A Study on the Optimization and Improvement of the Construction of the Campus Football Development Model by a Factor Analysis Method under the Background of “Healthy China”

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In order to enrich campus sport life and promote the development of campus ball game, this paper uses the analysis method to analyze the development mode of campus football and evaluates the relevant factors combined with the development status, characteristics, and future trend of campus football. Factor analysis is a comprehensive analysis method, which can realize multifactor comprehensive analysis and qualitative and quantitative analysis of campus football. At the same time, analyze the relationship between various factors and find a scheme conducive to the development of campus football. The results show that both comprehensive method factors and single method factors are positive, indicating that the two models have a significant positive impact on the development model of students’ football. However, the influence degree of the comprehensive method (0.314) is the largest, followed by the single method factor (0.128), and the sig. values of the two variable factors are <0.05, so the comprehensive method is the main mode of campus football development. Therefore, the factor analysis method proposed in this paper is conducive to the selection of campus football development model and provides support for the development of campus football.

1. Introduction

At present, the development of campus football in China is divided into four modes: single football mode, mixed development mode, learning from foreign modes, and self-innovation mode, each accounting for 7%, 10%, 26%, and 57%, respectively. Among them, mixed development and foreign models are comprehensive methods, while self-innovation and single football model is single methods. However, the results of different development models are different so that colleges and universities cannot choose their own campus football development model. Factor analysis is to use a few factors to describe the multiple indicators affecting the campus football model and determine the relationship between different factors. Factor analysis is to use a few factors to describe the multiple indicators affecting the campus football model (Brahmachary et al.) [1] and determine the relationship between different factors. Factor analysis method uses cluster analysis to classify the variables with high correlation into the same category, and each category of variables becomes a factor, which reflects most of the information of the original data through fewer factors [2]. Because the factor analysis method has its own shortcomings, it cannot realize the analysis of massive data and dynamic data, so it is necessary to combine the correlation function to make up for the shortcomings of its own analysis. Therefore, the development process of campus football is complex and involves many factors. How to better analyze and improve the accuracy of analysis results is an urgent problem to be solved at present. Factor analysis has comprehensive characteristics, which makes each influencing factor dynamic and standardized, and makes better analysis. Factor analysis can easily find out the main factors affecting the development mode of campus football and the influence of each factor so as to realize the comprehensive analysis of campus football. Content of campus football—Influencing factors of campus football—Factors of campus football—Determine the main factors of campus
Factor analysis, as a research method, is suitable for large-scale statistical analysis. Some scholars also put forward eigenvalue analysis methods, which used a small amount of confirmed value data to carry out relevant analysis and research, and reflected the overall data characteristics, such as factor analysis method, the decision tree method, etc. To sum up, scholars at home and abroad had unified opinions on the development model of campus football and believed that the development model of campus football should be combined with its own situation for comprehensive and comprehensive analysis. However, there are many problems in campus football, such as less data and more influencing factors. Therefore, factor analysis and the analytic hierarchy process are suitable analysis methods.

3. Relevant Models

3.1. Overview of Factor Analysis. Factor analysis, as a comprehensive analysis method, mainly analyzes various factors and indicators comprehensively, and studies the influence degree of each factor on the final result. Finally, factor analysis determines the main factors in the analysis results and the role played by this factor. According to the results of factor analysis, some opinions and suggestions are put forward. Compared with other analysis methods, the results of factor analysis are more objective and accurate.

3.2. Mathematical Descriptions of Football Development Model. Assuming that any football pattern \( x_i \) is an observable random vector and its set is \( \{ x_1, \ldots, x_n \} \), the vector formula is \( \text{Ex}(x) \), the covariance matrix is \( \text{Co}(x) \), and the factor calculation formula of different vectors is shown as follows:

\[
\text{Co}(x) = \sum_{i=1}^{n} x_i + \xi,
\]

where \( \xi \) is the adjustment error of the factor. Assuming that the correlation of any football pattern is \( f_x \), which is a random observable vector and its set is \( \{ y_1, \ldots, y_m \} \), the vector formula is \( F(x) \), the covariance diagonal matrix is \( E(x) = \Sigma \), and the correlation calculation formula of different factors is shown as follows:

\[
E(y_i) = \sum_{j=1}^{n} x_j / F(x_j) + \tau,
\]

where \( \tau \) is the adjustment error of correlation. The mode selection formula of factor analysis method is constructed according to formulas (1) and (2), and the results formula is shown as follows:

\[
y_j = \text{Cox}(x_i) + E(y_i) + \xi + \tau.
\]

In order to improve the accuracy of the calculation results, it is necessary to construct the influencing factor matrix to realize the comprehensive analysis of the development mode of campus football. The specific calculation formula is shown as follows:

\[
y_j = [\text{Cox}(x_i) + E(y_i) + \xi + \tau] \cdot \begin{pmatrix} z_{11} & \ldots & z_{1n} \\ \vdots & \ddots & \vdots \\ z_{ml} & \ldots & z_{mn} \end{pmatrix},
\]

where \( \begin{pmatrix} z_{11} & \ldots & z_{1n} \\ \vdots & \ddots & \vdots \\ z_{ml} & \ldots & z_{mn} \end{pmatrix} \) is the influencing factor judgment matrix and \( \begin{pmatrix} z_{11} & \ldots & z_{1n} \\ \vdots & \ddots & \vdots \\ z_{ml} & \ldots & z_{mn} \end{pmatrix}^T \neq 0. \)

3.3. Research Assumptions. Based on previous studies, this paper puts forward relevant basic assumptions \( H_1, H_2, \) and \( H_3 \). In the empirical analysis, variance and correlation analysis is used to verify the relevant basic assumptions [11]. After verification, most of the assumptions are true or partially true. The result is shown in Table 1.

3.4. Variable Designs and Model Construction. Firstly, project preparation was performed. This paper combines the interview results and open-ended questionnaire survey results, including demographic characteristics survey, such as gender, age, experience, and so on. The second part is the evaluation effect of corresponding indicators, which is composed of 1–5 points, representing nonconformance, basic conformance, conformance, relatively conformance, and very conformance [12]. Secondly, the reliability analysis is the reliability analysis of the effect questionnaire, in which the values of each variable and factor \( \alpha \) are shown in Table 2. According to Table 2, the overall reliability of the campus football development model measurement table is 0.835, which is at a high reliability level.

3.4.1. Validity Analysis. This paper uses the KMO test and Bartlett’s sphere test to analyze the survey data so as to determine whether the items in the questionnaire meet the effect of factor analysis. The result is shown in Table 3.
The KMO value is 0.826, DF (degree of freedom) is 27, Sig. < 0.01, which has significant difference, representing the suitability for factor analysis. After Bartlett’s spherical test, this questionnaire obtains a significant chi-square value, which further shows that it is suitable for factor analysis. The result is shown in Table 4.

According to the mode analysis in Table 4, the eight measurement indicators of the campus football development mode are divided into two modes. The first mode belongs to comprehensive method factors, and the second mode belongs to single method factors.

3.5. Data Analysis Method. Through the investigation, the campus football data of a university are obtained, and the statistical analysis of Excel and SPSS 17.0 is carried out to analyze the validity and reliability of the questionnaire and the differences between the data of each group so as to fully understand the impact of demographic variables on the development mode of campus football [13]. Firstly, descriptive statistical analysis was performed. Descriptive statistical analysis can preliminaries describe data information, such as output variables and input variables. This paper makes a descriptive statistical analysis of demographic variables, including gender, age, and grade, and takes the percentage as the index [14].

Secondly, validity analysis was performed. Through the factor rotation, the percentage of the factor in the total survey data is obtained and it is tested by KMO measure and Bartlett sphere test. Among them, KMO ≥ 0.80 represents significant Bartlett’s test. The result is shown in Table 5.

Thirdly, reliability analysis was performed. The Pearson correlation coefficient of the questionnaire distributed in this paper is ≥0.5, which belongs to medium and high reliability and has good content consistency (high efficiency: ≥0.7 Wu [15]; medium validity: 0.5–0.7; low validity: ≤0.3). The result is shown in Table 6.

4. Results and Discussion

4.1. Sample Selection and Data Source. In this paper, questionnaires were distributed to 13 colleges and universities in area A. A total of 420 questionnaires were distributed, and 400 were recovered. The total effective rate was 95.2%, including 10 anonymous questionnaires, 6 questionnaires missing more than 3 answers, and 4 questionnaires with unclear handwriting.

The lowest score of the questionnaire on campus football development mode in this study is 1, and the highest score is 4. Therefore, the middle value of 3 is taken as the reference standard [16].

First, descriptive statistical analysis of demographic characteristic variables, the result is shown in Table 7. Second, the descriptive statistical analysis of football development model, the result is shown in Table 8.

It can be seen from Table 8 that among the different influencing factors, "football practice form" (3.618) scores higher, indicating that commission and training reward have a great influence on them to stay in the enterprise. The score of "training reward" and "extracurricular practice" are slightly lower, at the middle value of 3, indicating that the incentive index is at the medium level [17]. Thirdly, the influence of demographic characteristic variables on the development model of campus football was assessed. T-test and single-factor analysis were carried out to study the influence of gender, age, experience, and grade on the development model of campus football. The result is shown in Table 9.

4.2. The Analysis Results. First, gender differences were analyzed, and the result is shown in Table 9. The significant probabilities of campus football development mode, infrastructure, football practice form, practice standard, football match, extracurricular practice, personnel structure, and grade ratio are greater than 0.05, indicating that there is no significant difference in the evaluation of the above indicators between different gender development modes [18]. Second, the age differences are shown in Figure 1.

It can be seen from Tables 3, 4 that students of different ages have significant differences in the variable of football match, but there is no significant difference in other variables. Third, the grade differences are shown in Table 10.
It can be seen from Table 10 that there is no significant difference in the evaluation of students’ practice standards, training awards, extracurricular exercises, personnel structure, and grade ratio in different grades.

Fourth, experience differences are shown in Figure 2. It can be seen from Figure 2 that there is no significant difference in the evaluation of students’ practice standards, football matches, training awards, extracurricular exercises,
4.3. Effect Analysis. In this paper, Pearson method is used to analyze the relationship between each dimension and the development mode of campus football, and the correlation degree between the indicators is obtained to verify the hypothesis put forward earlier.

First, the correlation analysis of football development model indicators was performed. It can be seen from Table 10 that there is a significant positive correlation between the eight football development model indicators: infrastructure [19], training, football practice forms, football matches, training awards, practice standards, extracurricular practice, personnel structure, and grade ratio, indicating that there is a certain interaction and positive impact among the indicators. The result is shown in Table 11.

Secondly, correlation analysis between campus football development model and incentive indicators was performed. The result is shown in Table 12.

Table 8: The descriptive statistical analysis of football development model indicators (n = 400).

| Factor                        | N  | Maximum | Minimum | Average | Standard deviation |
|-------------------------------|----|---------|---------|---------|--------------------|
| Incentive effect              | 400| 4       | 1       | 2.996   | 0.910              |
| Infrastructure                | 400| 5       | 1       | 2.866   | 0.849              |
| Football practice form        | 400| 5       | 1       | 3.618   | 0.747              |
| Practice standard             | 400| 5       | 1       | 3.161   | 0.654              |
| Football match                | 400| 4       | 1       | 2.882   | 0.851              |
| Training reward               | 400| 5       | 1       | 3.616   | 0.745              |
| Extracurricular practice      | 400| 5       | 2       | 2.995   | 0.63               |
| Structure of personnel        | 400| 5       | 1       | 3.163   | 0.911              |
| Grade ratio                   | 400| 5       | 2       | 2.872   | 0.851              |

Table 9: The difference analysis of gender on various research variables (n = 400).

| Research variables                          | Gender | N     | Mean value | Standard deviation | T value | Sig. |
|---------------------------------------------|--------|-------|------------|--------------------|---------|------|
| Development model of campus football infrastructure | Male   | 133   | 3.44       | 0.821              | 0.977   | 0.779|
|                                             | Female | 267   | 3.91       | 0.905              |         |      |
| Football practice form practice standard    | Male   | 133*  | 3.06       | 0.908              | 0.928   | 0.753|
|                                             | Female | 267   | 2.94       | 0.880              |         |      |
| Football match training reward              | Male   | 133   | 3.88       | 1.328              | 0.598   | 0.074|
|                                             | Female | 267   | 3.76       | 1.495              |         |      |
| Extracurricular practice structure of personnel | Male   | 133   | 3.80       | 0.896*             | −0.059  | 0.130|
|                                             | Female | 267   | 3.80       | 0.999              |         |      |
| Grade ratio research variables              | Male   | 133   | 3.42       | 0.789*             | 1.248   | 0.264|
|                                             | Female | 267   | 3.27       | 0.917              |         |      |
| Development model of campus football infrastructure | Male   | 133   | 3.57       | 0.879*             | −0.733  | 0.034|
|                                             | Female | 267   | 3.79       | 1.031              |         |      |
| Football practice form practice standard    | Male   | 133   | 3.59       | 0.829*             | −0.592* | 0.390|
|                                             | Female | 267   | 3.66       | 0.892              |         |      |
| Football match training reward              | Male   | 133   | 3.52       | 0.803              | 1.103   | 0.578*|
|                                             | Female | 267   | 3.39       | 0.843              |         |      |
| Extracurricular practice                   | Female | 133   | 3.21       | 0.738              |         |      |
|                                             | Male   | 267   | 3.17       | 0.699              | 0.399   | 0.289*|

*P < 0.05.
Table 10: The analysis on the differences of various research variables in grade.

| Variable                        | Secondary specialized school | Junior college | Undergraduate | Master | F    | Sig. |
|---------------------------------|-----------------------------|----------------|---------------|--------|------|------|
| Incentive effect                | 2.26                        | 2.79           | 3.24          | 3.02   | 3.775| 0.027|
| Infrastructure                  | 2.55                        | 2.81           | 2.91          | 3.33   | 4.311| 0.001|
| Football practice form          | 3.73                        | 3.76           | 3.55          | 3.89   | 1.284| 0.015|
| Practice standard               | 3.18                        | 3.39           | 3.57          | 3.86   | 3.363| 0.092|
| Football match                  | 3.45                        | 3.17           | 3.19          | 3.58   | 3.486| 0.795|
| Training reward                 | 3.55                        | 3.60           | 3.64          | 3.94   | 4.227| 0.331|
| Extracurricular practice        | 3.27                        | 3.35           | 3.66          | 3.89   | *976 | 0.351|
| Structure of personnel          | 2.73                        | 2.97           | 3.43          | 3.83   | 7.311| 0.255|
| Grade ratio                     | 3.18                        | 3.05           | 3.02          | 3.36   | 3.507| 0.102|

Figure 2: The difference analysis of experience on various research variables ($n=400$).

Table 11: The analysis on the correlation between research variables.

| $x_1$ | $x_2$ | $x_3$ | $x_4$ | $x_5$ | $x_6$ | $x_7$ | $x_8$ | $x_9$ |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.182** | 0.115 | 0.014 | 1     | 0.259**| 0.094 | 0.129 | 1     | 0.307**|
| 0.121*  | 0.203**| 0.556**| 1     | 0.389**| 0.105 | 0.078 | 0.553**| 0.605**|
| 0.194** | 0.126 | 0.215**| 0.257**| 0.251**| 0.266**| 1     | 262*  | 0.072  | 0.133 | 311** | 0.365**| 0.497**| 0.127 | 1     |
| 262*    | 0.072 | 0.133 | 311** | 0.365**| 0.497**| 0.127 | 1     | N     | 400    | 400   | 400   | 400   | 400   | 400   |

**Significantly correlated at the 0.01 level (bilateral); *Significant correlation at 0.05 level (bilateral). $x_1$ = infrastructure, $x_2$ = football practice form, $x_3$ = football match, $x_4$ = training reward, $x_5$ = practice standard, $x_6$ = extracurricular practice, $x_7$ = personnel structure, $x_8$ = grade proportion.

Table 12: The correlation analysis results between campus football development model and various indicators.

| Pearson relevance | 0.514** |
|-------------------|---------|
| Single method factor | Significance (bilateral) | 0.000 |
| Pearson relevance | 0.47** |
| Comprehensive method factors | Significance (bilateral) | 0.000 |
| N | 400 |

**Significantly correlated at the 0.01 level (bilateral).
Therefore, the research hypothesis is fully established. As shown in Tables 3–8, the comprehensive method factors have the greatest correlation with the development model of campus football, which fully shows that each factor accounts for 64.43% of the total influencing factors, which can explain most of the results. The result is shown in Table 13.

As shown in Tables 3–8, the comprehensive method factors have the greatest correlation with the football development model, and the correlation coefficient is 0.514. This shows that the comprehensive method factors have a significant positive impact on the development model of campus football. Therefore, the research hypothesis H2: Students’ comprehensive method has a significant positive impact on the development model of campus football, and the hypothesis is fully established.

4.4. Regression Analysis. Taking the development model of campus football as dependent variable and long-term and short-term factors as independent variables, this paper makes a linear retrospective analysis and constructs a regression equation. The analysis results show that the complex correlation coefficient $r = 0.6443$, the judgment coefficient $R^2 = 0.235$, and the adjusted judgment coefficient $R^2 = 0.176$, which fully shows that each factor accounts for 64.43% of the total influencing factors, which can explain most of the factors. The result is shown in Table 13.

The analysis results in Table 14 show that the statistical variable $f = 8.750$, and there is a significant correlation between various variables, $\text{SIG.}< 0.01$, indicating that the regression analysis model established in this paper is suitable for the analysis of various indicators, and there is a linear relationship between independent variables (short-term and single-method factors) and dependent variables (football development model) [20], with significant correlation and statistical significance. The result is shown in Table 15.

According to the regression coefficient and test in Table 15, there is a significant correlation between the comprehensive method and the single method in the $t$-test results, and its value is less than 0.01. This shows that the regression coefficient between the two influencing factors is $>0.01$, and there is a significant correlation. The constant in the regression model is less than 0.01, indicating that there is a significant difference between the constant term and 0.

Through the above analysis results, it can be concluded that the multiple regression equation affecting students’ campus football development model is campus football development model = 4.330 + 0.314∗ comprehensive method factors +0.128∗ by single method factor formula (4–1). From the regression equation, it can be seen that both comprehensive method factors and single method factors are positive, indicating that these two factors have a significant positive impact on students’ football development model. Among them, the influence degree of one method factor (0.314) is the largest, followed by the comprehensive method factor (0.128), and the sig. values of the two variable factors are <0.05, which is statistically significant. This is basically consistent with the above correlation analysis results. Therefore, the development factors of football development model in area a are single, and comprehensive analysis methods should be adopted. The result is shown in Table 14.

From the results of Table 14, we can see that the factors proposed in this paper have a significant impact on the development of campus football, indicating that the research results are reliable. At the same time, the research results of this paper are basically consistent with the related research at home and abroad [21].

5. Conclusion

Based on the incentive theory, this paper analyzes the selection of the development mode of campus football, combined with the corresponding theory and the development needs of students [22], puts forward systematic, targeted and different opinions and suggestions so as to ensure the effective development of campus football and give full play to the sports function of campus football. Therefore, the factor analysis method can realize dynamic analysis of multiple factors and improve the accuracy of analysis results. Factor analysis has more obvious advantages and realizes
comprehensive analysis of a large number of data. The details are as follows:

(1) Local colleges and universities pay more attention to the development mode of campus football and make targeted mode selection according to their own needs, improve students’ football enthusiasm, give full play to their own ability, effectively promote the development of campus football and create a good development environment. At the same time, local colleges and universities should aim at the research results of this paper, and put forward measures from the aspects of personnel and system to promote the development of campus football.

(2) Colleges and universities should change the concept of campus football model, according to the old concept, combined with students’ personal characteristics and needs, give play to the choice of appropriate campus football development model, and promote the corresponding football model development model.

(3) Improve the content of football development, build a comprehensive form of campus football development, realize objective and reasonable evaluation, and promote the sustainable development of campus football.

In the process of factor analysis, this paper lacks the comparison between different models. In the future work, we will focus on the comparison between different models.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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