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Fuzzy correlation analysis method-based Chinese football development influence factors study

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ABSTRACT

Chinese football is always the focus of sports circles, press circles and even public life discussion, its every move matters to Chinese sports development in all every moment. With respect to this, research on Chinese football development and its position in world football have also become one of Chinese scholars' main topics. On the basis of analyzing Chinese football excellent players, coaches' status, as well as "national football" position in world football, the paper firstly utilizes correlation analysis method, by comparing Pearson correlation coefficient sizes, studies on Chinese football development influential numeral factors' compactness degree with Chinese football position in world football, so that judges reserve talent, coaches' qualities and fields construction are main influence factors. On the basis of correlation analysis, utilize fuzzy mathematical evaluation method, it evaluates Chinese football development, and then get conclusion: in the evaluation of Chinese football athletes development, reserve talents are most major factors in Chinese football development evaluation. Whether Chinese football can rapidly develop or not is up to teams' players' qualities, from which it mainly has numbers of excellent players, players' cultural qualities, and age structure and so on. But in the purpose of propelling to Chinese football development, it should on the basis of considering players factors, make comprehensive consideration of coaches' qualities, field construction, management mechanism, cultural level and other factors so as to comprehensive develop Chinese football.

KEYWORDS

Chinese football; Correlation analysis; Pearson correlation coefficient; Fuzzy mathematics; Factor analysis.



INTRODUCTION

As one of Chinese “three big balls”, Chinese football has a long history. Football was called “Chuk-guk” as earliest, early in the spring and autumn period, State of Qi had sprung up Chuk-guk activities. With historical development, it gradually evolved into today’s football. Modern football was originated in Britain, and gradually widely spread in the world. Chinese football as one of largest sports events in Chinese sports, its development affects national heart in any time, therefore more scholars research on it, and also get some conclusions that make contributions to Chinese football development researches.

Zhao Xiao-Ling in Chinese football development influential several factors study, she utilized information analysis and comparative analysis method, on-the-spot visited and carried on questionnaire survey, found out Chinese football development process existing problems, obtained first hand information, and accordingly put forward corresponding countermeasures and suggestions, which provided theoretical basis and practice guiding for Chinese football development; Fan Bing in exploration of Chinese football development countermeasures studies, by deepening researching on Chinese football development status, excavating Chinese football development influential main factors, and combining with China’s national conditions, he put forward feasible suggestions, and proposed that promoted Chinese football development should purify football environment, perfect management mechanism, strengthen cultivation of excellent reserve talents so that explore a path to adapt to Chinese football development; Han Bing in Chinese football sustainable development researches, he based on social investigation, obtained first hand investigation information, carried on feasible analysis of present Chinese football development status and influence factors, highlighted that developed Chinese football should focus on talents cultivation, constantly innovate management mechanism, and put forward Chinese football sustainable development new ideas; Lian Xin in study Chinese football professionalization, on the basis of humanistic sports and social sports, took Chinese football professionalization development as research objects, utilized documents literature, logic analysis and other methods, interviewed experts, made comprehensive and systematic analysis of Chinese football professionalization’s development ideas, and finally provided current stage Chinese football development existing problems and feasible solutions.

The paper on the basis of formers study, based on Chinese football position in world football, combines with lots of literatures, carries on correlation analysis of Chinese football development influential economic factors, reserve talents factors, coaches’ factors and field construction as well as others, and gets factors that are closely linked to Chinese football world ranking. Besides, it further establishes Chinese football development fuzzy evaluation model, carries on comprehensive evaluation on numerous main factors, finally it gets reserve talents factors are major evaluation factors, and excellent athlete is the key to affect one team development pace. Develop Chinese football should comprehensive consider football players, coaches’ qualities problems, strengthen management mechanism, create good training environment, so that let Chinese football to comprehensive develop and rank among advanced countries in world football.

MODEL ESTABLISHMENTS

Chinese football as an important part of Chinese sports, its development has crucial impacts on Chinese sports. As always, Chinese football is in the tank; its performance in Olympic Games is not going well. With respect to this, Chinese sports circles have already taken corresponding actions, such as strengthen team management, perfect management mechanism, improve players qualities and techniques levels, but Chinese football is still the key to restrict Chinese sport development.

Vertical analysis of Chinese football position in world football

Chinese football also calls “national football” is always hotspot of sports circles or event press circles, and focus of public life discussion. However, football development suffers a nation per capita GDP; its development extent is also different in different countries. Below TABLE 1 is statistical data from China’s sports statistical yearbook.

TABLE 1 : World football powers per capita GDP comparison status until 2013

Country	Per capita GDP (dollar)	GDP global ranking	Team world ranking
Brazil	8594	67	1
Argentina	11982	52	2
Spain	23911	24	9
Italy	28670	19	14
France	28145	20	7
Portugal	19340	35	10
Britain	28877	18	8
Germany	29240	15	11
China	5791	94	56

Football as one of largest Chinese sports events, national support, and government investment status will surely affect its development, so economic factor is one of factors that should consider in exploring Chinese football development. To better analyze Chinese football development status, compare Chinese football and world football powers gap, now carry on vertical comparison of China and world football powers economics, and draw above table data into following bar Figure 1, and get conclusion.

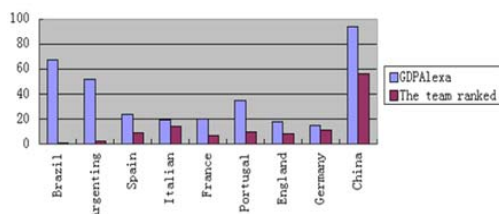


Figure 1 : Football world power per capita gross domestic product (GDP)

From above bar Figure 1, it is clear that per capita GDP has very important influences on football development. Countries with high per capita GDP, their football development is relative faster and football teams rankings are also higher. Among them, Brazil football team ranks the first, secondly is Argentina, Spain and so on, Chinese football team ranks relative backward, which also suffers national economy development and domestic emphasis influences to a certain extent.

Horizontal analysis of Chinese football excellent athletes’ recent situations

A football team development is fast or slow, it suffers national economy influence on a macro level, but most important is the team basic construction, personnel structure and so on. Chinese football excellent athletes are lifeline of “national football”, they play crucial roles in changing “national football” status and promoting its development. Below TABLE 2 is data that extracts from China’s statistical yearbook.

TABLE 2 : Chinese football excellent athletes numbers

Year	2008	2009	2010	2011	2012
Number of people	520	519	517	515	514

Player is the key to a team, excellent players' numbers are key to affect Chinese football development. In order to more clearly study Chinese football players' development status, now make horizontal analysis of Chinese football athletes numbers changes in 2008~2012, and draw above table data into following Figure 2 so as to better observe Chinese football excellent athletes numbers changing trend.

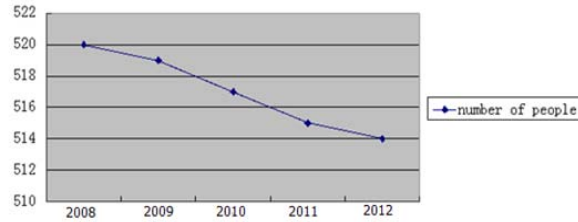


Figure 2 : China football change number of excellent athletes

From above broken line Figure 2, it is clear that Chinese football excellent athletes numbers have constantly declined in recent years, which has an inseparable relationship with present Chinese football overall declining trend. Declination of football athletes numbers are also one of important reasons that cause present Chinese football sluggishness. Football athlete is lifeline of a football team, only excellent football athletes can propel to the whole football team development, in future stage, we should perfect athletes management mechanism, improve athletes qualities and techniques levels, and cultivate more excellent athletes.

Chinese football coaches status

Coach is the key to a team; excellent coach surely plays considerable important roles in team management, players training and cultivation. Therefore, coaches' qualities high or low impacts on Chinese football development also cannot be ignored. Below TABLE 3 is China's statistical yearbook data, the number of China's football coaches that achieve senior professional post title in 2004~2012.

TABLE 3 : Number of coaches that achieve senior professional post title

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012
Football	47	42	49	49	52	47	34	40	54

As players' cultivators, coaches are the key to cultivate excellent players and improve team overall qualities. At present, China has partial coaches gained senior professional post title, but the amount is not many. To better observe its numbers changes, now draw above table data of 2004~2012 Chinese football coaches' with senior professional post title into broken line Figure 3, and then further analyze its numbers of people changes, and get conclusion:

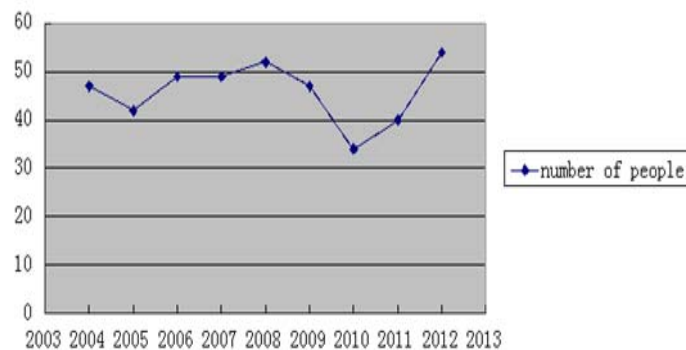


Figure 3 : Senior title of Chinese football coaches number change

From above broken line Figure3,it is clear that before 2008 Chinese football high level coaches numbers development are basically flat, since 2008,it starts to slowly reduce, but after 2010, it starts to rise, till 2012 it has already arrived at peak point of numbers of people. It shows China starts to focus on football coaches qualities cultivation, regulation of football has shows efficiency, it should continue to target at cultivate high quality, high technological coaches so as to propel to Chinese football development in future.

CORRELATION ANALYSIS METHOD-BASED CHINESE FOOTBALL DEVELOPMENT INFLUENCE FACTORS STUDY

There are many factors affect Chinese football development, economic factor (per capita GDP), reserve talents (number of excellent athletes), coaches qualities, management mechanism, field facilities and others are its influence factors, every factor different development trend will surely restrict “national football” development. Now utilize correlation analysis method to analyze economic factor (per capita GDP), reserve talents (number of excellent athletes), coaches qualities, field construction four kinds of main factors. Below TABLE 4 is statistical data that consults from internet and China’s statistics yearbook.

TABLE 4 : Influence factors statistical table

	World ranking	Per capita GDP	Reserve talents	High grade coaches numbers	Field construction
2008	52	314045.4271	520	52	4165
2009	54	340902.8126	519	47	4189
2010	51	401512.7952	517	34	4265
2011	55	473104.0486	515	40	4271
2012	56	518942.1073	514	54	4274

Establish model

Carry on correlation analysis of two or multiple variables factors with correlations so as to check each factor intimateness extent. Carry on correlation analysis surely requires each factor to have certain connections or comparability, it included range almost covers each aspect of our life.

In Chinese football development influence factors, economic factor (per capita GDP), reserve talents (number of excellent athletes), coaches qualities, field construction, all the four have certain relationships with Chinese football world ranking. Therefore, carry on correlation analysis of above data.

Data handling and result

Correlation analysis is utilizing software to handle with data, compares correlation by comparing correlation coefficient sizes. Common correlation coefficient has Pearson correlation coefficient and Spearman rank correlation coefficient. The paper utilizes Pearson correlation coefficient to make correlation comparison.

Pearson correlation coefficient is used to show two variables similarity extent mathematical statistical quantity, it can be used to make quantitative calculation on two variables similarities. Its calculation formula is as following :

$$\rho(X,Y) = \frac{\text{cov}(X,Y)}{\sigma_x \sigma_y} = \frac{E((X - \mu_x)(Y - \mu_y))}{\sigma_x \sigma_y}$$

Among them, covariance is used as numerator, is product of two variables standard deviation, and it requires two variables standard deviation not to be 0.

$$\text{And } \mu_x = E(X), \sigma_x^2 = E(X - \mu_x)^2 = E(X^2) - E^2(X)$$

Therefore, Pearson correlation coefficient can also be written as:

$$\rho(X, Y) = \frac{E(XY) - E(X)E(Y)}{\sqrt{E(X^2) - E^2(X)}\sqrt{E(Y^2) - E^2(Y)}}$$

When two variables Pearson correlation coefficient gets closer to 1 or -1, it shows the two correlation is big, or closely related. It gets closer to 1 shows the two are in positive correlation, on the contrary it gets closer to -1 shows the two are in negative correlation.

In Chinese football development influence factors study, regard Chinese football world ranking as observable variable, establish Chinese football development influential numerous factors and Chinese football world ranking correlation coefficient formula, utilize SPSS software to handle with above TABLE 4 data, it can get following TABLE 5 result:

TABLE 5 : Data correlation

Control variable	World ranking	Per capita GDP	Reserve talents	High grade coaches numbers	Field construction
Pearson correlation	1.000	.144	.885	.705	-.210
World ranking Significance (bilateral)	.	.856	.790	.295	.115
df	0	2	2	2	2

By above data TABLE 5, it can get conclusion: reserve talents (number of excellent athletes) Pearson correlation coefficient is the largest one, secondly is high grade coaches qualities, field construction and per capita GDP, it shows reserve talents have largest relationship with Chinese football ranking in the world, secondly is high grade coaches factor. In Chinese football development, it should fully consider excellent athletes and coaches two factors, and integrate with domestic per capita GDP and field construction and other factors, perfect management mechanism, and propel to Chinese football development.

FUZZY EVALUATION METHOD-BASED CHINESE FOOTBALL DEVELOPMENT COMPREHENSIVE EVALUATIONS

Fuzzy evaluation is a method that carries on comprehensive evaluation on things in the perspective of quantity, in real life its applied range is very widely, academic theses level high or low, one disease medical treatment efficiency is significant or not, atmospheric environmental quality evaluation and others will use it. It is on the basis of fuzzy mathematics, applies fuzzy mathematical principles, establishes multiple influence factors indicator set, by fuzzy algorithm, calculates each indicator weight and compares weight sizes so that defines evaluation matrix, utilizes maximum membership principle to final define important extent.

Define evaluation indicator set

On the basis of above correlation analysis, and consult lots of literature information, and finally define reserve talents (number of excellent athletes), high grade coaches qualities, field construction as evaluation indicators, according to : $U = \{u_1, u_2, \dots, u_m\}, m = 1, 2, 3,$

Evaluation indicator set is = {Reserve talents, high grade coaches qualities, field construction}.

Define evaluation grade set

For systematic evaluation grade, mainly determination method is expert evaluation method. In Chinese football development evaluation, its evaluation grade set is as following, according to :

$$V = \{v_1, v_2, \dots, v_n\}, n = 1, 2, 3, 4$$

Chinese football development evaluation grade set is = {Very good, good, general, bad}.

Define each evaluation indicator weight

Weight mainly expression method is: $w = \{\mu_1, \mu_2, \dots, \mu_m\}, m = 1, 2, 3$

Among them: $\sum_{m=1}^6 \mu_m = 1$

Define evaluation grade indicator weights methods are mainly analytic hierarchy process and normalization method, from which normalization formula is as following :

$$w_i = \frac{\frac{C_i}{S_i}}{\sum_{i=1}^n \frac{C_i}{S_i}}, (i = 1, 2, \dots, m)$$

Among them, w_i is evaluation parameter i monitoring value; \bar{S}_i is evaluation parameter i standard arithmetic mean value of m grade, then weight set is:

$$w = \{w_1, w_2, \dots, w_m\}.$$

Here, apply normalization method to calculate weight, result is : $w = \{0.5, 0.3, 0.2\}$

Define evaluation matrix

Comprehensive evaluation matrix R evaluation method is mainly experts' evaluation method, analytic hierarchy process, membership function method. In order to let calculation result to be more accurate, here use membership function method, define fuzzy relation matrix R , from which:

$$R = (R_1, R_2, R_3)^T$$

(1)Evaluation grade on the 1 grade

$$\mu_{i1(u_i)} = \begin{cases} 0 & u_i \geq v_{i2} \\ -\frac{u_i - v_{i2}}{v_{i2} - v_{i1}} & v_{i1} < u_i < v_{i2} \\ 1 & u_i \leq v_{i1} \end{cases}$$

(2)Evaluation grade on the j grade

$$\mu_{ij}(u_i) = \begin{cases} 0 & u_i \leq v_{ij-1} \text{ OR } u_i \geq v_{ij+1} \\ \frac{u_i - v_{ij-1}}{v_{ij} - v_{ij-1}} & v_{ij-1} < u_i < v_{ij} \\ -\frac{u_i - v_{ij+1}}{v_{ij+1} - v_{ij}} & v_{ij} \leq u_i < v_{ij+1} \end{cases}$$

(3)Evaluation grade on the n grade

$$\mu_{in}(u_i) = \begin{cases} 0 & u_i \leq v_{in-1} \\ \frac{u_i - v_{in-1}}{v_{in} - v_{in-1}} & v_{in-1} < u_i < v_{in} \\ 1 & u_i \geq v_{in} \end{cases}$$

Input data into above each parameter’s each grade standard membership function formula, it can solve each evaluation parameter membership to each evaluation grade, and then construct fuzzy relation matrix R .

Calculation result

$$R_1 = (0.6, 0.3, 0.1); R_2 = (0.7, 0.2, 0.1); R_3 = (0.6, 0.25, 0.15)$$

Carry on comprehensive evaluation

Known $W = (\mu_j)_{1 \times m}$, $R = (r_{ji})_{m \times n}$, by

$$S = w \circ R = (\mu_1, \mu_2, \dots, \mu_m) \circ \begin{pmatrix} r_{11} & r_{12} & \dots & r_{1n} \\ r_{21} & r_{22} & \dots & r_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ r_{m1} & r_{m2} & \dots & r_{mn} \end{pmatrix} = (s_1, s_2, \dots, s_n)$$

It can get fuzzy evaluation set S , from which “ \circ ” is fuzzy composition operator. $M(\cdot, \oplus)$ operator reflects weight effects are relatively obvious with respect to other kinds of operators, comprehensive extent is stronger, and utilize R information is most sufficient, it belongs to weighted average type, it is more accurate for data processing. Therefore, here take fuzzy operator as $M(\cdot, \oplus)$

operator, that: $s_k = \min\left(1, \sum_{j=1}^m \mu_j r_{jk}\right), k = 1, 2, \dots, n$

Input above calculation result into above formula and can get: $S = (0.45, 0.37, 0.18)$

By fuzzy evaluation vector S analysis, it makes comprehensive conclusion. Generally, it can adopt maximum membership principle, weighted average principle, fuzzy vector uniformization, in order to let calculation result to be more accurate, get closer to theoretical practical conclusion, here applies maximum membership principle to make comprehensive evaluation on evaluation vector S .

For maximum membership principle, if given fuzzy evaluation set $S = (S_1, S_2, \dots, S_n)$, (from which S_i is grade v_i membership to fuzzy evaluation set), $M = \max(S_1, S_2, \dots, S_n)$, M corresponding element is evaluation result of comprehensive evaluation.

By $S = (0.45, 0.37, 0.18)$, it is clear: $M = \max(S_1, S_2, \dots, S_n) = 0.45$

Therefore, in Chinese football athletes' development evaluation, reserve talents (excellent athletes' numbers) are most major factor to Chinese football athletes' development evaluation. Whether Chinese football can rapidly develop or not, it mainly up to team's players' qualities, from which it mainly has excellent players' numbers, players' cultural qualities, age structure and so on. In addition, coaches, referees, as well as court's field construction and others are factors that restrict Chinese football development, promote Chinese football development and improve its world positions should comprehensive consider these factors then can comprehensive develop Chinese football.

(1) Chinese football as one of important parts of Chinese sports, its development has very important impacts on Chinese sports position in world sports, it has effects on Chinese sports performances in Olympic Games and other large-scale world level competitions that cannot be ignored. There are multiple factors that impact on Chinese football development, from which it mainly has athletes' qualities, coaches' qualities, and football field construction and so on.

(2) Athlete is a soul of one team, is the key to win the competition. Players' qualities include age structure, cultural level, techniques high or low and so on, all are factors that affect players' abilities. Besides, coaches are also impetus to propel to team development, only excellent coaches can train excellent players, train excellent teams. But promote football development should make comprehensive consideration of field construction, management mechanism, cultural level and other factors on the basis of considering the two.

(3) Develop Chinese football should combine with China's national conditions, strengthen excellent reserve talents cultivation, purify football environment, constantly innovate management mechanism, perfect system, and constantly explore new ideas and new methods that propel to Chinese football sustainable development, follow the development path that suits to Chinese football.

CONCLUSION

The paper utilizes correlation analysis method, studies Chinese football development influential per capita GDP, athletes' qualities, coaches' qualities, football fields construction and other factors, and utilizes SPSS software to handle with data, calculate each factor and Chinese football world ranking Pearson correlation coefficient, and decide numerous factors and "national football" world ranking compactness extent by comparing coefficients sizes. The paper on the basis of correlation analysis method, carry on fuzzy mathematical evaluation method on factors relative compact with Chinese football world ranking, so that define Chinese football development evaluation system which kinds of factor is main evaluation indicator, and get conclusion: reserve talents (excellent athletes numbers) are most major factors to Chinese football athletes development evaluation, is very important for propelling to team development. In addition, coaches, football field construction as well as management mechanism perfection and others are factors should be comprehensive considered when evaluate Chinese football development.

REFERENCES

- [1] Pang Jianmin; Analysis And Comparison Research In Dynamic Development And Changes In The Number Of Excellent Athletes Of Chinese Basketball, Volleyball And Football. *Journal of Anhui Sports Science*, **30(4)**, 14-18 (2009).
- [2] Lin Ming, Yan Jie; An Analysis of the Factors That Influence the Development of High Jump in China. *Journal of Capital College of Physical Education*, **19(5)**, 105-109 (2007).
- [3] Liu Bang-hua, Li Yan-ling, Li Jing, Zhou Huai-qiu, Liu Guo-hong; Strategy for Olympic Games and Sustainable Development of Hunan Competitive Gymnastics. *Journal of Beijing Sport University*, **28(12)**, 1713-1714 (2005).
- [4] Ye Jiabao et al.; Objective of Chinese sports competitiveness at the 28th Olympic Games and countermeasures to develop athletics continually. *Journal of Shandong Physical Education Institute*, **18(4)**, 1-5 (2002).
- [5] Zhou Guo-hai, Yuan Gui-cai; Case Analysis on Family Cultivating Sport Talents—Taking Snooker Player Ding Jun -hui as a Case. *Bulletin of Sport Science & Technology*, **16(11)**, 27-28 (2008).
- [6] Qiu Ming, Li Mingxue; Research on Olympics Core Competitive Ability in Antagonism Ball Game. *Journal of Jilin Institute of Physical Education*, **24(5)**, (2008).
- [7] Ren Zhong; The Analysis of the Main Reasons which 2008 Olympic Game U-17 Affect the Reserve Talents Fostering in Athletic Volleyball. *Journal of Xuchang University*, **25(2)**, 80-83 (2006).
- [8] Yan Jie, Huang Jian-min, Lin Ming; Analysis on the Causes and Diagnosis of Technique Development of Male High-Jumping in China. *Journal of Beijing Sport University*, **29(12)**, 1727-1729 (2006).