

Research Article

Construction of Evaluation Model of Tennis Skills and Tactic Level and Application of Grey Relational Algorithm

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Based on the application characteristics of the world's elite tennis players' skills and tactics, this paper establishes the evaluation model of skill and tactic level. According to the principle of normal distribution, taking the overall average as the reference value and the overall standard deviation as the discrete distance, the deviation method commonly used in sports statistics is adopted to formulate the grade evaluation standard. The standard is divided into five evaluation grades: excellent, good, passing, poor, and extremely poor. The equivalent evaluation scale of diagnostic indexes of tennis skill and tactic level is established. It also discusses many factors that characterize the skills and tactics of tennis singles. At the same time, it introduces the grey relational algorithm, constructs the evaluation model of skills and tactic level, and makes an example application. Through experimental analysis, it is concluded that this model can be applied not only to the diagnosis of individual athletes but also to the evaluation of a sports team. This article is aimed at further enriching the analysis system of tennis skills and tactics.

1. Introduction

With the continuous development of tennis and the increasing influence, tennis is becoming more and more popular with the public [1]. Most people have participated in the tennis competition, which has set off a wave of tennis in China's social development [2]. Tennis has high technical requirements. Among all sports, the rules and requirements of tennis for athletes' behaviors on the court are more detailed and strict. Under the background of actual economic globalization and material and cultural diversification, how to improve the competition skills of Chinese tennis players and promote the development of tennis in China has become an important direction for the development and reform of tennis in China [3]. Game technical and tactical statistics is a cognitive activity that uses concrete data to reflect the quantitative relationship and characteristics between each link of the game technical and tactical and each component of the system [4]. It is characterized by using a large number of specific data to reflect the present situation, changes, and rules of technical and tactical activities in the competition. The purpose is to grasp the overall

quantitative characteristics of technical and tactical activities in the competition, so as to realize the essence of technical and tactical activities in the competition. Tennis skills and tactics are complex and changeable, and it is often difficult to make accurate and scientific decisions on such problems [5]. With the development of information technology, decision-making can be carried out with more information, which greatly increases the complexity of decision-making, and restricts the right decision-making based on personal knowledge and experience. Most of the traditional game analysis is based on the general mathematical statistics. By looking up the literature, we make a primary analysis of the statistical data [6]. The statistical index is too simple, and the information of competitive state of diagnosis feedback is small. Although some methods of multivariate analysis have been used for diagnosis and evaluation and some progress has been made, these methods often fail to find the crux of the problems in the training process and the competition process.

Whether the players successfully use the skills and tactics in the competition often becomes the decisive factor of the competition [7]. The diagnosis and analysis of tennis skills

and tactics are mostly based on the comparative analysis of various technical statistical indicators of athletes in the competition, in order to provide reference for training and formulating competition strategies and tactics. The competitive state of athletes is a complex system, and many contradictions in the system cannot be solved only by dealing with the quantity relationship [8]. Therefore, we cannot just stay in the study of quantitative relationship, but we must study things, characteristics, and values, and we must study the relationship and changes of these three, in order to get a solution to the contradictions [9]. At present, most of the researches are based on the technical and tactical characteristics of the first few athletes in the whole competition or a certain competition. However, the performance of sports competition is restricted by athletes' competitive state during the competition period, environmental factors in the competition, and accidental factors in the competition, and competitive sports itself has the characteristics of unpredictability and contingency of the competition results, so it is difficult for other players to refer to and evaluate the winning rules of tennis skills and tactics [10]. From the literature reports, the technical and tactical research of sports competition has been a very important research topic in sports research for a long time. This paper reviews the current research methods of sports techniques and tactics, aiming at reflecting the current research level and current situation of sports techniques and tactics from the perspective of methodology.

In the process of the continuous development of ball games, the rules of the game are also evolving. Different stages of development have different characteristics, so it is very important to accurately understand and grasp the development trend and objective laws of tennis [11]. In the previous comparative analysis of athletes' skills and tactics, the technical and tactical data of each competition were only isolated individuals, and there were no systematic comparison and evaluation of the quality differences between each competition. The lack of longitudinal analysis cannot directly reflect the ups and downs of athletes' staged competitive state and the fluctuation of various technical and tactical application effects [12]. The technical and tactical analysis of tennis matches cannot be separated from the understanding of the objective laws of this event. Only by starting from the basic theory of special training, following the winning rule and grasping the competitive elements, can the evaluation model be constructed properly and accurately reflect the situation of tennis players' skills and tactics [13]. The results can be helpful to the diagnosis and analysis of coaches and the arrangement of the next training plan, so that the evaluation model can stand the test of practice. The evaluation model of sports skill and tactic level designed in this paper is based on the basic principle of grey relational algorithm, and the evaluation model of sports skill and tactic level based on grey relational algorithm is constructed [14]. A tennis match is described with an introduction matrix of game state transition. On this basis, the winning probability of the match is calculated by Markov chain and the competitive efficiency values of various game states are further determined. Compared with the traditional evaluation and

analysis method of tennis match, this method can not only make descriptive statistical analysis of techniques and tactics through the transition probability of various match states but also determine the influence of various match states on the winning probability of the whole match.

2. Related Work

Literature [15], by using the fast video analysis system of tennis match and the data collection and intelligent analysis system of tennis skills and tactics, makes a simple statistical analysis of the technical and tactical characteristics of Chinese women tennis team by video statistics and points out some problems existing in the economic indicators of Chinese women tennis players. In literature [16] by using the methods of literature, mathematical statistics, and comparison, the technical and tactical indexes of tennis women's singles players in the competition were statistically analyzed. Literature [17] points out that there is a significant gap between Chinese tennis women's singles players and world-class tennis women's singles players in terms of technical and tactical indicators such as the scoring rate of the first serve, the scoring rate of the second serve, the scoring rate of receiving the serve, the success rate of breaking, and nondestructive mistakes. Literature [18] and Literature [19], respectively, studied the diagnosis and evaluation of tennis attack tactic level in the research of "Diagnosis and evaluation of tennis attack tactics level" and "Application of multivariate analysis in tennis evaluation." Literature [20] pointed out that it is also a requirement of technical and tactical decision to simulate and predict the influence of various technical and tactical indicators on the results of the competition through technical and tactical modeling research. Literature [21] describes the theory and method of mathematical simulation competitive diagnosis of ball games in the research of "Theory and practice of mathematical simulation competitive diagnosis of ball games." It was successfully deduced with an example of mathematical simulation of tennis match. Literature [22] introduces matter-element analysis into the diagnosis method by using the basic idea of technical and tactical characteristic model. Using extension set and correlation function, the characteristic model of tennis women's doubles skills and tactics is divided into three dimensions. They are basic skills, basic tactics, and the substructure of sending and gaining and losing. Literature [23] uses a mathematical simulation diagnosis method to diagnose and evaluate competitive state. It opens up a new way to study the competitive state. He can not only make general descriptive statistics on the competition state but also determine the influence of various competition states on the winning probability of the whole competition through mathematical calculation. Literature [24] studies the theory and methods of data mining and discusses the application of data mining based on association analysis and data mining based on rough set in the field of tennis technical and tactical decision-making and makes a concrete application case analysis.

Based on the research of related literatures, this paper finds that due to the different items and requirements, there

are various theories and methods used in technical and tactical research, each of which has its own characteristics. Based on the analysis and research of the advantages and disadvantages of these methods, this paper puts forward a new evaluation model construction method of tennis skills and tactics. Based on the theory of grey correlation algorithm, this paper uses a grey correlation method to construct the diagnosis and evaluation system of tennis skill and tactic level. By using the methods of literature review, questionnaire survey, and video statistics, the evaluation indexes of tennis skills and tactics were established. The indicators that are highly representative and can objectively reflect the actual situation are selected. It has solved the technical and tactical landing decision-making problems such as the analysis of the association rules of the last two beats, the association rules of the first three beats of the serving wheel, and the association analysis of the first two beats of the receiving service. Experiments show that the comprehensive evaluation model of tennis skills and tactics based on the grey relational algorithm is practical and feasible. Provide objective and scientific decision support for the evaluation of tennis skills and tactics.

3. Methodology

3.1. Concept and Significance of Tennis Skill and Tactic Level Evaluation. Technology and tactics are two frequently used terms in sports, and they are two necessary links to improve the competitive level. Technology is the way to complete actions; tactics are the strategies and actions taken to defeat opponents. Technology is interpreted as the experience and knowledge accumulated by human beings in the process of utilizing and transforming nature and embodied in productive labor and also refers to other operational skills [25]. Continue to narrow the scope to tennis, and technology is one of the performance characteristics of tennis. It mainly includes serving, receiving, forehand shooting down the earth, backhand shooting down the earth, interception, high-pressure ball, lob, and small ball. According to the theory of sports training, sports technology refers to the method of completing sports movements, which is an important determinant of athletes' competitive ability.

Sports tactics refer to all kinds of strategies and actions taken to defeat opponents or achieve ideal results according to the competition rules of special sports. Here, strategy refers to premeditation and on-the-spot strategy before the game. Action refers to the behavior mode of carrying out pregame planning and on-the-spot strategy. Tactics consist of tactical concepts, tactical guiding ideology, tactical principles, tactical awareness, tactical knowledge, tactical forms, and tactical actions [26]. There are technical and tactical behaviors in any sports competition, but different sports require different levels of skills and tactics. The quantitative diagnosis of technical and tactical level is to use scientific detection methods to obtain information related to athletes' technical and tactical level. Then analyze the information, so as to evaluate the technical and tactical level of athletes, find out the shortcomings, and provide the basis for improving the technical and tactical training quality. We diagnose the cause of failure and its degree according to certain procedures or rules. The specific steps are shown in Figure 1.

Tactical ability refers to the ability of athletes to master and use tactics, which is the main component of the overall competitive ability of athletes. Good tactics, if the athletes cannot perform effectively in the competition, or if the athletes do not follow the original tactical plan according to the changes of the competition situation, they are likely to fall into a passive position and fail to achieve the expected competition results [27]. Therefore, it puts forward high requirements for athletes' tactical ability. In the ball game, the complexity and flexibility of techniques and tactics and their flexible application in the game make the ball game performance and sports quality show a nonlinear relationship, and it is difficult to predict the athletes' performance according to sports quality, while techniques and tactics play an extremely important role in the outcome of the game.

Technology and tactics are dialectically interrelated, interdependent, and mutually restricted. It is the material basis of technology and tactics. In the competition, technology is always reflected in tactical coordination and action, and it can be fully played and played a good role in time. Advanced tactics can in turn actively promote the improvement and development of technology. Scientific and systematic diagnosis and analysis of players' technical and tactical ability are one of the core contents to improve the scientific training and participation of tennis events.

The strength of athletes' tactical ability is reflected in the advanced tactical concept, the strength of individual tactical awareness and cooperation awareness, the amount of tactical theoretical knowledge, the quality and quantity of mastered tactical actions, the immediacy and effectiveness of tactics, etc. In sports, the degree of dependence of competition results on skills and tactics is quite different among different sports groups. The technical and tactical requirements of various events are divided into three levels: basic role, important role, and decisive role. For sports with high technical and tactical requirements, the successful application of athletes' technical and tactical skills in the competition often determines the outcome of the competition, which is a very important factor.

The technical and tactical characteristic model refers to the sum of the technical and tactical characteristics that athletes need to have when they take up the role of a special task in competitive sports. The establishment of the technical and tactical characteristic model is the logical starting point for the practical research of athletes' training and training, and it is also an important foundation for a series of athletes' team management and development techniques. The statistical analysis of sports skills and tactics is mainly that the technical and tactical information indicators in sports competitions are listed into tables in advance, and then the technical and tactical indicators are recorded and counted by on-the-spot observation or watching the video of the competition, so as to obtain the technical and tactical counting data of athletes in the competition, and then further statistical analysis and collation of these technical and tactical data are carried out, and the technical and tactical rules reflecting the athletes' competition performance are obtained. The frame structure of the comprehensive evaluation system of technology and tactics in this paper is shown in Figure 2.

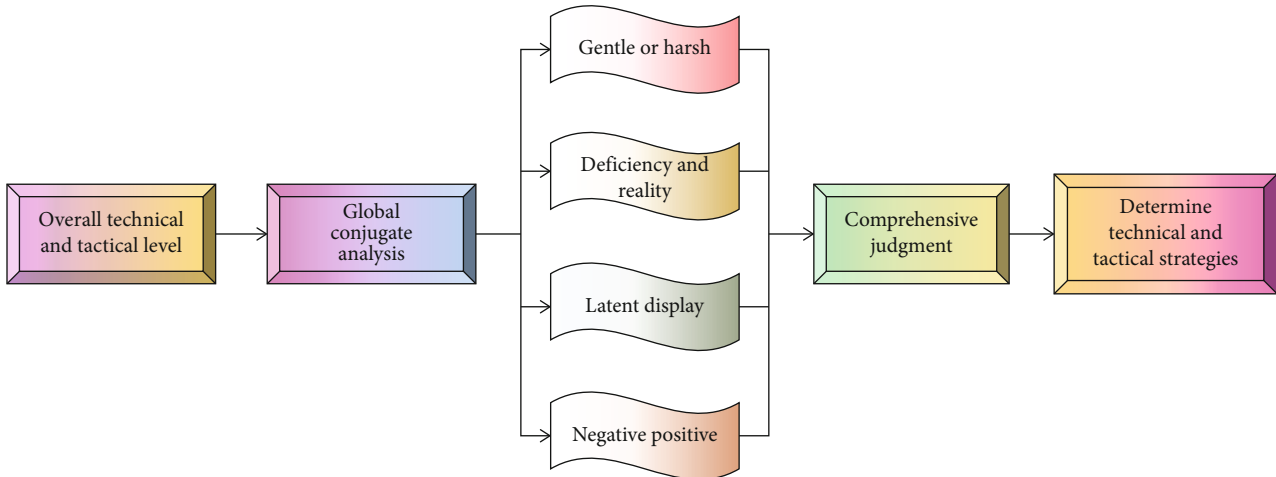


FIGURE 1: Quantitative diagnosis process of athletes' technical and tactical level.

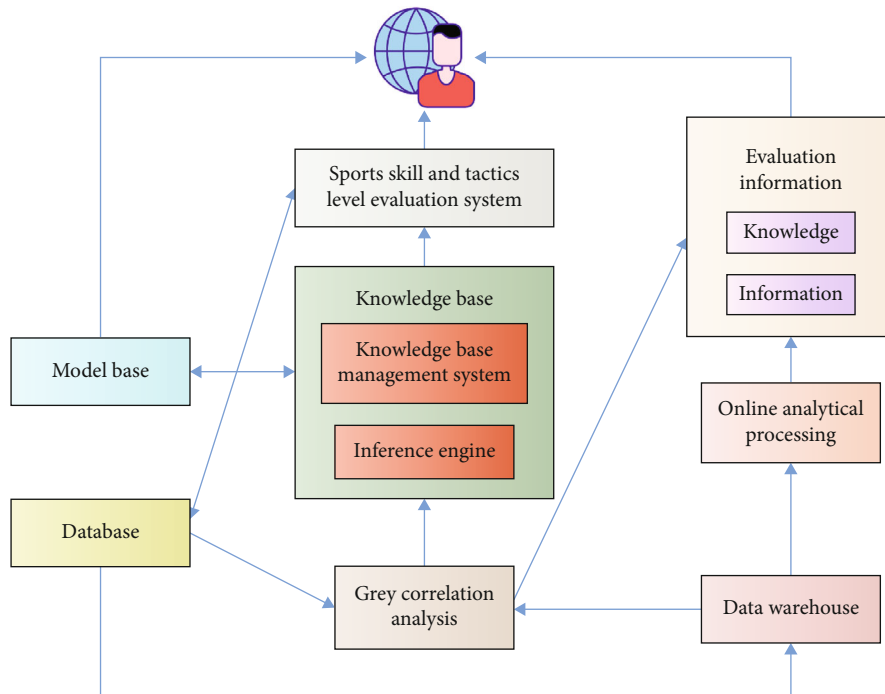


FIGURE 2: Framework of comprehensive evaluation system of tactics and techniques.

Evaluation usually means to determine the meaning, value, or state of an object through detailed and careful research and evaluation. Modeling technical and tactical behavior is also a way to study the performance of competitive sports. Sports model is an analytical technology that provides practical information, because it directs the modeler's attention to key features of data, which can successfully describe athletes' performance in competition, and the model can reliably predict future competitions according to the deep-seated features of sports performance.

3.2. Evaluation Model of Tennis Skill and Tactic Level Based on Grey Relational Algorithm. Grey system correlation analysis is not only an important part of grey system theory but

also the cornerstone of grey system analysis, modeling, prediction, and decision-making. Research in recent years shows that grey relational theory is undoubtedly the most widely used and dynamic part of grey system theory. Association analysis can find interesting relationships between things hidden in large databases. These connections can be given in the form of association rules and frequent item sets. Association analysis can be applied to business management, medical diagnosis, scientific data analysis, and other fields. The existing grey relational analysis is based on the following idea: according to the similarity of geometric shapes of series curves, it is judged whether the relationship is close. The closer the curves are, the greater the correlation between the corresponding series, and vice versa. Association analysis

can find interesting relationships between things hidden in large databases. These rules or relationships can be found by using an algorithm of association rules.

At present, the construction of grey relational grade algorithm model is mainly from two angles. On the one hand, the correlation degree is constructed by reflecting the similarity of development process or magnitude between two sequences. On the other hand, it is constructed by reflecting the similarity of the development trend or curve shape of the two series, that is, the closeness of the relative change trend between the main engraved series curves. In practical applications such as grey clustering and grey decision-making, the correlation analysis of the closeness between each known pattern and the ideal pattern is often used. The closer the known pattern and the ideal pattern are, the higher the closeness and the larger the value of the closeness. That is to say, this correlation analysis is a kind of proximity analysis, not similarity analysis.

Grey comprehensive evaluation is mainly based on the following models:

$$R = E \times W. \quad (1)$$

In the formula, $R = [r_1, r_2, \dots, r_m]^T$ is the comprehensive evaluation result vector of m evaluated objects. $W = [w_1, w_2, \dots, w_n]^T$ assigns n vectors to the weights of n evaluation indicators, where

$$\sum_{j=1}^n w_j = 1. \quad (2)$$

E is the evaluation matrix of each index:

$$E = \begin{bmatrix} \xi_1(1) & \xi_1(2) & \dots & \xi_1(n) \\ \xi_2(1) & \xi_2(2) & \dots & \xi_2(n) \\ \dots & \dots & \dots & \dots \\ \xi_m(1) & \xi_m(2) & \dots & \xi_m(n) \end{bmatrix}. \quad (3)$$

In the formula, $\xi_i(k)$ is the correlation coefficient between the k -th index of the i -th scheme and the k -th optimal index. The value of R is obtained, and the techniques and tactics of the evaluation objects are sorted. Determine the optimal set of metrics (F^*). Assume

$$F^* = [j_1^*, j_2^*, \dots, j_n^*]. \quad (4)$$

In the formula, $j_k^*(k = 1, 2, \dots, n)$ is the optimal value of the k -th index. If it is a high-quality index, the optimal value is the maximum value among the schemes; if it is a low-quality index, the optimal value is the lowest value among the schemes. After selecting the optimal index set, the matrix D can be constructed:

$$D = \begin{bmatrix} j_1^* & j_2^* & \dots & j_n^* \\ j_1^1 & j_2^1 & \dots & j_n^1 \\ \dots & \dots & \dots & \dots \\ j_1^m & j_2^m & \dots & j_n^m \end{bmatrix}. \quad (5)$$

The evaluation index system of tennis technical and tactical effectiveness is the main basis for judges to score the skills and tactics used by tennis players in tennis matches. The establishment of tennis technical and tactical efficiency evaluation system needs to be based on the basic unit skill process and divide the whole tennis game into several basic unit competition modules. According to the athletes' "score and loss of beat number" in the basic compound competition process, this paper analyzes and judges the base station performance and economic characteristics of tennis players. The basic unit competitive process refers to the process of offensive and defensive confrontation between players in the competition for every point, which is the most basic unit of the tennis competition process. The "winning and losing scores" produced by each basic unit competitive process is not only the expression form of athletes' technical and tactical application but also the stage characteristics of the basic unit competitive process of tennis competition. Scoring rate and utilization rate are the most basic evaluation parameters for the technical and tactical analysis of the holding-racquet-net-against-net event.

Sports competition behavior and its results are influenced by many factors. The complexity and difficulty of explaining these factors make some scholars begin to study sports competition from a systematic point of view. Although it is still inconclusive whether the technical and tactical behavior of sports competition is a self-organizing system or a complex system, it is based on the systematic view to study sports competition. In the course of the competition, in order to give full play to the technology, reasonable tactical choice is also necessary. In the process of sports training, tactical awareness must be used to guide technical training. Only in this way can we train the most useful skills in the competition. On the other hand, it is necessary to choose a tactical system suitable for athletes from their technical characteristics.

The first step of technical and tactical statistical analysis is to collect data according to statistical indicators. According to the different collection time, it can be divided into two categories: on-the-spot collection and postmatch collection. On-the-spot collection means real-time collection of skills and tactics during athletes' competitions. On-the-spot data collection has few indicators and reflects little information, but the collection time is short, which is conducive to rapid information feedback, and is mainly used for technical and tactical statistics of sports teams during competitions. Postmatch collection refers to technical and tactical collection by watching video data after the game. Because this kind of collection is not limited by time, it can observe and record as many technical and tactical indicators as possible, which is conducive to more detailed and in-depth technical and tactical research of the game. For discrete data series, the

so-called closeness of two curves refers to the closeness of curve slopes of two time series in each corresponding time period. If the curve slopes of two curves are equal or have little difference in each time period, the correlation coefficient between them will be larger; otherwise, it will be smaller.

The physical characteristic displacement difference $d_{ij}^{(0)}(t)$ describing similarity and the physical characteristic velocity difference $d_{ij}^{(1)}(t)$ and acceleration difference $d_{ij}^{(2)}(t)$ describing similarity are used to reflect the degree of correlation between sequences. Order

$$\begin{aligned} d_{ij}^{(0)}(t) &= \sum_{k=1}^n |x_i(k) - x_0(k)|, \\ d_{ij}^{(1)}(t) &= \sum_{k=1}^{n-1} |x_i(k+1) - x_0(k+1) - x_i(k) + x_0(k)|, \\ d_{ij}^{(2)}(t) &= \sum_{k=2}^{n-1} |[x_i(k+1) - x_0(k+1)] - 2[x_i(k) + x_0(k)] \\ &\quad + [x_i(k-1) - x_0(k-1)]|. \end{aligned} \quad (6)$$

Then, the formula for calculating the B-type correlation degree is:

$$r(X_0, X_1) = \frac{1}{1 + (1/n)d_{ij}^{(1)}(t) + (1/(n-1))d_{ij}^{(0)}(t) + (1/(n-2))d_{ij}^{(2)}(t)}. \quad (7)$$

As a net-separated confrontation event, the competition for each ball in the competition is a unit competition process. Therefore, the analysis of the structure of gains and losses is an important part of the whole competition and the whole competitive process. The structure of winning and losing points in tennis has many characteristics: due to the fierce confrontation in tennis competition, the scores in the competition include both active offensive scores and the mistakes of opponents. When watching the game, we often see the unforced errors of athletes. Because of the different times when athletes' best state appears in the course of competition, the proportion of athletes' gains and losses is different in different stages of competition. The success or failure of high-level competitions often takes the gain or loss of one or two key balls as the inflection point, showing a clear trend. The final result of a tennis match is calculated by scores, so scoring and losing points are the starting points to guide training and competition.

In the process of establishing the technical and tactical characteristic model, we discuss it from three aspects: basic technology, basic tactics, and the structure of gains and losses. Technology is the foundation of tactics and the necessary condition for tactics to be realized. The basic skills of tennis singles include serving, receiving, forehand, backhand, chopping, volley ball, high-pressure ball, putting small ball, and picking high ball. On the structure of score and

loss, it is discussed from two aspects: the means and timing of score. In terms of means of gain and loss, we use active scoring as the index, and in terms of scoring opportunity, we use the first four beat scoring and stalemate scoring stages to describe.

4. Result Analysis and Discussion

Only analyzing the single technical and tactical indicators of tennis players can not reflect the problems existing in the whole competition process, and the results are rather one-sided. Therefore, it is necessary to comprehensively evaluate the effectiveness of each technical and tactical indicator from a comprehensive perspective and obtain the comprehensive evaluation results, so as to reflect the quality of the whole competition. Among the various techniques of tennis, serving is the only one that is not restricted by opponents. A good serve can not only score directly but also mobilize the opponent into his own tactical design. A good serve is not only a sharp weapon to score directly but also an important means to take the initiative and create a winning chance. As the most efficient scoring method, the technique before the net is often ignored by the bottom-line players, but under the trend of comprehensive technology, the technique before the net gradually shows its importance.

During the whole game, because there are not too many differences in serving speed, serving strength, and other aspects between players of both sides of the game, this research activity will analyze the importance of serving and receiving in the whole tennis game from the third row of the game to the whole game with the aid of this stage of attack and defense stalemate. Statistical analysis of a certain technical and tactical index of athletes can evaluate the local situation of athletes' technical and tactical application in the competition. If we want to evaluate the technical and tactical performance of the whole competition, we need to "integrate" the application of each tactical index in the competition. Figure 3 is a schematic diagram of the average utilization rate and average scoring rate of each beat technique and tactics used in the basic unit competition of the world's elite tennis players in hard court competition.

The differences in the average utilization rate and average scoring rate of each beat technique and tactics in the basic unit competitive process show the differences in the characteristics of technique and tactic application and scoring effect in the three stages.

Considering the characteristics of association rule algorithm, that is, it produces frequent itemsets in combination. However, the decision-making requirement of the hitting point of tennis ball is in order, and it is related to the hitting effect. Therefore, the grey relational algorithm is used to mine the characteristics of hitting point of tennis technique and tactics. It can excavate and analyze the relationship between the hitting point and the winning and losing points of the first two strokes of the serving wheel and the receiving wheel and can also analyze the correlation between the hitting point and the winning and losing points of the last two strokes of each score. The evaluation index mainly involves three aspects, namely, benefit index, cost index,

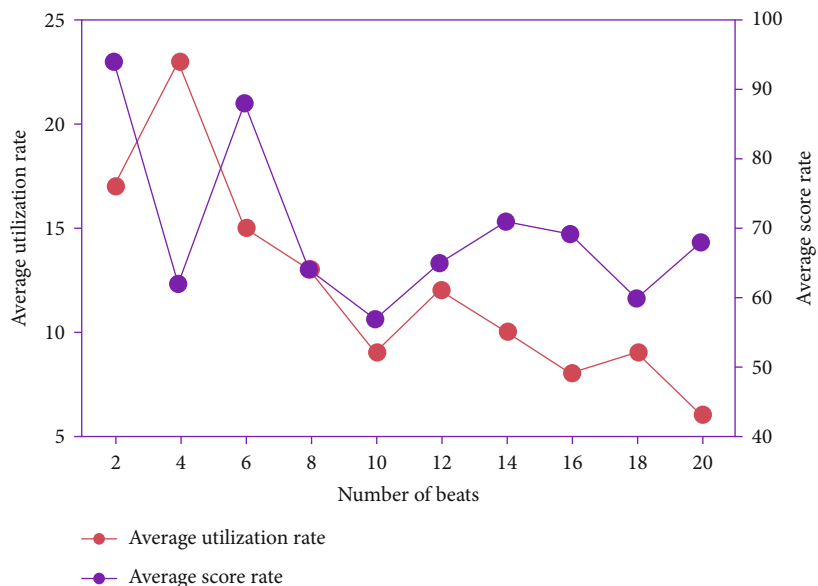


FIGURE 3: Average utilization rate and average score rate of each beat in hard court competition.

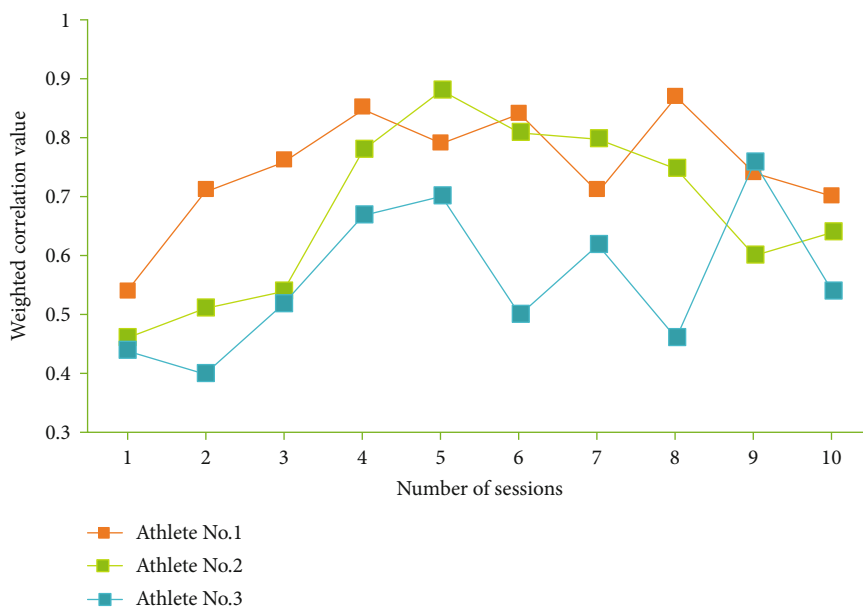


FIGURE 4: Trend chart of comprehensive evaluation of athletes' skills and tactics.

and moderate index. The larger the benefit index, the better the effect. The smaller the cost index, the better the effect. Moderate index indicates that the better the effect. Because the benefit index, cost index, and moderate index belong to three different categories and have different properties, they should be dimensionless. Select the data of the technical and tactical effects used in 10 games of Athlete No.1, Athlete No.2, and Athlete No.3, and get the comprehensive evaluation of the competition technical and tactical as shown in Figure 4.

Through further observation of the contents in the picture, it is found that the comprehensive technical and tactical value of Athlete No.3 in the competition is good, the competitive state is relatively stable, and the competitive performance conforms to the law of sports training, which

reflects the scientificity and effectiveness of Athlete No.3's usual training.

The "three-stage index evaluation method" is characterized by the division of "stages" according to the law of hitting order in tennis matches, so that the strength of the same player in different periods or among different players in the same period can be compared. It is a macroscopic evaluation of an athlete's ability to play on the spot in the competition. Its advantages are easy to understand and easy to operate. In order to verify the accuracy and feasibility of this algorithm, this paper compares the accuracy and recall of different algorithms. The obtained accuracy is shown in Figure 5, and the comparison of recall rate is shown in Figure 6.

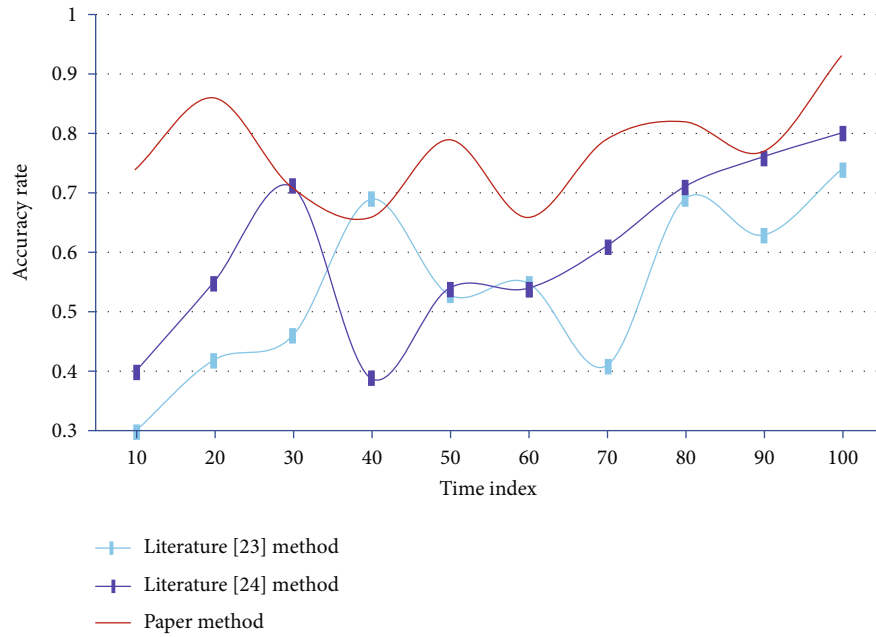


FIGURE 5: Comparison of accuracy of different algorithms.

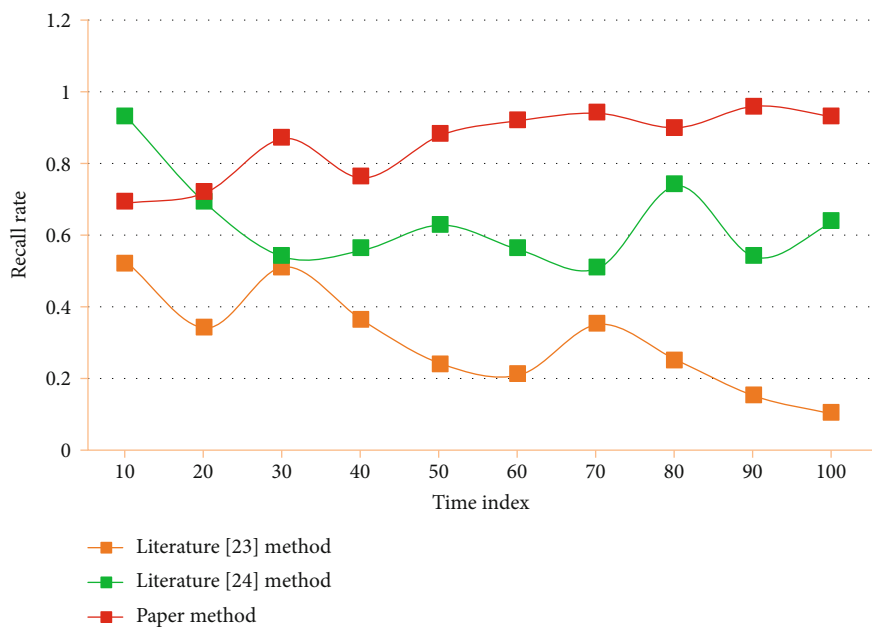


FIGURE 6: Comparison of recall rates of different algorithms.

By analyzing Figure 5, we can see that the accuracy rate of this algorithm is higher than that of literature [23] and literature [24], and it is concluded that this algorithm has the highest accuracy rate. In the comparison of the recall rate of the three algorithms, the recall rate of this algorithm is the best, which is higher than those of the other two algorithms. This further demonstrates the accuracy and superiority of this algorithm.

The “stalemate stage” is an important stage to evaluate the skill level of tennis players in the whole game. At this

stage, the two sides of the competition are in a state of close competition for a long time, and there is not much difference in the strength relationship between them, so it is impossible to win or lose in a short time. If you want to beat your opponent in tennis, you must break your opponent’s serve, or your opponent’s serve point. Therefore, receiving and serving technology is an important technology in parallel with serving technology. With the development of baseline technology, service receiving technology has become more and more aggressive, and the traditional passive return has been

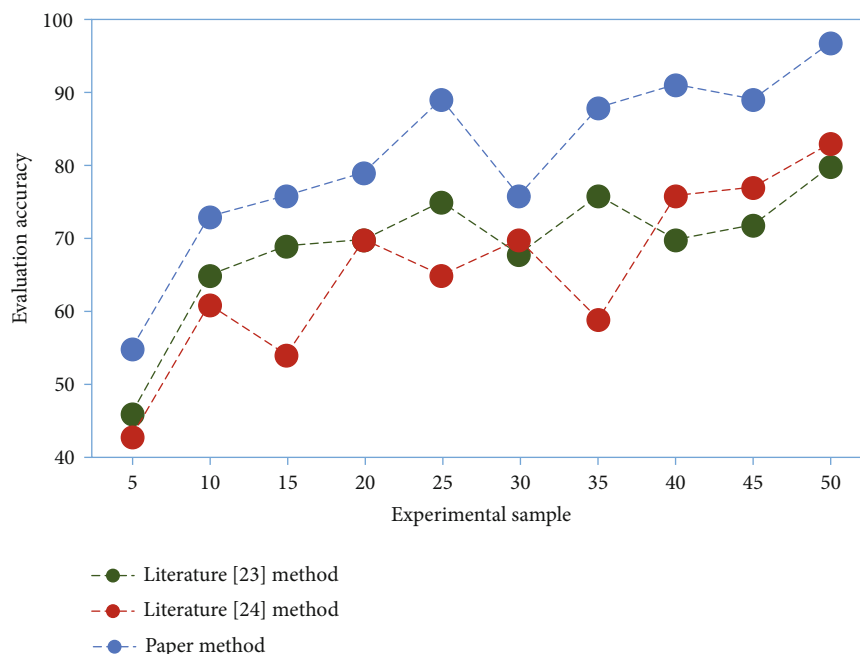


FIGURE 7: Accuracy of different models in evaluating technical and tactical level.

replaced by active service receiving and attacking. Practical experiments are carried out on the model established in this paper. By comparing the models in literature [23] and literature [24], the accuracy of three different models in evaluating tennis skills and tactics is obtained. The results are shown in Figure 7.

Through analysis, it can be concluded that the accuracy of the models in literature [23] and literature [24] in evaluating the technical and tactical level is comparable. Among them, the model in this paper has the highest accuracy in evaluating the technical and tactical level. Further confirmed the practicability and feasibility of this model.

Different indexes can reflect different contents and have different comparability. We should use standardized processing methods to process the original data, reduce the influence of dimensions, and ensure that different indexes can carry out quantitative calculation. From the gray absolute correlation degree, it shows that there is a certain correlation between the two sequences. However, from the perspective of grey proximity correlation degree and grey similarity correlation degree, it shows that the two sequences are neither close nor similar. Therefore, in the actual cluster analysis and decision analysis, we should choose a unified correlation degree according to the actual target to be analyzed, and some cannot choose grey absolute correlation degree; some can choose grey proximity correlation.

There are many indexes for evaluating the technical and tactical effectiveness of tennis events. Only by selecting the indexes that are highly representative and can objectively reflect the actual situation can we comprehensively reflect the level of competition quality. The evaluation model of tennis technical and tactical level based on grey relational algorithm can quantitatively reflect the advantages and disadvantages of athletes' technical and tactical efficiency in dif-

ferent periods, and it has certain practical value in tennis technical and tactical efficiency evaluation.

5. Conclusions

In competitive tennis, technique and tactics are one of the main factors that affect the competition results, and whether it is successfully used or not often becomes the decisive factor for the outcome of the competition. Therefore, it is an important topic in the research field of sports technology and tactics to study the technical and tactical rules of tennis competitive competition and improve the scientific level of technical and tactical decision-making. In this paper, based on the basic principle of grey relational algorithm, starting from grey relational algorithm, the evaluation model of sports skill and tactic level based on grey relational algorithm is constructed. Through the analysis of the overall technical and tactical level and conjugation, it is known that there is a great gap between China's elite players and the world's elite players in basic technology. However, the technique of baseline pumping is comparable to that of the world's best players. There is a gap in the basic skills and tactics and the use of play, but there is little difference in the structure of gains and losses. The ability to score in the first four beats is weak, and the ability to win quickly needs to be improved.

In this study, the evaluation index system of tennis skills and tactics is selected, and the comprehensive evaluation of tennis skills and tactics is carried out by using the grey relational algorithm. Experiments show that the method based on grey correlation can comprehensively evaluate tennis skills and tactics. The evaluation method is scientific and effective. To some extent, it can predict the competitive state of athletes in a certain period of time, and it can also provide

data support for empirical facts, so as to provide reference for coaches' decision-making and athletes' training adjustment. It has certain practical value in the evaluation of tennis skills and tactics. The purpose of this evaluation model is to provide objective and accurate data for coaches and athletes in the future training competition, to guide the development of scientific training, and to provide some overall ideas and suggestions for the development of tennis skills and tactics. The research on sports skills and tactics has always been a hot issue in the field of sports competition. Due to the limited research energy and ability of the author, as far as the current research results of this study are concerned, some work needs further in-depth study in the future.

Data Availability

The labeled dataset used to support the findings of this study is available from the corresponding author upon request.

Conflicts of Interest

The author declares no competing interests.

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