, and a personal heart rate peak will appear when reflected in the maximum heart rate. The comparison of the maximum heart rate monitoring accuracy of each real-time monitoring method is shown in Table 1.

According to the test results in Table 1, the maximum heart rate monitoring accuracy obtained by the mobile terminal-oriented real-time monitoring methd for athletes' special training load is 87.52%, which is 11.10% higher than the real-time monitoring method based on big data technology and virtual reality technology. And 12.99%. The monitoring results of the average heart rate can reflect the athlete's cardiopulmonary function and maximal oxygen uptake capacity. After the training, the average heart rate is increasing, which means that the interval has not been adjusted properly, and after high-intensity

Table 1. Comparison of maximum heart rate monitoring accuracy (%)

Testing frequency	Mobile terminal monitoring method	Big data monitoring methods	Virtual reality technology monitoring method
1	86.24	79.67	78.46
2	89.62	75.38	74.83
3	85.80	74.26	71.63
4	87.56	76.05	72.25
5	88.48	78.54	75.58
6	86.75	75.81	73.17
7	85.19	74.98	70.47
8	89.53	76.62	75.51
9	87.81	75.35	76.05
10	88.25	77.54	77.32

training, the heart rate has not been lowered. The comparison of the average heart rate monitoring accuracy of each real-time monitoring method is shown in Table 2.

Table 2. Comparison of average heart rate monitoring accuracy (%)

Testing frequency	Mobile terminal monitoring method	Big data monitoring methods	Virtual reality technology monitoring method
1	89.40	80.49	79.48
2	91.87	81.68	78.87
3	92.64	82.27	76.64
4	88.28	80.54	79.31
5	89.56	83.88	78.05
6	92.12	82.65	81.53
7	93.65	84.36	82.66
8	91.81	82.23	83.28
9	90.54	83.05	82.94
10	89.27	83.12	84.51

According to the test results in Table 2, the average heart rate monitoring accuracy obtained by the real-time monitoring method of athletes' special training load for mobile terminal proposed in this paper is 90.91%, which is 8.48% and 10.18% higher than the real-time monitoring method based on big data technology and virtual reality technology.

The average intensity can reflect the physical quality of athletes. Between repeated intervals and exercise, the average intensity represents good cardiopulmonary function to adjust breathing and heart rate. Coaches can tap athletes' greater potential from other aspects, such as techniques and tactics, or physical strength and quality. The comparison of average intensity monitoring accuracy of each real-time monitoring method is shown in Table 3.

Table 3. Comparison of average strength monitoring accuracy (%)

Testing frequency	Mobile terminal monitoring method	Big data monitoring methods	Virtual reality technology monitoring method
1	85.44	71.49	72.56
2	86.81	73.87	76.42
3	87.68	72.64	75.06
4	85.52	75.31	72.27
5	86.28	74.55	73.84
6	85.56	72.26	76.91
7	88.24	71.03	72.68
8	89.38	73.15	70.32
9	86.91	75.82	71.53
10	85.80	70.88	74.75

According to the test results in Table 3, the average intensity monitoring accuracy of the real-time monitoring method of athletes' special training load for mobile terminal proposed in this paper is 86.76%, which is 13.66% and 13.13% higher than the real-time monitoring method based on big data technology and virtual reality technology. In addition to good technical and tactical ability and spiritual willpower, excellent physical fitness and special speed ability requiring neuromuscular coordination are also the key parts that high-level athletes must have. Therefore, the monitoring results of average speed are directly related to the effect of special training. The comparison of average speed monitoring accuracy of each real-time monitoring method is shown in Table 4.

According to the test results in Table 4, the average speed monitoring accuracy of the real-time monitoring method of athletes' special training load for mobile terminal proposed in this paper is 86.40%, which is 11.85% and 14.16% higher than the real-time monitoring method based on big data technology and virtual reality technology. Therefore, the real-time monitoring method of athletes' special training load proposed in this paper can accurately reflect the training state of athletes. Combined with the training preparation state, it defines the training load pressure of players, and feeds back to the competent coach in time to obtain certain support and recognition. According to the monitoring results of training load, combined with the overall performance and

Table 4. Comparison of average speed monitoring accuracy (%)

Testing frequency	Mobile terminal monitoring method	Big data monitoring methods	Virtual reality technology monitoring method
1	88.46	75.98	70.64
2	86.68	76.86	71.88
3	85.25	74.65	75.96
4	87.54	73.54	74.63
5	88.37	72.41	73.52
6	84.61	71.12	72.73
7	86.84	75.75	71.61
8	86.32	76.58	70.25
9	85.20	75.26	71.78
10	84.74	73.33	70.42

readiness, it is necessary to increase the load moderately in order to continuously improve the overall competitiveness of athletes.

Test the results of real-time data collection rate of athletes' special training load before and after the use of this method under different sampling rate settings, as shown in Fig. 4.

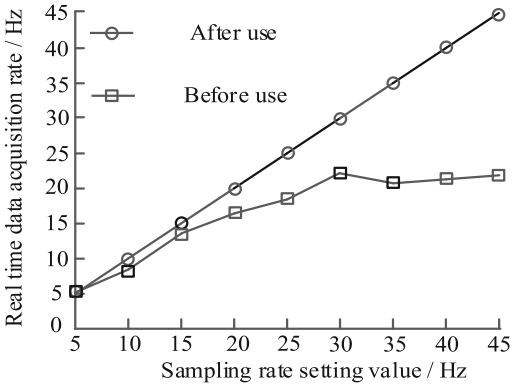

Fig. 4. The real-time data acquisition rate before and after using this method

By analyzing Fig. 4, it can be seen that under the condition that the sampling rate setting value is 5 Hz, the real-time data collection rate of athletes' special training load before and after the use of the method in this paper is the same as the setting value; Under the condition that the setting value continues to rise, the values of the two methods remain the same after the use of the method in this paper, while the deviation between the

values of the two methods gradually increases before the use of the method in this paper. Therefore, it can be shown that the method in this paper has excellent data collection effect of athletes' special training load, without data collection delay, and meets the real-time requirements of safety monitoring of athletes' special training load.

4 Conclusion

The daily training load is generally lower than the actual competition load requirements. Athletes are in a low-intensity training state for a long time. Technical and tactical training is very easy to lead to inertia of the body. Once they face the situation of high-intensity competition, the body is very easy to suffer from discomfort and function decline, resulting in the decline of athletes' competitive ability. There are differences in the training load and intensity of different training contents. In the technical and tactical training, coaches should strengthen the targeted training of some players, take the competition load and intensity data as a reference, and formulate an effective training scheme to achieve the training effect. This paper presents a real-time monitoring method for athletes' special training load facing mobile terminal. This method can improve the accuracy of load monitoring and has high application value. Because the server only realizes the data upload function, the function is relatively single. Hadoop processing technology can be connected to the background service layer of the system, which provides a new direction for the application research of real-time monitoring of training load.

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