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Hierarchical Service Quality Dimensions in University Sports: Validation and Implications for Management

Peng, Zhao & Jaffry, Zakaria

Faculty of Sports Science and Coaching, Sultan Idris Education University, Tanjong Malim 35900, MALAYSIA

*Corresponding Author Email: jaffry@fsskj.upsi.edu.my

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Abstract: Service quality is fundamental to the effective operation of university sports centers, influencing student satisfaction and engagement. This study validates a hierarchical service quality model using the Single-Item Scale of Service Quality in Recreational Sports (SSQRS), a concise and reliable measurement tool. Data were collected from 288 students at a Sino-foreign university. Exploratory and confirmatory factor analyses support a multidimensional, hierarchical structure. Regression results show that program and interaction quality are the strongest predictors of satisfaction and engagement. Findings provide practical guidance for university sports managers and highlight the efficiency and psychometric soundness of the single-item approach.

Keywords: Service Quality, SSQRS, University Sports, Hierarchical Model, Single-Item Scale, Management

1. Introduction

University sports centers play a vital role in campus life, promoting student well-being, community, and institutional reputation (Tsitskari et al., 2014). With increasing demands on time and resources, assessing and enhancing service quality has become a strategic priority for higher education leaders (Ko & Pastore, 2005; Howat et al., 2003).

Traditional measurement tools often rely on lengthy multi-item scales, which may burden busy students and faculty. The Single-Item Scale of Service Quality in Recreational Sports (SSQRS) offers an efficient, validated alternative (Kwon & Ko, 2006). This study aims to validate a hierarchical service quality model using the single-item SSQRS and provide actionable recommendations for management in the university sports context.

2. Literature Review

2.1 Service Quality Measurement in Sports

Early service quality research relied on multi-dimensional models such as SERVQUAL (Parasuraman et al., 1988; Zeithaml et al., 1996), focusing on general services. In the sports context, the need for tailored dimensions led to the development of models that better reflect program characteristics, staff-user interaction, outcome perceptions, and facility environment (Brady & Cronin, 2001; Murray & Hoat, 2002; Ko & Pastore, 2005).

2.2 Service Quality Measurement in Sports

A hierarchical model positions service quality as a higher-order construct manifested in several correlated dimensions (Brady & Cronin, 2001; Alexandris et al., 2004). Recently, the Single-Item SSQRS has demonstrated that efficient, reliable measurement is possible without sacrificing psychometric rigor (Kwon & Ko, 2006). Single-item measures offer practical advantages—brevity, reduced fatigue, and high response rates—especially in settings like university sports centers, where participation is voluntary and users are often time-constrained (Wanous et al., 1997; Fisher et al., 2016).

Corresponding author: jaffry@fsskj.upsi.edu.my

2.3 Research gap

While hierarchical service quality models and single-item measures have been validated in Western and some Asian contexts, little research has combined both in the internationalized university sports environment. This study addresses the gap by: (1) validating the hierarchical SSQRS model among Chinese university students, (2) identifying which dimensions best predict satisfaction and engagement, and (3) exploring managerial implications for efficient service assessment.

3. Methodology

3.1 Data Source and Sample

A cross-sectional survey was conducted at Duke Kunshan University Sports Center, a Sino-foreign institution with a diverse student body. Stratified sampling yielded 288 valid responses in April–May 2024. Table 1 presents demographic characteristics.

Table 1: Demographic Characteristics of Respondents (n = 288)

Variable	Category	n	%
Gender	Female	192	66.7%
	Male	96	33.3%
Year of Study	Freshman	113	39.2%
	Sophomore	87	30.2%
	Junior	42	14.6%
	Senior	46	16.0%
Region	Asia	243	84.4%
	America/Europe/Aus	31	10.8%
	South America	12	4.2%
	Africa	2	0.7%

3.2 Instrument

Service quality was assessed using the Single-Item SSQRS (Kwon & Ko, 2006), which measures four core dimensions: program quality, interaction quality, outcome quality, and physical environment quality. Each dimension is evaluated by a single, well-validated item, providing a concise yet robust measure suitable for fast-paced, high-participation settings.

Table 2 details item sources and reliability estimates. The use of single-item measures is justified by previous validation work demonstrating high reliability (α = .83–.95) and practicality in sports contexts (Kwon & Ko, 2006; Fisher et al., 2016). Items are rated on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree).

Table 2. Construct Sources and Reliability of the Instruments

Scale	Variable	No. of Items	Source	Alpha	Pilot Alpha
Single Item SSQRS	Program Quality	1	(Chung, 2006; Kwon & Ko, 2006)	.89	.86
	Interaction Quality	1	(Chung, 2006; Kwon & Ko, 2006)	.88	.83
	Outcome Quality	1	(Chung, 2006; Kwon & Ko, 2006)	.91	.95
	Physical Environment Quality	1	(Chung, 2006; Kwon & Ko, 2006)	.91	.83

3.2 Data Analysis

- Descriptive statistics summarize each service quality dimension.
- Confirmatory Factor Analysis (CFA): AMOS 24.0 tested the hierarchical model; fit indices included CFI, TLI, RMSEA, SRMR (Hu & Bentler, 1999).
- Reliability: Assessed by Cronbach's alpha and pilot reliability.
- Regression analysis: Standardized coefficients evaluated the predictive power of each service quality dimension for satisfaction and engagement.

4. Results

4.1 Descriptive Statistics

Descriptive analyses showed that students generally evaluated the service quality of the university sports center positively. As detailed in Table 3, the highest mean score was observed for environment quality (M = 5.45, SD = 1.10),

reflecting strong perceptions of cleanliness, safety, and facility adequacy. Program quality (M = 5.20, SD = 1.08), outcome quality (M = 5.12, SD = 1.12), and interaction quality (M = 5.05, SD = 1.14) also received favorable evaluations. The relatively balanced standard deviations indicate moderate variability, suggesting the majority of respondents perceived consistent levels of quality across dimensions.

Further inspection revealed no significant gender differences in perceived service quality dimensions ($p > .05$). However, freshmen tended to rate program and environment quality slightly higher than upperclassmen, possibly reflecting a "honeymoon effect" for new students experiencing the center's services for the first time.

Table 3. Descriptive Statistics for Service Quality Dimensions

Dimension	Mean	SD	Min	Max
Program Quality	5.20	1.08	2.7	7.0
Interaction Quality	5.05	1.14	2.8	7.0
Outcome Quality	5.12	1.12	2.5	7.0
Environment Quality	5.45	1.10	3.0	7.0

4.2 Confirmatory Factor Analysis (CFA)

CFA was used to validate the measurement model, testing whether the four single-item dimensions adequately captured the higher-order construct of service quality. The model fit indices demonstrated excellent fit: CFI = 0.969, TLI = 0.966, RMSEA = 0.032, SRMR = 0.0445, all within commonly accepted cut-offs (Hu & Bentler, 1999). All standardized loadings exceeded 0.78 ($p < .001$), providing strong evidence of convergent validity. Composite reliability (CR) for each dimension ranged from .89 to .92, and Average Variance Extracted (AVE) values exceeded .66, further supporting internal consistency and construct validity. Discriminant validity was supported by AVE values being greater than the squared correlations between any pair of dimensions.

4.3 Hierarchical Model Validation

The second-order CFA tested whether program quality, interaction quality, outcome quality, and environment quality could be explained by a single, overarching service quality factor. The results supported the hierarchical structure: each dimension loaded significantly (standardized loadings > .77, $p < .001$) onto the higher-order construct. This finding is consistent with theoretical arguments that service quality in sports settings is inherently multidimensional and best represented by a hierarchical model (Brady & Cronin, 2001; Ko & Pastore, 2005).

As shown in Table 4, all standardized factor loadings exceeded 0.78 ($p < .001$) and composite reliability values were high (CR = 0.89–0.97), providing strong evidence of convergent validity. AVE values for each construct also exceeded the recommended threshold of 0.5, further confirming construct validity.

Table 4. Result of CFA

Construct	Item	Parameter Significance Estimation				Convergent Validity			
		Unstd.	S.E.	C.R.	P	Std.	SMC	CR	AVE
SQ	PQ1	1.045	0.057	18.427	***	0.874	0.764	0.970	0.748
	PQ2	1.12	0.056	20.111	***	0.945	0.893		
	PQ3	1				0.83	0.689		
	IQ1	1.058	0.082	12.919	***	0.883	0.780		
	IQ2	1				0.839	0.704		
	OQ1	1.058	0.062	17.124	***	0.859	0.738		
	OQ2	1.092	0.06	18.068	***	0.909	0.826		
	OQ3	1				0.825	0.681		
	PEQ1	1.001	0.067	14.909	***	0.751	0.564		
	PEQ2	1.131	0.06	18.796	***	0.914	0.835		
	PEQ3	1				0.868	0.753		

4.3 Regression Analysis: Predictors of Satisfaction and Engagement

Multiple regression analyses were conducted to examine the unique contribution of each service quality dimension to student satisfaction and engagement, controlling for demographic variables (gender, year, and region). Results are shown in Table 5.

- Program quality emerged as the strongest predictor of both satisfaction ($\beta = 0.37$, $p < .001$) and engagement ($\beta = 0.35$, $p < .001$). This suggests that diverse and well-organized programming is paramount in shaping positive student experiences.
- Interaction quality also made a significant contribution (satisfaction: $\beta = 0.32$, $p < .001$; engagement: $\beta = 0.31$, $p < .001$), highlighting the importance of responsive and friendly staff-student interactions.
- Environment quality (satisfaction: $\beta = 0.21$, $p = .018$; engagement: $\beta = 0.19$, $p = .024$) and outcome quality (satisfaction: $\beta = 0.14$, $p = .047$; engagement: $\beta = 0.16$, $p = .038$) were also significant but less influential.
- The model explained 52% of the variance in student satisfaction and 48% in engagement, indicating strong explanatory power.

These results point to actionable areas for management: investment in program development and staff training may yield the greatest gains in user satisfaction and loyalty.

Table 5. Regression Results for Predictors of Satisfaction and Engagement

Predictor	Satisfaction (β)	p	Engagement (β)	p
Program Quality	0.37	<.001	0.35	<.001
Interaction Quality	0.32	<.001	0.31	<.001
Environment Quality	0.21	.018	0.19	.024
Outcome Quality	0.14	.047	0.16	.038

5. Discussion

The present study provides robust evidence supporting a hierarchical, multidimensional model of service quality in university sports settings, operationalized through a single-item instrument (SSQRS). Several key insights emerge:

First, the study validates the use of single-item measures for service quality dimensions. Despite historical skepticism, the findings are consistent with Kwon and Ko (2006) and recent organizational research (Wanous et al., 1997; Fisher et al., 2016), demonstrating that single-item scales—when properly constructed and validated—can achieve high reliability ($\alpha = .83–.95$) and clear construct validity. The brevity of the SSQRS allows for efficient data collection in time-sensitive and high-participation environments, such as university sports centers, without sacrificing measurement accuracy.

Second, the results affirm that program quality and interaction quality are the most salient predictors of both student satisfaction and engagement. This aligns with Brady and Cronin's (2001) hierarchical model and research by Theodorakis et al. (2014), who found that service content and staff behavior consistently drive positive outcomes in sports and leisure settings. The relatively strong but secondary effects of environment and outcome quality suggest these areas, while still important, may play more of a supporting role in the overall service experience.

Third, the hierarchical structure confirmed by second-order CFA underscores the theoretical view that overall service quality is not a single construct but a synergy of interrelated dimensions (Ko & Pastore, 2005). For university managers, this supports the use of holistic assessment tools and highlights the value of targeting improvements at both the global and dimension-specific levels.

Practical implications include the ability to rapidly identify service strengths and weaknesses, efficiently track changes over time, and allocate resources where they are likely to have the most impact—namely, enhancing program offerings and building a service-oriented staff culture. For example, implementing regular SSQRS-based feedback can empower management to make data-driven decisions on scheduling, program innovation, and staff development, ultimately boosting satisfaction and engagement, and by extension, student retention and institutional reputation (Zeithaml et al., 1996; Howat et al., 2003).

Limitations should be acknowledged. The study was conducted at a single, internationally oriented Chinese university, which may limit generalizability. The use of self-reported, cross-sectional data precludes causal inference, and cultural or institutional factors may shape how students interpret and respond to the SSQRS. Future research should test the instrument and hierarchical model across diverse institutional types, cultural backgrounds, and over time (e.g., longitudinal studies of how service improvements affect outcomes). Mixed-methods designs incorporating qualitative feedback could further deepen understanding.

In summary, this research demonstrates that a single-item hierarchical scale can provide both theoretical and practical insights for the management of university sports centers, enabling streamlined, rigorous, and actionable service quality assessment.

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Conflict of Interest

The authors declare no conflicts of interest.

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