

Study on Analyzing the Key Factors of Table Tennis Players for Training by Analytic Hierarchy Process

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Abstract

In recent years, the international community has held a number of international large-scale table tennis game, many of them have our players to participate in international players for honor. But training first-class players is not easy, there will be a lot of factors in the process of his training interrupted, so this study to train table tennis players as the goal to improve the quality of training. Because of this research by training the table tennis player for goal. Through the penetration literature discussion, discovers the correlation construction surface and the factor. Then use Modified Delphi Method (MDM) and Analytic Hierarchy Process (AHP) determination important appraisal factor.

Application of AHP to explore the training of table tennis players' related literature is not much. But AHP through the comparison matrix and systematic procedures to solve specific problems has been successfully used in management, industrial and other fields. Therefore, this study combines MDM expert questionnaire and AHP, as the goal, to identify the key factors affecting the training, and arrange their importance. The findings indicate that main criteria that affect the training of table tennis players are the most important "Family factors", and in this main criteria "Parenting Styles" as the most important. Therefore in the future training the table tennis player can be in the "Family factor" parenting styles, provide the players motivation to participate combination coaches guide effective training methods and establish relevant training strategies, will effectively improve the quality and efficiency of player training.

Keywords : table tennis player, training, Modified Delphi Method, Analytic Hierarchy Process

Introduction

In recent years, sports are popular, there are many large international competitions. Common Taiwanese table tennis players are in the competition for the country honor. However, the training of table tennis players is very difficult.

Players are in training period will encounter many factors that affect his continued training, resulting in training quality and quantity can not effectively improve, thus producing excellent players of the fault phenomenon. In order to avoid the loss of future table tennis players, this study will review the current situation of domestic players training, find out factors that affect table tennis player training, and arrange their importance. In the future so that players training towards

professional, holistic, institutional direction of planning. Improve the training of table tennis players quality and technical level.

Therefore this research by training the table tennis player for goal, the process of this study are as follows:

- (1) Study theories related to the development of table tennis and athlete selection, players training, participate in motivation and support, and define the key factors that affect table tennis players' continual training by MDM expert questionnaires.
- (2) Analyze and sort the key factors that affect table tennis player training through AHP.
- (3) Analyze the questionnaire data, and give suggestions according to the research results to provide a reference for relevant units continual training planning in their future.

Literature Review

1. Development of table tennis

Because social structure is changing, leisure sports are popular. People began to contact table tennis. The sport of table tennis is popular in our country. Began to have the training of players and participate in the planning of the game. The process of training may be up to the entire national education stage [1]. As the education stage changes and skills grow, the players have become the best in the national race to win. There are many sponsors of the training process [2]. There are many large and small events held at home and abroad providing the stage of the athletic competition. Taiwan athletes because of the strength of table tennis in many important events at home and abroad cut a striking figure, after Taiwan exit from the United Nations, the table tennis is seen as another successful sport diplomacy [3].

2. Athlete Selection

Domestic and abroad through the selection of models established, such as: The athletes physical, physical, responsive, agile, psychological, decision-making, tactical, intelligent, genetic and athletic performance allow the coach to develop a training program to improve the effectiveness of the training [4]. The training process, through the principles of sports science, systematic training, monitoring training intensity, nutritional supplements and physical and mental recovery quantify and exercise science to improve the skill level of table tennis athletes [5].

3. Participate In Motivation And Support

The maintenance movement needs the motive, motive degree and goal, affect the players continue to participate in sports [6]. In psychology or in health, social needs, interest satisfaction, interpersonal and skills performance may be the main source of motivation [7],[8]. In addition, social and school support, such as: corporate sponsorship team to maintain a systematic training and enhance the training effectiveness of players. Combining policy and industry provide protection such as academic, employment, incentives and other subsidies. The school offers specialized training equipment administrative support provides table tennis players with a more focused training environment [9]. So training an excellent table tennis player if can use motivation and related support factors, can help that in the long training to continue grow up [10]. From family support such as: parental expectations and parent-child care, communication with the coach, are conducive to enhance the effectiveness of players training and sustained participation in the power [11], [12], [13], [14]. In the training of the players, the pressure of competition with the teammates, the sense of accomplishment, the avoidance of academic stimulation, the pressure to express the motivation to maintain the training, these related factors affect the player continue to accept the key to cultivation [15],[16]. Therefore, this study has compiled the secondary criterion factors for the above related literatures and summarized it into the main criteria and revised them according to the expert questionnaire as the relevant facets and indicators of the MDM questionnaire.

Research Method

1. Research Design

Firstly, research topic and range were determined after the analysis and discussion of the documents. Key factors were summarized from the documents and accordingly questionnaire indicators were drawn up. This study explores 5 primary principles and 25 subordinate principles. The subordinate principles of “Social factors” can be divided into policy legislation, corporate sponsorship, social status, government funding and rewards system. The subordinate principles of “School factors” include subject counseling, campus culture, class arrangement, peer pressure and site equipment. The subordinate principles of “Family factors” include parenting styles, achievement expectations, family economics, affected by relatives and friends, and genetic inheritance. The subordinate principles of “Coaching factors” can be divided into training methods, lead the team style, coach achievement, coach expectations and training planning. The subordinate principles of “Player factors” include physical quality, participation motivation, skill achievement, development potential and pressure to express. The factors described is shown in Table 1 as follows:

Table 1.
Questionnaire Criteria Description

Criteria Factor	Description
1.Social factor	Comes from societys correlation support.

1-1.Policy legislation	Government by law stipulation training welfare or rights and interests safeguard.
1-2.Corporate sponsorship	Corporate sponsorship for training athlete, provide relevant benefits or benefits.
1-3.Social status	Such as sports stars, well-known athletes as widely praised by the public.
1-4.Government funding	The government provides a budget for the training of players.
1-5. Rewards system	A mechanism for giving incentives or related benefits based on the players performance.
2.School factor	Comes from schools correlation support.
2-1.Subject counseling	The school offers athletes with academic counseling, such as remedial teaching or other disciplines.
2-2. Campus culture	Promotion of player training as the courses explored by school were emphasized or focus on the development of school.
2-3.Class arrangement	Refers to the class of players focus on sports.
2-4.Peer pressure	Classmates to give the learning pressure.
2-5.Site equipment	The school provides a training environment.
3.Family Factors	Comes from family correlation support.
3-1.Parenting styles	Parents educational methods and ideas in children s growth.
3-2.Achievement expectations	Parents expectations of the childs movement.
3-3.Family economy	Family economic level, such as parental income.
3-4.Affected by relatives and friends	Participate in training through advice and advice from friends and relatives.
3-5.Genetic inheritance	Because of their own genetic thence participate in training.
4.Coaching factor	Comes from Coach correlation support.
4-1.Training methods	Coaches provide a variety of training methods.
4-2.Lead the team style	The coach is leading the way the team manages.
4-3.Coach achievement	Coach achievement in professional competence such as being a national champion player or areas of expertise.
4-4.Coach expectations	The coachs expectations of the players performance.
4-5.Training planning	The coach arranged the next stage of the training group or school.
5.Player factor	Comes from player correlation support.
5-1. Physical quality	The players own physical condition and psychological quality.

5-2. Participation motivation	The players motivation to participate in the training.
5-3. Skill achievement	The athletes performance during training.
5-4. Development potential	Continue to participate in training with development potential.
5-5. Pressure to express	To relieve stress and continue to attend the training.

This study has to assess priority, generate alternatives, and evaluate the best project, it applied AHP as research method. The procedure can be divided into 3 stages-determining theme, establishing hierarchical structure. Finally questionnaire, consistency and design check.

2. MDM (Modified Delphi Method)

Murry & Hommons proposed MDM similar to the Delphi method. But omits the complicated steps of open questionnaires. Use the literature to explore and expert interviews to replace the way. Using a structured questionnaire to replace the first round of the questionnaire. In addition to saving a lot of time, but also to the group of experts can focus on research topics.

In this study, questionnaire procedures of MDM: (1) Experts selection; (2) Progress of implementation; (3) Design the questionnaire content; (4) Evaluation measures of questionnaire; (5) Analysis of questionnaire data.

Therefore, the use of MDM to compile the first questionnaire data and then implement the second questionnaire. After consensus has been reached by the expert group, the relevant criteria are established and a hierarchical structure is established.

3. AHP (Analytic Hierarchy Process)

AHP important steps to define and analyze the assessment elements, the establishment of hierarchical structure, design questionnaires and delivery, establish a pair-wise comparison matrix between criteria, calculate the eigenvector and the largest eigenvalue, consistency test, and the decision making of each factor.

Hierarchical analysis of various applications, in the case of uncertainty, there are multiple assessment criteria for decision making, complex problems can be systematized, and through a comprehensive quantitative assessment.

Research Results

1. Analysis of MDM Experts Questionnaire Data

The evaluation of MDM results is based on the scholars theory. This study evaluates the standard criteria. The average Likert five-point score for each item exceeds 3.5, and the average is less than 1 only to retain, but then delete. In addition, the second round of the questionnaire, the change in the convergence conditions for the Likert five-point scale average greater than 3.8. The hierarchical structural chart of evaluation factors is shown in Figure 2 as follows: The standard deviation is less than 1, only to retain, but then delete. This shows that the group of experts on the “key factors affecting the training of table tennis players “. Dispatch and importance of each criterion option. This study invited 10 professionals from the field of table tennis, education, association and company.

They are in the training and operation of players into success, and at least had an athletes expert or scholar to investigate. Implementation of questionnaires and data aggregation analysis. Investigation group of experts the mean and standard deviation of the degree of consent for each factor.

The results of this study show, in the first questionnaire results analysis “Social factors” of the main criteria, the average of the Likert five-point scale is less than 3.5 so deleted. In addition to other secondary criteria, “ Class arrangement “, “Site equipment”, “Genetic inheritance”, “Coaching achievement”, “Development potential” and “ Pressure to express “, for Likert five-point scale average are less than 3.5, so delete. Other primary criteria and secondary factors were retained until the second questionnaires were discussed.

After analyzing the feedback of the second MDM questionnaire, it was found that all standard deviations were less than 1, averages higher than 3.8, which indicated that specialists have reached a consensus with high concordance on both the 4 primary criterion hierarchies and the 14 subordinate criterion hierarchies, it also accorded with Saaty’s suggestion that hierarchical elements should be less than 7.

Therefore, in this study AHP questionnaire was used to construct the second round of modified Delphi questionnaire. Total of 4 main criterias and 14 factors hierarchical structure, chart of evaluation factors is shown in Figure 1 as follows:

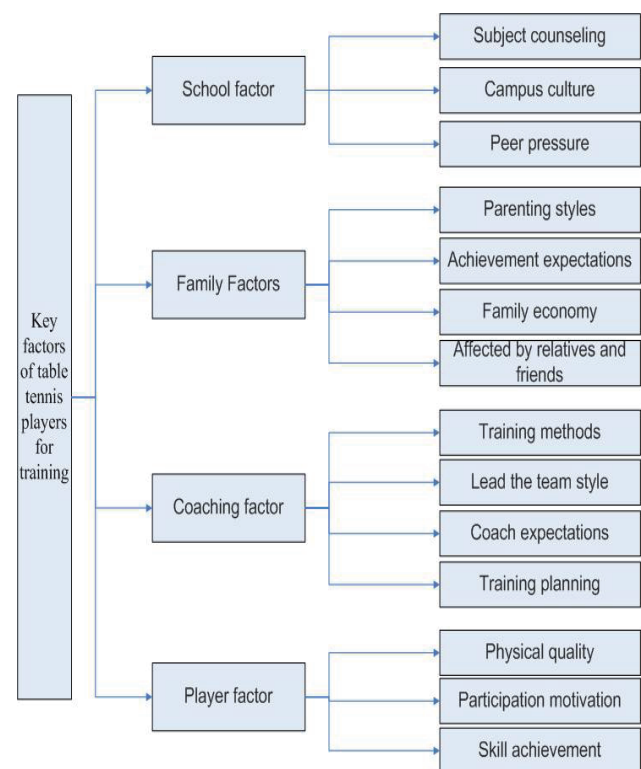


Figure 1.
 Hierarchical Structural Chart

2. Analysis of AHP Results

Through the MDM questionnaire, the results produced 4 main criteria with 14 factors. Design the AHP questionnaire for “Key factors of table tennis players for training”. Questionnaire subjects set to participate was coaching for 2017 table tennis youth national player selection team. Using random sampling to obtain a valid sample total of 40 copies.

Analysis of data and relative weights, and according to Saaty proposed consistency criteria that value must be less than 0.1, as the allowable error, the importance of sorting, see Table 2 for details.

In this study, the weights were arranged, the order of importance of each main criteria is Family factors (0.291), Player factors (0.288), Coaching factors (0.271), School factors (0.151).

The order of importance of the secondary criterion factors in the main criteria is: 1. School factors: sorting for Subject counseling (0.470), Peer pressure (0.290), Campus culture (0.240); 2. Family factors: sorting for Parenting styles (0.515), Achievement expectations (0.224), Family economy (0.209), Affected by relatives and friends (0.052); 3. Coaching factors: sorting for Training methods (0.481), Lead the team style (0.254), Training planning (0.184), Coach expectations (0.080); 4. Player factor: sorting for Participation motive (0.436), Physical quality (0.407), Skill-achievement (0.157).

Therefore, the factors in Table 2 use the AHPs contrast matrix to get the overall weight ordered can understand the relative importance of each factor. Such as: the main factor in the “Family factor” (0.291) is the most important. Followed by “Player factor” (0.288), “Coaching factor” (0.271), and “School factor” (0.151). “Parenting styles” (0.150) were most important. Followed by “Training methods” (0.130), “Participation motivation” (0.126), “Physical quality” (0.117), Subject counseling (0.071), etc. However, “Affected by relatives and friends” (0.015), “Coach expectations” (0.022), “Campus culture” (0.036) were less important.

After comparison of various criterion hierarchies through AHP, and comprehensive analysis of 4 dimensions and 14 hierarchies, the Table 2, namely the analytic statistics of weight sequencing was drawn, and relative importance of various factors can be further understood accordingly.

Table 2.
 AHP Comprehensive Analysis: Analytic Table of Weight Sequencing

Goals	Criterion	Criterion weight	Secondary criterion	Secondary criterion weight	Secondary ranking	Composite weight	Comprehensive ranking
Key factors of table tennis	School factor	0.151	Subject counseling	0.470	1	0.071	5
			Campus culture	0.240	3	0.036	12
			Peer pressure	0.290	2	0.044	11
	Family factor	0.291	Parenting styles	0.515	1	0.150	1

Coaching factor	0.271	Achievement expectations	0.224	2	0.065	7
		Family economy	0.209	3	0.061	8
		Affected by relatives and friends	0.052	4	0.015	14
		Training methods	0.481	1	0.130	2
Player factor	0.288	Lead the team style	0.254	2	0.069	6
		Coach expectations	0.080	4	0.022	13
		Training planning	0.184	3	0.050	9
School factor	0.151	Physical quality	0.407	2	0.117	4
		Participation motivation	0.436	1	0.126	3
Skill-achievement	0.157	Skill achievement	0.157	3	0.045	10

Conclusion and Suggestions

This study is based on modified Delphi method and hierarchical analysis, the key factors that affect the training of table tennis players from the overall weight can understand the impact of “Family factors” on table tennis players training is much higher than the “School factor”. Especially, this study is aimed at school period players “Parenting styles” was much higher than “Affected by relatives and friends”, but also higher than “Family economy”. In the support of “Family factors” show “Parenting styles” may result players to withdraw from the training, and skills can not grow. Followed by “Player factor”, “Coaching factor” in the overall weight but also affect the players continue to receive training the main factors. Especially in the “Coach training methods”, “Players participation motivation”, and “Physical quality” factor, are much higher than “Coach expectations”, “Skills achievements” and “Training planning” factors. Research shows, if coach use the players motivation to participate for

the excellent quality of players, than improve players' participation motivation or coaches expect or change the campus culture who participated in the training will have more opportunity to continue training become an excellent table tennis player in the game to win.

Another "School factor" main criteria was less important than others, but secondly of criteria factor "Subjective counseling" in the overall weight, sorting after "Parenting styles", "Training methods", "Participation motivation" and "Physical quality". Studies have shown that players are trained at school period, academic ability is a relatively important influencing factor, academic ability is a relatively important influencing factor in the national education stage, under the premise of balanced development in addition to sports training in intelligent education academic ability counseling is also an important factor for players to continue to participate in training.

Based on 14 criterias in the 4 main criterias of this study. Provide players or coaches refer to the execution or planning of the player training process suggested the combination of government and industry continue to provide players with good training channels. Not only to improve the players to participate in the motive, but also to increase the effectiveness of training. Under the support of the family, parent-child relationships and cooperation with the training team at school period for Taiwan training of table tennis players be effectiveness. Taiwan table tennis players can show the best performance in the competition on behalf of the country in international competitions and obtain victory.

This research because of research funding and time constraints. So the experts related to the questionnaire can only be targeted for some experts (professors, teachers, coaches a total of 10). In some areas criteria factor results maybe a few experts attach importance influencing factors, it can not cope with the training of all kinds of players. Therefore suggested follow-up study can use deep interview or other research methods, make the study more complete and on the subject can be targeted at different skills level table tennis players, different levels of training institutions, and different stage players to do more advanced research. It is expected that such research will make the training of table tennis players more scientific and efficient.

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