

## *Retraction*

# **Retracted: Variation Factors and Dynamic Modeling Analysis of Tennis Players' Competitive Ability Based on Big Data Mining Algorithm**

### **Journal of Sensors**

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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

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

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

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

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


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

### **References**

- [1] Y. Xie, B. Bai, and Y. Zhao, "Variation Factors and Dynamic Modeling Analysis of Tennis Players' Competitive Ability Based on Big Data Mining Algorithm," *Journal of Sensors*, vol. 2022, Article ID 3880527, 8 pages, 2022.

## Research Article

# Variation Factors and Dynamic Modeling Analysis of Tennis Players' Competitive Ability Based on Big Data Mining Algorithm

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In order to fully tap the potential of tennis players, speed, strength, and endurance are further improved in physical factors. Improve the overall competitiveness of tennis to a higher level and further improve the scientific level of tennis training. This paper truly reflects the adaptability of athletes' functional state to training load. At the same time, the data mining algorithm is used to analyze the correlation between athletes and athletes in the application of techniques and tactics. The results show that timely adjustment of training plan and training load can provide a scientific and objective basis for improving the guidance of combat readiness training. At the same time, adjusting the training plan and training load provides a scientific and objective basis for further improving the guidance of combat readiness training. This paper improves the metacognitive level of athletes' participation, accurately and timely adjusts the athletes' personal goals and realistic positioning, and timely feeds back the relevant information of the competition. Only by being good at creating a competition environment can athletes give full play to their advantages and actively seek and pursue improvement in the stage of competitive ability.

## 1. Introduction

The characteristics of tennis determine that tennis players should have comprehensive competitive ability. The main factors affecting the competitive ability of tennis players are tactics, physical fitness, and psychology [1]. The training process of tennis players has the characteristics of long-term, systematic, and complex. This process is not only divided into different stages in time, such as sports material selection, basic training, special training, and high-level training [2]. The law of tennis competition is the concentrated embodiment of skills and tactics and their own competitive ability; the relationship between training and competition is the core to promote the positive variation of competitive ability; the variation factors of tennis players' competitive ability can be divided into self-control factors and non-self-control factors [3]. It refers to the synthesis of various physical abilities necessary for athletes to improve their sports technical and tactical level and create excellent sports

results, including athletes' body shape, physical function, physical health, and sports quality [4]. In other words, the transformation from closed scene to open scene has changed the performance and performance of athletes. This result is positive and negative [5]. The changes of tennis players' competitive ability are mainly caused by self-control factors. The best way to test athletes' sports ability level or obtain social recognition is sports competition, as well as the differences in time and space conditions between sports competition and sports training [6].

In competitive competitions, there are changes in "rhythm" and "athletes' competitive ability," that is, the change law of athletes' competitive ability in the time structure during the competition [7]. Tennis technology is an open technology. In tennis competitions with high requirements for technology and accuracy, tennis players must respond according to the situation of their opponents and move quickly and accurately to ensure the continuity of the competition [8]. The smooth realization of athletes'

competitive ability from realistic state to target state “has experienced a qualitative change from relative disorder to highly ordered structure in time and space” [9]. In terms of functional regulation, we need to examine the potential of storing and transferring substances, as well as the ability to adapt to comprehensive changes in the environment. Use some method to measure and identify the patterns found by data mining, and evaluate their effectiveness and applicability [10]. Improve the proportion of young athletes, shorten the training time, and prolong the athletes’ sports career; at the microlevel, strengthen the monitoring of the scientific training process to make the training content more targeted and effective [11]. Among them, physical fitness, as an important basis for competitive ability of competitive athletes, is the basis for supporting other competitive ability elements and normal play of super level competition [12]. It is these characteristics that make footwork and physical strength play an important role in the competition, and physical strength is an important guarantee to win. The relative stability of sports technology and the uniformity of real-time strain make sports technology have a stable sports structure, which changes continuously with the site, environmental conditions, and situation of opponents [13].

According to the physical, technical, intellectual, and psychological advantages of athletes, focus on cultivating athletes’ special abilities and interests in sports training. The unbalanced potential difference promotes the orderly development of competitiveness [14]. Data mining integrates the knowledge and achievements of many disciplines in the development process, so its research has produced various types of data mining methods [15]. For professional tennis players, competition training has run through the whole year, and competition has become a part of training. Form a competitive ability structure with differences, nonunity, and particularity. If the competitive ability describes the subjective situation of athletes from the content of athletes participating in training and competition, then the competitive strength is obtained from athletes through training to meet the athletes’ response to the competition. This fierce competition and continuous competition is a great challenge to the physical quality and recovery ability of athletes and integrated into the process of special sports [16]. Therefore, athletes need to have high anaerobic endurance, and tennis players should have a high level of anaerobic glycolysis. This paper aims to study the changing factors of tennis players’ competitive ability and data mining algorithm [17], achieve satisfactory results in the game, and even get the description of the subjective and objective conditions of game victory [18]. For long-time multishot and multiround shooting, athletes need high aerobic capacity. Aerobic endurance is the basis for athletes to quickly recover strength in the long-term competition and high-frequency events [19]. At the same time, people also judge the competitive level of athletes by observing their competitive ability in the competition and finally make a comprehensive evaluation of sports performance according to the situation of athletes’ competitive ability.

This paper presents a data mining algorithm to analyze the changing factors of tennis players’ competitive ability.

In short, the contributions of this paper are as follows: (1) The algorithm is a new data mining algorithm to analyze the changing factors of tennis players’ competitive ability. (2) The algorithm has a wide applicability in data mining environment and has a high applicability to the analysis of tennis players’ competitive ability. (3) The algorithm has a high operation efficiency, good recognition effect, and good visualization effect.

## 2. Related Work

McGawley et al. believed that healthy physical quality is necessary to promote health, prevent diseases, and improve daily life efficiency, including cardiopulmonary endurance, muscle endurance, muscle endurance, flexibility, and appropriate percentage of body fat. Physical quality can be divided into competitive physical quality and healthy physical quality. Competitive physical fitness refers to the body elements required by athletes to achieve excellent results in competitive competitions [20]. Hoffmann Jr. and others found that training to improve strength quality has a direct impact on the performance of tennis players. In strength training, we should increase the training of multiple muscle groups. The front of the body of excellent athletes is very strong, including chest and deltoid muscles. The posterior rotator muscle is an important muscle group, which can improve joint stability and protect joints [21].

Vescovi proposed the “comprehensive theoretical model” in their research in 2014. Due to the different degree of automation of athletes’ skills, there are obvious differences in competition experience and self-consciousness, their psychological function process is destroyed, and the sports process is declining. Therefore, they stressed that the characteristics and technical level of exercise should be considered when analyzing the mechanism of “asphyxia.” It is also considered that precompetition emotion is an intermediary variable in the relationship between athletes’ training level and competition level [22]. Torres-Luque et al. pointed out in 2015 that there is a “stage inspection” mechanism in sports competitions, especially when the strength of athletes is comparable; the probability of this “stage inspection” phenomenon is higher [23]. da Silva and others considered the causes, phenomena, and results of a series of events in sports competitions, namely “small probability events.” The competition environment, the timing of the use of sports technology, and the super level are all related to the emergence of “small probability events” in the stadium. The emergence of “small probability events” is an inevitable and irreversible phenomenon in the law of sports behavior [24].

## 3. Materials and Methods

Suitable load refers to the training principle of giving corresponding measured load in training according to the actual possibility of athletes, the training adaptation law of human function, and the demand of improving athletes’ competitive ability, so as to achieve ideal training effect. Athletes’ body will inevitably produce corresponding training effect after experiencing a certain sports load, and the body will adapt

to the load. At this time, if the sports load cannot change with the improvement of athletes' competitive level, there will be a bottleneck period. The change of space-time conditions leads to the change of the structural elements of competitive ability obtained by athletes before the competition and then leads to the change of competitive ability function. The relationship between competitiveness elements is shown in Table 1 and Figure 1. The diversity of competitive ability performance is reflected in the different achievements of the same athlete under different competition conditions, and different athletes also have different achievements under the same competition conditions. Generally speaking, physical fitness and technical tactics are the main contents of training, and there are few links of psychological training and ideological education. When athletes have similar sports ability or strength, physical quality is the key to achieve excellent sports results. Tennis players are a technology-oriented and body-based network confrontation project. Only when tennis players have comprehensive skills and strong special physical fitness can they adapt to the changeable competition situation and the needs of different venues. Tennis technology mainly includes bottom line technology, front net technology, high-pressure ball and hanging ball technology, small ball technology, and service and receiving technology. With the trend of athletes mastering fine and comprehensive technology and tactical flexibility, technology and tactics have become a balance point, and physical quality is the key to break this balance. Basically, the overall training of athletes shall be comprehensively arranged. The results of various indicators of fitness test will feed back the effectiveness of the plan. Its project characteristics determine that the unbalanced compensation of tennis players' competitive ability structure mainly focuses on the compensation of physical and tactical ability. It can be said that without good physical strength as the basis, techniques, and tactics will not play a role.

Tennis players should have comprehensive, solid, and skilled basic skills, master special skills, and practice killer mace on the basis of comprehensive technology. The tactical ability mainly focuses on their own specific playing methods and makes rational use of various tactics. Therefore, speed and quality are still the key to obtain "space-time advantage." Competing for jet lag and space advantage, whether we can catch the coming ball in advance needs speed to support. Without fast movement and reaction speed, even if the prediction is correct, it is also a passive shot, because physical quality is the basis to ensure that athletes can give full play to their technical and tactical abilities in the competition. The accuracy and subtlety of sports observation and the clarity and richness of sports imagination are the intellectual functions that tennis players need to pay attention to. Tactical literacy, brain shackles, changes in technology and tactics, and changes in hitting points are all good examples of sports intelligence. In other words, athletes' physical quality will affect their competitive level to a great extent and then affect the achievement of sports results. In normal training, in order to adapt to the fast moving speed in the competition and win valuable time for athletes, it is necessary to strengthen the training of reaction ability and

TABLE 1: The relation of competitive ability elements.

	Balance	Level
Skill	10.50	8.05
Physical fitness	9.72	7.18
Mind	9.02	8.19
Intelligence	8.91	8.22

increase the experience of dealing with various competition situations. Otherwise, it is either normal or unstable, and its final effect will not reach the ideal expectation. Therefore, in sports competitions, especially some special events, the requirements for athletes are normal and can give stable play to their competitive ability.

The specific motion quality parameters are shown in Table 2 and Figure 2. Tennis players are in a special stage of progress. According to sports training theory, the main task of basic training stage is to develop general sports ability. The main task is to improve their special competitiveness. The training content includes specific techniques and tactics. The increase of athletes' muscle volume is only the primary stage of strength training with additional conditions in some sports. The further improvement of power level mainly depends on the control and coordination of nervous system. Explosive power training is regarded as the training of coordination ability to a great extent. The main contents of training include basic sports ability; some basic technologies and parameters are shown in Table 3 and Figure 3.

ATP-CP is a multi-intermittent and fierce confrontation project. Its energy supply is characterized by providing 8-10 seconds of exercise time and fast and explosive energy under anaerobic conditions. From the characteristics of tennis energy supply, it is mainly provided by ATP-CP and anaerobic digestion in the short term, and the overall physical quality of individuals is also unbalanced. Only by adopting the training suitable for athletes' internal biological adaptation can we play a beneficial biological role and improve athletes' competitive ability. Individual competitive ability is the basis of training and competition, whether in individual or collective sports. It is unrealistic to change the adaptability of athletes' physical function in a short time. If you can't give full play to your technical advantages in the game, it will have a negative impact on the whole game process, resulting in the failure of the game. In sports with two or more people, the tactical combination and arrangement of coaches, based on individual competitive ability, constitute the competitive ability of the group under certain conditions. Combining theory with tennis, the basic quality of the body is not only the basis for mastering various techniques, but also the premise for using and perfecting techniques in the competition. Therefore, the good protection and play of each part of competitive ability is an important factor affecting the change of athletes' competitive ability. The change factors of competitiveness participation are shown in Table 4 and Figure 4. Although the collective project emphasizes the integration of the overall competitiveness level, it is also based on the combination and arrangement change of individual competitiveness.

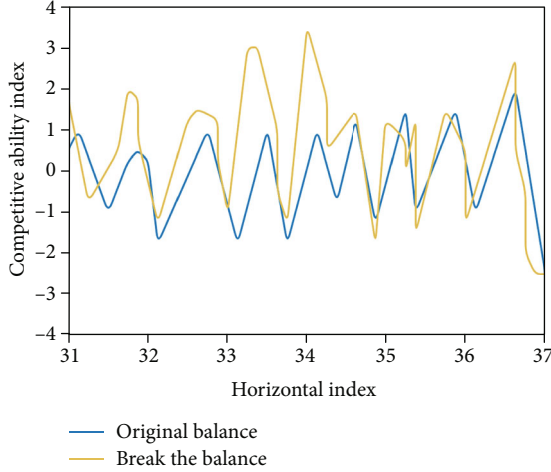


FIGURE 1: The relation of competitive ability elements.

TABLE 2: Training tasks in the special improvement phase.

	Train	Increase
Special skills and tactics	10.08	8.06
Special sports quality	9.62	7.95

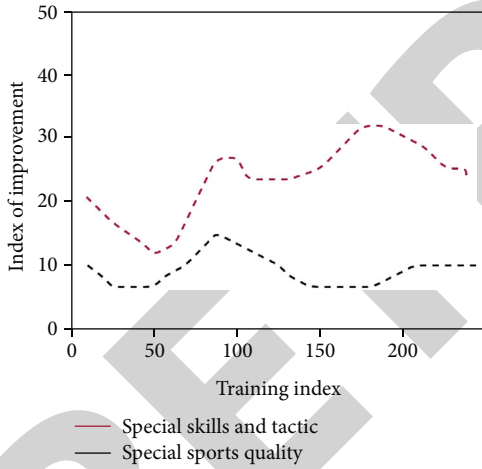


FIGURE 2: Training tasks in the special improvement phase.

TABLE 3: Training tasks in basic training stage.

	Train	Increase
Basic sports ability	15.05	13.12
Several basic technologies	10.25	9.18

#### 4. Result Analysis and Discussion

In data mining, all data objects are first put into a group, and then a group is divided into smaller groups in each iteration until each data is recorded in a separate group or meets a condition. Through the game data collected by the data acquisition module in the tennis technical and

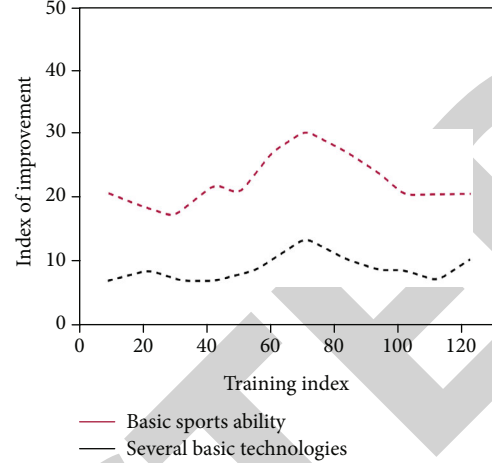


FIGURE 3: Training tasks in basic training stage.

tactical analysis system, the developed class library is introduced into the comprehensive analysis module to analyze the selected game. In many cases, the body is in an unbalanced state. Through core training, it can strengthen the balance and stability of the body, help prevent injury, and integrate the whole body strength to hit the ball. At the same time, it is also the main link of comprehensive strength. It plays a key role in the coordination of upper and lower limbs. If there is any unforced error, emotional disorder, psychological tension, etc. at the critical moment of the game, that is, the score, count, and game score, it is easy to lead to the failure of the game. The numerical distribution under iteration is shown in Table 5, and the data mining analysis process is shown in Figure 5. Tennis is a sport based on anaerobic metabolism. At the same time, it is also the main link of the whole army. It plays a key role in the coordination of upper and lower limbs. In many cases of hitting the ball, the body is in an unbalanced state. The function of each component of athletes' competitive ability will directly affect the result of competition, which is a direct factor affecting athletes' competitive ability. Monitoring this index will help to improve the physical exercise content of aerobic metabolism and anaerobic metabolism in time, helps prevent injuries, and integrates full body strength to hit the ball. During exercise, the proportion and quantity of lactic acid produced are large. Through core training monitoring, the balance and stability of the body can be strengthened.

In the process of evaluating the variation of tennis players' competitive ability in competition, the technical indexes can be directly substituted into the formula to calculate the positive value:

$$y_i = f\left(\sum_j w_{ij}x_j - \theta_i\right),$$

$$O_t = f\left(\sum_i T_{li} - \theta_l\right).$$
(1)

TABLE 4: Variation factors of competitive ability in competition.

	Influence	Judge
Personal factors	23.05	5.06
Psychological factor	19.13	3.27
Environmental factor	19.05	3.05

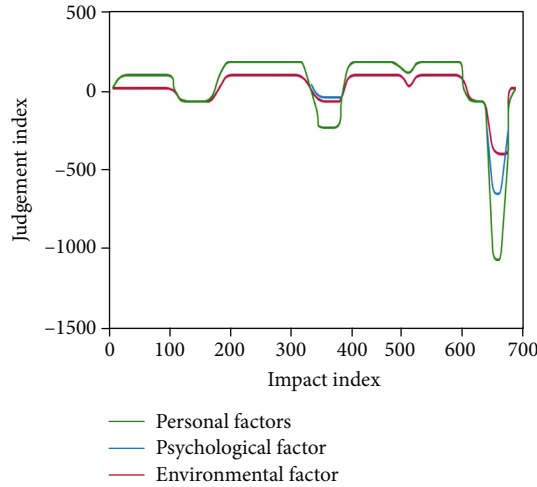


FIGURE 4: Variation factors of competitive ability in competition.

TABLE 5: Weight assignment.

	Extract	Weight
Data preparation	17.16	9.56
Association rule mining	16.52	9.13

Through various references, it is concluded that the judgment of competition variation is based on the pre-competition training (or competition) results of an athlete:

$$w_{ij}(k+1) = w_{ij}(k) + \eta \delta_i x_j, \quad (2)$$

$$F_p = (P_A - P_B) A_p.$$

The variance shown by the difference in performance derived from the formula must be combined with the qualitative evaluation of coaches and athletes. Only the difference in performance is incomplete:

$$I_\omega \ddot{\delta} = F_r d - K_\omega \dot{\delta} - C_\omega \delta - K_1 e \delta. \quad (3)$$

The difference of the main body and the change of the main body's self-control factors are the direct factors leading to the variation of the competition:

$$Q_i = C_q A_i \sqrt{\frac{2\Delta P_i}{\rho}}. \quad (4)$$

Changes in the object of the game are indirect factors that contribute to the variation of the competition:

$$P_S - P_A = \frac{\rho}{2C_q^2 A_1^2} Q_1^2. \quad (5)$$

In this step of data mining, the corresponding algorithm must be selected according to the characteristics of the data itself and the functions expected to be implemented, so that the implicit mode is extracted from the data by continuously updating the weights:

$$a = f(wp + b). \quad (6)$$

To calculate the error between the nodes in the hidden layer, you need to weight the error connected to the node in the next layer:

$$n = \sum_{i=1}^R P_i W_{l,j} + b, \quad (7)$$

$$n = W * P + b.$$

The error of propagation is reflected by updating the weight and offset. The formula for weight update is as follows:

$$f(x) = \frac{1}{1 + e^{-x}}. \quad (8)$$

The offset is updated by the following formula. Change amount formula:

$$E_p = \frac{\sum (t_{pi} - o_{pi})^2}{2}. \quad (9)$$

The basic purpose of tennis training is competition, and competition is the most direct way and ultimate goal. Therefore, sports competition is the way to show and develop competitive ability. In order to achieve the ideal training effect, only by grasping the leading factors closely related to the specific characteristics and carrying out key training in a hierarchical and orderly manner, the structure and development of individual competitive ability can better meet the competitive needs of a certain stage. Physical fitness has become a key factor affecting the success of the competition. Therefore, we should treat the relationship between physical fitness and tactics differently and realize that physical fitness and tactics are independent in the elements of competitive ability and unified in the competition. The length of competition time also plays a role in the change process of competition. The competition process is short. If there is competition variation, the process is also short. Once it is formed, the athletes' self-regulation mechanism is difficult to play a role, especially in the case of negative variation, because time does not allow athletes to make rapid and effective judgment and adjustment. According to the characteristics of tennis, observing and analyzing the changes of athletes' body shape not only has the significance of material

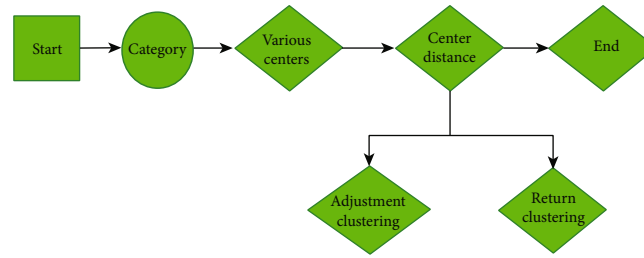


FIGURE 5: Data mining analysis flow chart.

selection, but also feeds back the training effect and effect from one side. At the same time, it is a platform for athletes to transform the subjective conditions of participating in competitive sports activities into objective reality, which is carried by athletes' performance and social evaluation. The significance of group variation is that it is based on individual variation and is closely related to the characteristics of different sports. Therefore, it determines the change of competitive variation among different individuals and ultimately affects the competitive process and results. In the game, save each resolved action. Through the analysis of game data, some rules can be found. The data can be saved in the string array by intercepting the data, so as to analyze the game data. The relationship between different types of changes is shown in Figure 6.

In the competition, athletes need to change the application of technology, size control, rhythm control, and emotional expression according to the changes of the field. The change of athletes' emotion plays an important role in the achievement of excellent sports results. Athletes' good emotional state in the competition is the psychological feature of competition success. It helps athletes to better tap the potential of the body, give better play to their technical level, and win the competition. The application of tennis technology requires the body to play a better role in balance, and coordination quality also plays an important role in maintaining body balance. Each training stage has its specific main training tasks. In order to accurately reflect the real situation of these systems, it is necessary to measure and evaluate specific indicators in order to achieve these indicators.

The change process of tennis players' competitive ability participation is shown in Figure 7. After the athletes have the basic competitive ability, for the athletes in the indirect confrontation group, the competition is mainly caused by objective conditions. Therefore, the phased characteristics of the development and construction of competitive ability structure determine the phased nature of the sports training process. The complete process of the development and construction of athletes' competitive ability structure is composed of multiple interrelated different training stages. Through various tennis competitions, according to the sports performance of the competition and the level of personal tennis competition, receive tennis professional training, obtain the unique sports ability of tennis, and reach a certain tennis training level. For the team athletes in direct confrontation, the subject is also due to the role of the object. The change of activity mode includes the change of time and

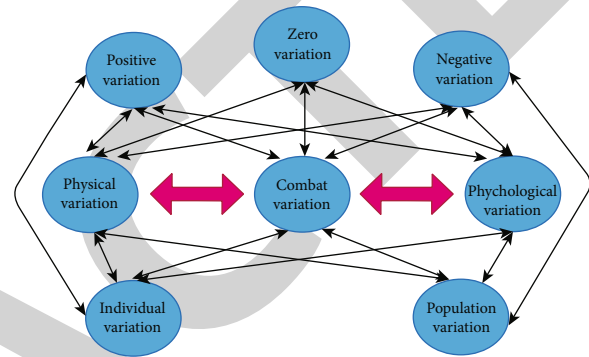


FIGURE 6: Interrelation among variations of different species.

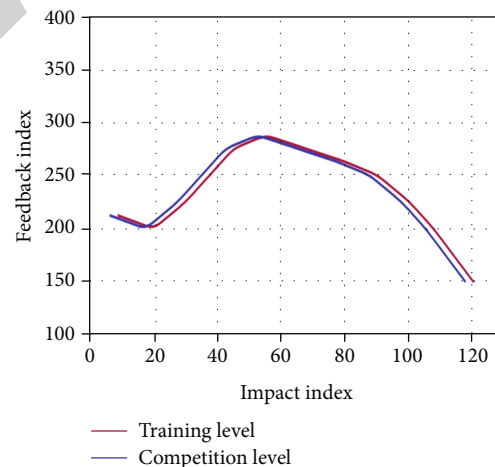


FIGURE 7: Variation of tennis athletes' competitive ability in competition.

space of technical action and the change of tactical adjustment. Judge the level of athletic ability of tennis players.

## 5. Conclusion

In tennis matches, some techniques and tactics are often used to train and improve athletes' memory, imagination, and thinking ability and help athletes make rational use of professional theoretical knowledge and correctly understand coaches' training intention, so as to greatly shorten the

process of learning and mastering sports skills. Based on data mining algorithm, this paper analyzes the changing factors of tennis players' competitive ability. Combined with the idea of data mining, this paper looks for the action combination often used by athletes in the process of competition. Technical warfare can make the project group have the characteristics of group integration and symbiosis, core technology and tactical guidance, attack and defense transition control, and bureaucratic point outbreak. The skill advantage group has the characteristics of target fear polarization and variability of variation process. People are the main body of tennis. Tennis training and competition are the research objects. In training and competition, the difference between subject and subject control factors is the direct factor leading to the competition. The strength, speed, and endurance of athletes develop with the arrangement of training contents. The improvement of flexibility is partly due to the original physical condition of athletes, and athletes have sports injuries, so there is little improvement or change. However, there is no in-depth analysis of the lack of self-control ability and countermeasures in this paper. Self-control is the stimulating factor that causes athletes' psychological response in the competition. Therefore, a series of measures should be taken in the future research.

### Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

### Conflicts of Interest

The author declared that they have no conflicts of interest regarding this work.

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