

# Implementation of Basketball Training Management System Based on Big Data Technology

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## **Abstract**

*The technology of large data analysis has important practical significance to players digging, tactics and training monitoring. In order to improve the performance of basketball training, the big data technology is applied in the training management system. The reform of basketball training is being carried out, and the research on the combination selection mode of the basketball training is being discussed. This is not only from the traditional technology to the combination of training to our physical education, but also from the tactical thinking to cultivate students. This can promote the performance and training interactive quality in basketball sports training and training.*

**Keywords:** *performance; basketball training; combination selection mode; tactical thinking; training management system.*

## **1. Introduction**

Basketball that is a traditional sport, not only has a certain game, but also has competitive aspects of the confrontation. Moreover, due to the basketball team's cooperation in the ordinary work and life, the basketball sports is also a platform to enhance the feelings, mutual exchange. In our country, it is a very popular sport by all walks of life. At the same time, it is an international sports event, either in NBA or CBA, we also need more professional basketball players, which bring the audience a wonderful visual effect, but also put forward higher requirements to the basketball players training institutions, especially basketball education workers and basketball players. Therefore, the training of the training should be used in combination training, on the one hand, it is the combination of training, on the other hand, it is the training of basketball tactics thinking mode [1-2].

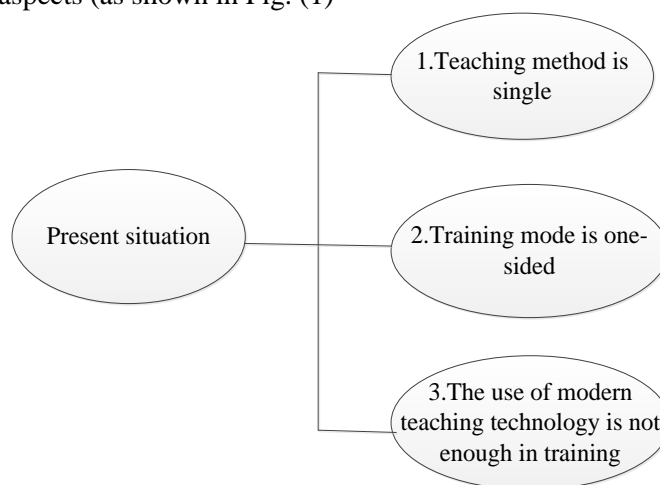
Popular basketball sport refers a practical activity, which is played by the great majority of the social members in their spare time by the means of basketball games, with the purpose of body building, joyful body and mind, and satisfying people's increasing needs for basketball culture and promoting people's overall development and social harmonious progress. For the over 50 years after the establishment of the People's Republic of China, basketball sport, directed by the Party and Government's body building policy--developing sports to build up the people's health--has been played widely in the national schools, enterprises and institutions, and mass organizations, and become people's favorable sports game, thanks to its characteristics of being simple and convenient for body building and entertainment. At present, the positive elements, such as our country's political stability, fast development of national economy, body building for the entire people more and more popular, Beijing 2008 Olympic Games, will doubtlessly play a vital role to promote our country's popular basketball sport. Due to the poor interaction of traditional basketball training method, the efficiency of the usage of basketball training resources is low. In order to solve the problem, the big data thinking should be used to reform the traditional basketball training method.

Entering in twenty-first Century, with the rapid development of information technology, human society is made walk into the era of big data information. Big data is the inevitable outcome of the development of modern science and technology and information, it sets the networking [3], cloud computing, various IT industry and promotes the Internet technology of disruptive change in many areas of social management and governance of the country and people's life. It produced a huge effect; bring the information field in the revolution of the new era. In big data era, the change of the internal and external environment of competitive sports system has brought about unprecedented opportunities and challenges to the competitive sports information system [4].

This paper mainly studies the application of the big data technology in basketball training from five parts. The first section is the preface which introduces the study purpose, background, content and methods of this paper. The second section is the overview part. It summarizes the related researches of the big data construction in basketball training, both at home and abroad. The third section is an important part of this article which dissects the necessity and viability to establish a big data in the basketball training. It reveals the interdependence and promoting relationships between the big data technologies in the basketball training. It introduces the basic algorithm in the basketball training. The fourth section makes a detailed mode of the big data technology in the basketball training. The experiment is done in this part. The fifth section discusses the comparison result and data obtained in the fourth part.

## 2. Overview

The present situation of our country's basketball training training mainly has the following three aspects (as shown in Fig. (1))



**Figure 1. The Present Situation of Our Country's Basketball Training**

At present, it is also deeply influenced by the traditional training method in the course of our country's basketball training, which makes our country's basketball training methods and methods relatively old. In training content, teachers who carry out the training content is usually to shoot, dribble and pass the ball for training according to the students' basic footwork and posture [5]. Training mode is single, making classroom training and training boring. In the training method, it is also the teacher's demonstration of the training content and then the traditional method of organizing the students to carry out the practice, only the basketball basic technical system and the standardization of emphasis. In this way, it can only guarantee the students in the basketball technology system to have certain characteristics for students in the basketball training and the main body of the status [6]. This will enable students in the long-term learning process to be

always in a passive state, the enthusiasm of the students which participate in the activity and the quality of basketball training curriculum is very bad.

In our country's basketball training process, the training method is usually that the student carries on the imitation and the repetition training to the teacher's demonstration. For this kind of training method, although it can help students to grasp the basic technology of basketball in a more rapid way, this method will spend more time in the process of learning. It will not only be able to meet the needs of students, but also cannot meet the needs of students, and it cannot meet the needs of the students.

In our country, the number of students has been a great increase. The basketball training is no longer individual training. In the training process, teachers need to face a lot of students, in order to let all students can learn, teachers are mostly used to explain the way to achieve the corresponding action and the formation of the concept through the students' imitate training. However, many teachers are limited by the objective conditions of age and physical quality. Technical movements are sometimes difficult to standardize and standardized, athletes do not have a very good understanding and grasp of the situation in the action of these norms. Through their own imitation training may not reach the standard action essentials, but once forming, it is difficult to be correct in the late [7]. Therefore, the use of modern educational technology can overcome some difficulties in physical education and training in the training and training of teachers which cannot directly demonstrate the technology, etc. Some of the more difficult actions can be played by repeated slow or freeze to learn. From the perspective of information theory, the process of training is a feedback process. The traditional training method and the students' learning effect feedback mainly comes from the teachers' observation, analysis and induction, and then they use their own language to feedback to students, students understand their learning situation [8]. However, because of the number of students, the teacher's attention is scattered, students are difficult to get timely and accurate feedback. In the practice, students' understanding of the own action is not enough, once the error exists, it is not conducive to training. And the use of modern education technology can be timely feedback to the students through the training of information, in order to strengthen the correct action, correct the wrong action and improve sports technology.

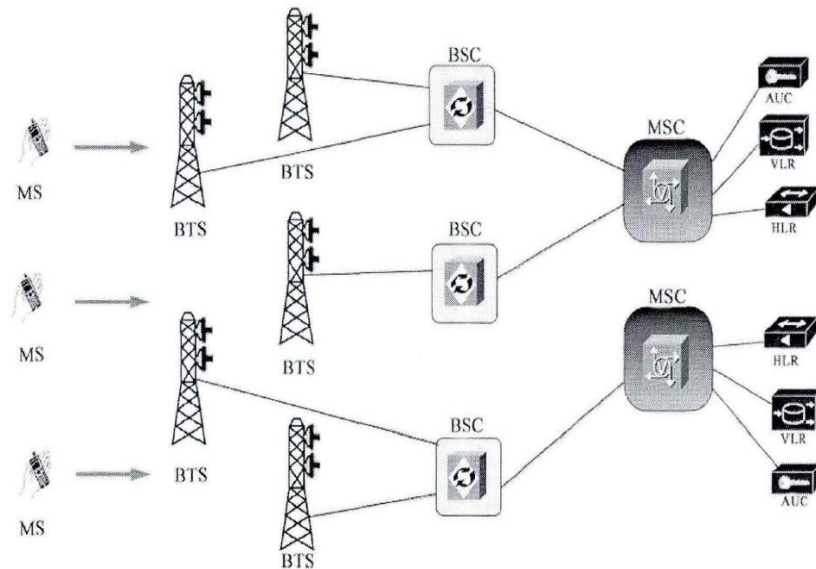
Cui's [9] paper mainly uses the research method and data analysis to study the development of NBA League data, data resources and advanced data analysis system and application. The results show that: 1) The NBA data analysis system based on big data technology has been established, data application ability and data transformation has changed the basketball data management mode. 2) The technology of large data analysis has important practical significance to players digging, tactics and training monitoring. Suggestions: CBA League should accelerate the construction of data analysis of talent training system; the introduction of the equipment of advanced data statistics; strengthen cooperation with institutions of the Internet, gradually establish the CBA improve the data query system, build their own data analysis system, the innovation of China's Professional Basketball League driven development to provide intellectual support and scientific guidance, to contribute to the construction of the professional sports power [10].

### **3. The Big Data Technology and Algorithm**

Nowadays, big data has become an important direction of development of modern information technology, and sharing and analysis of big data would not only bring immeasurable economic value, but also play a significant role in promoting the development of society. Big Data-as-a-Service (BDaaS) is a new data resource usage pattern and a new form of service economy, by encapsulating heterogeneous data; it can provide ubiquitous service consumers, standardization, and on-demand services, including search, analysis or visualization [11-12].

In behavior analysis area, it still faces four challenges:

- 1) There is no standardized, user experience based BDaaS architecture which can shield the complexity of data sources and operations;
- 2) The lack of generic unstructured data model which reflects user behavior characteristic, made BDaaS for unstructured data difficult to build;
- 3) Existing data model follows the Web services model, however, so far, holistic BDaaS service model with the characteristics of big data has not yet appeared;
- 4) There is no appropriate solution in providing data retrieval, analysis and visualization services and optimizing service capacity. However basic network architecture of GSM network is same for every network operator as shown in Figure 2.



**Figure 2. The Model and Architecture**

Today, with the advancement in information technology and the development of the economic, internet has gotten a more and more important position in our life. The rapid expansion of Internet, network traffic, network user and the number of host computers increases with the exponential growth. With the development of mobile devices, embedded systems and sensor networks, the new Internet element, Internet-scale will continue to grow in a long time. Internet applications have developed from simple traditional applications to real-time multimedia applications. Nowadays Internet applications have the new characteristics that sharing the resource and collaboration. However, the important reason for Internet reaching today's position is that the rapid development of Internet services, network application, diversified types of business and personal trends. In a closed or semi-open network which, the security is assured; this paper uses data mining algorithms of Bayesian incremental learning to classify user data for obtaining the characteristics of user behavior and data model then using Bayesian incremental learning algorithm to optimize the model to orientate consumer behavior accurately. In addition, the user behavior analysis system can connect directly with operator's business systems. More specifically, the user behavior analysis system can help to find more potential users in the way of advertising. We analyze the 3G networks operators that are meeting brand-new business challenges, introducing the system diagram of user behavior analysis.

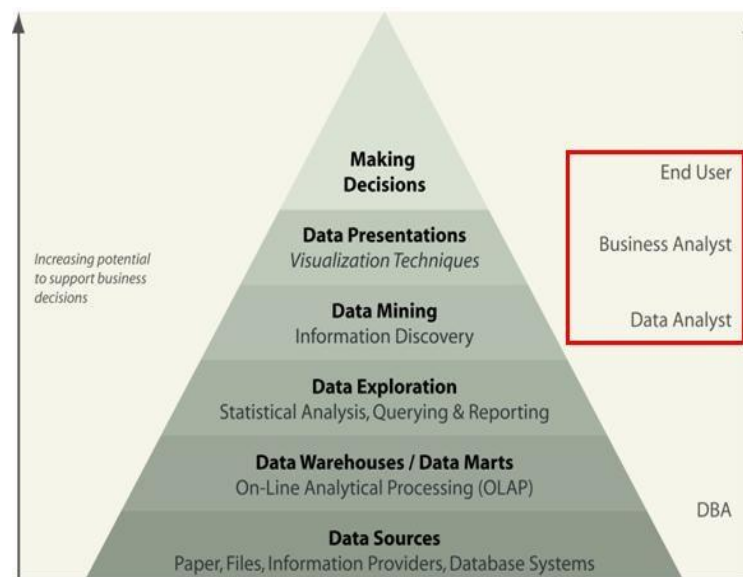
Figure 3 shows the composition of data mining technology.



**Figure 3. The Composition of Data Mining Technology**

With the increasingly fierce competition of the telecom industry, Data Mining, as a measure of the Knowledge Discovery and the Decision Support, has already been widely used. However, the Human Turbulence and the Inhuman Turbulence on the telecom industry's Data Acquisition and Processing System which cause the Data Source's Data Quality differing largely and some problems of Data Warehouse's ETL mechanism which lead to the data missing and data mistake when the data is integrating that result in the low quality of data which affects the result of Data Mining. So solving the above-mentioned problems, improving the veracity and the efficiency of Data Mining and making use of Data Mining to improve the normal operations of services in the telecom industry have practical significance. Although the Data Mining technology has been studied for more than ten years and some technologies are suggested to try to solve kinds of problems that Data Mining technology in the telecom industry is encountered when it is applied, these technologies do not adapt to the complex and large-scale data in the telecom industry.

Figure 4 shows the basic procedure of data mining technology.



**Figure 4. The Basic Procedure of Data Mining Technology**

A less self-disciplined developer, who committed software plagiarism, may elude punishment by seriously disguising the original open source projects.

The basic model for online error identification as follows [13-14]:

$$TSP(t) = \begin{cases} TSP_1 & 0 \leq t \leq \Delta t \\ TSP_2 & \Delta t \leq t \leq 2\Delta t \\ \dots & \dots \\ TSP_n & (n-1)\Delta t \leq t \leq n\Delta t \end{cases} \quad (1)$$

$$\min d(T) = \sum_{k=1}^n \sum_{i=1}^N \sum_{j=1}^N c_{i,j}(k \square \Delta t) \quad (2)$$

$$s.t \quad \Delta t = \frac{T}{n}, \frac{\Delta c_{i,j}}{\Delta t} = 0 \quad (3)$$

We may get the calculating method for the main index in the following equation (4)-(5):

$$M_{ij} = \exp\left(-\frac{\|x_i - x_j\|^2}{\sigma^2}\right) \quad (4)$$

$$L = \begin{bmatrix} L_1 & & \\ & \ddots & \\ & & L_k \end{bmatrix} \quad (5)$$

Their matching eigenvectors matrix is shown in the following equation (6):

$$H = [h_1, h_2, \dots, h_k] = A^{1/2} E \quad (6)$$

So, we can get:

$$U_{ij} = \frac{H_{ij}}{\sqrt{\sum_{t=1}^k H_{it}^2}}, i = 1, \dots, n, j = 1, \dots, k \quad (7)$$

$$P = I - A^{-1/2} M A^{-1/2} \quad (8)$$

According to the equation (6), the calculating formula can be obtained in equation (7)-(10).

$$g(x, \omega) = \frac{1}{(2\pi)^3} \int g(k, \omega) \exp(-ik \square x) dk \quad (9)$$

$$g(k, \omega) = \begin{bmatrix} G_{ik}(k, \omega) & \gamma_i(k, \omega) \\ \gamma_k^T(k, \omega) & g(k, \omega) \end{bmatrix} \quad (10)$$

$$G_{ik} = (\Lambda_{ik} + \frac{1}{\lambda} h_i h_k^T)^{-1}, \quad g = -(\lambda + h_i^T \Lambda_{ij}^{-1} h_j)^{-1}, \quad \gamma_i = \frac{1}{\lambda} h_k^T G_{ki}, \quad (11)$$

$$\Lambda_{ik}(k, \omega) = k_j C_{ijkl}^0 k_k - \rho_0 \omega^2 \delta_{il}, \quad h_i(k) = e_{kil}^0 k_k k_l, \quad h_l^T = e_{ikl}^{0T} k_i k_k, \\ \lambda(k) = \eta_{ik}^0 k_i k_k \tag{12}$$

$$\frac{1}{2\pi} \int_{-\infty}^{\infty} e^{-ik_3 x'_3} dx'_3 = \delta(k_3) \tag{13}$$

$$s(X \rightarrow Y) = \frac{\sigma(X \cup Y)}{N} \tag{14}$$

$$c(X \rightarrow Y) = \frac{\sigma(X \cup Y)}{\sigma(X)} \tag{15}$$

The formula generates labels for each file block.

$$for(j = 0; j \leq n-1; j++); \tag{16}$$

$$\{W_j = r * (j+1); \quad T_i = [h(W_j) * m_j]^c \bmod N\}; \tag{17}$$

$$Output(T_0, T_2, \dots, T_{n-1}); \tag{18}$$

And local fractional integral of  $f(x)$  defined by Eq.9.

$${}_a I_b^{(\alpha)} f(t) = \frac{1}{\Gamma(1+\alpha)} \int_a^b f(t) (dt)^\alpha \\ = \frac{1}{\Gamma(1+\alpha)} \lim_{\Delta t \rightarrow 0} \sum_{j=0}^{j=N-1} f(t_j) (\Delta t_j)^\alpha \tag{19}$$

Its local fractional Hilbert transform, denoted by  $f_x^{H,\alpha}(x)$  is defined by

$$H_\alpha \{f(t)\} = \hat{f}_H^\alpha(x) \\ = \frac{1}{\Gamma(1+\alpha)} \int_R \frac{f(t)}{(t-x)^\alpha} (dt)^\alpha \tag{20}$$

Where  $x$  is real and the integral is treated as a Cauchy principal value, that is,

$$\frac{1}{\Gamma(1+\alpha)} \int_R \frac{f(t)}{(t-x)^\alpha} (dt)^\alpha \\ = \lim_{\epsilon \rightarrow 0} \left[ \frac{1}{\Gamma(1+\alpha)} \int_{-\infty}^{x-\epsilon} \frac{f(t)}{(t-x)^\alpha} (dt)^\alpha + \right. \\ \left. \frac{1}{\Gamma(1+\alpha)} \int_{x+\epsilon}^{\infty} \frac{f(t)}{(t-x)^\alpha} (dt)^\alpha \right] \tag{21}$$

#### 4. Experiment and Analysis

Research methods contain grouping comparison method, mathematical statistics method, literature data method.

The experimental group (A, B two groups) uses the combination of training practice training.

First stage: Students are required to preliminary understanding for the characteristics of basketball in combined exercises, learn and master the basketball movement, run, dribble and pass technology, and improve utilization technology of consciousness and ability in practice. The main training contents and methods is to explain this kind of technology demonstration, to start from the actual angle, and to make students understand the practicability and characteristics. It also contains run mobile combination practice (coordination, fast, cut, sliding move practice), combination of simple dribbling practice (single and double ball control, obstacle of dribble); practice combination of simple pass (mobile, dribble) , transport, pass, the combination of mobile angle basketball, handball, and the game training practice by constantly repeating, sustaining, transforming and cyclic method training. Training requirements: Students are required to actively practice in the leading teachers. It is from easy to difficult to combine the game gradually close to the actual combat for increasing the confrontation exercise and improving interest.

The second stage: the students grasp the shooting and all kinds of actual combat through the combination of practice; they carry out all kinds of transmission, transport, investment combination technology in the use of actual combat with technology; they test the ability to test the use of technology and understand the actual combat in practice. Main training contents and methods contains explanation and demonstration of shooting and matching technology, combination of simple shooting practice (all dribble layup different operational practices, near and far distance of different position mobile shooting), simple exercises (unarmed, two or three kinds of practical distribution technology), the first stage and the second stage of the various techniques, gradually from a single technology to a combination of multiple technologies, and increasing the use of actual combat. The teacher explains the analysis of the tactics based on the actual needs of the actual combat to improve in cooperation with the means through repeating, continuous, transformation, negative defense and active defense. Training requirements: students are required to organize and arrange the combination of practice, which is from easy to difficult. Students can improve interest and promote the master in the practice of confrontation and the game.

The third stage: in order to strengthen the technical proficiency, the students are divided into several groups of 2 people, 3 people, 4 people, 5 people in the half court and the whole field of confrontation practice, which is to improve the use of technology, tactics, and improve running, judgment, coordination, endurance and other special physical quality through the great strength of the training. The main training content and methods: single group technology is gradually to the development of many people, the use of simple tactics to the development of advanced tactics, so that students master skilled technology and tactics. Training requirements: students are required to use the skills and tactics, to explain the technical and tactical mistakes in the match, and to strengthen the comprehensive practice of physical quality, the comprehensive training of skills and tactics. Control groups (C, D group) are for the traditional training method. The two groups increased ten minutes of physical exercises after each class. The experimental group has the basketball special physical fitness training, and the control group have the conventional physical fitness exercise.

Combined technology training compare and analyze from traditional training method in the students' technical assessment and standards. After a year of experimental training, we have carried out the same conditions, strict and uniform requirements of the study of the two groups of students. Table 1 reflects the comparison of the results of the standard



and the technical assessment results. Combined technology training compare and analyze from traditional training method in the physical quality of the students before and after the experiment. From table 2, the two groups of training objects in the five standards of the project have improved, there are significant differences in the experiment, the experimental group was better than the control group. But it also can be seen, there is a lack of method about the basketball special physical quality of practice in the standing long jump. Combined technology training compare and analyze from traditional training method in the practical application after the experiment. In order to evaluate the students' ability that uses the basketball technology, it arranged the training practice in the third stage of the final stage. According to the level of technology, it is divided into two groups: L and H, two groups of each class for three games, 13 technical indicators for the four groups were recorded, and we recorded average. See Table 3.

**Table 1. The Technology Comparison and Achievement Standard of the Two Groups after the Experiment**

Index		Experience group	Control group	p value after the experiment
Pass the ball with hands folded (BPM)	standard	36.5	35.2	P<0.05
	Technical evaluation	92.3	91.9	P<0.05
Shot in situ single hand shoulder (a / min)	standard	5.4	4.3	P<0.05
	Technical evaluation	82.9	80.2	P<0.05
The six round shot (s)	standard	59.6	63.7	P<0.05
	Technical evaluation	89.6	87.4	P<0.01
The S type dribble (s)	standard	40.5	42.6	P<0.01
	Technical evaluation	86.4	84.2	P<0.01
Triangle slide (s)	standard	26.9	27.7	P<0.05
	Technical evaluation	85.5	81.8	P<0.05

**Table 2. Comparison of the Results of the Five Standards Before and After the Experiment**

Project	Group	Sample size	Before the experiment	After the experiment	P value
100m(s)	Experience	58	15.64±0.61	14.64±0.55	P < 0.01
	Control	57	15.54±0.57	15.12±0.62	P < 0.01
Shot-put(m)	Experience	56	7.58±0.59	7.88±0.45	P < 0.05
	Control	60	7.53±0.65	7.72±0.42	P < 0.01
Standing long jump(m)	Experience	60	2.15±0.66	2.33±0.59	P < 0.01
	Control	59	2.20±0.56	2.25±0.72	P < 0.01

Pull ups(time)	Experience	60	6.58±0.72	16.65±0.98	P < 0.01
	Control	57	6.72±0.88	13.55±0.49	P < 0.05
1000(s)	Experience	56	242±7	221±8	P < 0.05
	Control	57	236±7	229±6	P < 0.01

**Table 3. The 13 Technical Indicators of Four Groups Students after the Experiment**

Index	L		H	
	Experience	Control	Experience	Control
Three points (number)	7	0	8	3
Error about three points (number)	3	5	2	4
Free throws(points)	7	5	9	3
Penalty error(number)	5	7	3	4
Two points(points)	18	16	22	16
Error about two points (number)	13	19	12	20
Fast break points(points)	15	6	17	8
Rebound(number)	18	7	23	16
Block a Shot(number)	5	4	6	2
Score(points)	13	7	15	4
Steals(number)	8	1	6	3
Error(time)	4	10	8	11
Foul(time)	6	11	8	13
Total score(points)	64	37	77	44

## 5. Discussion

From the table 1, the experimental group's 5 technical assessments and compliances are better than the control group, the results showed that the two groups were significantly or very significantly different, which shows that the experimental group of students have a great impact to master the technical movements.

From table 3, we can see the significant differences between the two groups and can draw conclusions.

(1) In the experimental group and control group, the difference of actual combat consciousness between the experimental group and the experimental group was obvious.

(2) The technology use ability gap has a big gap, which reflects that the experimental group is more flexible, reasonable and practical. The consciousness of control group is poor, the technical mastery is stiff, and coherence is poor.

(3) The experimental group on the field control ball ability is stronger with the tacit understanding, highly motivated and active atmosphere. In addition, the good physical quality, reflect the running, starting, and endurance ability are better than that of the control group.

The training of basketball combination technique is based on the theoretical basis, which is consistent with the characteristics of modern basketball. It is in accordance with the law of basketball technology training. It is helpful for students to better accept and master the training of basketball in a short time. Basketball combination technique training is advantageous to the students to master the knowledge and ability, and give full play to the initiative and enthusiasm of students' learning, and lay a solid foundation for the future of lifelong physical exercise.

## 6. Conclusion

Through the training experiment of students of basketball, the effect of tactical thinking mode training is better than the traditional training mode significantly. It reflects the "training" of democracy, "learning" of the autonomy, "management" of openness, and "test" of flexibility, which will enable students to learn not limited to the contents of the teacher, so as to improve the learning ability.

In order to improve the performance of basketball training, the big data technology is applied in the training management system. The reform of basketball training is being carried out, and the research on the combination selection mode of the basketball training is being discussed. The reform of college basketball training is being carried out, and the research on the combination selection mode of the basketball training is becoming more and more important. This is not only from the traditional technology to the combination of training to our physical education, but also from the tactical thinking to cultivate students. This can promote the university basketball sports better training and training. This is not only from the traditional technology to the combination of training to our physical education, but also from the tactical thinking to cultivate students. This can promote the performance and training interactive quality in basketball sports training and training.

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