Goal programming-based China sports tourism group preference and development strategy research

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ABSTRACT

Sports tourism is one kind of tourism, it not only combines with tourism element, but also possesses sports activities functions, is best choice of current society promoting people's living quality and building perfect spiritual lives. The paper mainly starts from China sports tourism development and tourists sports tourism selection two main aspects, goes deeper research into sports tourism status, sports tourism group basic information, tourists selective sports tourism time frame and main purposes as well as preference, combines with numerical analysis, statistical analysis and goal programming methods, and then gets correlation results regarding China sports tourism practical investigation: 18~40 years old group, which include students, professionals, working class and so on are main forces of sports tourism, when selecting sports tourism types, coast, countryside and la plantation resort, lakes are the type of most preference. These tourists group very focuses on sports tourism, most selects to take sports tourism in statutory holidays, main purposes are for entertainment, enhanced physique, and relaxing mood.

KEYWORDS

Sports tourism; Numerical analysis; Statistical analysis; Goal programming; Tourism group.

INTRODUCTION

With economic development, and meanwhile people's living conditions are gradually improving, people selection when traveling are getting more, requirements are also becoming more and more strict. As an important tourism type, sports tourism not only can pastime, but also can enhance physique, is by far most popular one kind of tourism type.

When researching on urban sports tourism, Zhao Cheng-Lei by the article "China urban sports tourism resources and products theory and empirical research ", took sports tourism resources and products as main research orientations, analyzed their resources and products development. The article referenced lots of formers achievement and on this basis, re-positioned self research orientation, entirely analyzed data, and then got research results. The article pointed out since China economy was rapidly developing, China urban sports tourism product and resources exploitation and utilization had been very considerable, lots of sports products and resources were fully exploited, but compared to world every developed main country, Chinese urban sports tourism products hadn't yet occupied very favorable market that still needed to be exploited.

In high-end sports tourism researches, Zhao Jin-Ling through "China high-end sports tourism theory and empirical research" analyzed high-end sports tourism basic concepts and practical development status. The article analyzed high-end sports tourism types and their development history in China, public satisfaction index on them and so on, and then advertised high-end sports tourism effects and functions, encouraged China masses to take high-end sports tourism. The article pointed out: China high-end sports tourism included mountain climbing, skiing, golf and others numerous items, types were various, fit for people of all ages, and could mold character, relieve mind, pass time, best choices of contemporary urban group pursuing high-end spiritual life.

In China sports tourism development and research, Diao Zhi-Ying through the article "China sports tourism development countermeasures and mode research", introduced on the condition of current stage China's national conditions and economic status, sports tourism development countermeasures and relative development modes. The article considered China present practical life conditions, investigated from economic conditions, government conditions, masses conditions and others multiple aspects, researched sports tourism types that adapted to different living levels, and then got most suitable China sports tourism development mode. The article pointed out: Developing China sports tourism should combine with China's national conditions, start from practice, and define most suitable sports tourism schemes for China masses.

The paper on the basis of formers, by time investigating, analyzes China sports tourism status and sports tourism group practical conditions, and then puts forward China tourists' preference types when doing sports tourism selection, and advertises sports tourism development in China masses life.

CHINA CURRENT SITUATION OF SPORTS TOURISM

Sports tourism is an important part of China tourism industry, from which sports tourism mainly includes three main types that are respectively events of sports tourism, nostalgia sports tourism and movement of sports tourism.
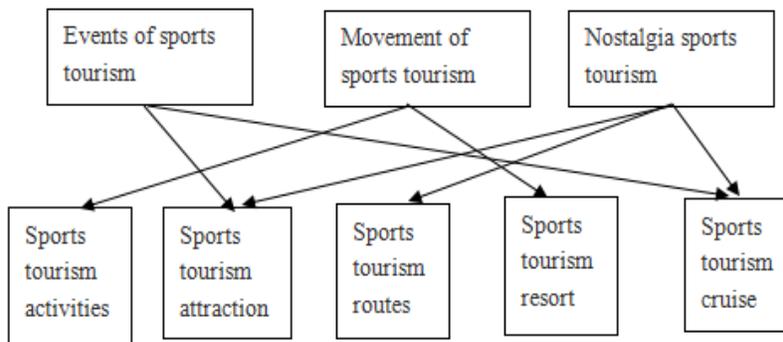

Figure 1 : The three major categories of sports tourism and its content

Above Figure 1 three main types sports tourism and their contents relationship correlation shows sports tourism is the same as other types of tourisms, it has sports tourism activities, sports tourism attraction, sports tourism routes and so on. In the following, it makes comprehensive analysis of sports tourism from sports tourism status, sports tourism group structure and tourists sports tourism types selection preference these aspects.

Beneficial factors for sports tourism development

Sports tourism is an important factor to propel to a city development. And for sports tourism, its development also suffers many factors influences. Urban environment, cultural atmosphere, infrastructure and urban economic level and else, all are sports tourism development correlation factors, correlation data is as TABLE 1.

TABLE 1 : Sports tourism development influential correlation factors and their proportion

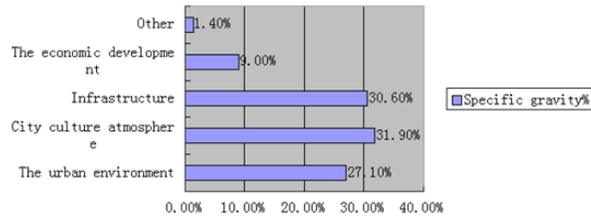|	The urban environment	City culture atmosphere	Infrastructure	The economic development	Other
Proportion%	27.1%	31.9%	30.6%	9.0%	1.4%

Figure 2 : The related factors affecting the development of sports tourism

Above statistical Figure 2 shows : in sports tourism influential numerous city factors, city cultural atmosphere and infrastructure have largest influence on sports tourism, their proportions are respectively 31.9%,30.6%. City cultural atmosphere reflects a city historical detail, and infrastructure construction is foundation of tourists' tourism, therefore, cultural atmosphere and infrastructure are very important for sports tourism development.

Sports tourism position

Sports tourism is a kind of entertainment, body building comprehensive activity; it not only combines with sports elements, but also combines with entertainment elements. Below table is visitors' leisure time's time distribution table, by comparing visitors' time distribution, observe sports activities importance degrees in their mind.

TABLE 2 : Visitors leisure time distribution table

|	Watch TV, movie	Sleep	Travel	Participate in sports activities	Read books and newspapers	Play chess and card, mahjong
Percentage%	57.60%	42.50%	33.20%	33.10%	28.20%	26.50%
Ranking	1	2	3	4	5	6
	Social communication activity	Tutoring children learning	Participate in religious activity	Participate in public benefit activity	Participate in cultural, technical learning	Other
Percentage%	17.30%	11.50%	7.90%	7.60%	6.90%	5.80%
Ranking	7	8	9	10	11	12
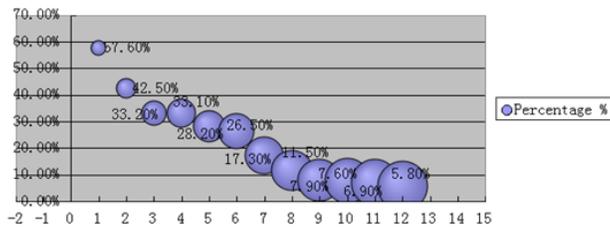
Figure 3 : Visitors leisure time allocation table

By above bubble Figure 3, it can get conclusions: in activities that all visitors can participate in, participate in sports activities rank the fourth, is second to travel. It is clear about sports activities importance in people's life. There are many masses have recognized sports activities importance.

Sports tourism group structure

Age problem is an important problem should be considered that affects masses participating in sports tourism, and also key problem. Age limitation has very large influences on sports tourism. Below TABLE 3 is sports tourism participation group age structure, different ages sports tourism participation proportions are different.

TABLE 3 : Age structure

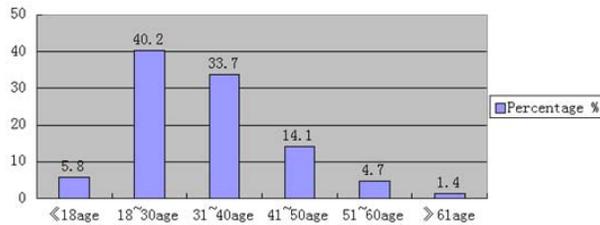|	《18years old	18~30 years old	31~40 years old	41~50 years old	51~60 years old	》 61 years old
Percentage %	5.8	40.2	33.7	14.1	4.7	1.4

Figure 4 : The age structure of sports tourism group

By above bar Figure 4, it can get conclusions: group that participates in sports tourism concentrates on 18~30 years old secondly is 31~40 years old, which mainly is affected by physical quality. In all groups that participate in sports tourism, 18~40 years old group is upmost part group.

Whether can participate in sports tourism, it also significant correlates to economic level. Good family income is foundation of implementing sports tourism, with sufficient fund then can smoothly take sports tourism. Below TABLE 4 is group family per capita income that takes sports tourism, analyze its family income, and then analyzes impacts on sports tourism.

TABLE 4 : Family per capita income

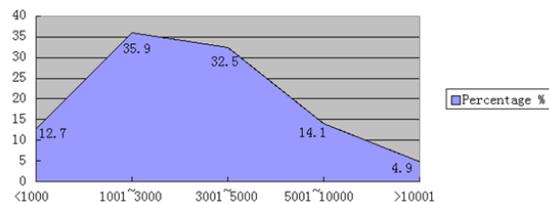|	《1000 Yuan	1001~3000	3001~5000 Yuan	5001~10000 Yuan	》 10001 Yuan
Percentage%	12.7	35.9	32.5	14.1	4.9

Figure 5 : The family per capita income of sports tourism group

From above area Figure 5, it can get conclusions: group that takes physical exercises, its family per capita income concentrates on around 1001~5000 Yuan. Sufficient family income is guarantee of physical exercises, is the key to support its sports tourism smooth implementation. Therefore, family per capita income is very important for sports tourism.

Cultural deposits are one kind of another important factor in taking sports tourism. Different cultural education background groups' sports conscious understanding levels are different. Cultural standards get higher, then sports consciousness will be strong, and understanding on sports tourism knowledge is also different. Below TABLE 5 is group's occupation level statistics that takes physical exercises.

TABLE 5 : Occupational level

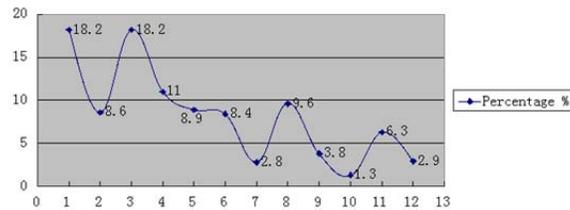|	Students	Workers	Professionals	Commerce and trade service staffs	Administrative staffs	Free-lance professionals
Percentage%	18.2	8.6	18.2	11	8.9	8.4
	Peasants	Executives	Left and retired staff	Unemployment and semi-unemployment staff	Private-owned enterprises	Other
Percentage%	2.8	9.6	3.8	1.3	6.3	2.9

Figure 6 : Sports tourism group into the professional level

From above broken line Figure 6, it gets conclusions: students and professionals are main groups that take sports tourism; their proportions are the highest both are 18.2%. And affected by working time, administrative staffs, peasants, executives and other working class participation proportions in sports tourism are not very high.

Tourists select sports tourism status

When taking sports tourism, different tourists' selective sports tourism time is different, statutory holidays, the two-day weekend, paid leave, and other holidays, all are selective time frames that tourists taking sports tourism. Below TABLE 6 are tourists selecting sports tourism's time statistics.

TABLE 6 : Tourists' selection sports tourism time

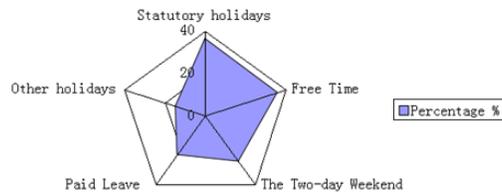|	Percentage%	Ranking
Statutory holidays	36.2	1
Free time	35.8	2
The two-day weekend	26.5	3
Paid leave	22.9	4
Other holidays	14.8	5

Figure 7 : Tourists choose sports travel time

By above radar Figure 7, it can get conclusions: statutory holidays are tourists selecting sports tourism's best time, it is because for working class, statutory holidays are most free time, and then also peak season of tourists' tourism, tourism attractions opening.

Lots of tourists, when they take sports tourism, their main purposes are different, most tourists select sports tourism main purposes are all for entertainment and relaxing mood. Below TABLE 7 is statistics on China tourists main purposes in taking sports tourism, by statistical analysis of them, it gets conclusions.

TABLE 7 : Main purposes of tourists' sports tourism

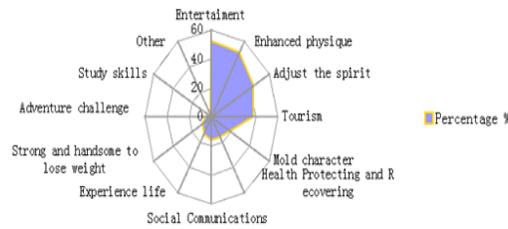|	Entertainment	Enhanced physique	Adjust the spirit	Tourism	Mold character	Health protecting and recovering
Percentage%	52.6	51.0	44.1	38.3	19.8	16.2
	Social communications	Experience life	Strong and handsome to lose weight	Adventure challenge	Study skills	Other
Percentage%	16.2	13.4	9.0	4.7	2.8	2.0

Figure 8 : The main purpose of the sports tourism

By above analysis Figure 8,it can get : entertainment, enhanced physique and adjust the spirit, relax mood are main purposes that tourists take sports tourism, in addition, there are 38.3% tourists are for tourism. It is clear, sports tourism not only owns tourism entertainment, adjusts spirit, relaxes mood functions, but also possesses sports events enhancing physique function, is best choice of tourists to spend holidays.

GOAL PROGRAMMING-BASED TOURISTS PREFERENTIAL SPORTS TOURISM TYPES RESEARCH

Sport tourism is one of important selection that China tourists pass time in leisure time. With development of sports, sports tourism is also more and more favored by public, correlation data is as TABLE 8.

TABLE 8 : Goal programming data investigation table

	Coast	Hot spring	Village, countryside	Lake	Hilly area	Urban holiday village	Skiing	Golf	Other
Percentage	49.7%	39.6%	31.6%	28.0%	23.1%	23.0%	17.3%	8.7%	1.1%
Satisfaction index	25.1%	23.9%	19.7%	15.6%	7.8%	5.4%	4.9%	3.6%	2.5%

Goal programming guiding thought

As the name suggests, goal programming is programming all given systematical problems by mathematical methods and further getting a group of optimal schemes of practice expected goal. Goal programming overcomes linear programming constraints that only solve a group of linear constraint conditions. In addition, to certain goals, they should have primary and secondary ones, and also mutual complementation and mutual antagonism. Meanwhile, there is also maximum value, minimum value as well as a difference of quantitative and qualitative, LP cannot solve these problems, while goal programming just overcomes the drawback.

Generally, goal programming has three kinds of methods, weighted coefficient method, priority method and effective solution method. Among them, weighted coefficient method is defining a weight on every solved goal, and further converting complicated multiple goals problems into single goal problems, but its weight rationality is hard to set; priority method is to classify each goal into different grades, its classification evidence is each goal importance. Effective solution can take all goals into account and further get most satisfied solution.

Goal programming objective function common basic form is :

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

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

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

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

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

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

Known that d is decision variable function,positive deviation variable $d^+ = \max\{d - d_0, 0\}$ represents the part that calculation value surpasses goal regulated value, negative deviation variable $d^- = -\min\{d - d_0, 0\}$ represents the part that calculation value less than goal regulated value, and d_0 is d goal regulated value, it always has $d^+ \times d^- = 0$.

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

Goal programming normal mathematical model is:

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

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

Goal programming data processing

According to above goal programming guiding thought, carry on data processing with tourists preferential sports tourism types data, here adopts sequential algorithm here. Sequential algorithm is according to priority order, transforming complicated multiple goals programming problems into multiple simple goal programming problems, its main process is as following:

To $k = 1, 2 \cdots, q$, solve:

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

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

$$\sum_{j=1}^{n} c_{ij} x_j + d_i^- - d_i^+ = g_i, i = 1, \cdots, l \tag{3}$$

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

$$x_j \geq 0, j = 1, 2, \cdots, n \tag{5}$$

$$d_i^-, d_i^+ \geq 0, i = 1, 2, \cdots, l \tag{6}$$

Among them, optimal value is z_k^*

At first, most important is tourists' satisfaction index, therefore its priority lists the first grade P_1; secondly, tourists sports tourism implementation suffered economic conditions influences, is the second grade P_2; finally, tourists sports tourism selection also relates to their spare time, is the third grade P_3. It is required tourists satisfaction index should be larger than 15%. Therefore, it gets corresponding goal programming model :

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

$$5.7 x_1 + 3.2 x_2 + 26.4 x_3 + 11.5 x_4 + 21.4 x_5 + 28.1 x_6 + 3.6 x_7 + 2.5 x_8 + 1.2 x_9 = 0.15$$
$$7.8 x_1 + 5.4 x_2 + 25.1 x_3 + 15.6 x_4 + 19.7 x_5 + 23.9 x_6 + 2.5 x_7 + 3.2 x_8 + 1.9 x_9 = 20$$

$$x_1, x_2, \cdots, x_i, d_i^+, d_i^- \geq 0, i = 1, 2, \cdots, 9$$

Calculate above objective function by MATLAB software, and further get goal programming optimal solution is :
$z^* = (1, 2, 3)$, and tourists satisfaction index is 19.8%.

Result analysis

From above objective function optimal solution, it can get conclusions: coast, countryside and la plantation resort, lakes are best choice for China tourists to take sports tourism, and tourists' satisfaction indexes on these three tourism places are universal higher. Analyze from the perspective of environment, the three kinds of tourism places environment is good, quiet and fresh that fit for masses activities.

CONCLUSION

The paper firstly researches sports tourism status and sports tourism group basic information, from sports tourism development influential factors, sports tourism position, as well as sport tourism group age structure, family per capita income, occupational level to concrete analyze above two aspects, by statistical analysis, it finally gets conclusions: cultural atmosphere and infrastructure construction are key factors that affect sports tourism individual development, by far China masses put more emphasis on sports tourism, especially for 18~40 years old group, include students, professionals, working class and so on, and all of them have certain fund base.

Secondly, the paper makes concrete analysis of tourists' sports tourism implementation time frame and main purposes, and then further analyzes their preferential sports tourism types. The article by numerical analysis and goal programming, draws radar map and solve optimal solution, finally gets correlation conclusions: when tourists taking sports tourism, most of them select statutory holidays, coast、countryside and la plantation resort、lakes are their preferential sports tourism types, and basic purposes are for entertainment, enhancing physique and relaxing mood.

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