Advances in Social Science, Education and Humanities Research, volume 310
3rd International Conference on Culture, Education and Economic Development of Modern Society (ICCESE 2019)

Exploratory Research on the Evaluation Scale of Track and Field Coach's Ability

Ye He
Physical Culture Institute
Leshan Normal University
Leshan, China 614000

***Abstract*—The purpose of this paper is to develop a evaluation scale of track and field coach's ability. This paper uses the literature review method to initially draft 32 articles of the scale according to the standard procedure. 326 track and field coaches of different levels were tested by a pre-test scale. Project analysis, exploratory factor analysis, reliability analysis and other statistical methods were used to analyze the data. According to the research results, the evaluation scale of track and field coach's ability consists of five sub-scales, including 22 items: track and field management ability (7 items), sports science knowledge (5 items), injury prevention management (3 items), biological science knowledge (3 items), and track and field training ability (4 items). The Cronbach's α coefficient value of the scale is 0.894, and α coefficient value of each sub-scale is from 0.657 to 0.886. The author obtains the conclusion. The scale has good reliability and validity, and can objectively evaluate the ability of track and field coaches.**

Keywords—track and field coach; ability scale; exploratory research

I. INTRODUCTION

The ability is the skill to complete certain activities. It is the necessary condition to ensure that a person can successfully complete a certain activity. It is divided into general ability and special ability. The former refers to the necessary basic ability to carry out various activities, and the latter refers to necessary ability to perform certain professional activities. The ability refers to the behavior, knowledge, and comprehensive skills that can help a person succeed in a particular job. Scholars associate abilities with skills, outputs, tasks, knowledge, responsibilities, role expectations, or the process by which someone completes work in a particular field. One of the most prominent problems in the current research on capacity assessment or the construction of capacity model is that there is no consensus on the concept of competence. Shi Hongxia [2] believes that coaches should have rich professional theoretical knowledge, arrange appropriate training intensity, reasonably arrange recovery time and means during training, accurately diagnose the status of players in training and competition, have certain planning change ability, and sensitively discover and solve problems in training and competition. Also, the coaches should master advanced training methods and scientific training means, correctly use the collected information, be familiar with sports material selection, be proficient in using computer to analyze competition information, have good ability to read foreign languages, and translate training and competition results into text descriptions. At the same time, the coaches should also have the ability to apply scientific and technological achievements, be able to learn from other project training methods and predict the prospects of their own sports projects, and not be limited to existing experience and training methods. They should study assiduously and make innovation.

Track and field coaches are usually specialized physical education teachers whose knowledge and skills reflect the progress and timely changes in the curriculum of various sports at home and abroad. [3] Cai Li divided the professional ability structure of track and field senior coaches into six major sections, with a total of 57 questions (items), including the ability of guiding training, the ability of guiding competition, management ability, scientific research ability, sports selection ability and social interaction ability. [4] According to Wang Xiaochun's study, the factors influencing the coaching ability of high-level track and field coaches in China are: training practice, professional learning and education, sports environment and sports genetic factors. [5] The research by Zhang Yanping, el at. shows that the comprehensive performance evaluation indicators of excellent track and field coaches are mainly reflected in four aspects: "morality", "capacity", "diligence" and "performance" under the influence of certain environmental factors.

The distribution of track and field coaches in China is very extensive. From the survey results of the demand for teachers, the demand for coaches of national and provincial teams, teachers with high professional titles and academic degrees, researchers, senior managers of sports systems, sports teams or clubs and other personnel is ranked from the high to the low [3]. Therefore, it is necessary to conduct the study on coach's ability in various sports organization to get more feedback and improve the coach's ability.

The purpose of this study is to further explore the skills and abilities of track and field coaches required for performing the necessary work.

II. RESEARCH OBJECTS AND METHODS

A. Research Object

In this study, we selected a total of 400 track and field coaches at different levels, aged 45 ± 4.4 years old, and worked for 15 ± 2.8 years. Questionnaires will be sent to the track and field coaches of track and field sports meeting, sports technology school, college track and field team, track and field club and other track and field coaches through on-site questionnaires or emails. Through detailed description of the research details, the track and field coaches who participated in the study were required to complete the questionnaire carefully. A total of 350 questionnaires were collected, and the recovery rate is 87.5%. There are 326 effective questionnaires, and the effective rate is 93.14%.

B. Research Methods

1) Literature review method: The author studied the relevant literature to understand the research progress and research conclusions of the ability evaluation, coaching ability evaluation and track and field coaching ability evaluation. According to the data collection, 24 items reflecting the ability of track and field coaches were formed.

According to the data collection, 24 items reflecting the ability of track and field coaches were formed.

2) Interview: Through informal interviews with track and field coaches, eight additional items specific to track and field coaching duties were added.

3) Delphi method (expert investigation method): The content validity of the above items is assessed by three experts. According to the opinions of experts, a total of 34 items of the Liker 5-point self-assessment initial questionnaire were established. The evaluation level can be divided: "very unimportant", "not important", "uncertain/undetermined", "important", "very important". And the score is successively 1 point, 2 points, 3 points, 4 points, 5 points. Finally, the scale statement was reviewed by a Chinese professor to ensure that the expression is unambiguous and easy to understand.

4) Mathematical statistics: The author used SPSS18.0 to build the database, analyzing the results.

III. RESEARCH RESULTS

A. Project Analysis Results

The factor analysis method is used to filter the items, and the factor load value of each item is obtained after the maximum orthogonal rotation of the variance. The items that the load capacity on any factor less than 0.30, the load capacity on multiple factors greater than 0.30, inconsistent with the operational definition of the dimension or the topic of the same meaning will be deleted. The author uses the method of deleting one question and re-exploring it, and gradually explores a stable factor structure. Twelve items in this study were deleted. In summary, the scale eventually retained 22 items.

B. The Results of Exploratory Factor Analysis

The exploratory factor analysis is carried out on the initial measurement data. The principal component analysis method is used to extract the factor with the eigenvalue greater than 1. The mean orthogonal rotation method is used to rotate the factor load matrix, and the gravel map is referenced. Finally, 5 factors are extracted. The cumulative variance contribution rate of the five factors was 67.604%. (See “Table I”)

TABLE I. THE EIGENVALUE AND VARIANCE CONTRIBUTION RATE OF FIVE FACTORS

Factor	Number of Items	Eigenvalue	Contribution Rate %	Cumulative Contribution Rate %
1 Track and field management ability	7	6.874	32.847	32.847
2 Sports Science Knowledge	5	2.958	14.396	47.243
3 Biological knowledge	3	1.412	7.459	54.702
4 injury prevention management	3	1.273	6.726	61.428
5 track and field training ability	4	1.107	6.176	67.604

From the rotation component matrix, the correlation coefficient between the factor and each item can be seen, and the items enclosed by each factor can be obtained. As shown in "Table 2", the five factors contain 22 items: track and field management ability (item 18, 20, 9, 1, 7, 16, 10); sports science knowledge (item 6, 4, 5, 15, 17); biological knowledge (item 8, 19, 22); injury prevention management (item 11, 13, 2); track and field training ability (item 12, 14, 3, 21).

TABLE II. FACTOR ANALYSIS ROTATION MATRIX OF THE SCALE

	1	2	3	4	5
Q18	.802				
Q20	.782				
Q9	.762				
Q1	.756				
Q7	.713				
Q16		.675			
Q10		.664			
Q6		.736			
Q4		.686			

	1	2	3	4	5
Q5		.674			
Q15		.601			
Q17		.512			
Q8			.826		
Q19			.827		
Q22			.742		
Q11				.774	
Q13				.723	
Q2				.721	
Q12					.765
Q14					.670
Q3					.565
Q21					.504

C. Reliability Analysis of the Scale

TABLE III. INTERNAL CONSISTENCY RELIABILITY OF THE SCALE (CRONBACH'S A VALUE)

	Track and Field Management Ability	Sports Science Knowledge	Biological Knowledge	Injury Prevention Management	Track and Field Training Ability	Total Scale
α value	0.886	0.768	0.853	0.802	0.657	0.894

It can be seen from "Table III" that the Cronbach's α value of the total scale is 0.894, and the sub-scale reliability of the five factors is between 0.657 and 0.886. Nunnally and Bemstein believe that the Cronbach's α coefficient of the measurement tool is preferably higher than 0.70. However, if the number of items in the measurement tool is less than 6, Cronbach's α coefficient value greater than 0.60 also indicates that the data is reliable [6]. In this study, the number of "track and field training ability" dimension topics is four, Cronbach's α coefficient value is greater than 0.60, and Cronbach's α coefficient value of other dimensions is greater than 0.76. Therefore, the quality of the internal consistency of the questionnaire can be considered reliable.

D. Ranking Results of the Scores of Track and Field Coaching Ability

TABLE IV. RANKING RESULTS OF THE SCORES OF TRACK AND FIELD COACHING ABILITY

Rank	Item	Ability Expression	Mean	Standard Deviation
1	17	Understanding the specific risks inherent in sports activities	4.236	0.822
2	8	Understanding sports physiology knowledge	4.166	0.845
3	5	Understanding of sports psychology knowledge	4.141	0.844
4	19	Understanding of anatomical knowledge	4.118	0.881
5	15	Ability to use reasonable teaching methods during training	4.109	0.938
6	2	Understanding of injury prevention knowledge	4.046	0.889
7	22	Understanding of sports medicine knowledge	4.017	0.874
8	13	Ability to adopt effective decision-making in handling accidents	4.009	0.939
9	3	Focusing on the ability of the judicial process to deal with problems	3.994	0.861
10	4	Understanding of Physical Education Knowledge	3.986	0.927
11	12	Ability to conduct research for improved training methods	3.977	0.887
12	9	Ability to organize sports conferences/activities	3.946	0.995
13	6	Understanding of sports sociology knowledge	3.943	1.049
14	14	Ability to apply cooperation and competition theory in training	3.937	1.029
15	21	Procedures for establishing performance standards	3.851	0.887
16	18	Ability to arrange the game/meeting time reasonably	3.848	0.969
17	7	Ability to manage athletes' enrollment	3.768	0.926
18	11	Understanding of injury rehabilitation knowledge	3.759	0.997
19	20	Ability to use professional computer software programs	3.719	1.006
20	10	Ability to build good public relations	3.656	0.957
21	1	Ability to use office software for word processing	3.573	1.071
22	16	Ability to prepare budgets	3.573	1.071

In "Table IV", the abilities to be valued by track and field coaches include: the understanding of specific risks inherent in sports activities (17 items), the understanding of sports physiology knowledge (8 items), the understanding of sports psychology knowledge (5 items), the understanding of anatomical knowledge (item 19) and the ability to use reasonable teaching methods during training (15 items).

For track and field coaches, the abilities that attract less attention include: the ability to prepare budgets (16 items), the ability to use office software for word processing (1 item),

the ability to establish good public relations (10 items), and the ability to use professional computer software (20 items) and the understanding of injury rehabilitation knowledge (11 items).

IV. Analysis and Discussion

The purpose of this study is to determine the capabilities that a track and field coach should possess. After exploratory factor analysis of the initial scale, five dimensions were identified, including 22 items. They are track and field management abilities, sports science knowledge, biological knowledge, injury prevention management and track and field training abilities.

The track and field management ability ranked first after the exploratory factor analysis. Its eigenvalue was 6.874, explaining 32.847% of the total variance, Cronbach's α=0.886, and the item load is between 0.802 and 0.664. The main explanations of the track and field management ability include Q16 budgeting ability, Q7 management ability of sports enrollment, Q18 ability to arrange competition/meeting time, Q9 ability to organize sports meeting/activity, Q20 ability to use professional computer software program, Q1 ability to use office software for word processing and Q10 ability to develop good public relations. The track and field coaches should have the abilities and skills to promote their responsibilities in track and field. Track and field coaches should always use effective office procedures or computer software for registration, reporting, and notification. In addition, track and field coaches often have to schedule games, meetings, and are responsible for athletes' enrollment or budgeting. They must serve as sports managers sometimes. Most sports management studies have confirmed that competency skills such as the effective application of office programs or computer software are very important.

This study found that sports science is the second factor. Its eigenvalue is 2.958, explaining 14.396% of the total variance, Cronbach's α = 0.768, and the item load is between 0.736 and 0.512. Track and field coaches face different levels of athletes in a changing environment. They should fully understand Q5 sports psychology, Q6 sports sociology, Q4 physical education knowledge, Q17 understanding the specific risks inherent in sports activities, and Q15 ability to use reasonable teaching during training. Similar to some studies, the results of this study also confirm the importance of sports science knowledge. [7] For example, Kostopoulos (2011) studied 245 basketball coaches at three levels. According to these studies, sports science/practice is the first factor including six projects, Cronbach's α=0.760. Case & Branch (2003) also found that sports science programs were the most highly acclaimed [8]. Cai Li believes that there is a lack of cultivation for coaches' "abilities" in job training [9]. The items with high demand in training include training and characteristics of high-level athletes and children, excessive fatigue, prevention, diagnosis and treatment of sports injuries, high-level athletes' pre-match training and competition ability training, etc., reflecting the importance of knowledge of sports science during the coaching career.

In this study, the author has considered the following abilities such as Q8 understanding of exercise physiology, Q19 understanding of anatomical knowledge, and Q22 understanding of sports medicine knowledge are important parts of building track and field coach's knowledge structure. [3] Cai Li believes that the most important ability should be improved in the professional competence structure of senior track and field coaches is athletic material selection ability, followed by scientific research ability and guided training ability. The lowest level of demand is the ability to communicate with others, followed by the ability to command the competition. This requires good basic knowledge of biology. Some studies have incorporated them into sports science factors. This study takes these abilities as a third independent factor in biological knowledge.

The fourth factor includes Q11 understanding of injury rehabilitation knowledge, Q2 understanding of injury prevention knowledge, and Q13 ability to make effective decisions in dealing with accidents. Track and field coaches are experts in track and field sports. In addition to sports science and biology, they should know very well how to protect their athletes from harm. They can provide first aid and emergency care, and know the methods to guide athletes to complete the injury rehabilitation process. Foreign research attaches great importance to this. Davis (1987) believed that the ability and first-class skills required by recreational managers were first aid and safety. Lambrecht (1987) studied the ability of club managers, and believed that injury prevention/rehabilitation knowledge, first aid knowledge, safety and accident management were important capabilities [11].

Finally, the eigenvalue of the fifth factor (track and field training ability) is 1.107, explaining 6.176% of the total variance and the reliability Cronbach's α=0.657, and the item load is between 0.765 and 0.504. The factor includes Q21 ability to establish performance standards, Q12 ability to conduct research for improved training methods, Q3 ability to handle problems in the judicial process, and Q14 ability to apply cooperation and competition theory in training. Many studies have shown the important role of professional training techniques for coaches. [12] According to Li Jihui's study on the quality of track and field coaches, the core layer of dominant quality of track and field coaches in China includes an element of special training ability. The security layer includes commanding competition ability, special experience, and basic theoretical knowledge of sports training, medical and health care knowledge of sports, management ability, philosophy and thinking science knowledge, covering six explicit quality indicators.

V. Conclusion

The purpose of this study is to establish a scale to determine the capabilities that track and field coaches need. The results show that the core competitiveness of successful track and field coaches includes track and field management ability, sports science knowledge, biological knowledge, injury prevention management and track and field training ability. Of course, this study also needs to make the analysis on the reliability, validity testing and confirmatory factor of

larger sample to further discuss the validity and reliability of the scale.

REFERENCES

[1] Cihai (1999 compact edition) [M]. Shanghai: Shanghai Lexicographical Publishing House, 2000: 589. (in Chinese)

[2] Shi Hongxia. Analysis of the factors influencing the coaching level of coaches of high-level sports teams in Jiangsu province [J]. Journal of Jilin Institute of Physical Education, 2009, 25(4): 108-109. (in Chinese)

[3] Cai Li. Research on the professional ability of track and field senior coaches[J]. Journal of Shanghai University of Sport, 2004, 28(2): 9-11. (in Chinese)

[4] Wang Xiaochun. Analysis of factors affecting the coaching ability of high-level track and field coach in colleges and universities in China[J]. Journal of Xi'an Physical Education University, 2007, 24(2):102-105. (in Chinese)

[5] Zhang Yanping, Zhai Feng. Study on the evaluation system of comprehensive ability of excellent track and field coaches in colleges and universities [J]. Journal of Physical Education, 2009, 16(11):77-80. (in Chinese)

[6] Jum C.Nunnally, Ira H. Bemstein. Sychometric Theory. mrd Edition. New York: McGraw. Hm. Inc.1994.

[7] Kostopoulos, N.(2011). Requiring competencies of basketball coaches in Greece.Biology of Exercise, 7:1: 41-47.

[8] Case,R. and Branch, J.D. (2003). A study to examine the job competencies of sport facility managers. International Sports Journal, 7(2): 25-38.

[9] Cai Li, Wang Xing, Ding Hairong, Zhu Chao. Cultivation of track and field senior coaches in China [J]. Journal of Shanghai Physical Education, 2008, 32(3): 83-87. (in Chinese)

[10] Davis. K. A.(1987). Selecting qualified managers: Recreational sport management in the private sector. Journal Physical Education Recreation and Dance, 58 (5), 81-85.

[11] Lambrecht,K.W. (1987). An analysis of the competencies of sports and athletic club managers. Journal Sport Management, 1:116-128.

[12] Li Jihui. Research on the construction of the dominant core quality structure system of track and field coaches in China[J]. Journal of Shenyang Institute of Physical Education, 2011, 30(5): 100-103. (in Chinese)