



Selected Indicators Influence the Talent Identification of Young Tennis Players

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Abstract

Background and Aim: Tennis is one of the most popular sports globally. Despite having the largest tennis population in the world, China has long lacked top-level athletes in this sport. One of the primary reasons is the difficulty in accurately identifying young tennis players with talent, which has led to the relative stagnation of the development of tennis in China. The purpose of this research is: (1) To Select the indicators that influence the talent identification of young tennis players in Guangzhou; and (2) To determine the weight of the indicators.

Materials and Methods: The primary tool for this research is an expert questionnaire. Using the Delphi method, we collected opinions from 19 tennis experts in various fields to filter out evaluation indicators that influence the talent identification of young tennis players in Guangzhou. Firstly, we used the Analytic Hierarchy Process to determine the importance of each influencing factor; secondly, we applied connoisseurship to validate the scientific and practical aspects of the research process and results; finally, we provided a descriptive summary and report on the overall performance of the players.

Results: Ultimately, a detailed and comprehensive evaluation indicator system was formulated, consisting of 7 primary indicators, 20 secondary indicators, and 44 tertiary indicators. The weightings of each indicator system were also determined, validating the feasibility and applicability of this comprehensive performance evaluation system for young tennis players in Guangzhou.

Conclusion: The research results have strong rationality and feasibility, providing significant theoretical value and practical implications for the indicator system affecting the talent identification of young tennis players in Guangzhou. In the future, this can be extended to other provinces nationwide for field testing and discussion validation, and the system can be further optimized and improved based on the results.

Keywords: Indicators; Talent Identification; Young Tennis Players

Introduction

Tennis is the most attended and most-watched sport globally. According to the International Tennis Federation (ITF) GLOBAL TENNIS REPORT 2019, there are 87 million professional and amateur tennis players, accounting for about 1.17% of the world's population. China (22.5%), the United States (20.7%), and India (9.2%) are concentration camps for tennis lovers (ITF GLOBAL TENNIS REPORT, 2019). Above 700 million people followed the 2019 WTA events, cementing tennis's top-rated position in sports (Kane, 2018). Among non-team sports, tennis deserves a reputation as one of the most popular sports in the world (Czermak, 2021). Tennis stars have highly high commercial value and social influence, and the desire for tennis stars is strong (Haynes, 2021; Chmait et al., 2020a; Chmait et al., 2020b). It's not surprising that countries worldwide are striving for more quality sports players.

China has the most significant number of tennis players but has no top 10 tennis players globally, whether ATP or WTA (ESPN, 2022). It is not difficult to find that China (22.5%), which has the highest proportion of tennis enthusiasts, is not favored by tennis courts. The number of tennis players had no visible role in elite player rankings. Chinese tennis is still in its infancy Sun (2013). How to develop elite players has always been a coincidence that sports educators worldwide are concerned about



(Bicalho & Da Costa, 2018; Kegelaers & Wylleman, 2019; Güllich et al., 2019; Gorczynski et al., 2021). Tian (2018) boils it down to two perspectives: selecting young talented players and players' training.

The concept of elite players is not solely dependent on hard work and practical training, but also talent. Furthermore, outstanding personal characteristics form the basis and potential for future remarkable achievements. People with extraordinary achievements are often rare, but hard work happens in every corner (Den Hartigh et al., 2018). Howe et al. (1998) presented an exploration of talent as the fundamental factor that produces outstanding performance. Baker and Wattie (2018) emphasized that talent has a certain degree of facilitating effect and impact on the performance of high-level players. Kinesiological, morphological, and physiological diagnoses have repeatedly appeared in studies of small mobilization selection as judges of young talented players (Pion, 2015; Fuchslocher et al., 2011; Hoare, 1995; Douglas, 2014). The way people diagnose is complex, multi-dimensional, and widely varied. Standard measures include resting heart rate, reaction time, vital capacity, abdominal skinfold thickness, waist circumference, hemoglobin mass, upper arm skinfold thickness, lower scapula angle, chest circumference, thigh circumference, ankle circumference, Achilles tendon length, height, Crest width, bodyweight, leg length, arm span, calf length, shoulder width, maximum dynamic back strength (Wilmore & Costill, 1994; Pion et al., 2015). However, the research field neglected the talent identification of Chinese tennis players, and China has not yet formed a unified test standard with high predictive ability.

The researcher studying in a doctorate program in physical education and has experience in tennis teaching and participating in tennis training for some time, is the International Tennis Federation Level 2 coach, saw that China cannot accurately define Young talented Tennis players because we do not have any tests to identify talent or young talent Tennis players to train so it is hard to capture talent and formulating the identification of talent characteristics. The good selection test could be used to identify talented players and could predict the players' future achievements. So, the researcher is interested in creating the selected tests which comprise various variables to Identify Young talented Tennis players. This comprehensive test will contribute to coaches' and teachers' use as a tool to select the appropriate players to train to be elite players in the future.

Objectives

To Select the indicators that influence the talent identification of young tennis players in Guangzhou, China.

To determine the weight of the indicators.

Literature Review

Research the selection of junior tennis players.

The selection of junior tennis players represents an area of significant interest within sports science and youth athletic development. It involves the identification of those who have the greatest potential to excel in competitive tennis, considering a wide range of factors such as physical abilities, technical skills, tactical understanding, and psychological traits.



Definition of Talent Young Tennis Players

The conceptualization of talent for young tennis players is an initial condition for capturing talent and formulating the identification of talent characteristics (Den Hartigh et al., 2018). Simonton (1999) defines talent as an individual's demonstrated ability in a particular field and the potential to be recognized. Potential and capability are two different concepts that can be transformed or complemented under certain circumstances. As Lykken (1982) defines potentiality, potentiality is a set of personal characteristics that people focus on that contribute to improving a specific ability. Potential, according to Lykken, refers to particular individuals exhibiting characteristics that make them good tennis players. Ability is the result of transforming potential into visible ability that points to the development of talented athletes and forms measurable indicators (Simonton, 1999; Gagné, 2004). However, transformation can be complete or incomplete (Den Hartigh et al., 2018). The conversion of potential to ability is often incomplete in junior tennis players. This incompleteness indicates that performance is not the only measure of excellence in junior tennis players. The point raised by Sun (2009) further corroborates this finding. As the body changes during adolescence, the motor function of young athletes will usher in a new transformation (Sun, 2009).

The passage emphasizes the criteria for defining Young Talented Athletes, which includes both demonstrated tennis abilities and recognized potential. This research refutes a viewpoint that suggests coaches in the past have overly focused on the abilities of young athletes while neglecting their potential. This has resulted in potentially talented athletes being overlooked, depriving them of educational resources and competitive opportunities that could have enabled them to become outstanding athletes. Therefore, this study highlights the crucial importance of identifying Young Talented Athletes in the field of tennis, which requires a comprehensive perspective that considers both potential and abilities. In this study, talented young tennis players represent young players with excellent tennis performance in various competitions and "future stars" with tennis potential. talented young tennis players point to visible winners and predictable winners in layman's terms.

Selection indicators for young talented tennis players

The physical aspects of junior tennis player selection often revolve around attributes like speed, strength, endurance, and coordination. For instance, Ulbricht et al. (2016) revealed that these physical attributes were key determinants of match-play performance in junior tennis players. Similarly, Kovacs (2006) highlighted the importance of anaerobic power and agility in junior tennis performance. A technical skill evaluation is another vital element of the selection process. Junior players need to master a variety of strokes, including forehand, backhand, serve, and volley. Fernandez-Fernandez et al. (2014) showed that technical skill proficiency significantly correlated with successful performance in junior tennis. Tactical understanding, including decision-making under pressure, game strategy, and opponent analysis, also plays a crucial role in tennis success. Researchers like McPherson (2000) have stressed the significance of tactical acumen in differentiating top junior tennis players from their peers. Lastly, psychological factors are increasingly recognized as influential in junior tennis player selection. Mental toughness, resilience, motivation, and the ability to concentrate under pressure are critical psychological attributes for elite tennis performance.

Identifying talent is a complex project due to the diversity and complexity of talent judging (Vaeyens et al., 2008). The talent identification approach includes the identification of individuals with



tennis talent characteristics who are not involved in tennis (Williams & Reilly, 2000), as well as the identification of people who are currently outstanding in the tennis field and who may achieve extraordinary achievements in the future (Russell, 1989). In the past, the identification of talented athletes was associated with physical characteristics (Vaeyens et al., 2008). The physical characteristics of adolescents in the developmental stage are more unpredictable, and the body changes in stages during the maturation process (Ackland & Bloomfield, 1996). In this regard, people put forward the idea of combining skills and abilities. However, motor skills are highly reproducible, closing the gap as the knowledge base of young athletes increases (O'Brien-Smith et al., 2019). The choice of young athletes is not to focus on the "current stage" but to focus on the future "height" in the sports field. The introduction of the concept of motor competence further contributed to identifying elite youth athletes (Deprez et al., 2015). Through multi-dimensional comparisons of anthropology, motor skills, and physiology, exercise capacity is more effectively rooted in determining expected future outcomes (Pion et al., 2015). A unified view of motor competence points to the body's ability to execute mental commands (Fransen et al., 2014). For most sports, motor competence is the essential ability of the athlete and determines the athlete's achievement (Burton & Miller, 1998). Fransen et al. (2017) found that motor competence is born in the early childhood of human development and ends in the juvenile (12 years old) of human development. Therefore, the changes in motor competence during adolescence were not significant and did not affect people's assessment of the adolescent's future.

In summary, identifying sports talents, especially tennis talents, is a complex task influenced by various factors. Although there is a wealth of research in the past on athlete selection and performance characterization, these studies have significantly improved our understanding of athlete selection and competitive ability characteristics, especially in sports like tennis. However, most scholars have elaborated on the selection index system of athletes in traditional sports events in detail or studied the unilateral impact of certain physical characteristics on the competitive performance of tennis athletes. Currently, there are no unified standards to use these indicators to comprehensively evaluate the sports potential of young tennis athletes. To better select promising young athletes for future excellent athlete training, it is necessary to develop comprehensive tests to measure and assess the performance of young talented tennis athletes.

Conceptual Framework

Based on the three theories of "Competitive Ability Dominates" talent selection model theory, human genetic theory, and human growth and development theory, as well as the three principles of scientific principle, practicality principle, and comprehensiveness principle, this study initially identified the indicators that influence the talent identification of young tennis players through interviews and literature review. Through the Delphi Method, opinions were collected from 19 tennis experts. After three rounds of screening, the indicators and related aspects were ultimately confirmed. The Analytic Hierarchy Process was used to determine the level of importance for each indicator. A connoisseurship approach was utilized to validate the scientific rigor and applicability of both the research process and its outcomes. Ultimately, a detailed and comprehensive evaluation indicator system was formulated, consisting of 7 primary indicators, 20 secondary indicators, and 44 tertiary indicators. Weights for each indicator system were also established, confirming the feasibility and



applicability of this system for evaluating the comprehensive performance of young tennis players in Guangzhou.

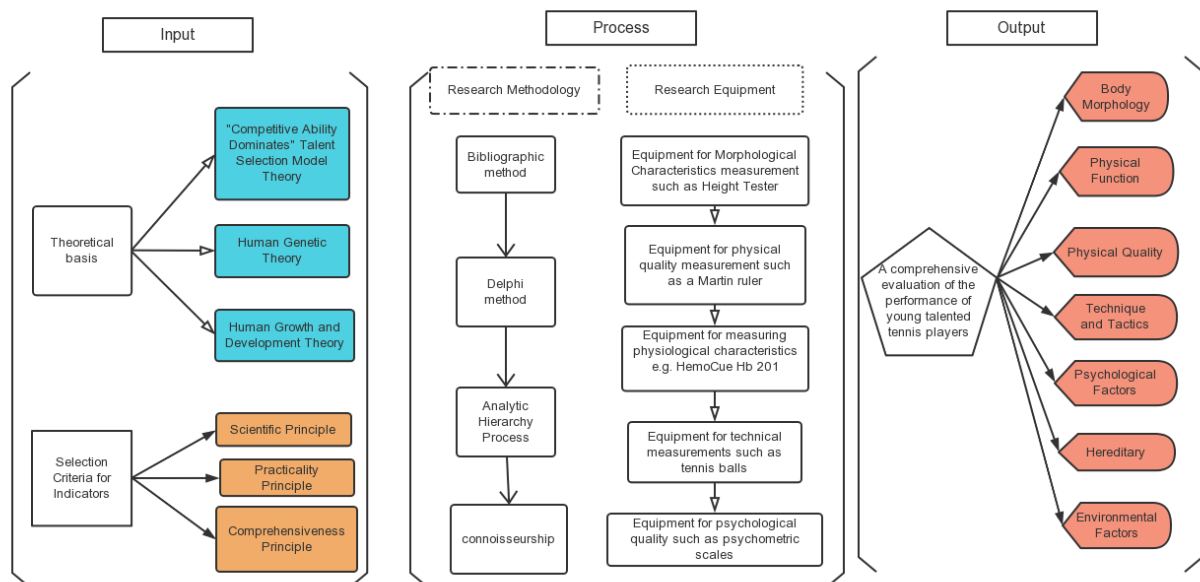


Figure. 1 Research conceptual framework

Methodology

This study initially identified the "Indicators that Influence the Talent Identification of Young Tennis Players" based on interviews and literature reviews. Using the Delphi Method, we collected opinions from 19 tennis experts, and after three rounds of filtering, we finalized the indicators and related content. Through the Analytic Hierarchy Process, we determined the importance of each indicator's impact. Finally, we employed the connoisseurship method and gathered opinions from 8 tennis experts to validate the scientific and practical aspects of both the research process and the research results.

Population and sample

Population specification and size (present specification and sample size formulation)

According to the statistics of the number of participants in youth tennis competitions in Guangzhou and the statistics of experts from the Chinese Tennis Association, the total number of people in this study is estimated to be around 600.

1. Identification of experts

Interview 19 experts related to tennis selection indicators. These include university professors, national team coaches, and provincial team coaches.

2. Selection of test samples

Age characteristics of the interviewed athletes: 8-12 years old.

Professional characteristics of interviewed athletes: players with more than two years of tennis training experience. To the provincial team, the city team players, as much as possible choose to have competition results or points ranking players.



Location of the interviewed athlete: Guangzhou.

3. Sampling techniques

Referring to the research results of De Vaus D A., to make the sampling error of the sample at the 95% confidence level, it is reasonable to determine the test sample of more than 120 people.

Data collection

The Delphi method is a technique that helps experts express their opinions anonymously and continuously revise their personal opinions according to the opinions of others, forming a final consensus result (Gordon, 2009). This study distributed a total of three rounds of survey questionnaires. At the end of each questionnaire, people share opinions and feedback, and the process iterates to narrow people's cognitive differences and reach a consensus.

Questionnaire surveys will be used to collect and analyze expert evaluations and opinions on the relative importance of different factors. By incorporating expert opinions and evaluations into the decision-making process, a more objective and systematic method can be employed to analyze the relative importance of multiple factors.

Connoisseurship involves organizing a structured and in-depth discussion among a group of experts, typically ranging from 6 to 12 individuals. This method is utilized to collect opinions and suggestions from coaches and experts.

Data Analysis

Delphi Method: the Delphi Method is an expert survey technique that aims to achieve consensus through multiple rounds of anonymous surveys and feedback. It is used to collect opinions from experts in the tennis field to develop and confirm the content of tests, evaluation indicators, and other relevant aspects. Through multiple rounds of surveys and feedback, a gradual consensus among the experts can be reached.

Analytic Hierarchy Process (AHP): The Analytic Hierarchy Process is a quantitative analysis method used to address complex decision-making problems. It helps determine the relative importance of various factors and allows for trade-offs. By structuring the evaluation indicators into surveys are used to determine the weights of each level of the indicator.

Descriptive Statistics: Descriptive statistics is a statistical method used to summarize, present, and describe collected data. It helps understand and present the key characteristics of the data. Using descriptive statistics to analyze and present the collected data can provide an overall description of player performance, serving as a foundation for further analysis.

Connoisseurship: Connoisseurship is a research method that involves group discussions to collect opinions and suggestions from coaches and experts. It facilitates communication and interaction and helps validate the scientific applicability of the research process and results.

Research Process: This research will operate in the following steps:

Step 1 Identifying factors and variables of elite tennis players' performance.

1.1 Review literature related to factors and variables of elite tennis players' performance.

2.2 Consulting experts, coaches, and persons on the sport performance test by focusing on elite tennis players' performance.

Step 2 Formulating selected tests to measure and evaluate elite tennis player performance



2.1 Analysis of factors related to elite tennis players' performance and the tests for those factors and variables to be selected as the research tools.

2.2 Confirm the contents of the tests by consensus on the most appropriate of the tests to measure and evaluate elite tennis players' performance by 19 experts with the Delphi Technique.

2.3 Concluded selected tests to measure and evaluate elite tennis player's performance.

2.4 Develop test protocol, procedure, and test manual.

Step 3 By utilizing the Analytic Hierarchy Process (AHP), it is possible to assess and compare various factors systematically and analyze the importance of all indicators, leading to the derivation of a predictive equation.

Step 4 Through Connoisseurship validation, the utility, appropriateness, usefulness, and satisfaction of stakeholders have been confirmed.

Step 5 Conclusion and writing the research report.

Results

Utilizing a multi-method approach, our research developed a detailed and comprehensive evaluation index system for measuring the performance of young tennis athletes in Guangzhou. Through three rounds of the Delphi method, we refined seven major dimensions of evaluation, each further categorized into specific sub-dimensions and scheme-level evaluation indicators—consisting of 7 first-level, 20 second-level, and 44 third-level indicators. The Analytic Hierarchy Process (AHP) was employed to quantitatively determine the weights of these dimensions and indicators. Connoisseurship interviews confirmed the system's rationality and feasibility. Despite its depth and detail, the system also highlights the particular importance of Physical Quality and Physical Function while acknowledging the roles of Technique and Tactics, Environmental Factors, and Psychological Factors. This robust framework not only holds significant theoretical value for tennis training but also has practical implications, laying a strong foundation for future research and practical applications in the field.

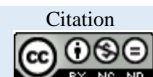
Construction of Evaluation Indicator System

This research employed the Delphi method to gather opinions from 19 tennis experts, and selected indicators that influence the talent identification of young tennis players in Guangzhou. As shown in the table below:

Table 1 Performance Indicator System for the Young Talent Tennis Players in Guangzhou

| Goal Layer | Main Criterion Layer | Sub-criterion Layer | Scheme Layer |
|---|----------------------|---------------------|------------------------|
| Performance Indicator System for the Young Talent Tennis Players in Guangzhou | Body Morphology | Length | Height |
| | | | Arm Length |
| | | Circumference | Achilles Tendon Length |
| | | | Chest Circumference |
| | Physical Function | Physique | Hip Circumference |
| | | | Body Weight |
| | | Cardiopulmonary | BMI |
| | | | Lung Capacity |

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| Goal Layer | Main Criterion Layer | Sub-criterion Layer | Scheme Layer |
|------------|-----------------------|----------------------|--|
| | | Function | Resting Heart Rate |
| | | Blood Function | Hemoglobin Mass |
| | | | Blood Oxygen Saturation |
| | Physical Quality | Speed | Fan-shaped Run |
| | | | 20-meter Sprint |
| | | Power | Throwing solid balls with both hands |
| | | | Badminton shuttlecock |
| | | Agility | Reaction Time |
| | | | Hexagonal Jump |
| | | Flexibility | Sit and Reach |
| | | | Shoulder Joint Flexibility Test |
| | | Endurance | 800M |
| | | | Intermittent Sprint Test |
| | | Coordination | Body Coordination Test for Children (KTK): |
| | | | Balancing Backwards (BB), |
| | | | Moving Sideways (MS), |
| | | | Jumping Sideways (JS), |
| | | | Hopping for Height (HH) |
| | | | Single-leg Stand |
| | Technique and Tactics | Technique | Forehand |
| | | | Backhand |
| | | | Serve |
| | | | Volley |
| | | Tactics | Coach Evaluation |
| | | | Decision-making ability |
| | Psychological Factors | Willpower | Competition Anxiety |
| | | | Psychological Resilience |
| | | | Concentration |
| | | Professional Burnout | Achievement Motivation |
| | | | Professional Burnout |
| | Hereditary | Body Morphology | Parental Height |
| | | | Parental Weight |
| | | Athletic Experience | Father's Athletic Experience |
| | | | Mother's Athletic Experience |
| | | Concentration | ACTN3 |



| Goal Layer | Main Criterion Layer | Sub-criterion Layer | Scheme Layer |
|------------|-----------------------|----------------------|---|
| | | | ACE |
| | Environmental Factors | Family Environment | Family Attitude Economic Capacity |
| | | Training Environment | Training Conditions Coach Competence |

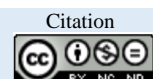
2. Determine index weights

In this study, the Analytic Hierarchy Process (AHP) is used to determine the index weight. After the completion of Delphi screening indexes, experts are invited to make a one-by-one comparison and judgment on the importance of indexes in the group. The quantitative assignment of the Saaty scale value is determined according to the mean difference of the importance data of each indicator by experts as the data for matrix construction and analysis. After sorting out the weights of all levels of indexes, the final weight table of the evaluation index system for the index weight influences the talent identification of talented young tennis players in Guangzhou. Details are as follows:

Table 2 The index weight influences the talent identification of talented young tennis players in Guangzhou.

| Goal Layer | Main Criterion Layer | Sub-criterion Layer | Scheme Layer |
|---|----------------------------|-----------------------------------|---|
| Performance Indicator System for the Young Talent Tennis Players in Guangzhou | Body Morphology (0.0962) | Length (0.0461) | Height (0.0267) |
| | | | Arm Length (0.0115) |
| | | | Achilles Tendon Length (0.0078) |
| | | Circumference (0.0270) | Chest Circumference (0.0127) |
| | | | Hip Circumference (0.0143) |
| | | | Body Weight (0.0085) |
| | Physical Function (0.1945) | Physique (0.0231) | BMI (0.0146) |
| | | | Lung Capacity (0.0595) |
| | | | Resting Heart Rate (0.0572) |
| | | Cardiopulmonary Function (0.1167) | Hemoglobin Mass (0.0474) |
| | | | Blood Oxygen Saturation (0.0304) |
| | | | Blood Function (0.0778) |
| | Physical Quality (0.2463) | Speed (0.0421) | Fan-shaped Run (0.0261) |
| | | | 20-meter Sprint (0.0160) |
| | | | Throwing solid balls with both hands (0.0168) |
| | | | Badminton shuttlecock (0.0149) |
| | | | Reaction Time (0.0207) |
| | | | Hexagonal Jump (0.0225) |
| | | | Sit and Reach (0.0188) |
| | | | Shoulder Joint Flexibility Test (0.0137) |

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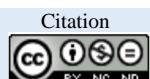


| Goal Layer | Main Criterion Layer | Sub-criterion Layer | Scheme Layer |
|------------|--------------------------------|-------------------------------|--|
| | | Endurance (0.0325) | 800M (0.0156) |
| | | | Intermittent Sprint Test (0.0169) |
| | | Coordination (0.0643) | Body Coordination Test for Children (KTK): |
| | | | Balancing Backwards (BB), |
| | | | Moving Sideways (MS), |
| | | | Jumping Sideways (JS), |
| | | | Hopping for Height (HH) (0.0579) |
| | | | Single-leg Stand (0.0064) |
| | Technique and Tactics (0.1329) | Technique (0.0731) | Forehand (0.0212) |
| | | | Backhand (0.0212) |
| | | | Serve (0.0198) |
| | | | Volley (0.0110) |
| | | Tactics (0.0598) | Coach Evaluation (0.0449) |
| | | | Decision-making ability (0.0150) |
| | Psychological Factors (0.1068) | Willpower (0.0793) | Competition Anxiety (0.0333) |
| | | | Psychological Resilience (0.0246) |
| | | | Concentration (0.0214) |
| | | Professional Burnout (0.0275) | Achievement Motivation (0.0170) |
| | | | Professional Burnout (0.0105) |
| | Hereditary (0.0817) | Body Morphology (0.0237) | Parental Height (0.0159) |
| | | | Parental Weight (0.0078) |
| | | Athletic Experience (0.0261) | Father's Athletic Experience (0.013) |
| | | | Mother's Athletic Experience (0.013) |
| | | Concentration (0.0319) | ACTN3 (0.0198) |
| | | | ACE (0.0121) |
| | Environmental Factors (0.1416) | Family Environment (0.0694) | Family Attitude (0.0368) |
| | | | Economic Capacity (0.0326) |
| | | Training Environment (0.0722) | Training Conditions (0.0268) |
| | | | Coach Competence (0.0454) |

Connoisseurship

Connoisseurship is a commonly used qualitative research method, suitable for exploring the ideas, attitudes, feelings, and experiences of the research object. In a connoisseurship discussion, one or more researchers (also known as investigators or moderators) guide a group of 6-12 people in a discussion. These group members are carefully selected because they all have common characteristics of special insights or experiences on the research question.

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Selection of Interview Experts

This study invited eight senior experts for interviews, mainly from university professors in relevant fields and senior coaches.

Interview Results Analysis

The expert discussion results are as follows: Firstly, the rigorousness and comprehensiveness of this research are commended. The research team has taken a holistic consideration of performance evaluation indicators for tennis athletes, introducing a broad range of variables, including Physical Quality, Physical Function, Psychological Factors, Environmental Factors, Technique and Tactics abilities, and even Hereditary factors. This all-encompassing perspective will assist in offering a more comprehensive, scientific, and reliable evaluation method.

Comprehensiveness: This research has designed an extremely comprehensive evaluation system, covering multiple dimensions including Physical Quality, Physical Function, Psychological Factors, Environmental Factors, Technique and Tactics, and Hereditary factors. This all-around analysis model ensures a comprehensive evaluation of young tennis players' abilities, not just their on-court performances.

Precision: This research employs the scientifically rigorous Delphi method and makes use of statistical expertise and practical tools (like variance coefficient, weights, etc.) to perform an in-depth analysis of the data. This not only assures the reliability of the research findings but also enhances the accuracy of the evaluation system.

Innovation: This research demonstrates obvious innovation in the method of evaluating the performance of young tennis players. Specifically, the inclusion of Hereditary and Environmental Factors in the evaluation system is a significant aspect often overlooked in many traditional evaluation methods.

Practicality: The outcomes of this research hold significant value not only theoretically but also in terms of practicality. It offers a useful tool for coaches, scholars, and even parents, helping them better understand and evaluate the performance and potential of young tennis players.

Flexibility: Although this evaluation system is designed for young tennis players in Guangzhou, its construction and fundamental principles grant it strong adaptability and flexibility. With suitable modifications and adjustments, it can be applied in other regions, or even other sports.

Overall, the experts express deep admiration and appreciation for this research. Its contributions extend beyond the sport of tennis and have a profound impact on the development of sports training and talent selection fields.

Research Approach

This study draws upon relevant theories and research methods such as the "Competitive Ability Dominant" selection model theory, human genetics theory, and the theory of human growth and development rules. It employs the Delphi method and the analytic hierarchy process among others. Following the basic approach of "subject-oriented → index selection → method determination → theoretical model establishment → evaluation index selection → index weight determination → index system determination", this study constructs indicators to evaluate the potential performance of adolescent tennis players in Guangzhou.



Following this research approach, the researchers formulated the technical roadmap for this study, as shown in Figure 2:

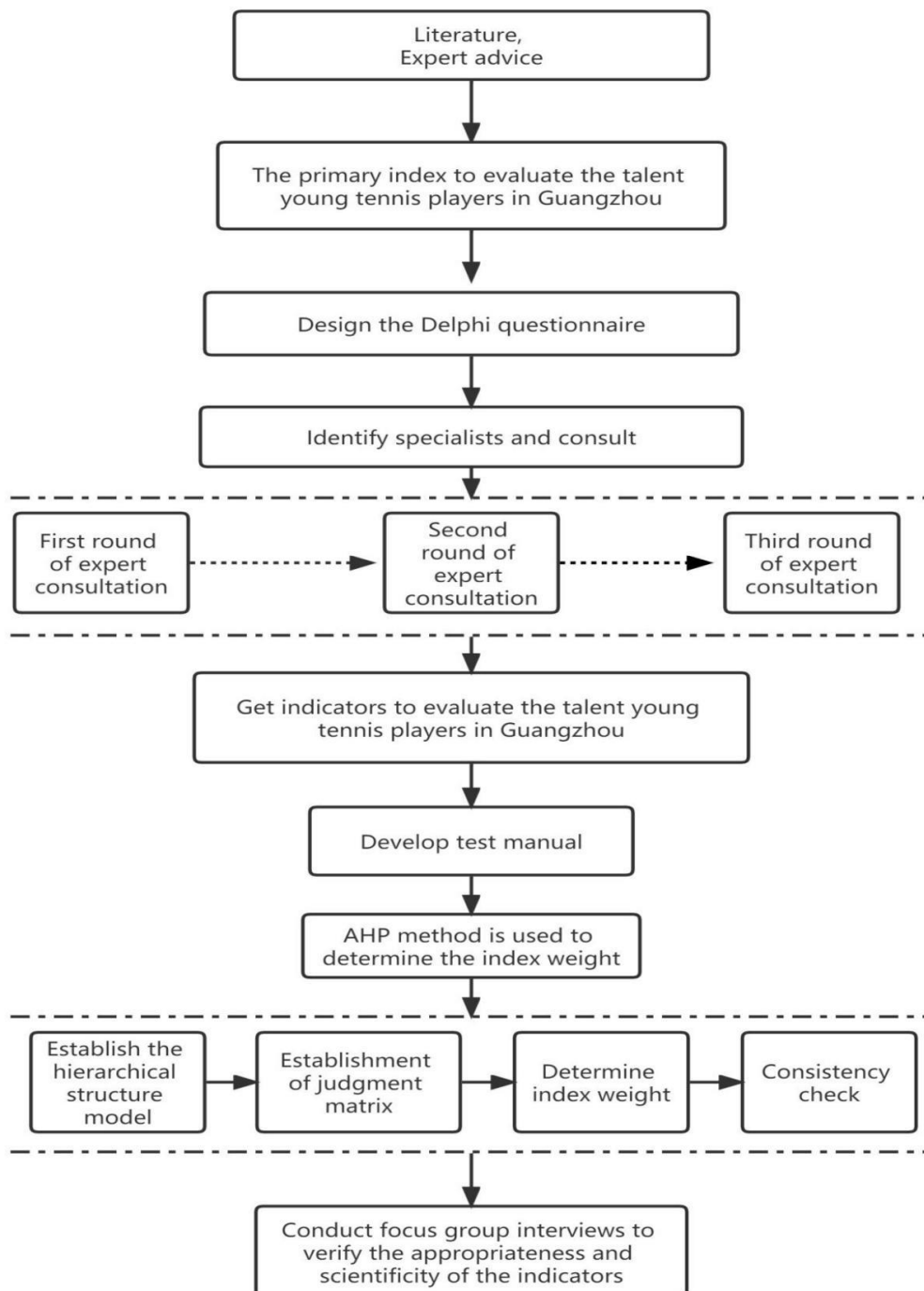


Figure 2. Technical roadmap for this study



Conclusion

This research adheres to the principles of scientific, practicality, and comprehensiveness.

1. Through three rounds of the Delphi method, this research has developed a comprehensive test to measure and evaluate the performance of young tennis athletes in Guangzhou. In this process, we have completed a detailed and comprehensive evaluation index system that includes seven major evaluation dimensions: Body Morphology, Physical Function, Physical Quality, Technique and Tactics, Psychological Factors, Hereditary Factors, and Environmental Factors. Each dimension includes more specific sub-dimensions and specific evaluation indicators at the scheme level, specifically including 7 first-level indicators, 20 second-level indicators, and 44 third-level indicators. This evaluation index system is not only comprehensive but also detailed. It can accurately reflect the comprehensive performance of young tennis athletes.

2. This study uses the Analytic Hierarchy Process (AHP) to determine the weight of each major evaluation dimension and the weights of indicators at all levels. These weights reflect that when evaluating the performance of young tennis athletes, Physical Quality and Physical Function should be given special attention, and the influences of Technique and Tactics, Environmental Factors, and Psychological Factors should not be ignored.

3. This study used Connoisseurship interviews to argue the rationality and feasibility of a comprehensive test to measure and evaluate the performance of young tennis athletes in Guangzhou. The results show that the evaluation index system has good rationality and feasibility.

However, our research is not without limitations. First, this evaluation index system is designed based on young tennis athletes in Guangzhou. Although it theoretically has strong universality, when applied to tennis athletes in other regions or of other age groups, it may need to be appropriately modified and adjusted. Second, although we have tried our best to make this evaluation index system as comprehensive and detailed as possible, there may still be some important evaluation indicators that have not been considered.

In general, our research provides a useful tool for tennis coaches, scholars, parents, and other relevant personnel, helping them to better understand and evaluate the performance and potential of young tennis athletes. This research results not only have important theoretical value for tennis training but also has a high degree of practicality.

In future research, we plan to test and verify this evaluation index system on the ground, and further optimize and improve it based on the test results. In addition, we also plan to study how to apply this evaluation index system to tennis athletes in other regions and of other age groups, intending to make it more universal and widely applicable.

Discussion

The conclusions of this study align with the results of many existing literature studies. Numerous studies have already confirmed the importance of physical quality, bodily function, technical and tactical abilities, psychological factors, etc., in assessing the performance of tennis players (Li B et al., 2017). However, this study scientifically determined the weights of these evaluation dimensions, something that many existing studies have not achieved.



Furthermore, our research introduced two new dimensions for evaluation: environmental factors and genetic factors. This innovative approach is based on our in-depth study of the literature. For instance, we discovered some studies that show the family and training environment have a significant impact on the development of young athletes (Hoffmann et al., 2022). Also, some genetic studies indicate that certain genes may be related to the physical quality and performance of athletes (Eynon et al., 2009). These findings prompted us to incorporate environmental and genetic factors into the evaluation index system.

However, while our research gained support from the literature in many respects, our results also raised some new questions and challenges. For example, our research results show that the importance of body shape is relatively low, but some studies believe that the body shape of athletes has a significant impact on their performance (Guo L et al., 2009; Tian G et al., 2011;). This discrepancy may be due to the different evaluation objects (our research targets young tennis players, while other studies might target adult athletes), or it could be due to the different evaluation methods (we used the Analytic Hierarchy Process to determine the weights, while other studies might have used different evaluation methods).

In summary, although this study is consistent with existing literature research in many aspects, our research also has its uniqueness and innovativeness. In future research, we plan to further explore these consistencies and differences, and search for more effective evaluation methods and indicators.

Recommendation

This study has developed a comprehensive test for measuring and evaluating the performance of young tennis players in Guangzhou. While our results provide a powerful tool, we acknowledge the need to further refine and expand this work. Here are some of our suggestions:

1. Broaden the sample base: Our research is solely based on tennis players in the Guangzhou area and may not fully reflect the characteristics of young tennis players in all regions of China. Therefore, expanding the scope of the study to athletes in other regions will help further validate and improve this evaluation system.

2. Include more evaluation dimensions: Although our evaluation system already includes multiple dimensions such as body morphology, bodily function, physical fitness, technical and tactical abilities, psychological factors, genetics, and environmental factors, there may be other related factors that have not been included. For example, an athlete's injury history, nutritional status, sleep quality, etc., may also affect their performance.

3. Periodic assessment: An athlete's performance may change over time, so periodic assessments might be more effective. This will help track an athlete's progress, identify potential problems in time, and provide timely intervention.

4. Multidisciplinary research methods: Further research could consider adopting multidisciplinary research methods, such as incorporating more perspectives from social science, psychology, physiology, etc. This would contribute to a comprehensive and deep understanding and evaluation of a tennis player's performance.

5. Utilizing new technology: With the development of technology, we can now use many new technologies to assess athletes' performance, such as sports tracking systems, virtual reality technology,



wearable devices, etc. These technologies can provide more detailed and accurate data, further enhancing the accuracy and effectiveness of the evaluation system.

These are some suggestions for future research. We look forward to seeing more researchers and practitioners get involved to collectively advance this important work.

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