An Investigation and a Study on the Physical Fitness Development in Zhangjiakou Based on Feasibility Algorithm

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Abstract

The construction of physical fitness projects in rural areas is a key link in the construction of spiritual civilization in China, and also an integral part of the development of national sports cause. With the continuous progress of social economy, the level of rural economic development has been improved by leaps and bounds. As a consequence, the rural population is increasingly wealthy, and their demands for consumption and life quality are also increasing, which has laid a solid foundation for the expansion of physical fitness undertakings in rural areas. Zhangjiakou City is located in the northwest region of Hebei Province, featured with a low economic development level. Chengde City lies in a transitional area in the northeast and northeast of Hebei Province. Subject to a variety of subjective and objective factors, the physical fitness consumption level of farmers in both cities is limited, and the construction level of physical fitness infrastructure is relatively backward, which poses a large constraint on the spiritual civilization construction level of the rural areas in Zhangjiakou and Chengde. Therefore, it is necessary to explore the present situation of the physical fitness development of the rural areas in Zhangjiakou and Chengde, so as to provide a reference for the development of physical fitness undertakings of the rural areas in Zhangjiakou and Chengde.

Keywords: Rural Physical Culture, Zhangjiakou, Chengde.

1. RESEARCH OVERVIEW

1.1 Research Background

China is a large agricultural country, and the number of rural population accounts for more than half of the population. In order to promote the harmonious progress of the society, it is of a necessity to intensify the construction of rural areas, to enhance the life quality of rural population and to improve the living environment in rural areas (Yuan, 2010). As early as the Eleventh Five-Year period, in the five-year development plan outline, China explicitly proposed to focus on the promotion of spiritual civilization in rural areas as well as a coordinated growth of the spiritual civilization between rural areas and urban areas. Specifically, as an integral part of spiritual civilization construction, the sports industry has a fundamental link to the construction of new socialist countryside, which is of great significance to reinforce the expansion of physical fitness in rural areas.

1.2 Literature Review

In the rural areas in Zhangjiakou City, the consumption of physical fitness have begun and accounted for a certain proportion in the farmers’ spending. However, generally speaking, Zhangjiakou farmers’ sports consumption is still in a relatively low level and remains negative. Meanwhile, the construction of sports infrastructure is limited so that only can farmers’ basic needs for physical fitness be satisfied. Zhangjiakou farmers’ consumption structure is fairly simple, mostly in the form of physical consumption, and the consumption for spiritual civilization is little, which is mainly due to the low income level (Zhang, 2012). The undertaking of physical fitness in rural areas lacks experienced sports instructors. Generally, sports workers are featured with a low educational level, an irrational age structure and poor overall qualities. As a result, farmers generally can not receive high-quality sports trainings. In some rural areas, athletic contests heat up, especially for basketball, which has gradually become the rural population’s favorite sports activity (Wu, 2011). Government departments can promote the development of physical fitness in rural areas by means of strengthening physical fitness clubs. The operators of the physical fitness clubs should realize diversified financing channels and conduct risk control on clubs’ funds, so as to ensure the long-term development of the physical fitness clubs in rural areas (Si, 2008).
2. AN EVALUATION SYSTEM FOR THE PHYSICAL FITNESS INFRASTRUCTURE IN RURAL AREAS

2.1 A Demand Elasticity Analysis on the Physical Fitness Infrastructure for Rural Population

Physical fitness club is a key part of the progress of the national physical fitness business. The main direction to the development of physical fitness clubs in rural areas stimulates the effective needs of farmers, and the construction of sports club will inevitably experience price fluctuations. As far as farmers are concerned, demand price elasticity occurs (Wang, 2012). The formula for the price elasticity of demand is:

\[ E = \frac{\Delta d}{\Delta P} = \frac{Q_1 - Q_0}{Q_0} \cdot \frac{P_0}{P_1} \]  

(1)

Specifically, \( E \) represents the demand elasticity coefficient; \( P_0 \) is the initial price of the sports club; \( Q_0 \) stands for farmers’ demand at the initial price (Lv, 2012). \( P_1 \) refers to the price level after the fluctuation, and \( Q_1 \) means farmers’ demand after the price fluctuation. The application scope of this formula is limited, and the fluctuation of price and farmers’ demand cannot be overly high. In the actual marketing process, if the price fluctuations are small, no fluctuations in the farmers’ demand would be caused, so the price volatility must reach a certain height. Demand elasticity formula can not meet the demand, so flexible adjustments to the formula need to be conducted.

\[ E = \frac{\Delta d}{\Delta P} = \frac{Q_1 - Q_0}{P_1 - P_0} \]  

(2)

In this formula, it is necessary to express in the form of an absolute value if the value obtained from the elasticity of the demand price is assumed to be negative. If the fluctuation of the denominator is small and the fluctuation of the numerator is large, the price elasticity of the demand is proved to fluctuate in the form of a percentage. Through the analysis of the formula, it is indicated that, when the price of physical fitness facilities drops, the demands of farmers will rise. Besides, when the price of physical fitness facilities rises, the farmers’ demand will be correspondingly improved (Yao et al., 2008).

2.2 Influencing Factors for Capital Structure of Rural Sports Infrastructure

The main factors influencing the capital structure of rural sports infrastructure mainly adopt the principal component analysis method, and the steps are as follows:

First, the original data matrix is established.

\[
\begin{pmatrix}
X_{11} & X_{12} & \ldots & X_{1p} \\
X_{21} & X_{22} & \ldots & X_{2p} \\
\vdots & \vdots & \ddots & \vdots \\
X_{n1} & X_{n2} & \ldots & X_{np}
\end{pmatrix}
\]  

(3)

A linear combination is conducted on the contents of the above raw data matrix, from which a value with the maximum variance is selected and set as \( F_1 \). Then, a value with no correlation with \( F_1 \) and the maximum variance is selected for a linear combination, which is set as \( F_2 \). By parity of reasoning, \( F_p \) is eventually derived. It is known that \( F_1 \) accounts for a higher proportion in the total variance. In a descending order, the proportion of \( F_p \) is the smallest. In general, the parts with a large proportion will be selected. In this way, some information will be lost. However, the most important influencing factors can be seized. Furthermore, the analysis and the resolution of the problem will be easier and more effective. The analysis on the components mainly includes the following steps.

The first step is to derive the matrix \( R = [r_{ij}] \).
The Chengde, In P3 farmers, fitness mainly As previous k selected. A cumulative and consumption, and the eigenvalues $\lambda_1 \geq \lambda_2 \geq \cdots \geq \lambda_3 \geq 0$ and unit eigenvectors $\mu_1, \mu_2, \ldots, \mu_p$ of the matrix R are required. Specifically, $\mu_i = \left\{ \mu_{i1}, \mu_{i2}, \ldots, \mu_{ip} \right\}$, $i = 1, 2, \ldots, p$(Hu and Wang, 2006). The following step is to calculate the contribution rate of each individual to the whole. The contribution rate of the i-th individual to the whole is $\frac{\lambda_i}{\sum_{i=1}^{p} \lambda_i}$, and the cumulative contribution rate of the former k individuals is $\frac{\sum_{i=1}^{k} \lambda_i}{\sum_{i=1}^{p} \lambda_i}$ (Hou et al., 2008). The cumulative contribution rate reflects the percentage of k individual components. Next, the main components are selected. Assume that k individuals have a significant effect on the whole and the eigenvalues are greater than 1, k main components are extracted(Liu and Qi, 2014). In other cases, if the cumulative contribution rate of the previous k individuals reaches a certain percentage, the first k components can be extracted.

As the calculations indicate, as far as the rural physical fitness business is concerned, its influencing factors are mainly embodied in the government’s policy support, the level of economic development, the level of physical fitness infrastructure construction, the level of fitness fees for sports clubs, the overall fitness awareness of farmers, and the professional competence of fitness coaches, etc. (Wang and Liu, 2009).

3. CURRENT SITUATION OF THE SPORTS CONSUMPTION AWARENESS OF THE RURAL POPULATION IN ZHANGJIAKOU CITY AND CHENGDE CITY

In order to investigate the sports consumption consciousness of the rural population in Zhangjiakou and Chengde, the form of questionnaire is taken to survey the residents of most towns in Zhangjiakou and Chengde. The results are as follows.

3.1 Consumption Capacity of the Rural Population in Zhangjiakou City and Chengde City

Investigate the age distribution of the population

- 8% Under 18 years old
- 11% 19-40 years old
- 39% 40-50 years old
- 16% 50-60 years old
- 26% 60 years old and above

Figure 1. Investigate the age distribution of the population
According to the statistics table, the surveyed farmers are mainly aged between 40 and 60 years old. Specifically, adolescents under the age of 18 only constitute 11% of the population, and most of them are left-behind children. Young people aged between 19 and 40 is a small population, with a percentage of only 16%. 26% of the population are aged between 40 and 50 and 39% of the population are the elderly, aged between 50 and 60. A small number of the elderly are over the age of 60, occupying only 8%. The statistics chart indicates that the majority of the surveyed are middle-aged and senior, and few of them are young. It is proved that, in Zhangjiakou and Chengde, more young and middle-aged laborers work in the cities. Therefore, most of the subjects are women and the elderly (Chen and Zhang, 2017).

![Figure 2. Average income](image)

Based on the statistics diagram, poor farmers with an income of below 1,000 yuan constitute around 12% of the whole population, and the earnings of the vast majority of farmers are between 1000 Yuan and 5000 Yuan. Specifically, farmers with income between 1000 Yuan and 3000 Yuan account for about 21%, and the income of 34% of farmers lies between 3000 Yuan and 5000 Yuan. It is indicated that the rural areas in Zhangjiakou and Chengde have gained certain achievements in terms of economic construction (Liang, 2014). Most farmers have been out of poverty, but overall, the income is not high. Besides, the number of farmers with the income of 5,000 Yuan and 7000 Yuan is fairly average, taking up about 16%. Only 9% of the farmers are rich and earn more than 7,000 Yuan.

![Figure 3. Farmers' views on sports consumption](image)

In light of the statistics chart, the majority of the rural population in Zhangjiakou and Chengde has little emphasis on sports consumption and is reluctant to spend on sports and fitness. Among them, 33% of the farmers have no intention of sports consumption. 27% of the farmers realize the significance of physical fitness, but are unwilling to spend money in this regard. Furthermore, 28% of the farmers have a certain attention on physical fitness. Only 12% of people believe that sports consumption is highly important, and will participate in physical fitness. This reflects that the rural population of Zhangjiakou and Chengde is inadequate in its degree of recognition for physical fitness, and most people are unwilling to spend some money on sports.
As indicated by the actual content of Figure 4, around less than 6% of the population is highly fond of the physical fitness activities. 28% of the population prefers sports and believes that sports can bring health and pleasure. 24% of the rural population prefers physical fitness, and they will engage in physical exercises if physical fitness equipment is available. 26% of people are not keen on physical fitness and demonstrate a low interest in physical fitness. And even 16% of the rural population dislikes physical exercise and will not participate in physical exercises. In general, the rural population in Zhangjiakou and Chengde has showed a certain interest in physical fitness, and most people are willing to invest in physical fitness. The reinforcement of the construction of sports facilities will certainly invite a large number of farmers to join in physical exercises.

There exist four main reasons why farmers are unwilling to make sports expenditure. Specifically, 33% of the farmers believe that their income is too low and is only able to maintain the family, so there is no extra money to carry out sports and fitness activities. 19% of the farmers regard that their work is highly pressured (Yin et al., 2014), and it is difficult to take time to carry out physical exercises. 23% of the farmers consider that sports infrastructure construction in rural areas is insufficient, and there is no professional venues for physical exercise. 25% of the farmers think their time is limited. They spend most of the time in farm work, housework and babysitting. In general, although there are a number of reasons affecting farmers’ consumption of sports, the most important cause is economic problem (Mi et al., 2016). Impacted by a variety of subjective or objective factors, the economic development level of rural areas in Zhangjiakou and Chengde is insufficient, and the vast majority of farmers are only able to afford food and clothing. Although the economic level of urban and rural areas in China has seen a constant improvement, the income level of farmers in these two areas still relatively low and there is no surplus money to meet the needs of spiritual civilization (Yu et al. 2008).

4. SPORTS AND FITNESS DEVELOPMENT COUNTERMEASURES FOR THE RURAL
POPULATION IN ZHANGJIAKOU AND CHENGDE

4.1 Reinforce Rural Development and Enhance the Living Standards of Farmers

China is in the initial stage of socialist development, and the level of rural development is generally low. In case of the rural areas in Zhangjiakou and Chengde, the economy is under-developed. Most farmers can only afford food and clothing, and are barely possible to invest money into their spiritual civilization life. As a consequence, the development level of the rural sports industry is low, and the rural sports and fitness industry is hard to rapidly expand. Therefore, it is necessary to reinforce the progress of rural areas, to raise the income level of farmers, and to build up the farmers’ spiritual and cultural consumption needs. Consumer demands are used to react on the growth of the sports and fitness industry, thus promoting the development of the tertiary industry in the rural areas of Zhangjiakou and Chengde, the steady expansion of the overall economy, the optimization of the industrial structure, and the enhancement of the living standards of farmers.

4.2 Effectively Utilize Leisure Time

With the continuous development of mechanization, the level of agricultural mechanization development has been greatly raised. Agricultural machinery has become the main productive force of agricultural production, and the vast majority of agricultural production activities can be carried out by agricultural machinery. In this context, the agricultural production efficiency has experienced a significant boost, and farmers enjoy more and more leisure time. However, in the investigation, the vast majority of farmers will be playing cards, watching TV, baby-sitting and participating in other activities in their spare time. Few farmers will choose sports and fitness to kill time. This also reflects an insufficient promotion of sports and fitness from the relevant departments. Consequently, the vast majority of farmers are unaware of the significance of sports and of the way to carry out sports training, so the farmers develop no good sports habits. Besides, the local governments are required to enhance publicity. By way of promoting sports and fitness to the farmers, farmers can attach sufficient attention to physical fitness, thereby making better use of leisure time and engaging in sports and fitness activities.

4.3 Improve Infrastructure Construction

The survey indicates that the physical fitness infrastructure in the rural areas is not perfect. A number of farmers cannot find a standard physical fitness venue, which is an important reason why farmers lack an awareness of sports and fitness. Rural areas in Zhangjiakou and Chengde should emphasize the improvement of infrastructure construction. On one hand, the governments should pay enough attention to physical fitness, increase financial investment, and improve the infrastructure construction of sports and fitness. On the other hand, a variety of private enterprises should be introduced, and the rural sports infrastructure should be perfected by the stimulation of personal investment and the approaches of physical fitness clubs, fitness plaza, etc. At the same time, the governments should deepen the excavation of physical fitness infrastructure and elevate the utilization rate of physical fitness infrastructure by guiding more farmers to join sports and fitness activities.

4.4 Take Advantage of School Physical Education

School is the core of talent cultivation and plays a vital role in forming the students’ ideas and living habits. To promote the development of sports and fitness in rural areas, first, the students should receive lectures about the significance of physical fitness and establish a lifelong healthy sports awareness. Therefore, it is necessary to reinforce the construction of physical fitness facilities in rural schools. More high-quality sports talents are cultivated by means of the establishment of sound physical fitness facilities for schools and the combination with the schools’ physical education curriculum. These talents assume the role of publicity and education to develop the undertakings of physical fitness in rural areas and to guide farmers to correctly utilize the sports and fitness facilities.

5. CONCLUDING REMARKS

The construction of sports and fitness undertakings is an important link in the promotion of spiritual civilization in rural areas. Nowadays, the development of sports and fitness undertaking in rural areas is still problematic. A few measures need to be taken, such as intensified efforts to rural construction, the improvement of infrastructure construction and the publicity and education of sports and fitness, thereby promoting the
development of sports and fitness undertakings in rural areas at all directions.

ACKNOWLEDGMENTS

The Investigation and Research of Zhang Jiakou and Chengde's Development Status of Rural Sports Fitness Path. Project number HB15TY031.

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