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Development of Quality for Aerobics Gymnastics Competition System

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Abstract

Background and Aim: Aerobic gymnastics is not only one of the scoring events but also one of the sports events that demonstrate difficulty and beauty in skill-oriented categories. From the scoring guidelines, the changes and continuous changes of rules, the scoring basis for aerobic gymnastics judges in the evaluation process is not an accurate numerical value, and the scores are valid within this range. Therefore, this research aims to develop quality indicators for a competitive aerobics competition system.

Materials and Methods: The survey subjects are experts engaged in the field of competitive aerobics research, 6 active aerobics event management personnel within Guangdong Province, 62 competitive aerobics coaches, and 32 competitive aerobics referees, totaling 100. The event management personnel mainly include personnel from the organizer and co-organizer, and the coaches are mainly coaches of the Guangdong Provincial University Competitive Aerobics Team. Referees include international, national, national first, national second, and national third-level referees. This research mainly uses the Delphi method to collect the original data, to build the evaluation index system of decision-making ability in the scoring process of aerobic gymnastics.

Results: Firstly, 6 primary indicators, 18 secondary indicators, and 67 tertiary indicators have been established. Among them, the tangibility and safety in the first level indicators are objective systems in the service system of competitive aerobics competitions. Secondly, the subjective system includes the responsiveness, empathy, and reliability of the quality of competitive aerobics events. The secondary indicators include the quality of competition staff, competition support, and the ability to quickly respond to the demands of participants.

Conclusion: The construction of service quality indicator system for competitive aerobics events are as follows: (1) the rules and regulations of referees, as well as the professional competence and ethics of referees; (2) the quality of competition staff, competition support, and the ability to quickly respond to the demands of participants; and (3) the public nature of the quality of competitive aerobics events.

Keywords: Competitive Aerobics ; Event Quality ; Index System Construction

Introduction

Competitive aerobics is a non-Olympic event and currently has over 30 world champions in China, making it a strong country in aerobics. This not only cultivates an excellent team of athletes and coaches for the country, but also cultivates a series of excellent coaches, and promotes the development of China's competitive aerobics program. Under the guidance of the China Aerobics Association, the competition system of competitive aerobics in China is becoming increasingly perfect, with four station leagues, aerobics championships, and aerobics championships held every year. In each province, there will also be competitions of different scales, with the representative being the annual provincial aerobics championship (Luo, 2012).

Competitive aerobics is not only one of the scoring events but also one of the challenging and aesthetically challenging sports in skill-driven categories. Athletes with strong physique and

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movements are a perfect combination of strength and beauty. The biggest characteristic that distinguishes scoring items from measurable categories, scoring categories, and winning categories is that the referee's scoring process is not based on clear rules, and there is a great deal of subjectivity in the scoring process, which brings certain difficulties to the scoring process. The main trend in the development of rating categories clearly emphasizes the need to strengthen the objectivity of evaluation. Competitive aerobics is one of the representative scoring events. In competitive aerobics competitions, referees mainly evaluate the performance of athletes through three aspects: difficulty, completion, and art. Since 1995, aerobics has officially entered the International Gymnastics Federation, and during this process, the competition rules of aerobics have continuously developed towards standardization, internationalization, systematization, and standardization (Wu, 2019).

In the 13th Five Year Plan for the development of the sports industry in Guangdong Province, it is pointed out that key areas should focus on developing the sports competition and performance industry, encouraging various regions to adopt a model of "government guidance, social participation, and market operation", cultivate sports events with independent brands in our province, create Guangdong's business card, and actively introduce internationally renowned sports events. Utilize the positive spillover effect of sports events and promote the common development of sports events with related industries such as culture, tourism, catering, and infrastructure construction. As a part of the sports performance industry, competitive aerobics competitions have experienced rapid development in recent years. Guangdong Province holds more than ten aerobics competitions of all sizes every year, which are recognized by government departments at all levels. The scale of the competition is constantly expanding, and the number of people is constantly breaking records. It is understood that there are tens of thousands of professional and amateur enthusiasts participating in aerobics competitions in Guangdong Province every year, and the scale and quantity are still increasing. Since 1995, aerobics has officially entered the International Gymnastics Federation, and during this process, the competition rules of aerobics have continuously developed towards standardization, internationalization, systematization, and standardization. The FIG competitive aerobics rules, issued on a four-year basis, have gradually been improved and refined until the 2013 version. The FIG rules for competitive aerobics regulate the scoring criteria for difficulty, completion, and artistic judgment in competitive aerobics. From the scoring guidelines for difficulty, completion, and artistic judgment in various versions of competitive aerobics rules, it can be seen that although the rules are constantly refined, there are still certain problems with the scoring criteria (Sun, 2012). Therefore, it is necessary to develop quality indicators for the competitive aerobics competition system. Based on the characteristics of provincial-level events, local characteristics, limitations, coach composition, and referee composition, a quality indicator system for the development of competitive aerobics competitions is formulated to provide a theoretical basis for the development of provincial-level events. Provide a theoretical reference for the management personnel of competitive aerobics referees.

Objectives

Main objective

To develop quality indicators for a competitive aerobics competition system.

Subsidiary objective

To study the current situation of the competitive aerobics competition system.

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To draft system indicators for competitive aerobics competitions.
To validate metrics through the connoisseurship method.

Literature Review

Current Situation of Competitive Aerobics Competition

Aerobic gymnastics is a sports event that can perform continuous, complex, and high-intensity sets of movements accompanied by music. This sports event originated from traditional aerobic fitness: the complete set of movements must be demonstrated through continuous combinations of movements, demonstrating the flexibility and strength of athletes, diverse combinations of seven types of step movements, and the competitive ability to complete the complete set of movements in combination with difficult movements (He, 2001).

The competition consists of the following events: men's individual IM, women's individual IW, mixed pair MP, three-person TR (with three athletes of any gender), and collective five-person GR (with five athletes of any gender). All competition time is limited to a float of five seconds around 1 minute and 20 seconds. The competition venue must be 10×10 square meters. There are also special regulations for competition clothing, usually tight professional aerobics clothing. The competition has special aerobic gymnastics competition rules, which provide detailed explanations for each specific detail.

The special requirements for movements must include artistry: the requirements for the artistry of a complete set of movements are: full of vitality, creativity, the expression of movement design, and smooth transition movements in aerobics (Li, 2009). The complete set of movements must demonstrate the strength and flexibility of both sides of the body without repeating the same movement. Completion: Any action that is not completed according to the definition of aerobic gymnastics will be penalized. In mixed doubles and three-person (six-person) sets, a maximum of three lifts or support coordination movements are allowed, including the start and end. Difficulty: At least one difficulty action for each type, and the difficulty score will be the total score of the 12 highest difficulty actions.

The complete set of movements must demonstrate the balance between the types of aerobics movements (combinations of high and low movements), style, and difficulty of the movements. The posture requirements for aerobics movements are that the torso is straight, in a straight-line position, the arm and leg movements are powerful, and the appearance is clear. Choreography should make rational use of all space, ground, and air movements. The complete set of movements must include one of the following types of difficulty actions: A dynamic force, B static force, C jump and jump, D flexibility and balance (Dong, et al., 2006).

In summary, it can be seen that aerobic gymnastics is a diverse sports event, and referees need to rate athletes in multiple aspects such as gymnastics, difficulty, music, transitional connection, and expressive power in a short period. The final result is the athlete's performance, indicating the difficulty of referee work in the process of aerobic gymnastics competitions.

Research on the Competition of aerobic gymnastics

The research on aerobic gymnastics events refers to the organization, implementation, and development status of aerobic gymnastics events. The representative literature collected through the current search includes:

Niu (2018) conducted a study on the regional distribution of participating units in typical

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competitions such as China's aerobic gymnastics leagues, championships, and championships in the article "Research on the Regional Distribution of Participating Units in China's aerobic gymnastics Competitions". The results show that the regional distribution of the participating units shows a "ladder" feature. The regions with the largest number of participating units and people are East China and North China, and the overall competitive level of the participating teams in these two regions is relatively high. The number of participants in central China, southern China, and northeast China followed closely, and the overall competitive level of the team was also slightly lower than that in eastern China and North China; The Southwest and Northwest regions have the lowest number of participating units and participants, and the overall competitive level of the team is also the lowest. From this, it can be seen that there is an imbalance in the regional distribution of participating units in aerobic gymnastics in China. It is not difficult to see that the higher the level of competition, the more units and people participate in aerobic gymnastics events, and the higher the overall competitive level.

Cao & Wang (2021) used research methods such as literature review, comparative analysis, and video recording to conduct a profound analysis of the difficulty changes in aerobic gymnastics competition rules in their article "Longitudinal Analysis of Difficulty Changes in aerobic gymnastics Competition Rules". The results indicate that: (1) in aerobic gymnastics competitions, the total number of difficulty shows a decreasing trend; (2) in aerobic gymnastics competitions, the difficulty movements of each group are developing towards balance; (3) the requirements for the quality of movements in aerobic gymnastics competitions are further increasing, and the stable performance of complete sets of difficulty movements has become an important factor for aerobic gymnastics athletes to win in the competition.

Wang (2021) conducted a profound study on the artistic arrangement of mixed doubles events in the 2019 European aerobic gymnastics Championships through literature review, comparative analysis, video analysis, and other related research methods in his article "Analysis of the artistic arrangement of mixed doubles events in the 2019 European aerobic gymnastics Championships". The results indicate that: (1) in terms of music selection, European players usually tend to choose music with national or regional characteristics, with a theme of love; (2) In terms of aerobics movements, European aerobic gymnastics athletes usually create targeted exercises based on their ability level and theme, and the created aerobics movements often have relatively few changes in the rhythm of the exercises; (3) In terms of spatial utilization, European aerobic gymnastics athletes generally prefer the use of forward, left-right, and diagonal lines; (4) In terms of main content, European aerobic gymnastics athletes prefer the use of peer relationships, and rarely use difficult transitional connecting movements in the selection of main content; (5) In terms of artistry, European aerobic gymnastics athletes have very precise emotions and expressions, and their cooperation with their peers is also very tacit, with generally high expressive power.

Zhang, et al., (2017) and others conducted a statistical analysis of the results of the World Aerobics Championships from 2006 to 2016 in their article "Research on the World Pattern and Development Trends of Aerobic Gymnastics - A Comparative Analysis of Results Based on the World Aerobics Championships". Based on the results of the statistical analysis, they analyzed the world pattern and subsequent development trends of aerobic gymnastics. Research has shown that: (1) One of the characteristics of the evolution of the world pattern of aerobic gymnastics is that the monopoly situation of a few countries is gradually broken; (2) The second characteristic of the evolution of the

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world pattern of aerobic gymnastics is that the number of countries participating in the competition, the number of teams entering the final of the World Championships, and the number of teams receiving medals are gradually increasing; (3) The third characteristic of the evolution of the world pattern of aerobic gymnastics is that some countries with less outstanding competitive strength have begun to adopt the direction of single-player events as a breakthrough point for development.

Wang (2018) used research methods such as literature review, interviews, video observation, comparative analysis, and mathematical statistics to study the development trend of the new cycle rules in his article "Development Trends of aerobic gymnastics under the Guidance of the New Cycle Rules (2017-2020)". The results indicate that: (1) the difficult development of aerobic gymnastics has shown diversified characteristics; (2) The new rules have added scoring rules for operational and main content, highlighting the complex and diverse development characteristics of operational and main content; (3) The completion penalty points of the new rules have significantly improved compared to the previous level of rigor, and high-quality completion actions have become a key factor in winning. (4) Lifting holds a very important position in the new rules and is an important trend in future technological development.

Based on the research of experts and scholars mentioned above, it can be concluded that the current research on aerobic gymnastics in China has involved multiple aspects such as the development of aerobic gymnastics projects, sports training, event analysis, and reserve talent cultivation. Among them, there is the most literature on aerobic gymnastics training and event analysis, which is currently a hot topic in the field of aerobic gymnastics research. However, there is relatively little research on the discretion of aerobic gymnastics.

Research on the Competition Rules of Aerobic Gymnastics

Wang (2002) in “Analyzing the Development Trend of aerobic gymnastics and the Countermeasures to be Taken from the Change of Rules”, which was published by Wang Mei, analyzed the competition rules (International Gymnastics Federation) of the 1997 and 2001 editions and concluded that the current aerobic gymnastics set pay more attention to the innovation of movements; Added penalty points for completing your actions; Reduced the number of difficulty actions and upgraded some difficulty groups; Improved the appreciation value of aerobics.

Zou (2011) analyzed the competition rules of aerobic gymnastics in the five cycles of 1994 1996, 1997 2000, 2001 2004, 2005 2008, and 2009 2012 in "Research on the Changing Trends of New and Old Rules of Aerobic Gymnastics". He concluded that international aerobics competitions are becoming increasingly fierce, and with the changes in competition rules, the development of difficult movements tends to be complex and novel.

Sun (2012) "Evolution and Development Trends of FIG aerobic gymnastics Rules", a study was conducted on the rules of aerobic gymnastics from 1994 to 1996, 1997 to 2000, 2001 to 2004, 2005 to 2008, and 2009 to 2012. The conclusion was drawn that the development goal of FIG aerobic gymnastics rules is to specify the development goals of international aerobic gymnastics; The principle pursued by FIG is the fairness of aerobic gymnastics competitions, which will affect the accuracy of the final scoring results of the competition.

Yao (2011) concluded in "Research on the Evolution of aerobic gymnastics Competition Rules" by studying five aerobic gymnastics rules from 1994 to 1996, 1997 to 2000, 2001 to 2004, 2005 to 2008, and 2009 to 2012: the time for complete sets of movements has been shortened, some difficult

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movements have been reduced, and the scoring points have been continuously refined. Every rule modification has its focus, but the dominant factor is always the action elements.

Li (2015) in "Analysis of the Impact of the Implementation of the New Rules on the Collective Five Person Aerobics Project in China", the 2009 and 2013 versions of the rules were used as research blueprints to conclude that there were significant changes in the scoring rules during the 2013-2016 cycle, and more detailed standards were established for the key points of art scoring, completion scoring, and difficulty scoring.

In summary, research on the rules of aerobic gymnastics has achieved some results, and many academic journals and magazines in China have rarely systematically and comprehensively explored the main content of changes in the rules of aerobic gymnastics. Most of the discussions are based on difficulty and art, but there are a few aspects of completion. The scoring basis for aerobic gymnastics judges in the evaluation process is not an accurate numerical value, and the scoring is valid within this range. This phenomenon still exists. Therefore, there is a great deal of subjectivity in the scoring process of aerobic gymnastics referees.

Delphi method

The Delphi method was first proposed by Helmer and Gordon in the 1940s. In 1946, the Rand Corporation of the United States used this method for qualitative prediction to avoid the shortcomings of subjecting authority or blindly obeying the majority in collective discussions. Later, this method was quickly and widely adopted. In the mid-20th century, when the US government insisted on launching the Korean War, the RAND Corporation submitted a prediction report, predicting that the war would be defeated. The government completely failed to adopt it, resulting in a complete defeat. Since then, the Delphi method has been widely recognized. Delphi is an ancient Greek place name. Legend has it that Apollo, the sun god, killed a python in Delphi and became the owner of Delphi. There is an Apollo temple in Delphi, a place of prophecy for the future, so people borrowed this name as the name for this method.

Legend has it that Apollo could foresee the future. Therefore, this prediction method is named the Delphi method. In 1946, Rand Corporation first used this method for prediction, and later it was quickly and widely adopted.

The Delphi method is based on the system's procedures and adopts an anonymous way of expressing opinions, which Medians that experts cannot discuss each other, do not have horizontal connections, and can only have relationships with investigators. Through multiple rounds of investigation, experts' opinions on the questions raised in the questionnaire are repeatedly consulted, summarized, modified, and finally summarized into a consistent opinion of the experts, which is used as the predicted result. This method has broad representativeness and is relatively reliable. Delphi method is an important tool in prediction activities, and in practical applications, it can be divided into three types: classical, policy, and decision Delph (Hou, et al., 2005).

The Delphi method is an expert prediction method developed to overcome the shortcomings of the expert meeting method. In the prediction process, experts do not know each other and do not interact with each other, which overcomes the common drawbacks of expert meetings where experts cannot fully express their opinions and authoritative figures influence the opinions of others. Experts can truly and fully express their predictive opinions.

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Conceptual Framework

The conceptual framework for this research is as follows:

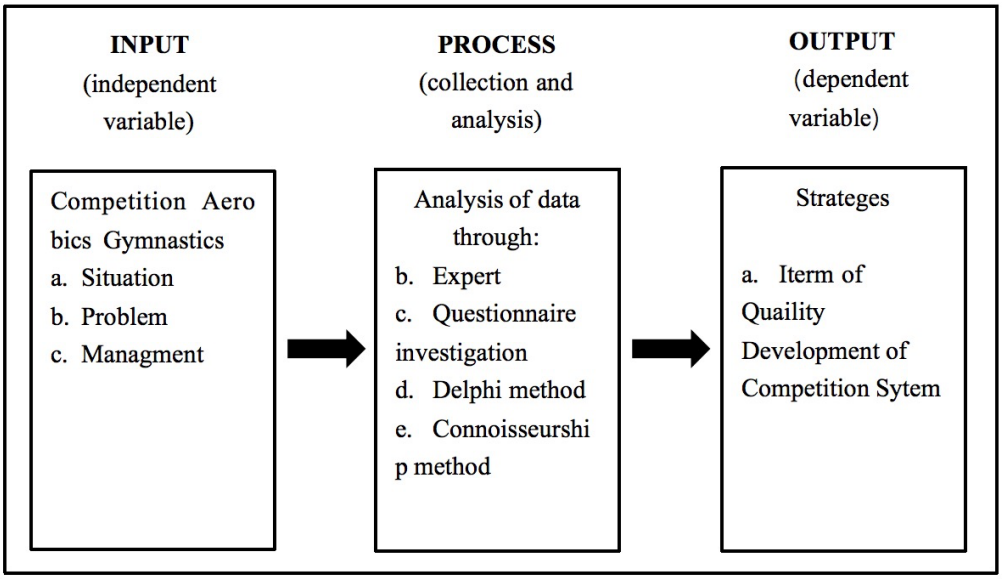

Figure 1 Conceptual framework

Methodology

1. Research Tools

1.1 Literature and Data Method

According to the needs of research content and purpose, this article collects and reads a large number of works, journals, papers, and literature materials related to the development quality of competitive aerobics competition systems, competitive aerobics referees, selection of competitive aerobics referees, and the scoring characteristics of artistic event referees in recent years through CNKI search. It also collects domestic and foreign literature on aerobic gymnastics rules and discretionary power. 4712 articles are searching for the keyword "The quality of the event" on CNKI, 2616 articles searching for the keyword "aerobic gymnastics", and 21 articles using advanced search topics such as "The quality of the event" and "sports". There is currently no research on the relationship between the quality of the event and economic aerobics.

1.2 The Delphi method

Aiming at the construction of the evaluation index system of competitive aerobics discretion, the Delphi method is mainly adopted in this study.

By listening to the opinions of the survey experts on the questions raised in the questionnaire and listening to the opinions of the experts, the results of the three rounds of return visits were finally summarized into the basic consistent opinions of the experts as the prediction results. This method is widely representative and more reliable.

1.3 Questionnaire survey method

To investigate the application of discretion in the scoring process of competitive calisthenics, we will design and distribute an electronic questionnaire through the Questionnaire Star platform. In this study, the front-line referees who refereed the competition were investigated through the

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questionnaire survey method to understand the impact of competitive calisthenics on the quality evaluation index system of the competition. The validity and reliability of the questionnaire will be ensured through the Project Objective Alignment (IOC), assessed by 7 experts.

Population and Sample

Population specification and size

The research object of this study is the research on the discretionary power of aerobic gymnastics. The survey subjects are experts engaged in the field of aerobic gymnastics research and aerobic gymnastics referees within Guangdong Province, including international, national, national first-level, national second-level, and national third-level referees. The qualifications of the selected experts include a professional title of deputy high school or above, a graduate degree or above, and at least 10 years of work experience.

Sample

6 active aerobics event management personnel within Guangdong Province, 62 competitive aerobics coaches, and 32 competitive aerobics referees, totaling 100. The event management personnel mainly include personnel from the organizer and co-organizer, and the coaches are mainly coaches of the Guangdong Provincial University Competitive Aerobics Team. Referees include international, national, national first, national second, and national third-level referees.

Data Collection

This research mainly uses the Delphi method to collect the original data, to build the evaluation index system of decision-making ability in the scoring process of aerobic gymnastics under the discretion.

The first questionnaire: an "open-ended questionnaire" for experts.

The second questionnaire: Design a "Five Level Rating Scale for Discretionary Power of aerobic gymnastics" with 5 options, namely 5 representing "strongly agree", 4 representing "relatively agree", 3 representing "average", 2 representing "relatively disagree", and 1 representing "very disagree".

To develop the quality evaluation index system for competitive aerobics events, I will do the following:

Round 1: Design an open questionnaire for experts, distribute questionnaires to 19 experts, and conduct interviews. The content of the open-ended questionnaire includes an understanding of the quality of competitive calisthenics events, the influencing factors of the quality of competitive aerobics events, etc.

Round 2: By collecting and organizing data from open-ended questionnaire interviews, a five-level rating scale for the quality evaluation index of competitive calisthenics competition was designed.

Round 3: I analyzed the questionnaire data of the experts, fed it back to the experts again, and asked the experts to confirm the analysis results until all the experts agreed with the analysis results, to find out the consistency indicators proposed by the experts, and build an evaluation index system for the quality of competitive aerobics events.

Data Analysis

Based on the purpose and needs of the research, this paper analyzes the statistical results of the data obtained from the questionnaire survey using three methods: percentage, Median, and standard

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deviation. The percentage reflects the proportion of statistical data results, and the average reflects the degree of data concentration; the Standard deviation reflects the degree of dispersion of data.

Results

1. Preliminary draft of quality evaluation index items of competitive aerobics events in China

Through the collation of the literature data, In total, seven articles with strong associations were collected, After sorting out, we found that the following factors have been mentioned, Content coefficient is as follows: site selection, competition category, rules and regulations, referees and technical officials, service platform construction, schedule, scoring system, facilities, medical support, safety and security, promotion and marketing, the ceremony, volunteer management, support, guidance and after evaluation, the staff attitude, staff quality, competition atmosphere construction, protective measures, site comfort, health and cleaning, staff dress, organization reaction ability, public welfare activities, democratic service, service consciousness, auxiliary service, etc.

Table 1: Items of evaluation indexes (preliminary plan)

Level 1 indicator (A)	Level 2 indicator (B)	Level 3 indicator (C)
A1 tangible	The B11 arena environment	C111 of the surrounding ecological environment level
		C112 Air quality
		C113 Noise control
	B12 Sanitary cleaning	C121 site hygiene level
		C122 grandstand sanitary level
		C123 supplies hygiene level
		C124 Convenience of garbage delivery
	B13 staff members dress up	C131 uniform and neat
		C132 Behavior civilization degree
		C133 Language Fluency
	B14 equipment and facilities	C141 channel setting is a scientific
		C142 facilities are comprehensive
		The C143 sound system configuration is professional
		C144 exercise area setting rationality
		C145 fire fighting facilities are reasonable
		C146 Medical security configuration is complete
		The C147 lighting system configuration is professional
	B15 referee rules and	Improvement and suitability of the C151 rule

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Level 1 indicator (A)	Level 2 indicator (B)	Level 3 indicator (C)
	regulations	C152 is assisted by relevant management agencies
		C153 Professional competence level of the referee
		C154 referee
		C 155 Detailed event schedule
	B21 service platform construction	C211 competition registration channels of diversity
		C212 event information release platform diversity
		C213 competition platform development diversity
A2 responsiveness	B22 tissue response capacity	C221 responded positively to the contestants
		The C222 responded quickly to the contestants
		C223 responds accurately to the contestants
		C224's ability to quickly remedy false responses
	B23 event publicity ability	The C231 competition publicity strategy is a scientific
		C232 event publicity channel development ability
		C233 event audio and video data production level
		The C234 event's ability to integrate regional
		Ability to collect behind-the-scenes information on C235
A3 empathy	B31 site comfort level	C311 practices consistency with the playing field
		C312 field temperature control level
		C313 competition venue mobile personnel control ability
		C314 competition field lighting debugging level
		C315 Competition Process Wizard setup
	B32 staff attitude	C321, stick to your post
		C322, work enthusiasm
		C323 Post responsibility
	B33 staff quality	C331 Professional Services
		C332 Efficient service
		C333 for the ability to handle emergencies
	B34 competition atmosphere creation	C341 Competition field decoration design
		C342, Entertainment schedule
		C343, interactive link setting
A4 security	B41 Protective	C411 Safety and Epidemic Prevention Inspection

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Level 1 indicator (A)	Level 2 indicator (B)	Level 3 indicator (C)
	measures	C412 event order maintenance
		C413 Safety emergency measures
		C414 Venue guideboard
	B42 Security personnel	C421 post enthusiasm
		C422 Emergency handling
		C423 Order maintenance capability
		C424 Physical fitness level
		C425 Field familiarity
	B51 event support	C511 Traffic configuration or guidance
		C512 accommodation configuration or guidelines
		C513 Arrange the welcome signs
		C514 Parking Park Services
		C515 to distribute event souvenirs
		C516 business super configuration or guidance
A5 reliability	B52 Public welfare activities	C521 Community national fitness results display
		C522 Sports poverty alleviation activities
		C523 Nursing Home sympathy and other public welfare
	B53 response service	C531 Competition performance professional guidance
		C532 skills promotion and professional services
		C533 Skills exchange and symposium of participants
		C534, competitors, complaint service
	B61 Democratic services	C611 selected different groups at different ages
		C612 The government provides public services for
		C613 gives care to special groups to participate in the
		C614 with diverse public needs
		C615 The relevant departments shall consider the public
A6 Public		C616 service time is accurate and effective
		C617 offers free on-site services
	B62 service awareness	The C621 competition information is open and
		C622 The competition business is simple and easy to
		C623 Online and offline interaction is smooth

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Level 1 indicator (A)	Level 2 indicator (B)	Level 3 indicator (C)
	And B63 ancillary services	C631 Public welfare activities
		C632 ticketing service
		C633 Other services

As can be seen from the above table, 95 valid questionnaires were recovered. Through the calculation results of the mean, standard deviation, variance, range, minimum, and maximum value, the data reflected the central trend and discrete trend of the data, and the small difference indicates the concentrated set of data distribution.

2. Questionnaire reliability test

Table 2: Questionnaire reliability analysis table

Turn	Index level	Number of indicators	Cronbachs α
first round	one-level	6	0.814
	two-stage	20	0.827
	three-level	83	0.831
second round	one-level	6	0.823
	two-stage	19	0.854
	three-level	80	0.866
third round	one-level	6	0.837
	two-stage	18	0.882
	three-level	67	0.904

The internal consistency test of the data obtained through three rounds of expert consultation was conducted, and it was found that the value of the Cronbach α system was above 0.8, indicating that the three rounds of expert consultation questionnaire had good internal consistency.

3. Questionnaire validity test

Table 3： Item-Objective Congruence

Turn	Index level	Number of indicators	IOC
first round	one-level	6	0.714
	two-stage	20	0.721
	three-level	83	0.885
	one-level	6	0.829

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Turn	Index level	Number of indicators	IOC
second round	two-stage	19	0.754
	three-level	80	0.903
	one-level	6	0.877
The third round	two-stage	18	0.782
	three-level	67	0.904

Analyzing the significance and IOC value in the table above table, which indicates that the questionnaire data is suitable for factor analysis, and the IOC value is higher than 0.7, indicating that the questionnaire has good validity.

4. Indicator analysis results

Table 4：Indicator analysis results

	first round		second round		third round	
name of index	Median	I.R.	Median	I.R.	Median	I.R.
Tangible	4.133	1.313	4.067	1.032	4.067	1.325
Reactive mode	4.533	1.275	4.467	1.421	4.333	1.321
Empathy	4.733	1.436	4.800	1.321	4.467	1.112
Safety	3.867	1.023	3.933	1.409	3.600	1.311
Reliability	3.933	1.283	3.867	1.483	3.737	1.421
Public character	4.800	1.232	4.867	1.123	4.867	1.296

5. Connoisseurship

This study established an indicator construction system through 1-3 rounds of the Delphi method. In the early stage, open interviews were conducted with 3 experts in the field of aerobics. In the middle stage, 21 experts in the field of aerobics were used to repair and update the indicators. Finally, 6 primary indicators, 18 secondary indicators, and 67 tertiary indicators were established.

Table 5 Expert Basic Information Table

number	name	sex	professional ranks and titles	position
1	Xu *	Men	professor	Former Director of the Department of Sports Arts at Guangzhou Sport University
2	Du **	Woman	professor	Deputy Director of the Department of Sports Arts at Guangzhou Sport University

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number	name	sex	professional ranks and titles	position
3	Huang **	Woman	professor	Arbitration Committee of Guangdong Province Aerobics Competition

We now invite three additional experts to conduct a final evaluation of the quality evaluation index system for China's competitive aerobics events, and generally recognize the research steps and adjusted and updated indicators for the first three rounds. Among them, Professor Xu Aimei suggested deleting "temperature control level of the competition venue" and "complaint service of participating units". Professor Du Xiru pointed out that the terms "maintenance of competition order" and "safety emergency measures" can be modified.

From this research, 6 primary indicators, 18 secondary indicators, and 67 tertiary indicators have been established. Among them, the tangibility and safety in the first level indicators are objective systems in the service system of competitive aerobics competitions.

Secondly, the subjective system includes the responsiveness, empathy, and reliability of the quality of competitive aerobics events. The secondary indicators include the quality of competition staff, competition support, and the ability to quickly respond to the demands of participants.

Conclusion

This study explores the construction of a service quality indicator system for competitive aerobics events. The following conclusions have been drawn from this study: Firstly, the rules and regulations of referees, as well as the professional competence and ethics of referees, are important factors and indicators that affect the quality of competitive aerobics competitions. Secondly, the quality of competition staff, competition support, and the ability to quickly respond to the demands of participants are all important indicators in the evaluation of the quality of competitive aerobics events, reflecting the ability of event organizers to provide intangible services to participants. Thirdly, the public nature of the quality of competitive aerobics events is the evaluation of event quality at the micro level, which is the most reflective indicator of the social value and mass sports attributes of competitive aerobics events.

Discussion

Taking competitive aerobics events as the research theme, we will explore the quality status of competitive aerobics events in China and help to promote the quality of competitive aerobics events in China. The participants of competitive aerobics events are generally students of primary and secondary schools and universities, so the demand for middle competition is reflected in the connotation of each index. In this research, the structural index of the quality of competitive aerobics events in China is excavated, and the experts and referees participating in competitive aerobics events are investigated and interviewed in-depth, and the specific contents of the quality of competitive aerobics events in China are explored and clarified. Combined with the current situation of competitive aerobics events held in China. Finally, it is possible to create a quality indicator for a competitive aerobics competition system, including 6 primary indicators, 18 secondary indicators, and 67 third indicators. Among these, tangibility and safety serve as objective components within the primary indicators of the competitive

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aerobics competition service system. Secondly, the subjective system encompasses responsiveness, empathy, and reliability concerning the quality of competitive aerobics events. The secondary indicators include the caliber of competition staff, competition support, and promptness in addressing participants' needs. These research results are consistent with Cao & Wang's (2021) research result which indicated that there is a growing emphasis on the quality of movements in aerobic gymnastics competitions, with consistent execution of complete sets of difficult movements emerging as a crucial factor for athletes to succeed in the competition.

Recommendations

1. Mobilize external forces to participate and consolidate the service foundation guarantee.
2. Carry out public welfare and charity activities to establish a good service image.
3. Optimize the physical environment of the event and create high-quality hardware facilities.
4. Promote the construction of balanced services to meet the multi-dimensional demands of the people.

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