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Willingness and Demand Preferences of Guangdong Residents for Ice and Snow Consumption Behaviour Demand Preferences

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Abstract: Although Guangdong Province has a lack of ice and snow sports and tourism resources, there is a huge demand for ice and snow consumption, and this study investigates and researches the willingness of ice and snow consumption behaviours and demand preferences of residents in Guangdong Province by using literature research, questionnaire survey and data analysis methods. On the basis of the study of literature, the Questionnaire on the Willingness and Demand Preferences of Residents' Ice and Snow Consumption Behaviour in Guangdong Province was designed. The questionnaire survey collected data on the ice and snow consumption of the residents in the Pearl River Delta, Guangdong Province, Guangdong Province, Guangdong Province, Guangdong Province, Guangdong Province, and Guangdong Province, Guangdong Province, and Guangdong Province, and carried out descriptive statistical analysis and in-depth analysis of the consumption behaviour of Guangdong Province's residents of snow and ice by using the K-means clustering and Logistic regression mathematical models, The study also used K-means clustering and logistic regression model to deeply analyse the influencing factors of the consumption behaviour, willingness and demand preference of Guangdong snow and ice residents, which provided a reference basis for the relevant enterprises to better meet the snow and ice consumption demand of Guangdong residents.

Keywords: Guangdong Residents; Ice and Snow Consumption; Demand Preference; Survey Research

1. Introduction

Guangdong Province, China's top economic province and also the top province in the sports industry, has the highest level of performance in snow and ice consumption in the country [1]. In the "Big Data Country Report on Ice and Snow Tourism Consumption (2019)" jointly released by the China Tourism Research Institute and Ctrip.com's Big Data Joint Laboratory, Guangzhou topped the list with a per capita consumption of RMB 6,018 yuan, and Shenzhen took second place on the list of cities' ice and snow tourism consumption with a per capita spending of RMB 5,987 yuan, as well as being ranked as the city with the fastest -rising per capita consumption with a growth rate of 20 percent. The latest China Ice and Snow Tourism Consumption Big Data Report (2023) points out that Guangdong Province is one of the top 10 ice and snow source provinces, showing that Guangdong residents are keen on ice and snow tourism.

Li et al. [2] point out that ice and snow consumption is influenced not only by natural conditions but also by social factors. Although Guangdong has inherent limitations in terms of natural conditions, its solid economic foundation and the strong enthusiasm of the populace for ice and snow experiences have contributed to a promising development momentum for winter sports. Hu et al. [3] notes that the snowfall conditions in southern China are relatively poor and that there is a lack of ice and snow culture, resulting in limited research on ice and snow tourism in this region. This has prompted a profound reflection in this study on the ice and snow consumption behaviours and demand preferences of residents in Guangdong Province.

Based on previous studies, this study will reveal the consumer behavioural willingness and demand preferences of Guangdong

residents in ice and snow tourism and analyse the driving factors behind them through the comprehensive use of literature analysis, questionnaire surveys, and data analysis methods, so as to provide data support for the local government and enterprises to formulate more effective market strategies, and to provide a reference for the development of the snow and ice consumption industry in other similar regions.

2. Research Objectives and Methods

2.1 Research Target

The period of this study is from February 2024 to April 2024. Against the background of the booming ice and snow tourism market in Harbin [4], a survey was conducted on the basic information, past consumption behaviour, consumption psychology, consumption choices, and demand preferences of the residents of Guangdong Province, including the four regions of the Pearl River Delta (PRD), Eastern Guangdong (EGD), Western Guangdong (WGD), and Northern Guangdong (NGD), in order to find out their willingness to consume snow and ice behaviour and demand preferences.

2.2 Research Methodology

2.2.1 Documentation method

This study was conducted through Chinese databases such as China Knowledge, Wipro, Wanfang, foreign data bases such as EBSCO and SAGE, and other foreign language databases, and based on "Guangdong Province", "Ice and Snow Consumption", "Ice and Snow Sports", "Ice and Snow Tourism", "Ice and Snow Tourism" and "Ice and Snow Tourism". "Guangdong Province" "Ice and Snow Consumption" "Ice and Snow Sports" "Ice and Snow Tourism" "Demand Preference" "Survey and Analysis Province" "Ice and Snow consumption" "Ice and snow sports" "Ice and Snow Tourism" "Demand preference" "Guangdong Snow Tourism" "Demand preference" "Survey and Analysis" are searched to obtain relevant literature at home and abroad for reference. We also collected and organised relevant reports and data from the State General Administration of Sport, Guangdong Provincial People's Government, Guangdong Provincial Sports Bureau, and so on.

2.2.2 Questionnaire method

The questionnaire method is economical, accurate, quantifiable and capable of collecting large amounts of standardised data in a relatively low cost and efficient manner [5]. Based on the analysis of literature, this study designed the Questionnaire on the Willingness to Consume Ice and Snow Consumption Behaviour and Demand Preferences of Guangdong Province Residents based on Maslow's Hierarchy of Needs Theory [6] and the Theory of Consumer Behaviour [7], and the characteristics of the development of ice and snow consumption and the current situation, and set up the quest ions based on the five sections of the ice and snow consumer's basic situation, past consumption behaviour, consumption psychology, consumption choices, and demand preferences. A total of 1,200 questionnaires were distributed to residents of the PRD, EGD, WGD, and NGD regions of Guangdong Province through online and offline channels, with stratified sampling. 1,157 questionnaires were recovered, and 1,068 questionnaires were valid, representing a validity rate of 92.31%. The survey was conducted from February 2024 to April 2024, and the reliability and validity of the recovered questionnaires were assessed. The recovered questionnaires were tested for reliability and validity, and the Cronbach's α coefficient reached 0.925, indicating that there was strong consistency and stability between the items of the questionnaire, with small errors, and the scale reliability coefficients were high. the KMO (Kaiser-Meyer-Olkin) value reached 0.824, which was greater than 0.8, indicating that the structural validity of the questionnaire was very good.

2.2.3 Data analysis method

The recovered valid questionnaires are subjected to data cleaning, data coding, and descriptive statistical analysis in the form of chart visualisation to gain a preliminary understanding of the consumer behaviour and demand preferences of Guangdong Province's residents in ice and snow tourism; combined with the results of the statistical analysis, a suitable model is selected for in-depth analysis to uncover the influencing factors behind the data. K-means clustering is used to study consumption behaviour, and ice and snow tourism consumers in Guangdong Province are

classified into different groups based on different consumer behavioural characteristics, and crowd portraits are conducted to identify the characteristics of each group and their demand differences; the impression factors of consumer willingness are studied based on logistic regression models, and the main influencing factors of ice and snow consumption willingness are analysed.

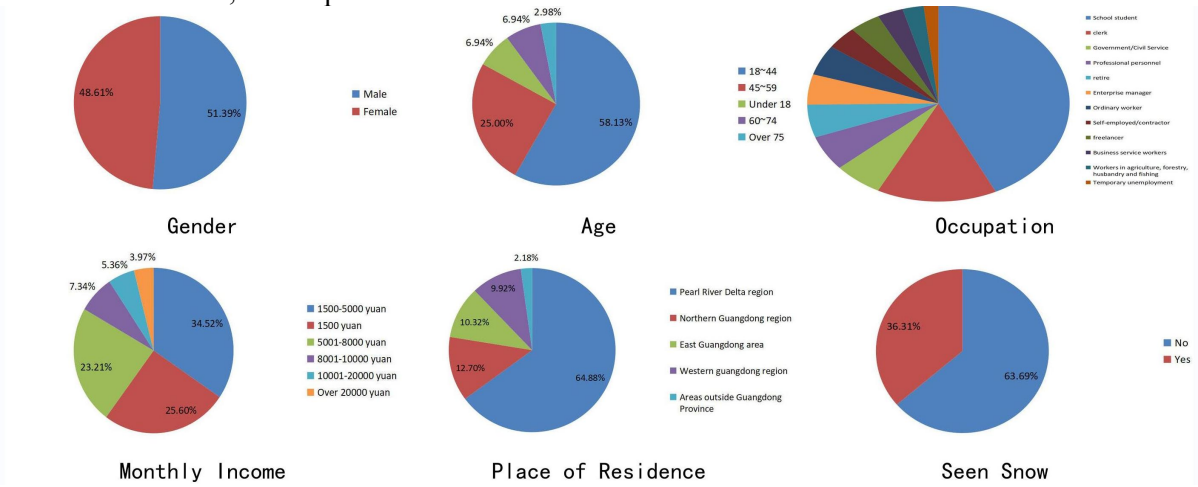

Figure 1. Statistical Chart of Respondents' Basic Information

3. Data Analysis and Findings

3.1 Descriptive Statistical Analysis

3.1.1 Basic information on respondents

The basic profile of the respondents is shown in **Figure 1**, the majority of respondents in this survey lived in the PRD region (64.9%), with a small difference in the proportion of male (51.4%) and female (48.6%) respondents. Nearly 60% of the respondents were in the age group of 18-44 (58.1%), with a wide range of occupations, mainly school students (42.5%), 34.5% of the respondents had a monthly income of RMB 1,500-5,000, and more than 60% (63.7%) of the respondents had never seen snow.

3.1.2 Survey on the willingness and demand preference

The statistical results of the survey on Guangdong residents' willingness to consume snow an d ice and their demand preferences are as follows **Figure 2** As shown in **Figure 2**, 71.83% of the residents expressed their willingness to experience snow and ice sports, 56.33% of the residents were motivated by "freshness and curiosity", 63.57% of the residents tended to choose skiing as the s now and ice consumption project, 56.07% of the residents tended to choose ice skating (the options overlap); 50.39%, 56.75% and 56.85% of the residents chose to put ice and snow tourism area as the consumption place. of residents chose to prepare to put ice and snow tourism area as a consumption location, leisure and relaxation (73.90%) and stimulation challenge (56.85%) is the main purpose of residents to participate in ice and snow consumption, 50.99% of the respondents said that they had experienced ice and snow consumption, 53.04% of the respondents in 1-2 times, 58.70% of the respondents in an average of single consumption in less than 300 yuan. Individual self-help consumption (36.65%) and ice and snow tourism package consumption (32.23%) are the more popular ways of ice and snow consumption.

3.2 Research Based on K-means Clustering

3.2.1 K-means clustering algorithm

K-means clustering is widely used to classify target user portrait labels, and then group customers with similar user labels into one category, mark the features of these categories, and help reach accurate marketing scenarios based on the features[8] In this paper, K-means clustering is used to portray crowd portraits based on consumer behavioural characteristics, to better portray the different behavioural characteristics of the ice and snow consumption crowd, and to provide more accurate suggestions for promoting ice and snow consumption.

3.2.2 Selection of clustering variables

In order to cluster the respondents using K-means cluster analysis method, the following characteristic variables of interest were selected including:

(1) Respondents' basic information (A1 Gender, A2 Age, A3 Occupation, A4 Monthly income/spare money)
(2) Respondent psychology (B1 level of willingness, B2 motivation to consume, B3 purpose of consumption)
(3) Respondents' choices (C1 Ice and snow programme choice, C2 Venue choice, C3 Consumption amount choice, C4 Consumption purpose)
(4) Respondents' past behaviour (D1 Whether experienced D2 Average spending, D3 Frequency of spending)
The variables of concern above were subjected to cubic splitting and data coding to facilitate subsequent analysis of the data.

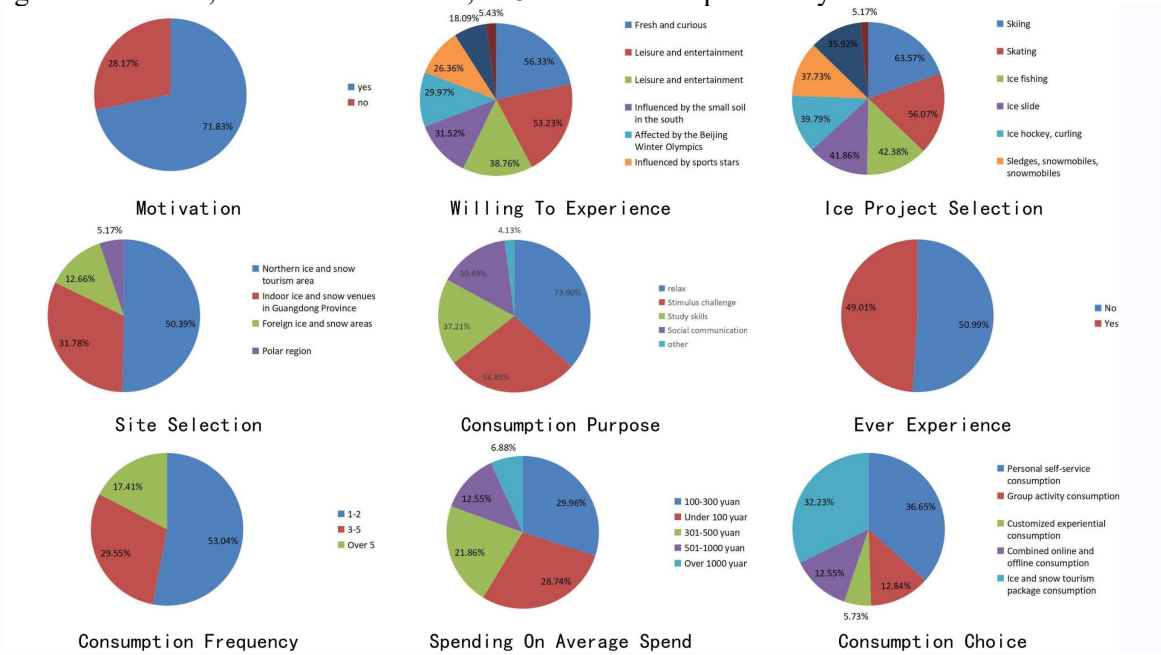

Figure 2. Behavioural Intentions and Demand Preferences

3.2.3 K-means clustering Analysis
In this paper, the value of k is determined according to the elbow method. Using Python to write a programme to plot the number of clusters with the corresponding variance as a line graph, by observing the line graph, it is easy to determine the value of k as 3. Under the condition of appointing the number of categories for K-means cluster analysis as 3, the clustering is carried out by using SPSS software. According to the clustering results, the population was divided into three categories as **Table 1** shown.

3.3 Study Based on Logistic Regression

3.3.1 Logistic regression modelling of build
Logistic regression model is suitable for the situation where the dependent variable is a dichotomous variable and the observations are independent of each other [9]. This study applies a multifactor Logistic regression model with the willingness to consume of Guangdong residents as the dependent variable. (0 for willingness to participate in ice and snow consumption and 1 for unwillingness), and regression analyses with each influencing factor as the independent variable, as shown in Equation (1).

$$Logit(\pi_i) = \ln(\frac{\pi_i}{1-\pi_i}) = \beta_0 + \beta_1 x_i \quad (1)$$

πidenotes consumers' willingness to participate in ice and snow programmes, $\beta.0\beta 1$ denotes the regression coefficient, and xidenotes the influencing factor [10].

Table 1. Cohort Profile Classification

Form	Basic Information	Psychosocial	Consumer choice	Past behaviour	Crowd Profiling Classification
1	Gender: Female Age: 18-44 Monthly income: 1500-5000 RMB Occupation: School student	Willingness level of 5 Fresh curiosity is the main thing	Programme: ice skating, ice slide Place: Tendency indoor ice place Frequency: Occasional consumption Purpose: leisure and relaxation as well as Exciting challenges	Have not participated in snow and ice programmes	Young women with ￥1500-5000 monthly income who had not participated in snow and ice sports

2	Sex: Male Age: 45-59 Monthly income: 8000- 10000 RMB Occupation: General Clerk	Willingness level 4 Mainly leisure and recreation	Programme: Skiing Location: Tendency towards northern ice and snow areas Frequency: Occasional consumption Purpose: to stimulate and challenge	Participated in 1-2 snow and ice programmes Spend ￥100-300 on a single visit	Middle-aged men with ￥8,000-10,000 monthly income who have participated in snow and ice programmes
3	Sex: Male Age: 60-74 Monthly income: 5000-8000 RMB Occupation: Retired	Willingness level 4 Focus on spending time with family and friends	Programme: Hockey, Curling Location: Tendency towards northern ice and snow areas Frequency: 1 consumption per year Purpose: mainly social interaction	Participated in 3-5 ice programmes Spend ￥301-500 on a single visit	￥5000-8000 monthly income older men who have Participated in snow and ice programmes

3.3.2 Solution of the model

After pre-processing and coding the data, logistic regression analyses were performed using SPSS software to calculate the extent to which each factor influences consumer participation in snow and ice programmes.

3.3.3 Analysis of the model

The level of significance of the two variables of gender is 0.176, which does not show significance at the level and cannot reject the original hypothesis, so it can be assumed that the willingness of consumers to participate in ice and snow programmes is not related to gender.

In terms of age, we can see that all age groups have passed the significance test, and the regression coefficients are larger, indicating that age has a significant effect on the willingness to consume ice and snow, and that the groups under 18 years old and 18~44 years old have a positive effect on the willingness to consume, while the regression coefficients of the groups45~59 years old, 60~74 years old and 75 years old and above have negative values, indicating that the willingness to consume has a negative effect.

In terms of monthly income/cost of living, only one of the six variables from monthly income cost of living of less than 1,500 yuan to monthly income of more than 20,001 yuan passes the significant test, and monthly income of 10,000-20,000 shows a positive effect on the willingness to consume ice and snow. Other lower income levels do not have a significant effect on the willingness to consume snow and ice.

Regarding occupation, the significance levels of school students and government/civil servants passed the significance test at the 1% statistical level, while the rest of the variables did not, indicating that these two occupations have a positive effect on residents' willingness to consume snow and ice.

The variable of whether or not they have ever seen snow also passes the significance test, with a "no" answer having a positive effect on the willingness to consume snow and ice.

4. Conclusions and Recommendations

4.1 Conclusions

Based on this study's data, over 70% of Guangdong residents expressed a desire to experience ice and snow consumption. The survey indicates that the primary motivation for residents is the novelty of the experience, especially among young people and those new to ice and snow sports. More than half of the residents choose to visit northern ice and snow tourism areas in pursuit of authentic experiences. Additionally, 53.04% of respondents reported a consumption frequency of 1-2 times, with most preferring short-term experiential consumption; this frequency is expected to gradually increase as ice and snow facilities become more popular and experience costs decrease.

Through K-means cluster analysis, we identified three groups: young women who have not participated in ice and snow programs, middle-aged men who have participated, and older men who have participated. The first group mainly consists of students who enjoy trying leisure activities like ice skating and sliding. The second group, middle-aged men, prefers more exciting activities like skiing, usually participating occasionally and spending between RMB 100-300 per occasion. The third group, older men, is motivated by social interactions and companionship, favoring collective activities like ice hockey and curling, with annual participation and spending between RMB 301-500 per occasion.

Subsequent logistic regression analysis revealed that age and income significantly affect residents' willingness to consume ice and snow. Younger groups, under 18 and 18-44, show higher interest, while participation declines significantly for those over 45. Residents with incomes of 10,000-20,000 RMB are more willing to engage in ice and snow consumption, indicating substantial market potential. Differentiated market strategies for low- and high-income groups will be crucial for future development.

4.2 Recommendations

4.2.1 Differentiated marketing strategies

To attract different demographics to ice and snow activities, tailored strategies are essential. For young people, focus on leisure-themed activities emphasizing safety and fun, with more indoor venues to meet their needs. Middle-aged individuals should be engaged with exciting sports like skiing and ice sculpture exhibitions, enhancing diversity in tourism packages. For the elderly, create social-focused ice and snow tourism options that promote participation through team activities and events like curling competitions. High-income groups, particularly business managers, can benefit from high-end customized experiences and personalized services.

4.2.2 Infrastructure enhancement

Given Guangdong's limited natural snow resources, artificial venues are crucial. Increasing indoor options such as skating rinks will attract young female consumers. Improving facility quality will enhance first-time participants' experiences. For older consumers, developing comprehensive tourism packages that include skiing and curling, along with improved transport and accommodation, will elevate overall satisfaction.

4.2.3 Lowering participation barriers

To expand participation among low- and middle-income groups, offering coupons and subsidies is vital. Multi-level pricing and package options can cater to diverse spending capabilities. As Harbin's ice and snow tourism market thrives, understanding Guangdong residents' preferences through data collection will inform actionable recommendations, driving market growth and meeting local demand.

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