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Article

Research on the Development of a Safety Education System and Risk Prevention Mechanisms for Youth Outdoor Camps

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Abstract: As an emerging industry that is rapidly developing, the safety risk management issue of youth outdoor sports camps has not received sufficient attention. This paper considers establishing a safety education risk factor system, determining the interactive factors of camp risks from three aspects: personnel, materials, and environment. Based on these risk factors, it proposes to calculate and identify the weights of each factor by combining the structural equation model. On this basis, a Kano model for camp safety risks is established to classify different elements in each attribute. The results show that the weights of the 55 risk factors range from 0.005 to 0.033, and the weights are relatively balanced. The highest priority of the personnel risk dimension belongs to the essential type of function, while in the material and environmental dimensions, they are of the non-differentiated type and the attractive type of needs respectively. Based on this, the corresponding safety education risk prevention and control mechanism is constructed.

Keywords: Youth camps; Structural equation model; Kano model; Risk factor system

1. Introduction

In recent years, outdoor camp education for teenagers has received significant attention from many developed countries in the world. It has become a new type of social education model compared to school education and family education, and is an effective supplement to school and family education [1-3]. However, safety is always the prerequisite. The purpose of the courses is not to suppress children's curiosity, but to help them learn to observe, judge and self-manage under the premise of protection [4-5].

The risks of outdoor camp education do not come from a single source but are the result of the combination of three dimensions: environment, individual, and behavior. In terms of the environment, it includes sudden changes in weather, rugged terrain, intense sunlight, unstable water sources, and animal and pest infestations, etc. [6-7]; in terms of the individual, it involves physical exhaustion, health conditions, improper use of equipment, and mood fluctuations [8-9]. The behavioral aspects include lack of division of labor, reckless behavior, neglect of navigation, and disregard for rest and hydration, etc. [10-11]. Changes in weather, complex terrain, and risks near water bodies are often inevitable, and the limited experience of teenagers and the need for improvement in risk perception are also factors to consider[12-13]. Therefore, the coordinated development of the safety education system and the risk prevention mechanism is particularly important. In the curriculum design, safety is not merely a collection of isolated "knowledge points", but a complete concept that permeates every activity planning, every drill, and every reflection [14-15]. Safety education is a continuous process of updating, and it is necessary to clearly explain the possible risks and also teach children to distinguish uncertainties and master basic self-protection and mutual assistance skills. The curriculum should respect the cognitive level of teenagers, adopt contextualized teaching that is close to life, and let them experience responsibility, collaboration, and self-restraint through participation.

This article identifies safety education risk factors through the interaction among personnel, materials, and environment in the youth outdoor camps, combines expert suggestions, and uses structural equation modeling to statistically measure the internal correlations among different risk factors, measure the advantages of the variables in the model, normalize the SEM path coefficients, and calculate the weight of risk factor indicators. Based on the identification of the above risk factor weights, the Kano model is used to describe the characteristics of risk factors, classify them into charm, expectation, essential, non-differentiation, and opposition attributes, and solve for the priority of outdoor camp safety education needs.

2. Construction of an Evaluation System for Safety Education in Youth Outdoor Camps

2.1. Identification of Risk Factors for Outdoor Camp Safety Education

During the implementation of the camp activities, accidents often result from the interaction of multiple risk factors rather than being caused by a single one. There may be interactions between personnel and the environment, personnel and materials, environment and materials, and interpersonal-environment interactions.

After establishing the risk source composed of personnel, materials, and environment as the basic analysis framework for risk identification, and based on the accident tree analysis of the case, combined with expert suggestions, the risk items obtained were further added, deleted, modified, and consolidated. The classified summary results are shown in Table 1. The total risk factors of personnel, materials, and environmental risk sources reached 15, 20, and 20 categories respectively.

Table 1. Summary grouped into itemized statistical results

Risk source	Risk factor	Quantity
Personnel	Participants	5
	Organizer	4
	Manager	3
	Others	3
Matter	Venue facilities	4
	Equipment and supplies	5
	Food and fresh water	4
	Animals and plants	4
	Other substances	3
Environment	Course routes	3
	Topography and geology	6
	Meteorological conditions	5
	Social environment	4
	Other environments	2
Total		55

2.1.1. Personnel Risk Factors

During the camp activities, there are numerous interactions among various personnel. Based on the all-inclusive nature of risk identification, personnel can be classified into participants, organizers, managers, and others. Different types of personnel have different potential risk attributes. In the analysis of accident cases, it has been shown that risk factors related to participants are the objects of particular concern. In this study, the participants are young people, who have distinct characteristics of the group. They have significant differences and imbalances in various aspects such as outdoor knowledge and experience, outdoor skills acquisition, risk identification and response, self-safety awareness, physiological and psychological reserves, and teamwork. The statistics of personnel-related risk factors are shown in Table 2. The risk factors for participants, organizers, and managers are respectively 5, 4, and 3 types. Besides these three types of personnel, medical staff cannot participate in treatment and emergency rescue, emergency rescue personnel cannot provide timely rescue, and conflicts with local personnel in the activity also have certain potential risks, which are classified as other personnel risks.

Table 2. Statistics of personnel-related risk factors

Primary	Secondary	Tertiary
Personnel (P)	Participants (P1)	Lack of outdoor experience (P11)
		Weak outdoor safety awareness (P12)
		Incorrect use of equipment and tools (P13)
		Insufficient emergency response ability (P14)
		Poor psychological quality (P15)
	Organizer (P2)	Insufficient safety education for students (P21)
		Lack of outdoor teaching experience (P22)
		Insufficient leadership and coordination skills (P23)
		Inadequate ability to respond to emergencies (P24)
	Manager (P3)	Insufficient material resources (P31)
		Inaccurate assessment of potential risks (P32)
		Inadequate emergency rescue plans (P33)
	Others (P4)	Rescue workers were unable to provide timely assistance (P41)
		Medical personnel were unable to provide timely treatment (P42)
		There were conflicts with the local residents (P43)

2.1.2. Physical Risk Factors

There are a wide variety of outdoor sports camps, including rock climbing and speed descent, team building activities, and water sailing. These activities all rely on venue facilities and equipment. However, outdoor hiking and jungle exploration also need to pay attention to potential risks such as food, fresh water, wild animals and plants, and transportation. In this study, these are classified as material-related risks. The identification of material-related risk factors is shown in Table 3. Among them, the risk factors for venue facilities, equipment, food and fresh water, wild animals and plants, and other materials are 4, 5, 4, 4, and 3 types respectively.

Table 3. Identification of material risk factors

Primary	Secondary	Tertiary
Matter (M)	Venue facilities (M1)	The site selection or construction was unreasonable (M11)
		It did not meet the requirements of the event (M12)
		Poor maintenance led to damage (M13)
		Overloading caused damage (M14)
	Equipment and supplies (M2)	Does not meet safety standards (M21)
		The operation is complex (M22)
		The applicability is not strong (M23)
		Equipment is damaged and functions fail (M24)
		It is forgotten, lost, and not replenished in time (M25)
	Food and fresh water (M3)	Insufficient reserves (M31)
		Accidental loss due to improper storage (M32)
		Physical discomfort caused by improper consumption (M33)
		Lack of emergency food and fresh water (M34)
	Animals and plants (M4)	Direct human-animal conflicts (M41)
		Injuries caused by animals and plants (M42)
		Damage to equipment caused by animals and plants (M43)
		Route changes caused by animals and plants (M44)
	Other substances (M5)	Traffic accident - Direct accident (M51)
		Vehicle malfunction (M52)
		Insufficient medical supplies and equipment (M53)

2.1.3. Environmental Risk Factors

The distinctive feature of outdoor sports camps is the complex and diverse open environment. The unique topography, climate conditions, etc. are all factors with relatively high potential risks. Besides the natural environment, the course routes, which are artificially designed factors, have relatively higher controllability of risks and require higher risk management capabilities. The social environment is an external objective risk factor of the camp system, which generally does not directly trigger risk incidents but influences other risk factors from various aspects. Its importance cannot be ignored. In this study, these several factors are uniformly classified as environmental-related factors. The statistics of environmental-related risk factors are shown in Table 4. Among the environmental risk factors, the course routes, topography and geology, climate conditions, social environment and other environmental risk factors respectively contain 3, 6, 5, 4 and 2 types.

Table 4. Statistics of environmental-related risk factors

Primary	Secondary	Tertiary
Quantity (Q)	Course routes (Q1)	The content design is unreasonable (Q11)
		The process arrangement is unreasonable (Q12)
		The technical operation is very difficult (Q13)
	Topography and geology (Q2)	Flash flood (Q21)
		Collapse (Q22)
		Landslide (Q23)
		Rapids (Q24)
		falling rocks (Q25)
		Lava flow (Q26)
	Meteorological conditions (Q3)	Thunder and lightning (Q31)
		Heavy rain (Q32)
		Strong wind (Q33)
		Heavy fog (Q34)
		Snowfall (Q35)
	Social environment (Q4)	The insurance system is not sound (Q41)
		The division of responsibilities is unclear (Q42)
		The rescue mechanism is not complete (Q43)
		The qualification certification is not standardized (Q44)
	Other environments (Q5)	Public health medical incident (Q51)
		Local social order in chaos (Q52)

2.2. Weight determination method based on structural equation model

2.2.1. Structural Equation Model

(1) Definition and Content of Structural Equation Model

The structural equation model (SEM) is a tool that combines with statistical analysis theory and has been widely applied in various disciplines such as economics, psychology, and management [16]. When studying the risks of safety education in outdoor camps for teenagers, it is sometimes necessary to study and analyze the degree of mutual influence among multiple risk factors on the overall project and among the risk factors themselves. Traditional statistical methods often fail to achieve this. This method takes into account the inherent correlation of influencing factors and the logical relationship between influencing factors, thereby achieving the analysis of multiple factors or multiple variables. It mainly adopts two statistical methods, namely conducting measurement analysis on the influencing factors and the measurement paths, which can simultaneously obtain the correlation degree between the measurement variables, latent variables, and error terms in the analysis model. After analysis, the correlation degree between latent variables and the measurement model can be obtained, which can more intuitively reflect the accuracy and validity of the measurement indicators corresponding to the influencing factors.

(2) Composition of Structural Equation Model

The structural equation model mainly consists of measurement equations and structural equations. The measurement equation represents the intrinsic connection between the measured variable and the corresponding endogenous and exogenous latent variables, while the structural equation represents the interaction between endogenous and exogenous latent variables.

Measurement Equation. The measurement equation is a method for confirmatory factor analysis and is used to analyze the correlation between the measured variable and the endogenous and exogenous latent variables. The expressions are as follows:

$$X = \Lambda x \xi + \delta \tag{1}$$

$$Y = \Lambda y \eta + \varepsilon \tag{2}$$

In the above expression:

X : Exogenous measured variable; Ax : The correlation coefficient matrix between X and ξ ; ξ :

Exogenous latent variable; δ : The error of the exogenous measured variable X ; Y : Endogenous measured variable; Λy : The correlation coefficient matrix between Y and η ; η : Endogenous latent variable; ε : The error of the endogenous measured variable Y .

Structural equation: Structural equation analysis is similar to path analysis and is used to express the correlations among latent variables, often represented as:

$$\eta = \beta\eta + \Gamma\xi + \zeta \tag{3}$$

In the above expression:

η : Endogenous latent variable; β : Factor loading; Γ : The influence coefficient of exogenous latent variables on endogenous latent variables; ζ : Residual error term of the structural equation; ξ : Exogenous latent variable;

2.2.2. Advantages of Structural Equation Model in Weight Calculation

(1) Measurement errors can be allowed within a certain range.

Regarding the independent variables of the research hypothesis, traditional linear regression analysis assumes no errors, but this assumption does not match the actual situation. The structural equation allows for errors within a certain range, thus enabling the analysis of latent variables and corresponding measurement indicators, making the calculation results more accurate.

(2) It can handle multiple dependent variables simultaneously.

Traditional statistical methods are difficult to precisely handle multivariate issues. They often conduct single studies on single-factor variables, easily neglecting the correlations among multiple variables, resulting in calculation results lacking correlation and accuracy, and unable to determine the degree of interaction between variables. However, the structural equation model can simultaneously process the correlations among multiple variables and also analyze the reliability and validity of indicators.

(3) It can simultaneously estimate factor structure and factor relationships.

Using conventional methods to analyze the correlations between variables requires step-by-step calculations. Meanwhile, the structural equation model can analyze the factor structure and relationships.

2.3. Calculation Results of Risk Factors Weights for Outdoor Campsites

2.3.1. Test of Discriminant Validity of Risk Factors

Before calculating the weights of risk factors using the structural equation model, a discriminant validity test was conducted for each of the major dimension indicators as shown in Table 5. In this discriminant validity test, the square roots of the AVE values of each dimension and itself were 0.73, 0.71, 0.73, 0.73, 0.75, 0.76, 0.71, 0.72, 0.75, 0.67, 0.67, 0.72, 0.68, and 0.72, respectively. The standardized correlation coefficients between each pair of dimensions were all less than the square roots of the AVE values corresponding to the dimensions. Therefore, it indicates that each dimension has good discriminant validity.

Table 5. Conduct validity tests for each dimension indicator

	P1	**P2**	**P3**	**P4**	**M1**	**M2**	**M3**	**M4**	**M5**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
P1	**0.73**													
P2	0.49	**0.71**												
P3	0.43	0.42	**0.73**											
P4	0.45	0.37	0.52	**0.73**										
M1	0.45	0.55	0.34	0.41	**0.75**									
M2	0.35	0.35	0.38	0.42	0.63	**0.76**								
M3	0.4	0.45	0.32	0.53	0.56	0.59	**0.71**							
M4	0.47	0.54	0.39	0.43	0.47	0.56	0.48	**0.72**						
M5	0.39	0.63	0.5	0.57	0.52	0.52	0.46	0.44	**0.75**					
Q1	0.55	0.59	0.59	0.43	0.33	0.43	0.53	0.56	0.46	**0.67**				
Q2	0.42	0.4	0.53	0.4	0.37	0.52	0.37	0.35	0.53	0.37	**0.67**			
Q3	0.58	0.61	0.4	0.49	0.45	0.34	0.37	0.35	0.54	0.42	0.48	**0.72**		
Q4	0.43	0.36	0.47	0.58	0.4	0.49	0.62	0.56	0.33	0.53	0.41	0.61	**0.68**	
Q5	0.47	0.4	0.63	0.34	0.63	0.51	0.37	0.49	0.55	0.51	0.54	0.38	0.59	**0.72**

2.3.2. Estimation of Risk Factor Observation Variables

The evaluation of the structural equation model is mainly divided into two parts: basic fit and general fit. The basic fit is to check whether the model violates the estimated values and whether the model conforms to the simplest basic fit. The general criterion adopted is that all significance level values must comply with the relevant standards, with the highest level not exceeding 0.08; otherwise, the data quality is poor, and the C.R. value is greater than 1.85. The standardized coefficients cannot exceed or approach 1; otherwise, the validity of the differences between variables is insufficient. Based on these requirements, corresponding basic fit indicators can be obtained according to the AMOS software. The SEM test of the safety risk factors of youth outdoor camps is shown in Table 6. The "violation assessment" test passes, and further fit assessment and subsequent fit evaluation can be conducted. The standard error S.E. is positive and all are close to 0. Basically, all the loads and path coefficients are significantly not equal to 0 at the level of P less than 0.001. Therefore, the data can meet the requirements of basic fit.

Table 6. Camp safety risk factor SEM test

Path	Unestimate	S.E.	C.R.	P	Estimate
P1←P	0.453	0.044	14.247	0.001	0.627
M2←M	0.603	0.021	17.581	0.001	0.229
Q5←Q	0.593	0.037	22.482	0.001	0.85
P11←P1	0.781	0.085	14.683	0.001	0.147
P13←P2	0.374	0.028	12.671	0.001	0.486
P21←P2	0.597	0.077	16.94	0.001	0.906
P23←P4	0.579	0.088	1.929	0.001	0.845
P32←P1	0.44	0.023	4.63	0.001	0.851
P11←P3	0.612	0.087	23.951	0.001	0.135
P43←P4	1.467	0.024	24.822	0.001	0.309
P24←P4	1.301	0.038	2.975	0.001	0.702
P44←P2	0.741	0.092	8.316	0.001	0.473
M11←M1	1.232	0.045	26.009	0.001	0.945
M21←M3	0.358	0.05	20.15	0.001	0.743
M24←M5	0.669	0.072	16.553	0.001	0.393
M23←M3	0.329	0.035	8.353	0.001	0.153
M31←M4	1.348	0.054	17.056	0.001	0.825
M33←M2	1.178	0.1	10.142	0.001	0.8
M42←M1	1.188	0.061	25.138	0.001	0.38
M44←M4	1.223	0.071	8.245	0.001	0.24
M52←M2	0.922	0.038	20.745	0.001	0.404
M41←M1	0.976	0.078	4.152	0.001	0.637
Q41←Q1	0.578	0.043	6.777	0.001	0.407
Q21←Q2	0.789	0.046	9.565	0.001	0.187
Q13←Q4	0.926	0.051	3.46	0.001	0.663
Q22←Q3	0.801	0.062	13.334	0.001	0.892
Q32←Q1	0.75	0.051	7.479	0.001	0.354
Q26←Q5	0.828	0.865	22.153	0.001	0.733
Q24←Q2	0.69	0.067	25.144	0.001	0.743
Q31←Q4	0.467	0.03	6.386	0.001	0.89

2.3.3. Identification Results of Risk Factor Weights

The path coefficients are normalized to obtain the weights of each risk evaluation indicator. The calculation formula is as follows:

$$P_i = \frac{X_i}{\sum_{i=1}^{n} X_i} (i = 1, 2, 3, \cdots, n; \sum_{i=1}^{n} X_i = 1) \tag{4}$$

Among them: X_i represents the coefficient of the i -th indicator in influencing the superior indicator, which is also the path coefficient obtained after the structural equation model is fitted. Based on the above formula, the weights of the risk factors for adolescent outdoor camp safety education are calculated as shown in Table 7. The minimum weight value of each risk factor indicator is 0.005, and the maximum is 0.033. The differences in the weight values of the risk factors are not significant, and the overall weight distribution is relatively balanced.

Table 7. The weight of risk factors for outdoor camp safety education

Primary	Secondary	Tertiary	Weight
Personnel (P)	Participants (P1)	P11	0.022
		P12	0.008
		P13	0.03
		P14	0.005
		P15	0.017
	Organizer (P2)	P21	0.032
		P22	0.029
		P23	0.03
		P24	0.005
	Manager (P3)	P31	0.011
		P32	0.024
		P33	0.016
	Others (P4)	P41	0.033
		P42	0.026
		P43	0.014
Matter (M)	Venue facilities (M1)	M11	0.005
		M12	0.029
		M13	0.028
		M14	0.013
	Equipment and supplies (M2)	M21	0.008
		M22	0.014
		M23	0.022
		M24	0.014
		M25	0.007
	Food and fresh water (M3)	M31	0.023
		M32	0.031
		M33	0.012
		M34	0.026
	Animals and plants (M4)	M41	0.026
		M42	0.031
		M43	0.018
		M44	0.008
	Other substances (M5)	M51	0.017
		M52	0.008
		M53	0.012
Quantity (Q)	Course routes (Q1)	Q11	0.011
		Q12	0.022
		Q13	0.022
	Topography and geology (Q2)	Q21	0.017
		Q22	0.016
		Q23	0.016
		Q24	0.008
		Q25	0.025
		Q26	0.016
	Meteorological conditions (Q3)	Q31	0.021
		Q32	0.024
		Q33	0.016
		Q34	0.014
		Q35	0.026
	Social environment (Q4)	Q41	0.017
		Q42	0.013
		Q43	0.016
		Q44	0.02
	Other environments (Q5)	Q51	0.014
		Q52	0.011

3. Safety Education Function Requirements for Youth Outdoor Camps

3.1. Kano Model

3.1.1. Basic Elements of the Kano Model

Previous studies have held that the relationship between service provision and customer satisfaction is linear, meaning that when a company provides a certain service, customer satisfaction will increase, and when it does not provide a certain service, customer satisfaction will decrease. However, this view has been overturned by the Kano model [17]. The classification results of product attributes based on objective product characteristics and subjective customer feelings according to the Kano model are shown in Figure 1. This model holds that when a company provides a certain service, customers will have three attitudes: satisfaction, dissatisfaction, and indifference. Similarly, when the company does not provide a certain service, customers will also have these three attitudes.

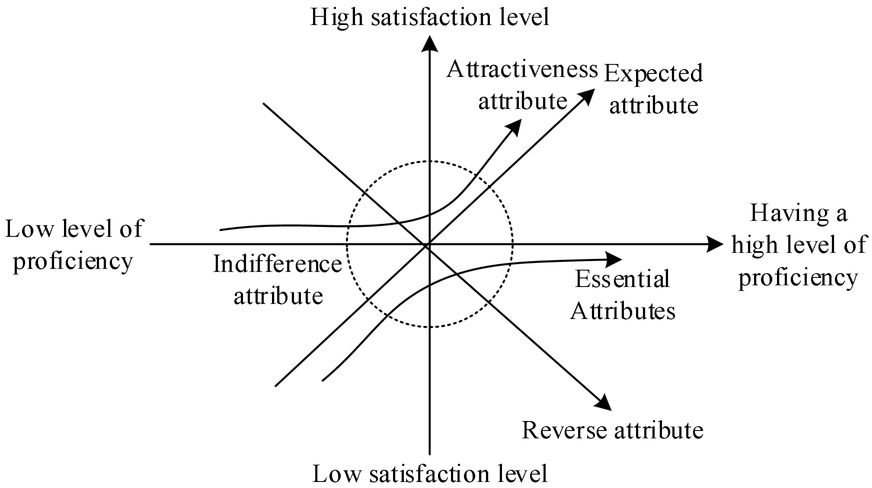

Figure 1. Kano classification category

(1) Essential Quality Attributes
Essential quality attributes refer to the most fundamental functions and characteristics of a product or service, which are considered necessary by customers and are thus not actively demanded by them during consumption. In practice, if enterprises provide these essential quality attributes to customers, their satisfaction will not increase, but if they do not provide them, customers will experience severe dissatisfaction and even abandon the purchase.

(2) Expected Quality Attributes

Expected quality attributes refer to the attributes that customers have clear expectations for, and their satisfaction level is linearly related to the degree of their satisfaction. When such attributes are provided, the greater the degree of customer demand satisfaction, the higher the satisfaction level; conversely, if these attributes are not met, customers will be extremely dissatisfied. Therefore, enterprises should focus on enhancing these attributes.

(3) Attractive Quality Attributes

Attractive quality attributes, also known as stimulating quality attributes, refer to the attributes that enterprises actually provide beyond customers' expectations, making customers feel excited and surprised. If such attributes are not provided, customers will not be dissatisfied; if provided, they will greatly enhance customer satisfaction. Enterprises with strong capabilities or abundant resources can consider providing such attributes to customers.

(4) Non-Differentiated Quality Attributes

Non-differentiated quality attributes are attributes that customers do not pay attention to or care about. Whether they are provided or not has no impact on customer satisfaction. In cases where enterprise resources are limited, the provision standards of such quality attributes can be lowered, or even excluded.

(5) Reverse Quality Attributes

Reverse quality attributes refer to quality characteristics that customers do not need or dislike. Without providing them, customers will not experience dissatisfaction and may even feel very satisfied; if provided, it will instead cause strong dissatisfaction from customers.

3.1.2. Symbol Definitions and Element Judgments

In the Kano model, a language-based approach is employed to describe the characteristics and classification of elements in detail. This paper uses the Kano model to categorize the safety risk factors of youth outdoor camps, thereby establishing the priority of risk management. The content of this section is to provide an explanation of the symbol definitions in the Kano model, laying the groundwork for the subsequent empirical analysis part.

P: Represents a product or service, which is the research object in the Kano model. In the empirical part of this paper, P will represent the youth outdoor camp project.

QE: Represents a quality element of the product or service; for different quality elements, they can be identified by subscripts, such as QE1. Since the research in this paper involves risk factors, for easier understanding, this paper will use RE instead of QE to represent the risk factors of the project.

T(QE, t): This is a vector representation, representing the distribution vector of quality element QE at time t of the quality element, generally represented as a one-dimensional vector with five components, symbolized as: {Na, No, Nm, Ni, Nr}. The five components in this vector respectively represent the proportion or number of the distribution of quality element categories in attractive quality, one-dimensional quality, essential quality, non-differentiated quality, and rebellious quality. Similarly, in the empirical part of this paper, T(RE, t) will be used to represent the distribution vector of risk element categories, symbolized as: {Na, No, Nm, Ni, Nr}.

A: Represents the attribute of charm;

O: Represents the attribute of expectation;

M: Represents the attribute of necessity;

I: Represents the attribute of no difference;

R: Represents the attribute of rebellion;

$\Gamma\langle T\rangle$: This operation is a classification operation performed on the vector T. It is also a core operation in the Kano model.

For the determination of the category to which an element belongs, the Kano model provides a very simple and feasible method, which is to select the element category represented by the component with the maximum distribution value in the element category distribution space. Mathematically, it is expressed as follows:

$$\begin{aligned}\Gamma\langle T\rangle &= \Gamma\langle T(RE,t)\rangle = \Gamma\langle\{Na, No, Nm, Ni, Nr\}\rangle \\ &= \mathrm{Max}(12,377,499,22,11) \rightarrow= M_0\end{aligned} \tag{5}$$

Among them, the Max operation is to obtain the maximum value from the set; the $x \rightarrow$ operation is to obtain the element category corresponding to the operand x. This method is only applicable when the Max operation yields a unique result. If there are two or more identical maximum values, this method cannot provide a reasonable explanation.

3.2. Solution to the Kano-based requirements for safety education functions

3.2.1. Description of Demand Sample Characteristics

Based on the Kano model, a questionnaire for investigating the functional requirements of safety education in youth outdoor camps was designed. The distribution method of the questionnaire was to distribute it on-site and also conduct a questionnaire survey via the online questionnaire star platform simultaneously. The distribution location was at a certain city's international youth camp. The recipients of the questionnaire were the teenagers participating in the camp activities. A total of 422 questionnaires were distributed, and 412 were retrieved. Among them, 405 were valid questionnaires, with a recovery rate of 97.63% and an effective rate of 95.60%. The recovery rate and effective rate were high.

The obtained questionnaires were processed using Excel and SPSS data analysis software, and the characteristics description of the demand survey sample is shown in Table 8. Among the 405 valid questionnaires, 67.7% were school students, and 32.3% were employed individuals. The ratio of male to female respondents was approximately 1.08:1, which was relatively balanced. The proportion of those who frequently participated in outdoor camp activities was 24.7%, the proportion of those who occasionally participated was 35.8%, and the proportion of those who had never participated was only 19.5%.

Table 8. Description of the sample characteristics for the demand survey

Variable name	Content	Encoding	N	%
Gender	Male	0	210	51.9
	Female	1	195	48.1
	Frequently	0	100	24.7
	Occasionally	1	145	35.8
	Very few	2	82	20.2
	Never	3	79	19.5
Social Role	Junior High School	0	51	12.6
	High School	1	70	17.3
	Undergraduate degree	2	102	25.2
	Graduate student	3	51	12.6
	In-service	4	131	32.3

3.2.2. Analysis of Priority Degree of Outdoor Camp Safety Education Needs

Based on the Kano model, the priority of the functional requirements for safety education in youth camps was identified using the collected questionnaire data. According to the "majority" principle, the results of the priority identification of the functional requirements for safety education in the camps were obtained, as shown in Table 9.

In the personnel-related risk dimension, the priority identification results showed that the essential type of functional requirements were the most, including P12, P14, P21, P22, P24, P31, and P32. Additionally, P11 belongs to the attractive type of functional requirements, and P23 and P43 are expected educational functional requirements.

In the material-related risk dimension, the priority identification results showed that the non-differentiated type of functional requirements were the most, including M12, M13, M23, M31, M41, M43, and M52. Additionally, M11 and M32 are essential type functional requirements, and M33 and M53 are attractive type functional requirements.

In the environmental-related risk dimension, the priority identification results mainly showed attractive type functional requirements, including Q11, Q21, Q22, Q25, Q32, Q41, and Q42. Additionally, Q13, Q23, Q24, and Q51 are essential type functional requirements.

Table 9. Priority level of safety education requirements for the camp

Dimension	Item	A	O	M	I	R	Result
Personnel	P11	148	56	148	67	107	A
	P12	63	46	143	39	52	M
	P13	123	63	102	62	129	R
	P14	30	60	112	58	65	M
	P15	91	21	72	61	94	R
	P21	29	90	125	117	109	M
	P22	74	70	97	86	52	M
	P23	105	120	89	73	73	O
	P24	48	52	148	147	44	M
	P31	21	32	135	129	122	M
	P32	62	42	134	55	93	M
	P33	23	49	63	113	25	I
	P41	93	113	44	144	113	I
	P42	29	147	118	90	90	I
	P43	59	34	90	84	75	O
Matter	M11	103	109	102	109	68	M
	M12	78	36	86	112	86	I
	M13	107	91	44	65	141	I
	M14	67	147	101	49	36	R
	M21	123	50	103	138	113	R
	M22	107	124	43	41	52	O
	M23	46	102	100	64	88	I
	M24	70	129	114	66	99	O
	M25	32	128	107	61	63	O
	M31	50	33	100	106	72	I

Quantity	M32	78	62	146	80	33	M
	M33	149	113	115	82	44	A
	M34	129	30	45	98	141	R
	M41	84	46	101	145	116	I
	M42	109	96	74	21	121	R
	M43	76	120	85	148	135	I
	M44	120	72	29	32	148	R
	M51	51	136	110	54	34	O
	M52	60	110	84	138	89	I
	M53	129	60	101	39	70	A
	Q11	142	106	73	130	119	A
	Q12	78	78	46	94	28	I
	Q13	87	31	110	94	66	M
	Q21	148	25	124	91	131	A
	Q22	146	76	57	81	112	A
	Q23	97	24	109	91	41	M
	Q24	92	78	120	99	113	M
	Q25	122	49	30	33	104	A
	Q26	61	49	80	82	74	I
	Q31	58	126	92	92	98	O
	Q32	158	148	77	144	109	A
	Q33	108	143	38	78	115	O
	Q34	36	76	44	46	23	O
	Q35	72	122	111	22	131	R
	Q41	150	34	89	67	24	A
	Q42	145	74	121	126	78	A
	Q43	87	73	108	138	74	I
	Q44	50	119	43	40	140	R
	Q51	39	66	108	81	30	M
	Q52	23	20	138	146	150	R

In order to further verify the accuracy of the Kano model in identifying the priority of safety education needs for teenagers at outdoor camps, and to numerically represent the identified results of safety education need priorities for the camps, based on the theoretical definition of the Kano model and the value range of the customer satisfaction coefficient, if the classification results of the Kano model for the same safety education function simultaneously fall within the value range of the customer satisfaction coefficient's value range, it indicates that the classification is accurate.

To ensure the accuracy of the selection of safety education function items for outdoor camps for teenagers, through the priority identification of the safety education function items for camps in the questionnaire, the functional categories of each safety education function item can be preliminarily determined, and then the selection of each function can be considered based on the interpretation of the definition of the five types of functional needs in the Kano model. Additionally, the results of the classification can be further tested by calculating the absolute values of the increased or eliminated customer satisfaction coefficients. The research found that by marking the absolute values of the increased customer satisfaction coefficient (CSI) and the eliminated customer satisfaction coefficient (CDSI) on the horizontal and vertical axes respectively, it is possible to more intuitively see the degree of influence of the safety education function items on the trainee satisfaction if they have or do not have this function. At the same time, the counteractive attribute (R) of the safety education risk items can be excluded. The four-quadrant satisfaction matrix for the safety education function satisfaction of outdoor camps for teenagers is shown in Figure 2. The absolute values of the CSI and CDSI coefficients calculated from the summary of all safety education function items are averaged to be 0.61 and 0.63 respectively. Using these two average values as the origin, the priority identification results of all safety education function needs can be reasonably divided into four quadrants.

The characteristics of the function items falling in the first quadrant are that the absolute values of the CSI coefficient and the CDSI coefficient are both very high, indicating that if this function is available, the trainee satisfaction will be greatly improved, and if this function is not available, the dissatisfaction of the trainees will increase significantly. The numerical expression is that the further the value is away from the average values of CSI and CDSI, the greater the degree of satisfaction or dissatisfaction. This attribute characteristic conforms to the expected type of function characteristics.

The characteristics of the function items falling in the second quadrant are that the CSI coefficient is very high and the absolute value of the CDSI coefficient is very low, indicating that if this function is available, the trainee satisfaction will be greatly improved, and if this function is not available, it will not cause dissatisfaction for the trainees. This attribute characteristic conforms to the attractive type of function characteristics.

The characteristics of the function items falling in the third quadrant are that the absolute values of the CSI coefficient and the CDSI coefficient are both low, indicating that adding this function requirement item will not improve the trainee's satisfaction, and eliminating this function item will not increase or decrease the trainee's satisfaction. This attribute characteristic conforms to the non-differentiated type of function characteristics.

The characteristics of the function items falling in the fourth quadrant are that the CSI coefficient is low and the absolute value of the CDSI coefficient is high, indicating that having this quadrant's function items will not improve the trainee's satisfaction, but eliminating this quadrant's function need items will greatly increase the trainee's dissatisfaction. This attribute characteristic conforms to the essential type of function characteristics.

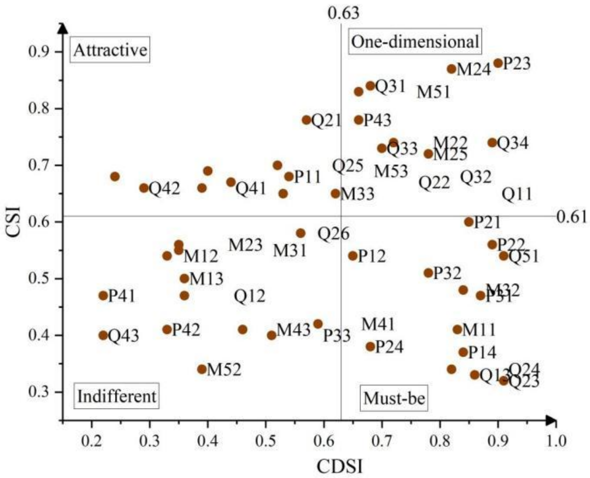

Figure 2. Outdoor Camp Safety Education Function Satisfaction Quadrant Matrix

4. Conclusion and Recommendations

4.1. Conclusion

This paper constructs a risk system for safety education in youth outdoor camps, which includes relevant factors at the levels of personnel, materials, and environment. Using the structural equation model, the weights of the risk factors are identified. The Kano model is applied to determine the safety factors of the camp, and the priority of the safety education functional requirements is solved. The risk factors with the highest, second-highest, and third-highest weights are rescue personnel failing to provide timely assistance (P41), inaccurate assessment of potential risks (P32), and failure of medical staff to provide timely treatment (P42), with weights of 0.033, 0.031, and 0.031 respectively. This indicates that these three safety risk factors are important characteristic items of current camp education. The Kano model is further used to describe the above safety risk factors, classifying all safety factors into five attributes: charm, expectation, essential, non-differentiation, and reverse. The priority of different factors' requirements is solved.

4.2. Suggestions

Based on the identification and analysis of risk factors for safety education in youth outdoor camps, the study proposes the following collaborative mechanism for safety education risks:

(1) For government departments, regular safety knowledge lectures and publicity should be held, and extensive publicity should be carried out through the Internet and new media. The publicity targets are all camp practitioners and enterprises. The content of the publicity is every aspect of camp safety, and training on camp knowledge and skills as well as case studies can be conducted to lower the threshold and expand the training base, thereby improving the quality and ability of practitioners.

(2) For related enterprises, the management of staff should be emphasized, and it should comply with enterprise standards. To increase the satisfaction of young people, the camp needs to improve service quality, the ability and character selection of personnel must be carried out according to standards, and a

series of training should be provided. Improve the quality of courses, continue to introduce high-level talents, and make improvements to the courses.

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