Grey Relational Degree-based Chinese Competitive Sports Developmental Study

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Abstract: Competitive sports are an important part in Chinese sports, which would constantly develop with social economic development. Development of competitive sports marks upward human spiritual civilization and their pursuit of healthy life. Thus, Chinese competitive sports development has become hot spot in the present. The paper started from numerous Chinese competitive sports development influence factors, combined with previous scholars' investigation results, took economy, amount of excellent sports team members and total funding as relevant major influence factors, and established grey relational degree model regarding Chinese competitive sports development influence. We reached the conclusion that main factor that affected Chinese competitive sports development was total funding, followed by amount of excellent sports team members and economy. On this basis, we made comprehensive evaluation on various factors, analyzed Chinese competitive sports development status and put forward feasible suggestions.

Keywords: Competitive Sports; Grey Relational Degree; Sports Industry; Developmental Strategies

1. Introduction

The strength of Chinese competitive sports directly affected the position of China in the world. Thus, China has laid more emphasis on the development of competitive sports so as to have a place in world competitive sports. By far, numerous scholars have studied on Chinese competitive sports.

In 2009, Bo Li, in Effects of Chinese competitive sports development on world sports, firstly analyzed previous Chinese sports contributions, on this basis, started from sports science and technology power, sports talents and sports industry to study on the effects of Chinese competitive sports on world sports [1-3]. In 2000, Jizhong Zhang, in the article Research on Chinese Competitive Sports Development Strategies, compared Chinese competitive sports events structure with that of countries with developed competitive sports, found out shortcomings in Chinese competitive sports, combined with experience of the developed countries, and got available strategy system for sustainable development of Chinese competitive sports [4-7]. In 2007, Keyi Jin, in the article Analysis of Chinese competitive sports development influence factors, made a survey on competitive sports development situation in 20 provinces and cities in China, found out many restrictions for balanced Chinese competitive sports development, such as, Chinese social economy, overall Chinese social level, current situation of ranking players, scientific research conditions and so on. On the basis, we analyzed these factors to make contributions to Chinese competitive sports development in the future [8-11].

On the basis of studying on Chinese competitive sports development conditions, the paper established grey relational degree model regarding Chinese competitive sports development influence, analyzed effects of economy, amount of excellent sports team members and total funding on development, and further concluded that Chinese competitive sports should focus on funding, constantly expand the number of excellent sports team members, speed up economic development so that build up firm foundation for development of Chinese competitive sports in the future.

2. Establish Grey Relational Degree Model Regarding Chinese Competitive Sports Development

Development of competitive sports directly affected Chinese economy, society and cultural life. And there are varieties of factors that

affect Chinese competitive sports development, such as economy(Gross domestic product GDP), social development level, funding, project development, sports management system, construction of excellent sports teams (amount of excellent sports team members) and reserve talents, etc. in according to Chinese competitive sports development conditions. We should work on individual factors and take comprehensive consideration so as to speed up development of Chinese competitive sports.

2.1 Initial Construction of Model

In grey system analysis method, grey relational degree analysis is one of the most fundamental methods, a method that bases on changes of system influence factors, calculates relational degree among factors and system and makes comparison, and further gets effects of influence factors on system. the significance of grey relational degree analysis lies in the base of system overall development changes. If system change is consistent with that of factor, relational degree between the two would be larger; if the two are not consistent or have certain differences, then relational degree between the two would be smaller.

Main influence factors in Chinese competitive sports development are economy, funding and construction of excellent sports teams, different development trend in every factor would surely restrict in the trend of Chinese competitive sports. Apply grey relational degree method to analyze number of Chinese competitive sports medals from 2010 to 2012 and the relationships among the three, so as to make references for Chinese competitive sports development study in the future.

2.2 Data Processing

Chinese competitive sports three main influence factors data are as follows, data is from Chinese statistic yearbook and China sports association.

To facilitate establishment of grey relational degree model. Among factors that affect total medal count in 2008 Beijing Olympic Games, 2010 The Asian Games, 2012 London Olympic Games, number of excellent sports team members take mean values from 2007 to 2008, 2009 to 2010, 2011 to 2012 as reference values of number of excellent sports team members in 2008, 2010 and 2012. Similarly, as

to total funding, mean values from 2007 to 2008, 2009 to 2010, 2011 to 2012 as reference values of total funding in 2008, 2010 and 2012.

2.3 Establish Model

(1) Establish time sequence for Chinese "three main balls" influence factors characteristic behavior sequence as following:

$x_i^{'} = \left(x_i^{'}(1), x_i^{'}(2), x_i^{'}(3)\right)^T, i = 1,2,3$, from which relevant factors line sequence is:

$x_1^{'} = (382521.03,\quad 382521.03,\quad 382521.03)$;

$x_2^{'} = (17617,\quad 19852.5,\quad 22352.5)$;

$x_3^{'} = (933842,\quad 1152903.5,\quad 1421246.5)$

Therefore, it can get:

$$x_i^{'} = \begin{pmatrix} 382521.03 & 382521.03 & 382521.03 \\ 17617 & 198525 & 223525 \\ 933842 & 1152903.5 & 1421246.5 \end{pmatrix}$$

(2) Define reference sequence

Take Chinese "Three main ball" history obtained medal amount sequence $x_0^{'}$ as reference sequence, $x_0^{'} = (100,\quad 416,\quad 88)$

(3) Handle with data by initialization method

Utilize formula $x_i(k) = \dfrac{x_i^{'}(k)}{x_i^{'}(1)}$, to handle with relevant factor line sequence.

(4)   Calculate

$\min\limits_{1 \le i \le 3}\min\limits_{1 \le k \le 3}\left|x_0^{'} - x_i(k)\right|, \max\limits_{1 \le i \le 3}\max\limits_{1 \le k \le 3}\left|x_0^{'} - x_i(k)\right|$

Input $x_1(k) = (1,\quad 1,\quad 1)$,

$x_2(k) = (1,\quad 1.13,\quad 1.27), x_3(k) = (1,\quad 1.24,\quad 1.52)$,

$x_0^{'} = (100,\ 416,\ 88)$ into above formula and can get:

$\min\limits_{1 \le i \le 3}\min\limits_{1 \le k \le 3}\left|x_0^{'} - x_i(k)\right| = 435.09$,

$\max\limits_{1 \le i \le 3}\max\limits_{1 \le k \le 3}\left|x_0^{'} - x_i(k)\right| = 435.43$

(5) Calculate "three influence factors" development correlation coefficient

And computational formula of correlation coefficient:

$$\zeta_i(k) = \frac{\min\limits_{1 \le i \le n}\min\limits_{1 \le k \le m}\left|x_0^{'}(k) - x_i(k)\right| + \rho \times \max\limits_{1 \le i \le n}\max\limits_{1 \le k \le m}\left|x_0^{'}(k) - x_i(k)\right|}{\left|x_0^{'}(k) - x_i(k)\right| + \rho \times \max\limits_{1 \le i \le n}\max\limits_{1 \le k \le m}\left|x_0^{'}(k) - x_i(k)\right|}$$

Among them, ρ is resolution ratio, and $\rho \in (0,1)$, $\rho = 0.5$, ρ gets bigger and then relation is bigger.

Input $\left|x_0^{'}(k) - x_i(k)\right|$ each value, and can solve:

$\zeta_1 = (2.0611,\quad 1.0317\quad 2.1423)$;

$\zeta_2 = (2.0611, \quad 1.0319, \quad 2.1442);$

$\zeta_3 = (2.0611, \quad 1.0321, \quad 2.1459)$

(6) Calculate correlation degree

Use correlation degree computational formula

$$r_i = \frac{1}{m}\sum_{k=1}^{m}\zeta_i(k), \text{ input}$$

$\zeta_1 = (2.0611, \quad 1.0317, \quad 2.1423),$

$\zeta_2 = (2.0611, \quad 1.0319, \quad 2.1442),$

$\zeta_3 = (2.0611, \quad 1.0321, \quad 2.1459)$

And get: $r_1 = 1.745, r_2 = 1.746, r_3 = 1.7463$, it further gets following data Table 1:

Table 1. Three Main Balls Historical Performance Grey Relational Degree Value

	GDP	Amount of excellent sports team members	Total funding
Relational degree	1.745	1.746	1.7463

(7) Evaluation results

Above Table 6 suggested that main influential factor for Chinese competitive sports development is total funding, that is government input, social sponsorship and revenue, and grey relational degree thereof is 1.7463, next are amount of excellent sports team members and GDP, their grey relational degrees are respectively 1.746, 1.745. By calculating grey correlation value, influence of the three factors on Chinese competitive sports development can be defined. Though different resolution coefficients would generate different relational degrees, they would have no change in size and order, relevant sequence is essence of relevant analysis. Though the three factors have different relational degrees with Chinese competitive sports development, their relational degrees are various. Therefore, when making comprehensive evaluation on the development trend in Chinese competitive sports development, we should take three factors into comprehensive consideration.

3. Comprehensive Evaluations on Chinese Competitive Sports Development Influence Factors

3.1 Economic Factor

Economic development is an important symbol of social development level, which directly affects competitive sports development. Therefore, no doubt that competitive sports development base is economy and it has become strong backers in competitive sports development. Chinese national economic development level should be improved to facilitate competitive sports development.

In order to better learn Chinese economic development conditions, other sports power economic development conditions are specially illustrated that is per capita GDP growth status from 2008 to 2012 as shown in Following Figure 1(unit as US dollar), data source is from Chinese Sports Bureau in 2013.
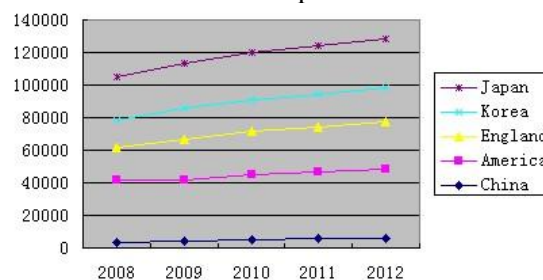

Figure 1. Per capita GDP Growth Chart

Figure 1 indicated that even though per capita GDP has been increasing in China, it still lags behind America, Britain, South Korea and Japan. Therefore, Chinese competitive sports development suffered serious influence. We should focus on economic development to better develop Chinese competitive sports.

3.2 Amount of Excellent Sports Team Members

State competitive sports strength is up to the number of excellent sports teams, which is guarantee for competitive sports development. Without back up of a strong excellent sports team, a country may hard to get excellent performance in competitive sports competition, and keep a foothold in world sports, we should constantly expand amount of excellent sports team members to facilitate Chinese competitive sports develop better and faster.

3.3 Total Funding

Any undertakings development needs funding; there is no exception for sports. Competitive sports, an important part in sport, material guarantee for its development is funding, which includes government input, social sponsorship and revenue, from which government input takes the lead. In order to facilitate Chinese competitive sports development, government should increase focus on it and increase more funding.

4. Conclusions

The paper utilized grey relational degree model, made comprehensive analysis of Chinese competitive sports development influence factors, as economy, amount of excellent sports team members and total funding. Conclusion is reached by comparing size of relational degrees that is total funding is a key factor that affects Chinese competitive sports development. Total funding should be increased so as to better develop Chinese competitive sports. On the basis of grey relational degree model regarding Chinese competitive sports development influence, it gets results. On this basis, comprehensive evaluation are made on economy, amount of excellent sports team members and total funding that supplements model results, making Chinese competitive sports development analysis more complete and contributions to Chinese competitive sports development in future.

References

[1] HUANG Xiao-mao, ZENG Wan-zhou. Research on the Commercialized Operation of Chinese Large Physical Games with the Public Welfare. Sci-Tech Information Development & Economy, 2007, 17(21):137-138.

[2] ZHOU Liang-jun, CHEN Xiao-ying and ZHOU Xi-kuan. Status and Role of Government in Sport Event Exhibition Industry --Taking Shanghai as an Example. Sports Science Research, 2007, 28(4):48-51.

[3] CAI Li-bin, JIA Jun-gang. the Role of Local Government in MICE. Journal of Huazhong University of Science and Technology (Social Science Edition), 2007, 21(5):67-70.

[4] HUANG Lu, FU Xiao-chun. On the Connotation of Sports Events. Journal of Capital College of Physical Education, 2005, 17(6):12-13.

[5] Guo Hong - bo, Zhu Yong. Analysis and Strategic Research on China's Current Sports Industry Development. Fujian Sports Science and Technology, 2013(3):3-5.

[6] REN Chunxiang, ZHANG Jie. the Research on Macro-environment of China's Sports Competition Exhibition Match Industry Market. Sports & Science, 2004, 25(3):14-17.

[7] Ye Chaozhong. On the Development of Sports Brokerage in Zhejiang Province. Journal of Anhui Sports Science, 2002, 23(2):30-32.

[8] LU Geng-hua, LIU Xin-min. Study on the Choice of Policy of Sports Industry Development During Construction of Well - off Society in Shaanxi Province. Journal of Xi'an Institute of Physical Education, 2006, 23(5):44-46.

[9] ZHOU Liang-jun, ZHOU Xi-uan. Study on the Theory and Method of International Competitiveness of Shanghai Sport Event Industry. Journal of Guangzhou Physical Education Institute, 2006, 26(5):13-16.

[10] HUANG Hai-yan, ZHANG Lin, LI Nan-zhu. Study on the Role of Shanghai Government in the Operation of Major Sports Competition Events. China Sport Science, 2007, 27(2):17-25.

[11] DONG Jie. Existing Mainly Problems, Reasons and Countermeasures About China Host Mega Sport Events. Sports & Science, 2012, 33(3):42-51.