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Chinese national traditional sports operation mode and its events redevelopment research

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ABSTRACT

Minority traditional sports are important parts of Chinese sports, their protection and inheritance is always one of focus issues that worth noting in sports development. Research on national sports not only have important effects on their protection, but also can propel to their development process. The paper takes national sports events development and future operation mode as entry points, comprehensive utilizes numerical analysis, extremum principle and goal programming method to analyze. Firstly, it analyzes national traditional sports advantages and their transmission paths, puts forward that carries forward national culture is the upmost function of national traditional sports. Secondly, it respectively establishes extremum principle-based national sports event development model and future national sports operation mode optimal model, analyzes Chinese national sports event development and future operation mode, and then gets conclusions: national aerobics and national martial arts are national sports events with most potentials, future Chinese national sports operation mode is mainly professional institutional operation and government-leading.

KEYWORDS

National sports; Numerical analysis; Goal programming; Operation mode.



INTRODUCTION

National traditional sports are comprehensive events that integrate national traditional culture, competitive race and fitness, they have stronger national characteristics, are important sports parts that worth continuous inheriting and protection. With the development of times, many sports events have already been lost.

In minority sports research, Liu Jian by the article “Yunnan province minority traditional sports intangible cultural heritage protection and inheritance research”, took Yunnan province as an example, researched on its intangible cultural heritage’s national traditional sports relative problems. The article through investigating Yunnan province each region’s sports institutions minority traditional sports basic information, analyzed its protection and inheritance basic information, and then got relevant conclusion. The article pointed out that in Yunnan province, minority traditional sports were important parts of intangible cultural heritage, Yunnan government put more emphasis on its protection and inheritance, protection was great, Yunnan province each region people also focused on national sports development.

In minority traditional sports cultural research, Xu Qiao by the article “ XiangXi Autonomous Prefecture minority traditional sports cultural research in the perspective of cultural ecology”, took cultural ecology as research perspectives, by investigating XiangXi autonomous prefecture minority sports status, made data analysis of them. The article took cultural ecology as base, researched on minority traditional sports cultural transmission and development status, and got conclusion: in the perspective of cultural ecology, XiangXi minority traditional sports culture had very important effects on its traditional cultural inheritance and protection.

In traditional sports tourism researches, Deng Kai-Min by the article “Yunnan province minority traditional sports tourism resources development and utilization research”, on the basis of Yunnan province minority sports, researched on its sports tourism resources problems. The article took Yunnan as an example, analyzed national sports tourism resources development problems, and put forward reasonable utilizing sports tourism resources not only could bring economic efficiency to Yunnan province, but also could spread Yunnan province minority traditional sports culture, and effects on its protection and inheritance could not be replaced.

The paper researches on Chinese minority sports events development and operation mode, by mathematical methods, makes quantitative analysis of data, and then gets that on China’s national conditions, most suitable Chinese national sports development sports events and operation mode, and then provides orientation for national sports research.

NATIONAL TRADITIONAL SPORTS ADVANTAGES AND THEIR TRANSMISSION

National traditional sports advantages

National traditional sports are important parts of Chinese sports; their development always affects Chinese sports industrial process changes. National sports not only contain national cultural parts but also can keep fit; they integrated artistry and competitive race, and have multiple advantages, as TABLE 1.

TABLE 1 : National sports advantages statistics

	Percentage%	Ranking
Carry forward national culture	87.69%	1
Appreciation art	53.85%	3
Keeping fit	67.69%	2
Competitive race	26.15%	5
Body shape	21.54%	6
Personality cultivation	30.77%	4
Industrial economic effect	12.31%	7
Entrance points adding	7.69%	8
Easy going abroad	1.54%	10

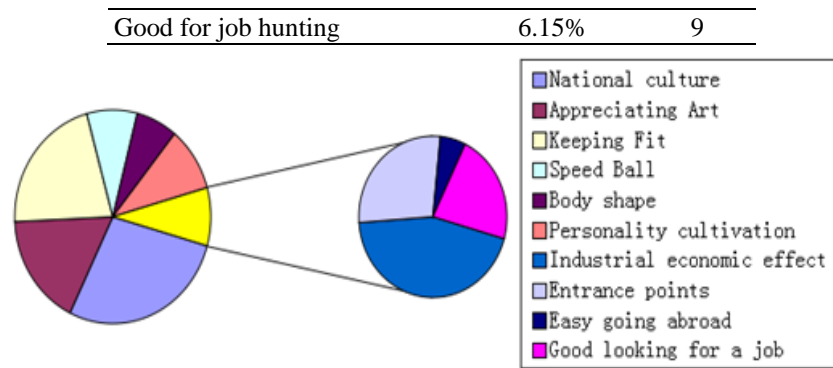


Figure 1 : The advantages of national sports

Above analysis Figure1 and table show that in national sports numerous advantages, most important is carrying forward national culture and national fitness; in addition, national sports also have national appreciation artistic advantages. In order to give Chinese national traditional sports advantages into play, it should positive develop its sports events.

National sports games transmission channels

As Chinese sports important parts, national sports transmission affects national cultural development. Television, the press, network and others, all are main transmission paths of national sports. But affected by economic levels, many rural residents cannot timely acquire national traditional sports knowledge. Below TABLE 2 is Chinese residents’ national sports knowledge acquiring main ways, and analyze on them.

TABLE 2 : National sports transmission way

	Percentage%	Ranking
Television	53.85%	1
The press	38.46%	2
Network	21.54%	3
Broadcast	20.00%	4
Government publicity	9.23%	6
Magazines	15.38%	5
Chat with friends	7.69%	7

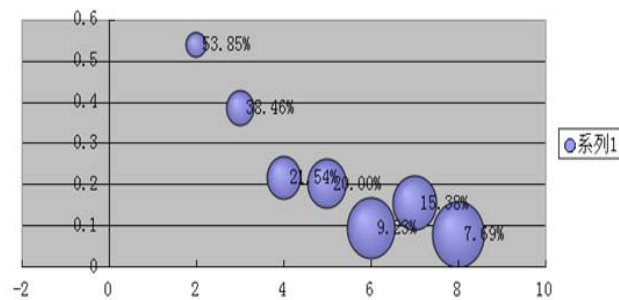


Figure 2 : The transmission way of the national sports

By above statistical Figure 2, it can get conclusion that national sports main transmission ways are television and the press, and though network is modern social newly-developed technological way,

its application in national sports is not very wide, which has very important relations with residents' living standards.

EXTREMUM PRINCIPLE-BASED MOST POTENTIAL NATIONAL SPORTS EVENTS DEVELOPMENT

National sports events mainly include performance, sing, martial arts, national aerobics and others numerous events. In these events, many have good development prospects. To research on national sports events with best development prospects, firstly make quantitative analysis of them, and then research results.

TABLE 3 : National sports events

	Percentage%	Ranking
Performance	1.54%	3
Cuqiu	4.62%	2
Aerobics	7.69%	1
Martial arts	4.62%	2
Softball	1.54%	3
Sing	1.54%	3
Dragon boat racing	1.54%	3
Horse racing	1.54%	3
Horse riding	1.54%	3
Wrestling	1.54%	3

Above TABLE 3 is national sports event statistical table, utilize variational method maximum value principle to analyze, and then study national sports events with most potentials, process is as following.

Variational method model establishment and solution

(1) Problems analysis and hypothesis:

(i) Folk custom sports events participants amount percentage is function of time t , it records as $x(t)$. The size of $x(t)$ is closely linked to people's living standard, sports facilities construction extent. Record initial participants amount as $x(0) = x_0$.

(ii) As time goes on, people's living standards are getting better and better. t moment people's living standards can use t moment national sports events participants percentage to sketch, living standards get higher, people pursue the spiritual life becomes more and more strong, and then number of people that participate in folk custom sports events also increase, record its change function as $m(t)$.

(iii) Sports facilities construction directly affects people's enthusiasm in participating in folk custom sports. If $u(t)$ is annual average sports facilities investment expense, $g(t)$ is t moment construction speed rate coefficient, then annual average folk custom sports facilities construction efficiency is $g(t)u(t)$. In addition, annual average folk custom sports facilities investment will not so big, its function is bounded function W , then $u(t) \in W$.

(iv) Set annual average facilities construction extent and folk custom sports events participants amount percentage ratio is p , then $px(t)$ represents t moment annual average facilities construction that t moment folk custom sports facilities perfection extent.

(v) Both $x(t)$ and $u(t)$ are continuous function of time t . If discount factor is δ , then it has

$$\begin{cases} \frac{dx(t_1)}{dt_1} = \delta x(t_1) \\ x(t) = 1 \end{cases}$$

It solves: $x(t_1) = e^{-\delta(t-t_1)}$

Let $t_1 = 0$, it gets t moment annual average sports facilities input discount is $e^{-\delta t}$. Therefore, t moment folk custom sports events participants amount percentage $x(t)$ discount is $x(t) e^{-\delta t}$, $u(t)$ discount is $u(t) e^{-\delta t}$, annual average sports facilities construction discount is $p x(t) e^{-\delta t}$.

(vi) To define time t_f and number of participants percentage $x(t_f)$ are free.

Model construction and solution

According to above problems hypothesis, it can get in case that allowed by people’s living standards and folk custom sports facilities construction investment, number of participant maximization state equation:

$$\begin{cases} \frac{dx(t_1)}{dt_1} = -m(t) + g(t)u(t) \\ x(0) = x_0 \end{cases}$$

In above state equation, among satisfied $0 \leq u(t) \leq U$ function set W , look for optimal control strategy $u^*(t)$.

Firstly write problems’ Hamiltonian function:

$$H[p x(t) - u(t)]e^{-\delta t} + \lambda[-m(t) + g(t)u(t)]$$

Then by co-state equation and boundary conditions, it solves $\lambda(t)$, that is by:

$$\begin{cases} \frac{d\lambda(t)}{dt} = -H_x = -p e^{-\delta t} \\ \lambda(t_f) = \varphi_{x(t_f)} = e^{-\delta t_f} \end{cases}$$

It solves: $\lambda(t) = (1 - \frac{p}{\delta})e^{-\delta t_f} + \frac{p}{\delta}e^{-\delta t}$

In the following, utilize maximum value principle to solve $u^*(t)$.

For:

$$H = p x(t) e^{-\delta t} - \lambda m(t) + [\lambda g(t) - e^{-\delta t}] u(t)$$

Obviously, H is linear function of u , therefore it can get:

$$u^*(t) = \begin{cases} U, & \lambda g(t) - e^{-\delta t} > 0 \\ 0, & \lambda g(t) - e^{-\delta t} < 0 \end{cases}$$

Or:

$$u^*(t) = \begin{cases} U, & [(1-\frac{p}{\delta})e^{-\delta t_f} + \frac{p}{\delta}e^{-\delta t}]g(t) - e^{-\delta t} > 0 \\ 0, & [(1-\frac{p}{\delta})e^{-\delta t_f} + \frac{p}{\delta}e^{-\delta t}]g(t) - e^{-\delta t} < 0 \end{cases}$$

For transformation point t_s , it should meet:

$$[(1-\frac{p}{\delta})e^{-\delta t_f} + \frac{p}{\delta}e^{-\delta t}]g(t) - e^{-\delta t} = 0$$

That:

$$[\frac{p}{\delta} - (\frac{p}{\delta} - 1)e^{-\delta t_f}]g(t) - 1 = 0$$

Therefore, it can solve t_s .

In the topic, set: $x(0) = 0.48, U = 1, m(t) = 2, p = 0.1, \delta = 0.05, g(t) = \frac{2}{(1+t)^{\frac{1}{2}}}$

Therefore, it can get t_s formula is $(1+t_s)^{\frac{1}{2}} = 4 - 2e^{0.05(t_s - t_f)}$.

When $t < t_s, u^*(t) = U = 1$, now state equation is:

$$\frac{dx}{dt} = -2 + \frac{2}{(1+t)^{\frac{1}{2}}}$$

When $t < t_s, u^*(t) = 0$, now state equation is:

$$\frac{dx}{dt} = -2$$

Then when $t > t_s$, it has:

$$\int_0^t \frac{dx}{dt} = \int_0^{t_s} [-2 + \frac{2}{(1+t)^{\frac{1}{2}}}] dt + \int_{t_s}^t (-2) dt$$

It solves:

$$x(t) = 4(1+t_s)^{\frac{1}{2}} + 96 - 2t$$

$$t_f = 2(1+t_s)^{\frac{1}{2}} + 28$$

Get: $t_s = 10.6, t_f = 69.8$

Then get optimal control strategy as :

$$u^*(t) = \begin{cases} 1, & 0 \leq t \leq 9.5 \\ 0, & 9.5 \leq t \leq 10.8 \end{cases}$$

Result evaluation

By quantitative analysis of national sports events, it is clear that among performance, cuqiu, aerobics, martial arts, softball and others Chinese national sports events, national aerobics and national martial arts are national sports events with most potentials. In future development, these two kinds of national sports events are events with most development prospects.

GOAL PROGRAMMING-BASED FUTURE NATIONAL SPORTS OPERATION MODE

In current stage, Chinese national sports operation mode is fully controlled by government and leading by government, from which professional organizations operation, intermediary organizations are also main modes. However, which operation mode has better development prospects in future society is main target of our research, as TABLE 4.

TABLE 4 : National sports operation mode

	Current	Future
Government fully control	17.54%	18.46%
Government lead	43.25%	47.69%
Professional organization operation	49.23%	50.77%
Lead by intermediary organizations	19.15%	20.00%
Else	1.35%	2.47%

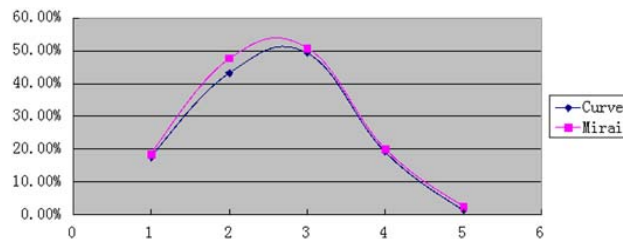


Figure 3 : The operation of national sports mode

By above statistical Figure 3, it is clear that future Chinese national sports operation mode is mainly professional organization operating. To further study Chinese national sports operation mode, now make goal programming analysis of above statistical data, and then analyze and get relative conclusions.

Goal programming guiding thought

Goal programming common basic form is:

Try to make positive and negative deviation small, and then further just arrive at goal value:

$$\min z = f(d^+ + d^-)$$

Try to make positive deviation small, no need to arrive at goal value:

$$\min z = f(d^+)$$

Try to make negative deviation small, surpass goal value and surpass quantity is not limited:

$$\min z = f(d^-)$$

Priority factor: P_1, P_2, \dots , and it has $P_k \gg P_{k+1}, k = 1, 1, \dots, q$, which represents P_k has bigger priority than P_{k+1} .

Goal programming normal mathematical expression is:

$$\min z = \sum_{k=1}^q P_k \left(\sum_{j=1}^l \omega_{kj}^- d_j^- + \omega_{kj}^+ d_j^+ \right)$$

$$\begin{cases} \sum_{j=1}^n a_{ij} x_j \leq (=, \geq) b_i, i = 1, \dots, m \\ \sum_{j=1}^n c_{ij} x_j + d_i^- - d_i^+ = g_i, i = 1, \dots, l \\ x_j \geq 0, j = 1, 2, \dots, n \\ d_i^-, d_i^+ \geq 0, i = 1, 2, \dots, l \end{cases}$$

Data processing

According to above target programming guiding thought, make data processing with national sports operation mode data, here adopts sequential algorithm. Its main process is as following:

For $k = 1, 2, \dots, q$, solve:

$$\min z = \sum_{j=1}^l P_k \left(\sum_{j=1}^l \omega_{kj}^- d_j^- + \omega_{kj}^+ d_j^+ \right) \quad (1)$$

$$\sum_{j=1}^n a_{ij} x_j \leq (=, \geq) b_i, i = 1, \dots, m \quad (2)$$

$$\sum_{j=1}^n c_{ij} x_j + d_i^- - d_i^+ = g_i, i = 1, \dots, l \quad (3)$$

$$\sum_{j=1}^l (\omega_{sj}^- d_j^- + \omega_{sj}^+ d_j^+) \leq z_s^*, s = 1, 2, \dots, k-1 \quad (4)$$

$$x_j \geq 0, j = 1, 2, \dots, n \quad (5)$$

$$d_i^-, d_i^+ \geq 0, i = 1, 2, \dots, l \quad (6)$$

Among them, optimal value is z_k^* .

Therefore, it gets corresponding goal programming model:

$$\min z = P_1 d_1^- + P_2 (d_2^+ + d_2^-) + P_3 (3d_3^+ + 3d_3^- + d_4^+)$$

$$0.1754x_1 + 0.4325x_2 + 0.4923x_3 + 0.1915x_4 + 0.0135x_5 = 1$$

$$0.1846x_1 + 0.4769x_2 + 0.5077x_3 + 0.20x_4 + 0.0247x_5 = 1$$

$$x_1, x_2, \dots, x_i, d_i^+, d_i^- \geq 0, i = 1, 2, \dots, 5$$

Calculate above objective function by MATLAB software, and further get goal programming optimal solution is : $z^* = (2, 3)$, and percentage is 50.77%, 47.69%.

By above result analysis, it is clear that future national sports operation mode mainly is professional organization operation and government leading. Relatively, government full controls, intermediary organizations and other modes have already been not practical any more.

CONCLUSION

The paper starts from national sports events development and future operation modes, analyzes Chinese national sports development prospects. Firstly, utilize statistical analysis method, study national traditional sports advantages and transmission ways, and on this basis, establish extremum principle-based national sports events development model, by analyzing performance, cuqiu, aerobics, martial arts, softball and other events, finally it gets: national aerobics and national martial arts are national sports events with most potentials.

Secondly, utilize goal programming, establish future national sports operation mode optimization model. By goal programming principles, analyze most potential development operation mode in government full controls, intermediary organizations and government leading several operation modes, and put forward that future national sports operation mode is mainly professional organization operation and government leading.

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