Public Sports Services in Community Sports Parks Based on the KANO Model Demand Hierarchical Analysis

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Abstract. In order to solve the problem of contradiction between the supply and demand of public sports resources and to improve the efficiency of sports resources, the study is based on the theory of customer satisfaction, taking the public sports services of community sports parks as the object of study, and using the traditional KANO model, the Better-Worse coefficient analysis, and the satisfaction quartile diagram analysis to carry out the demand hierarchy analysis of the public sports service items of community sports parks. The study shows that the public sports services include 13 Must-be Quality, 4 One-dimensional Quality, 6 Attractive quality and 2 Indifferent Quality, and finally puts forward improvement suggestions for different quality attributes, screens out the services that match the residents' needs for supply, facilitates the precise supply of sports resources, achieves the optimal allocation of resources, and provides suggestions and references for improving the level of public sports services.

Keywords: kano model; sports parks; public sports services; demand

1   Introduction

As China's grass-roots social management system continues to change, community sports are gradually becoming an important form of organisation for mass sports[1]. In order to realise a strong sports nation, the state has issued a policy emphasising the need to plan and build venues and facilities that are close to the community and conveniently accessible, to expand the new space for national fitness, to build or expand around 1,000 new or expanded sports parks nationwide by the end of 2025, to create a network of multilevel fitness facilities and a 15-minute fitness circle in urban communities, and to build a higher level of public service system for national fitness[2]. Under the impetus of the national policy, community sports parks combining physical fitness and green environment have been rapidly and hotly constructed in many cities across the country. However, the traditional one-way public product supply model of the government can lead to inefficient or ineffective supply[3]. Some scholars have suggested that paying attention to demand plays an important role in improving the level of public sports services[4]. Accurately grasping residents' actual demand for public sports

services is the basis and key to realising the effective supply of public sports resources and promoting people's active participation in sports. At present, domestic research on public sports services in community sports parks is relatively small and not diversified enough. On the basis of analysing the connotation of the demand for public sports services in community sports parks, the study analyses the level of demand and importance of public sports services in community sports parks by combining Attractive Quality Theory and the KANO model, screens out the sports services that match the demand of the residents and carries out accurate supply, which is conducive to improving the efficiency of the use of public sports resources, solving the problem of the contradiction between supply and demand in and enhancing the people's happiness in life.

2   Theoretical Framework

2.1   Attractive Quality Theory and KANO Model

Attractive Quality Theory believes that there is a non-linear relationship between the content elements of a company's products or services and customer satisfaction, and that there are differences in the impact of different quality attributes of the content elements on customer satisfaction[5]. The KANO model (Figure 1), as a metric tool of the Attractive Quality Theory, is a typical qualitative analysis model and an effective tool for classifying and prioritising user needs[6]. It classifies the quality characteristics of services into five types: Attractive Quality(A), One-dimensional Quality(O), Must-be Quality (M), and Indifferent Quality (I), as well as Reverse Quality (R), and Questionable Quality (Q). The public sports services of community sports parks cover a variety of aspects such as field facilities and sports instruction, and the impact of the supply level of each service on satisfaction is also non-linear, distinguishing between the demand attributes of each service can be a reasonable arrangement of sports resources.

Fig. 1. Schematic diagram of the KANO model

2.2   Steps in the Application of the Kano Model

Design of the KANO Questionnaire

The study adopts the KANO model structured questionnaire, based on the 25 sub-dimensions of public sports services for the design of the scale. Two types of questions, positive and negative, were set for each of the specific services, and each element of the indicators of the statistical results was attributed to identify the various types of needs and the priority of needs that affect user satisfaction, with a view to helping to formulate appropriate responses to improve user satisfaction. A five-point Richter scale was used, with options expressed in five scales: satisfied, inevitable, Doesn't matter, Grudgingly accept, and Discontented (Table 1)[7].

Table 1. Format of KANO questionnaire items

How would you rate the community sports park when it does and does not provide a particular service?					
Title \Option	satisfied	inevitable	Doesn't matter	Grudgingly accept	Discontented
Provision of this service：	5	4	3	2	1
This service is not available：	5	4	3	2	1

Implementation of Questionnaires and Cleaning of Data

Sample information was obtained by questionnaire and scientific methods were used to collect correct and valid information during the implementation process to ensure that the information obtained was correct, true and valid. The sampling information is obtained by means of questionnaires. After the questionnaires were collected, attention was paid to sorting out the information, and invalid questionnaires that did not meet the requirements of the KANO model, such as "satisfied" for all options and "dissatisfied" for all options, were excluded. On this basis, the results of the survey should be reasonably analysed and processed, and finally the basic conclusions and specific recommendations of the questionnaire design should be obtained. From the results of the questionnaire, the type of needs is judged by comparing them with the needs classification assessment form in the KANO model.

KANO Model Data Processing Approach

Two-dimensional Attribute Categorisation Analysis.

The questionnaire data were compared to the KANO model demand type classification matrix (Table 2), the number of M, O, A, and I in each sub-dimension was calculated, and the category corresponding to the maximum value was used as the final KANO classification of the item.

Table 2. KANO Model Demand Type Segmentation Matrix

		Unavailability of services				
		Satisfied	inevitable	Doesn't matter	Grudginglyaccept	Discontented
Able to provide services	Satisfied	Q	A	A	A	O
	inevitable	R	I	I	I	M
	Doesn't matter	R	I	I	I	M
	Grudgingly accept	R	I	I	I	M
	Discontented	R	R	R	R	Q

Better-Worse Coefficient Analysis.

The traditional KANO model is a qualitative analysis, and the study adopts the Better-Worse coefficient analysis method proposed by Berger[8] The Better-Worse coefficient analysis proposed by Berger et al. (1993) was used to further quantify the data results and make the classification of demand more scientific and reasonable. The absolute values of SI and DSI coefficients are in the range of [0,1], and the closer they are to 1, the greater the impact[9]. The formula is as follows:

$$SI = \frac{A+O}{A+O+M+I} \qquad (1)$$

$$DSI = (-1) \times \frac{M+O}{A+O+M+I} \qquad (2)$$

Satisfaction Quartile Analysis.

After calculating the SI value and the absolute value of DSI of each public sports service, the function points are distributed on a four-quadrant coordinate system, with the value of the Better coefficient as the vertical axis, the absolute value of the Worse coefficient as the horizontal axis, and the origin of the coordinates as the average value of all function points (Figure 2). Services falling in different quadrants have different demand attributes, and the use of the four-quadrant diagram of satisfaction can quickly identify the key to the problem and differentiate the priorities of the demand indicators of each public sports service, so as to formulate a targeted implementation programme.
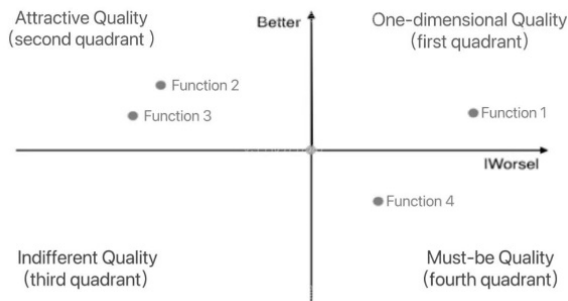

Fig. 2. Quadrant diagram of satisfaction

3   Data Sources

A city in China was used as the study area for sampling, and the research period was from November 2023 to February 2024. A city is a world famous cultural city, and in recent years the city has taken the construction of community sports parks at a high level as a key livelihood project, and has planned and built a system of 200 community sports parks, forming a public service system for national fitness with full coverage, service sharing and a higher level. Adopting the zonal stratified sampling method, 20 representative community sports parks in 6 urban areas of the city were selected as the research sites, and a total of 1,100 questionnaires were distributed to residents exercising outdoors and indoors, and 1,084 valid questionnaires were recovered, with a valid recovery rate of 98.54%. The results of the questionnaire were entered and statistically analysed using SPSS, and the Cronbach'α coefficient of the questionnaire was tested to be 0.847, which is greater than 0.7; the KMO value was 0.979, which is greater than 0.7, and the significance of the Bartlett's sphere test was 0.000, which is less than the 0.05 level of significance, which indicates that the reliability and validity of the questionnaire are relatively good.

4   Hierarchical Analysis of Demand for Public Sports Services in Community Sports Parks

4.1   Traditional KANO Model Analysis

Maslow's Hierarchy of Needs Theory states that human needs are constantly growing, from low to high[10]. The "hierarchy of needs" in the study refers to the identification of differences in sports needs according to the level of importance, which is generally divided into " Must-be Quality > One-dimensional Quality > Attractive Quality > Indifferent Quality" according to the degree of importance. The survey data from the questionnaire was put into the matrix of KANO model for the classification of demand types, and Table 3 was obtained.

Table 3. Hierarchy of demand for various public sports services

	Numbering and Specific Titles	Attractive Quality	One-dimensional Quality	Must-be Quality	Indifferent Quality	categorisation
Sports facilities services (A)	A1. No. of fitness equipment and venues	3.69 %	20.11 %	53.69 %	15.13 %	M
	A2.Easy access around Park	83.03 %	0.00 %	0.00 %	16.97 %	A
	A3.Maintenance of facilities upgraded	7.01 %	21.40 %	49.45 %	13.28 %	M
	A4.Safety of site facilities	4.61 %	22.51 %	52.58 %	11.99 %	M
	A5.Infrastructure	5.17 %	23.80 %	49.82 %	13.28 %	M

	Numbering and Specific Titles	Attractive Quality	One-dimensional Quality	Must-be Quality	Indifferent Quality	categorisation
	A6. Meeting the needs of multiple actors	23.43 %	30.26 %	21.77 %	24.54 %	O
	A7.Sports Scene Intelligence	71.40 %	0.00 %	0.00 %	28.60 %	A
Sports organisation services (B)	B1.Number of sports organisations	46.31 %	12.92 %	9.41 %	31.37 %	A
	B2.Types of sports organisations	33.95 %	35.06 %	14.94 %	16.05 %	O
	B3.Construction and Management	24.17 %	25.83 %	25.65 %	24.35 %	O
	B4.Service attitudes of sports organisers	11.25 %	34.13 %	37.64 %	16.97 %	M
Sports Event Services (C)	C1.Number of sports events	21.40 %	29.89 %	25.28 %	23.43 %	O
	C2.Types of Sporting Events	69.00 %	0.00 %	0.00 %	31.00 %	A
	C3. Organisation and Management	23.99 %	26.75 %	23.99 %	25.28 %	O
	C4. Novelty in organising sports events	70.11 %	0.00 %	0.00 %	29.89 %	A
Sports coaching services (D)	D1.Number of sports instructors	50.74 %	0.00 %	0.00 %	49.26 %	A
	D2.Sports Instructor Mentoring Attitude	11.81 %	41.88 %	33.76 %	12.55 %	O
	D3. Social counsellor for the disabled	18.08 %	52.58 %	18.63 %	10.70 %	O
Sports Information Service (E)	E1. Diversification of publicity channels	28.78 %	41.70 %	14.39 %	15.13 %	O
	E2.Sports Information Content	27.49 %	21.77 %	26.01 %	24.72 %	A
	E3.sports information is up to date	27.49 %	25.28 %	22.88 %	24.35 %	A
	E4.Feedback channels on demand	16.42 %	53.69 %	18.63 %	11.25 %	O
Physical Fitness Monitoring Service (F)	F1.Variety of services	12.55 %	40.22 %	32.84 %	14.39 %	O
	F2.has professionals for fitness monitoring	27.49 %	19.93 %	24.91 %	27.68 %	I
	F3.Establishment of a population fitness monitoring site	55.17 %	14.21 %	5.17 %	25.46%	A

Table 2 shows that in community sports parks, residents' Must-be Quality (M) needs for public sports services are A1, A3, A4, A5, and B4, which are the five service items that residents consider to be the most basic and are also considered to be the service needs that must be met; expectancy-type needs (O) are A6, B2, B3, C1, C3, D2, D4, E1, E5, and F1, which are the 10 service items that residents exhibit subjective willingness and desire to meet the level of needs; Attractive Quality (A) has

A2, A7, B1, C2, C4, D1, E2, E3, F3, these 9 service items exceed the residents' expectations and have a surprise effect; F2 is the Indifferent Quality (I), which indicates that the provision or non-provision of this service will not have an effect on the increase or decrease of residents' satisfaction.

4.2   Better-Worse Coefficient Analysis

The modified Better-Worse coefficient analysis method can further quantify the results of the KANO model, and can more accurately assess the satisfaction of residents participating in exercise in sports parks with sports services, thus making the classification of demand more scientific and reasonable. Based on the coefficient calculation method and the values in Table 3, the Better-Worse coefficient calculation for the 25 sports service demand items results in Table 4.

Table 4. Better-Worse Coefficient Values and Need Level Identification Statistics

	Numbering and Specific Titles	hierarchy of needs	SI	|DSI |
Sports facilities services (A)	A1.No. of fitness equipment and venues	M	0.257	0.797
	A2.Easy access around Park	A	0.830	0.000
	A3.Maintenance of facilities upgraded	M	0.312	0.774
	A4.Safety of site facilities	M	0.295	0.819
	A5.Infrastructure	M	0.314	0.799
	A6. Meeting the needs of multiple actors	O	0.537	0.520
	A7.Sports Scene Intelligence	A	0.714	0.000
Sports organisation services (B)	B1.Number of sports organisations	A	0.592	0.223
	B2.Types of sports organisations	O	0.690	0.500
	B3.Construction and Management	O	0.500	0.515
	B4.Service attitudes of sports organisers	M	0.454	0.718
Sports Event Services (C)	C1.Number of sports events	O	0.513	0.551
	C2.Types of Sporting Events	A	0.690	0.000
	C3. Organisation and Management	O	0.507	0.507
	C4. Novelty in organising sports events	A	0.701	0.000
Sports coaching services (D)	D1.Number of sports instructors	A	0.507	0.000
	D2.Sports Instructor Mentoring Attitude	O	0.537	0.756
	D3. Social counsellor for the disabled	O	0.707	0.712

	Numbering and Specific Titles	hierarchy of needs	SI	|DSI |
Sports Information Service (E)	E1. Diversification of publicity chan-nels	O	0.705	0.561
	E2.Sports Information Content	A	0.493	0.478
	E3.sports information is up to date	A	0.528	0.481
	E4.Feedback channels on demand	O	0.701	0.723
Physical Fitness MonitoringService (F)	F1.Variety of services	O	0.528	0.731
	F2.has professionals for fitness moni-toring	I	0.474	0.448
	F3.Establishment of a population fit-ness monitoring site	A	0.694	0.193
Average value			0.549	0.486

By analysing the satisfaction index of the 25 public sports service items in Table 4, it can be found that the items with Better values above the average are A2, A7, B1, B2, C2, C4, D3, E1, E4, and F3, which indicates that the contents and dimensions of these public sports service items have very high Better values, and they can effective-ly enhance the satisfaction of the participants in community sports parks Worse val-ues than average are A1, A3, A4, A5, A6, B2, B3, B4, C1, C3, D2, D3, E1, and trying to improve and maintain these services can effectively reduce the level of dissatisfac-tion of residents. Since the categories of Reverse Quality (R) and Questionable Qual-ity (Q) elements affect the quality and availability of sports service programmes, it is important to identify the demand for sports service programmes[11]. The absence of R and Q in identifying the demand hierarchy of sports service programmes indicates that the results are logical.

4.3   Satisfaction Quartile Analysis

For a more in-depth analysis, a four-quadrant quantile plot was used to show the dis-tribution of each demand element (Figure 3). The planar four-quadrant plot uses the SI values as the vertical axis and the absolute value of the DSI values as the horizon-tal axis, with the origin of the coordinates being (0.472, 0.551), and the results were analysed as follows by applying Excel software for image processing:
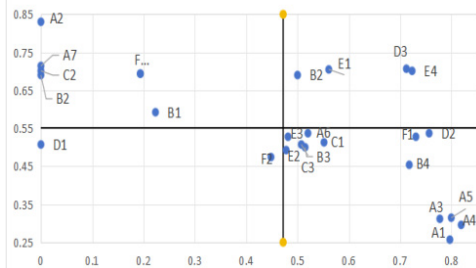

Fig. 3. Quadrant diagram of satisfaction with demand for public sport services

First quadrant: The absolute values of both SI and DSI are high, and if the services in this quadrant can be effectively implemented, they can greatly enhance residents' satisfaction. D3 and E4 did not enter this quadrant in the traditional Kano model analysis, and through the B-W coefficient analysis, the quadrant was entered by B2, E1, D3, and E4, indicating that these four services have a linear relationship with satisfaction, and that the provision of these four sports services within the community sports parks will increase the satisfaction of the residents, but the failure to provide them will result in the decrease of the residents' satisfaction with the community sports parks.

Second quadrant: High SI values and low absolute DSI values, the indicators in this quadrant are services with a low level of demand from the residents, the provision of such services can greatly increase the satisfaction of the residents, and if they are not provided, they will not have an impact on the overall satisfaction, corresponding to the following services: B1, F3, A2, A7, C2, B2.

Third quadrant: The absolute values of both SI and DSI are low, indicating that the availability or non-availability of the two public sports services D1 and F2 do not have any impact on the participants of the community sports park. In the future, there is a need to improve the irrationality of the two service items and gradually change from irrelevant attributes to attractive qualities.

Fourth quadrant: Low SI values and high absolute DSI values, the indicators within this quadrant are essential for community sports parks and the most basic sports needs of residents. Providing public sports services within this quadrant does not result in a significant increase in resident satisfaction, but failure to provide them or deviations in service quality can cause a significant drop in satisfaction. These indicators include E2, E3, C3, B3, A6, C1, F1, D2, B4, A3, A1, A4, A5.

5   Conclusions

According to the Attractive Quality Theory and the Kano model, the indicators for the 25 sports services in community sports parks are divided into four categories: 13 Must-be Quality, 4 One-dimensional Quality, 6 Attractive Quality and 2 Indifferent Quality. The indicators related to sports facility services, sports information services and sports event services also changed from Attractive Quality to Must-be Quality, indicating that these are the services most frequently experienced or used by residents when participating in sports activities, and that the government and the community should at least maintain the existing level of service quality, or else the satisfaction of residents will drop greatly; sports organisation services or social sports guidance services have little impact on the satisfaction of the residents for the time being; With the improvement of residents' health awareness in recent years, physical fitness testing services have gradually become a service with high expectations, and this type of service significantly influences residents' satisfaction with community sports parks. the KANO model has a good correspondence with demand satisfaction, and it can help the government and the relevant departments to better determine the attributes of

their service quality, so as to allow the implementation of public sports services to be more strategic and targeted.

The order of public sports services in community sports parks based on their importance is as follows: sports facilities service > sports information service > sports event service > social sports guidance service > sports organisation service > physical fitness monitoring service. The government or relevant departments should give priority to ensuring the Must-be Quality, giving priority to satisfying the One-dimensional Quality, and providing the Attractive quality as much as possible.

6   Recommendation

To consolidate sports venue and facility services, give priority to solving the necessary demand for public sports services in community sports parks, use new Internet technology to establish an intelligent network system, and realise finer and smarter venue and facility management; to enrich sports guidance as well as sports event services, explore the potential attractive demand for public sports services, and provide more novel sports and sports guidance services; and to look at sports information from a dynamic perspective. The government and sports parks should make full use of online social media to strengthen the publicity of community sports parks, and timely communicate the latest news and developments to residents exercising, as well as optimise the service environment for sports organisations, and attract diversified sports organisations to join the community sports parks, so as to provide diversified choices for residents to exercise; optimise the physical fitness monitoring service, provide residents with rapid and accurate physical fitness assessment, and provide personalised exercise programmes and fine-tuned services. Provide personalised exercise programmes and fine-tuned diet plans.

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