Research on the Performance Management of High-Level Sports Teams in Chinese Colleges and Universities: Taking Martial Arts as an Example

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Abstract

Nowadays, sports are flourishing and active all over the world. Since the Chinese government decided to set up high-level sports teams in colleges and universities in 1987, Chinese university students have been active in the international sports arena, but their achievements have not reached the expectations of the initial stage of the team. Therefore, this research to Chinese martial arts in colleges and universities high level sports team the performance of the research as the breakthrough point, in 235 the construction of high-level sports teams of Chinese colleges and universities as the investigation scope, based on the theory of the balanced scorecard, at the same time, using literature method, the entropy weight method, structural equation model, such as research methods, under the comprehensive analysis of qualitative research and quantitative research, Explore the key factors that affect the performance of high-level sports teams, and build a complete and practical performance evaluation system of high-level martial arts sports teams in Chinese universities.

In order to ensure the feasibility and effectiveness of the system, taking Chinese J university Martial Arts high-level sports team as the object, fuzzy comprehensive evaluation method is used to verify and analyze. It provides a set of scientific and effective performance evaluation index system for the development and management of high-level sports teams in Chinese universities, and promotes the long-term development of Chinese sports undertakings.

Keyword: Evaluation Index System, Entropy Weight Method, Entropy Weight Method, Entropy Weight Method, High-level sports teams, Martial Arts Performance

Introduction

In the process of globalization, sports competitions in various countries are booming, and the high standard sports teams in colleges and universities have got innumerable great achievements, showing their talents in the World Youth Championships, Youth Olympic Games and other large-scale world-class competitions. Since 1987, the Chinese government has decided to recruit a number of athletes with strong athletic ability or potential to participate in competitions through the special

enrollment policy of universities for professional training, so as to cultivate excellent talents for the realization of the Olympic glory program. However, in recent years, the Chinese government has given a great deal of financial support, policy support, venues and personnel support to the high standard sports teams in colleges and universities. However, the achievements made by the Chinese high standard sports teams have not met the expectations of the initial stage of the team. In this "national football" China, the development of Competitive Martial Arts is not as good as the development of football, track and field and other major sports.

However, in terms of the number and quality of the current training of outstanding athletes, it is extremely inconsistent with the pace of the development of national competitive sports, and it is difficult for them to undertake the development of national competitive sports. The performance of high standard Martial Arts sports teams is uneven, and it is difficult to cultivate excellent talents. Therefore, it is very urgent to construct a scientific, reasonable and convenient performance evaluation index system of high standard Martial Arts sports teams.

Research Objectives

1. Research universities

At present, China has 235 universities with high-level sports teams, 42 of which recruit high-level Martial Arts athletes. 235 universities with high-level sports teams were selected to ensure the rationality and coverage of the study to the maximum extent. In terms of testing the performance evaluation index system of high-level sports teams, taking a representative university (hereinafter referred to as J university) as an example, the fuzzy comprehensive evaluation method is used to verify and analyze the performance of the high-level martial arts sports teams in this university, so as to ensure the feasibility and effectiveness of the performance evaluation index system.

2. Subjects

The object of this study is the construction and application of performance evaluation indicators of high-level sports teams in 235 universities in China, as well as the correlation among the first, second and third indexes of the performance evaluation index system of high-level sports teams (especially high-level martial arts sports teams).

3. Survey subjects

The respondents were mainly athletes, coaches, administrators and martial arts experts from 235 Chinese universities' high-level sports teams.

Research Methodology

Literature Research Method

This research mainly adopts the method of collecting and reading literature, taking "high standard sports team", "high standard Martial Arts team" and "performance evaluation index system" as the search subject, collects and sorts out the relevant literature materials from 2000 to 2019 in CNKI, Google academic search engine and other websites, so as to form the correct understanding and recognizing of scientific concepts such as high standard sports teams and performance evaluation index, clear the theme and content of the study, build the general framework of this study.

Questionnaire Survey

Combined with the purpose of this study, object, using the method of expert interview method, the questionnaire revised and perfect, eventually formed the questionnaire: first, the present situation of Chinese martial arts in colleges and universities high level sports team questionnaire, mainly studies the development of the city's sports teams and the basic situation of Martial Arts athletes and coaches; Second, the Expert Questionnaire on The Weight of Performance Evaluation Indicators of High-level Martial Arts sports in Chinese Universities mainly provides the basis for the construction of performance evaluation index system, and is distributed to experts. Third, "Performance Evaluation Questionnaire of Chinese University Martial Arts High-level Sports Teams (Questionnaire for Managers and Coaches)"; Its 4, the Chinese colleges and universities high level sports team performance questionnaire (managers and coaches questionnaire) ", the questionnaire is in the Chinese martial arts in colleges and universities high level sports team performance evaluation questionnaire (managers and coaches questionnaire), on the basis of in combination with the practical situation of Chinese colleges and universities high level sports teams, modify the perfect, Since there are only 42 universities and colleges in China that build high-level Martial Arts sports teams, 235 universities and colleges that build high-level Martial Arts sports teams are included in the survey scope in this study to increase the sample size of the study and improve the scientific and rationality of the study.

Distribution and Recovery of Questionnaires

In order to ensure the recovery rate and coverage of questionnaire survey, on-site questionnaire survey and mail questionnaire survey were adopted in this study. A questionnaire survey was conducted on 600 high-level athletes, 50 coaches, 122 management personnel and 25 experts from 42 colleges and universities that have established high-level Martial Arts sports teams in China. The questionnaire included the current situation survey of high-level Martial Arts sports teams in Chinese colleges and universities. Expert Survey on the Weight of Performance Evaluation Indicators of High-

level Martial Arts sports in Chinese Universities; Performance Evaluation Questionnaire of Chinese University Martial Arts High-level Sports Teams (Questionnaire for Managers and coaches). On China's 235 martial arts (including 42 constructions of high-level sports teams in colleges and universities) has a high-level sports team of universities of 286 coaches and 735 managers in the Chinese universities high level sports team performance questionnaire (managers and coaches' questionnaire)" questionnaire survey, questionnaire distribution and recovery conditions are shown in table 1, 2.

Table 1 Distribution and Collection of Questionnaires

	Number of Distribution	Number of Collection (Collection Rate)	Invalid	Valid (Validity Rate)
Coaches	50	50(100%)	0	50(100%)
Athletes	600	590(98.33%)	36	564(95.59%)
Experts	25	25(100%)	0	25(100%)
Managers	122	120 (98.36%)	0	120 (100%)

Table 2 Distribution and Recovery of Questionnaires (Appendix 7)

	Number of Distribution	Number of Collection (Collection Rate)	Invalid	Valid (Validity Rate)
Coaches	286	286(100%)	15	271(94.76%%)
Managers	735	708 (96.33%)	23	685 (96.75%)

Reliability Test of Questionnaires

The reliability of the questionnaire was measured by Cronbach $\propto$ reliability coefficient method for athletes, coaches and experts. Through the test, $\propto$ > 0.8, which proves that the reliability of the questionnaire is good.

$$\propto= \frac{K}{K-1}\left(1 - \frac{\sum_{i=1}^{K} \sigma_{Yi}^2}{\sigma_X^2}\right)$$

Where:

$\propto$=Reliability;

K=Number of questions in questionnaire;

σ_{Yi}^2=Variability of each of question score;

σ_X^2= Variability of each of total questions score.

Table 3 Cronbach $\propto$ Reliability Coefficient

Cronbach $\propto$ Reliability Coefficient	Internal Consistency
$\propto\geq 0.9$	Very good
$0.9 > \propto\geq 0.8$	Good
$0.8 > \propto\geq 0.7$	Acceptable
$0.7 > \propto\geq 0.6$	Not good
$0.6 > \propto\geq 0.5$	Bad
$0.5 > \propto$	Unacceptable

Validity Test of the Questionnaire

In order to ensure the authenticity and effectiveness of the questionnaire, 10 experts (4 professors, 3 associate professors and 3 lecturers) were invited (Table 4) to evaluate and test the designed content of the questionnaire. respectively, of the 10 expert questionnaires (issue and recovery conditions are shown in table 5), invite them to review and check, the experts that rate shall be maintained at more than 80%, less than 20% of eliminate, in addition, according to the results of the experts to judge from the "right" to "inappropriate" four levels (table 6), to qualitative evaluation content validity, The questions unanimously disagreed by the experts were eliminated, while the ones unanimously expressed by the experts were retained. For the disputed items, the questionnaire with high efficiency was finally formed after consultation.

Table 4 Statistical Table of Composition of Experts

Professional Qualifications	Professor	Associate Professor	Lecturer
NO.	4	3	3
Proportion	40%	30%	30%

Table 5 Distribution and Recovery of Expert Questionnaires

Number of Distribution	Number of Collection	Collection Rate	Invalid	Validity Rate
10	10	100%	10	100%

Table 6 List of Experts Evaluation on the Content, Structure and overall of the Questionnaire

Category	Suitable	Basically Suitable	Not very Suitable	Not Suitable	Total
Frequency of Questionnaire Content Evaluation	6	4	0	0	10
Percentage	60%	40%	0%	0%	100%
Frequency of Questionnaire Structure Evaluation	5	5	0	0	10
Percentage	50%	50%	0%	0%	100%
The Overall Evaluation Frequency of the Questionnaire	6	4	0	0	10
Percentage	60%	40%	0%	0%	100%

Findings and Discussion

Determination of weight of performance evaluation indicator for high-standard martial arts teams in China universities

The way of determination of weight

The weight of performance evaluation index is determined by the entropy weight method. Entropy was first introduced into information theory by Shen Nong and has been widely used in engineering technology, social economy and other fields. The basic idea of entropy weight method is to determine the objective weight according to the index variability. Generally speaking, a smaller information entropy E_j of an index suggests the greater degree of variation of the index, the more information it provides, the greater role it can play in the comprehensive evaluation, and the greater weight. On the contrary, a greater information entropy of an index suggests the smaller degree of variation of the index, the less information it provides, and the smaller role it plays in the comprehensive evaluation, and the smaller weight.

The procedure of entropy weight method weighting

Data standardization

1) First, 10 experts are randomly selected to make a rating table on the scoring results of the second-grade indicators of performance evaluation (Table 4.6).

Table 7 The rating table of 9 second-grade indicators rated by 10 experts

indicator / expert	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
A	98	90	100	84	90	100	100	100	100
B	100	80.3	85	100	90	96.5	100	100	100
C	82.5	85	93.5	90	90	100	100	93.5	100
D	94.6	96.5	91.5	100	90	100	94.4	100	100
E	100	90	100	100	95	90	100	100	80
F	95.7	100	100	92.5	90	100	100	85.7	100
G	100	82.5	87.3	100	90	96.8	86	100	100
H	87.5	100	95	100	100	92	100	100	86.7
I	86.5	90.6	92.9	86.5	80	100	100	100	100
J	100	90	100	100	100	100	100	100	100

2) Use Excel to standardize the data in Table 4-6. Assume that the nine secondary indicators are X_1、 X_2... X_9, and normalize to Y_{11}、 Y_{12}... Y_{ij}.

Then the normalized formula is:

$$Y_{ij} = \frac{X_{ij} - \min(X_i)}{\max(X_i) - \min(X_i)}$$

The results of data standardization are shown in Table 4.7:

Table 8 Data standardization rating scale of 9 second-grade indicators rated by 10 experts

indicator expert	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
A	0.89	0.49	1.00	0.00	0.50	1.00	1.00	1.00	1.00
B	1.00	0.00	0.00	1.00	0.50	0.65	1.00	1.00	1.00
C	0.00	0.24	0.57	0.38	0.50	1.00	1.00	0.55	1.00
D	0.69	0.82	0.43	1.00	0.50	1.00	0.60	1.00	1.00
E	1.00	0.49	1.00	1.00	0.75	0.00	1.00	1.00	0.00
F	0.75	1.00	1.00	0.53	0.50	1.00	1.00	0.00	1.00
G	1.00	0.11	0.15	1.00	0.50	0.68	0.00	1.00	1.00
H	0.29	1.00	0.67	1.00	1.00	0.20	1.00	1.00	0.34
I	0.23	0.52	0.53	0.16	0.00	1.00	1.00	1.00	1.00
J	1.00	0.49	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Calculation of the information entropy of each index

1) According to the definition of information entropy in information theory, the data of the information entropy of this group (see Table 4-9):

$$E_j = -\frac{1}{\ln n}\sum_{i=1}^{n} P_{ij} \ln P_{ij}$$

Among them：

$$P_{ij} = Y_{ij} \bigg/ \sum_{i=1}^{n} Y_{ij}$$

（See Table 4-8 for P value），If：

$$P_{ij} = 0,$$

then：

$$\lim_{P_{ij}\to 0} P_{ij} \ln P_{ij} = 0$$

Table 9 The P value of each score item in the second-grade indicator

indicator\expert	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
A	0.13	0.10	0.16	0.00	0.09	0.13	0.12	0.12	0.12
B	0.15	0.00	0.00	0.14	0.09	0.09	0.12	0.12	0.12
C	0.00	0.05	0.09	0.05	0.09	0.13	0.12	0.06	0.12
D	0.10	0.16	0.07	0.14	0.09	0.13	0.07	0.12	0.12
E	0.15	0.10	0.16	0.14	0.13	0.00	0.12	0.12	0.00
F	0.11	0.19	0.16	0.08	0.09	0.13	0.12	0.00	0.12
G	0.15	0.02	0.02	0.14	0.09	0.09	0.00	0.12	0.12
H	0.04	0.19	0.11	0.14	0.17	0.03	0.12	0.12	0.04
I	0.03	0.10	0.08	0.02	0.00	0.13	0.12	0.12	0.12
J	0.15	0.10	0.16	0.14	0.17	0.13	0.12	0.12	0.12

Table 10 The information entropy of the second-grade indicator

second-grade indicator	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
The information entropy	0.86	0.92	0.81	0.83	0.91	0.87	0.84	0.88	0.91

Determination of the weight of each indicator

According to the calculation formula of information entropy, the information entropy of each indicator is calculated (see Table 4-9).

According to information entropy, the weight of each indicator is calculated (see Table 4-10):

$$W_i = \frac{1 - E_i}{k - \sum E_i}(i = 1, 2, ..., k)$$

Table 11 The weight of second-grade indicator

|	W_1	W_2	W_3	W_4	W_5	W_6	W_7	W_8	W_9
Weight	0.12	0.05	0.19	0.16	0.06	0.11	0.15	0.10	0.06

According to the weight of second-grade indicators, the weight of first-grade indicators can be calculated (see Table 4-11):

$$W_{A_1} = w_{B_1} + w_{B_2}$$
$$W_{A_2} = w_{B_3} + w_{B_4}$$
$$W_{A_3} = w_{B_5} + w_{B_6} + w_{B_7}$$
$$W_{A_4} = w_{B_8} + w_{B_9}$$

Table 12 List of weight determination of first-grade indicator

first-grade indicator	weight	Second-grade indicator	weight
A1condition guarantee	0.17	B1training facilities	0.12
		B2 fund	0.05
A2 university	0.35	B3 reputation	0.19
		B4 cultivation of sports talent	0.16
A3 sports team management	0.32	B5 organization and leadership	0.06
		B6 coach management	0.11
		B7 athlete management	0.15
A4 learning and growth	0.16	B8 athlete learning and growth	0.10
		B9 coach learning and growth	0.06

Modified Research Results Model
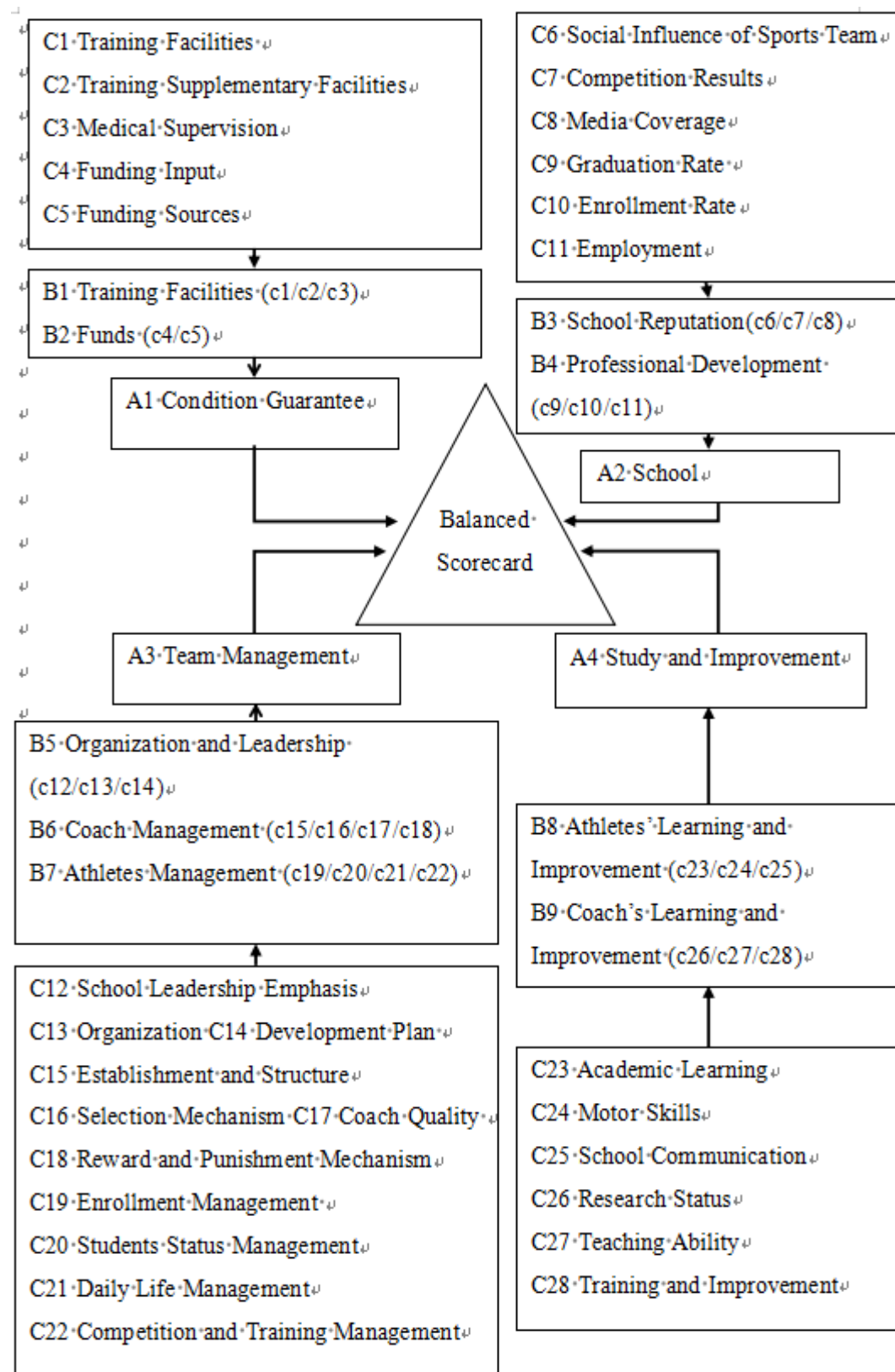
Recommendation for Future Research

Based on the investigation, research and analysis of the current situation of Chinese university Martial Arts high-level sports teams, based on the four dimensions of balanced scorecard, using entropy weight method to build a set of performance evaluation index system suitable for Chinese university Martial Arts high-level sports teams. Finally, this paper makes an example analysis of a high-level Martial Arts team in China by using this evaluation system and finds out the factors that affect the high-level Martial Arts team in this school. The following suggestions are put forward for the development of the school's high-level Martial Arts sports team:

Regarding sports injuries, the school should attach importance to the protection of Martial Arts athletes. The organization and institutional departments should set up the position of team doctor, provide certain funds, and take medical supervision as the top priority in the assessment.

In view of the phenomenon of poor academic performance of athletes, schools should first give athletes more freedom to choose their majors. Secondly, before choosing majors, they should conduct a thorough examination according to the majors selected by students. Those who achieve the standard in the examination can be assigned to the corresponding majors. Not up to standard need to be changed to other majors or schools arrange relevant teachers to high-level athletes choose a major to make up for the collective lessons, after the achievement is up to standard can enter this major study.

In the part of athlete training competition, the first step is to start from the coaches. The college should sign relevant agreements with the coaches to reward the coaches who achieve the standard and complete the task excellently, and punish the coaches who fail to complete the task. Secondly, the coaches' daily training and competition in each season should be evaluated for three times, rather than the final result and ranking as the final assessment content. Athletes should be strictly managed. Those who are not active or serious in training should be punished. Those with improper attitude should be expelled from the sports team. Finally, coaches and athletes should strengthen communication, enhance understanding, and regularly give the team to education.

n terms of scientific research, the college should first give coaches more time, less arrangement of college affairs, and give coaches time and tasks for scientific research. Secondly, in terms of training and further study, the college should increase investment in funds, organize coaches to study abroad during the off-season, and also arrange coaches to attend training classes.

In addition, according to the experience of this research, in the future research, as much as possible should be collected and sorted out related literature, the investigation scope and total amount should be as comprehensive and reasonable as possible, data calculation should be repeatedly checked and verified, and research should be conducted with rigorous and serious academic attitude.

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