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Research on Travel Happiness of Elderly People in Regular Public Transport

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Abstract

With the advent of an aging society, the travel needs of the elderly have garnered increasing attention. This study aims to explore the measurement of happiness in elderly people's regular bus travel and its influencing factors. The research employs a mixed-methods approach combining qualitative and quantitative analysis, utilizing questionnaire surveys to collect relevant data and construct a conceptual model of happiness in elderly people's regular bus travel. The study confirms the validity of the second-order relationships and the conceptual model, demonstrating that the five dimensions of service quality significantly impact travel emotions. Convenience, comfort, and safety have a significant effect on travel satisfaction, while reliability and attentiveness do not show a significant impact on satisfaction.

Keywords

Travel Well-being; Elderly Bus Travel; Quality Service; Structural Equation Model(SEM).

1. Introduction

In recent years, with the rapid growth of the elderly population, the transportation patterns of the elderly have undergone changes, making them one of the primary service targets of urban public transportation systems. The travel characteristics and patterns of the elderly differ from those of regular public transport users, and research on the travel happiness of the elderly has become a key focus in the study of public transport happiness [1]. To ensure that the elderly receive preferential services in an aging society and to make their travel more convenient and safe, it is necessary to study the happiness of elderly bus travel from the perspective of their perception of bus service quality.

Research on travel happiness began earlier in foreign countries. Chen et al. categorized the types of subjective well-being, with travel happiness being a part of subjective well-being, encompassing both cognitive and emotional dimensions [2]. Singleton, P.A., through survey results, found that the travel happiness of vulnerable groups is relatively low, while those who are physically healthy and have flexible working hours tend to have higher travel happiness [3]. Zhu, J. et al., using questionnaire surveys, discovered that direct factors affecting travel happiness include travel time and travel mode, with longer travel times correlating with lower happiness [4]. Foreign researchers have also proposed scientifically validated scales for measuring travel happiness. Patrick A. Singleton, through the analysis of survey results from 680 travelers, proposed a four-factor measurement model, including travel safety, traveler health, traveler ability level, and traveler emotions [5]. Ettema D. introduced the STS travel happiness scale, dividing the questions into emotional and cognitive parts [6]. In contrast, domestic researchers mostly use Likert scales to measure travelers' happiness.

Current research on elderly travel focuses on the characteristics of the elderly themselves and their travel environment [7][8]. The choice of travel mode for the elderly is influenced by family conditions [9], and elderly individuals without private cars are more inclined to use public transportation [10]. Personal economic status also significantly impacts elderly travel. Oña,

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through a study on factors influencing travel among residents of Rome, found that higher-income travelers are far less satisfied with public transportation compared to lower-income travelers [11]. Hahn discovered that elderly individuals with higher household incomes are more willing to travel and have greater freedom in choosing their travel modes compared to those with lower incomes [12]. The travel environment is closely related to elderly travel. Wei Wei's research on the accessibility of elderly travel found that the travel environment significantly affects the frequency of elderly travel, with steeper and more complex terrains reducing travel convenience for the elderly [13]. Böcker's research showed that the elderly have lower tolerance for high temperatures compared to younger individuals, while low temperatures have little impact on their travel. Weather significantly affects the travel time and mode of the elderly, especially during high temperatures, when they prefer to stay indoors [14]. In terms of travel happiness models, Ji Yanjie investigated travelers' satisfaction with tram services and established a structural equation model to explore influencing factors [15]. Shao Yuan, based on mobile phone observation data, studied the impact of various factors on the travel happiness of typical traveler groups [16]. Song Rongqiu surveyed the factors influencing urban workers' travel and established an ordered Probit model to study the relationship between these factors and economic and social attributes [17].

2. Questionnaire Design and Surve

Table 1. investigation content

Module	Questionnaire Content
Personal and Family Attributes	Gender, income, type of work, elderly card, physical health status, health code for travel
Travel Attributes	Purpose of travel, travel time period, travel duration, travel companions, activities during the trip, walking distance, travel frequency
Service Quality Attributes	Convenience, comfort, reliability, attentiveness, safety
Travel Happiness Attributes	This trip was the worst experience (1) – This trip was the best experience (5)
	The quality of this trip was very poor (1) – The quality of this trip was very high (5)
	This trip was not smooth (1) – This trip was very smooth (5) Felt stressed during the trip (1) – Felt calm and composed (5)
	Felt time pressure during the trip (1) – Felt relaxed about the travel time (5)
	Worried about not arriving on time (1) – Confident about arriving on time (5)
	Felt tired during the trip (1) – Felt energetic during the trip (5)
	Felt bored during the trip (1) – Felt entertained during the trip (5)
	Found the trip unbearable (1) – Enjoyed the trip (5)

The questionnaire in this study primarily covers the following four aspects.Personal Economic Attributes of the Elderly:This section investigates six indicators: gender, monthly income, employment status, health status, possession of an elderly card, and whether a health code is required during travel.Attributes of Elderly Bus Travel:This section focuses on the purpose of bus travel, travel time period, travel duration, travel frequency, walking distance, travel companions, and activities conducted during the trip.Perceived Service Quality of Bus Travel by the Elderly:This includes 20 measurement items across five dimensions: convenience, comfort, reliability, attentiveness, and safety. The questionnaire uses a five-point Likert scale, where the five levels of satisfaction—"very satisfied, somewhat satisfied, neutral, dissatisfied, very dissatisfied"—are assigned values of 5, 4, 3, 2, and 1, respectively.Travel Happiness:This section includes nine measurement items across two dimensions: cognitive satisfaction and travel emotions. The questionnaire design also employs a five-point scale.

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This study involves seven latent variables: "convenience," "comfort," "reliability," "attentiveness," "safety," "cognitive satisfaction," and "travel emotions." The first five variables represent the perceived service quality of regular bus travel by the elderly. These seven variables are latent and cannot be directly observed or measured; they require multiple observable variables to reflect them comprehensively. Therefore, based on mature scales from existing research, the seven latent variables are divided into dimensions and measured using observable variables. The relevant measurement variables are shown in Table 1.

2.1. Measurement Items of Perceived Service Quality

Perceived service quality includes five dimensions: reliability, convenience, comfort, attentiveness, and safety. These five latent variables can only be reflected through observable variables, as they cannot be directly observed or measured. Therefore, when dividing the dimensions of these five indicators, this study relies on mature scales with high reference value and uses observable variables for measurement, ultimately forming the final questionnaire. The questionnaire adopts the scoring method of the five-point Likert scale, with "very dissatisfied," "dissatisfied," "neutral," "satisfied," and "very satisfied" as the standard values for evaluating service quality indicators, assessed in ascending order. The specific measurement indicators are shown in Table 2.

Table 2. Measurement Items of Perceived Service Quality

Primary Indicator	Secondary Indicator	Questionnaire Item
Convenience	A1	Convenience of transferring to other transportation modes
	A2	Convenience of reaching/leaving the bus stop
	A3	Convenience of accessing bus travel information
	A4	Convenience of boarding/alighting the bus
Comfort	B1	Waiting environment at the bus stop
	B2	Crowding level at the bus stop
	B3	Crowding level inside the bus
	B4	Duration of standing inside the bus
	B5	Condition of the bus
	B6	Temperature and cleanliness inside the bus
Reliability	C1	Waiting time at the bus stop
	C2	Standardization of bus arrival and stopping
	C3	Punctuality of the bus in reaching the destination
Attentiveness	D1	Service attitude of the driver
	D2	Level of care for vulnerable groups
	D3	Accessibility of feedback channels for the elderly and responsiveness of the bus company
	D4	Availability of barrier-free facilities
Safety		Smoothness of bus operation
	E2	Satisfaction with epidemic prevention measures on the bus
	E3	Safety of the driver's operation

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2.2. Measurement Items of Travel Happiness

Travel happiness reflects the internal psychological state of individuals during their travel. The measurement of travel happiness primarily adopts the STS scale developed by Ettema et al., which includes two dimensions: cognitive satisfaction and emotional experience. This study focuses on the relationship between the service quality of elderly bus travel and their travel happiness. Given the significant differences in physiological and psychological aspects between the elderly and adults, as well as the limited cognitive level of the elderly regarding travel happiness, it is essential to develop a scale specifically tailored to measure the travel happiness of elderly bus users. This will better serve the elderly and enhance their travel happiness. Therefore, based on the STS scale, this study translates and appropriately adjusts it to generate measurement items for travel happiness, as shown in Table 3. Respondents can evaluate their level of agreement using a five-point scale.

Table 3. Travel Happiness Measurement Items

Measurement Dimension	Negative — Positive
Cognitive Indicators	This bus trip was the worst experience — This bus trip was the best experience
	The quality of this bus trip was very poor — The quality of this bus trip was very high
	This bus trip was not smooth — This bus trip was very smooth
Emotional Indicators	Felt stressed during this bus trip — Felt calm and composed
	Felt time pressure during this bus trip — Felt relaxed during the trip
	Worried about not arriving on time — Confident about arriving on time
	Felt tired during this bus trip — Felt energetic during the trip
	Felt bored during this bus trip — Felt entertained during the trip
	Found this bus trip unbearable — Enjoyed this bus trip

3. Model Construction

3.1. Structural Equation Model (SEM)

The Structural Equation Model (SEM), also known as "covariance structure analysis," uses the covariance matrix of variables to analyze the relationships between variables. It mainly consists of two parts: the measurement model and the structural model.

The measurement model consists of latent variables and observed variables, used to measure the relationship between these two types of variables. The equations for the measurement model are:

$$x = \Lambda_x \xi + \varepsilon_x \quad (1)$$

$$y = \Lambda_y \eta + \varepsilon_y \quad (2)$$

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Where: x : Vector of exogenous observed variables; Λ_x : Factor loading matrix of exogenous observed variables on exogenous latent variables; ε_x : Vector of error terms for exogenous variables; y : Vector of endogenous observed variables; Λ_y : Factor loading matrix of endogenous observed variables on endogenous latent variables; ε_y : Vector of error terms for endogenous variables.

The structural model represents the structural relationships between latent variables. The equation for the structural model is:

$$\eta=\mathrm{B}\eta+\Gamma\xi+\varsigma \tag{3}$$

Where: η : Vector of endogenous latent variables; ξ : Vector of exogenous latent variables; B : Path coefficients between endogenous latent variables, representing their mutual influence; Γ : Path coefficients between exogenous and endogenous latent variables, describing the influence of exogenous latent variables on endogenous latent variables; ς : Vector of error terms for latent or endogenous variables.

3.2. Model of Service Quality, Satisfaction, and Emotional Relationship

Service quality may influence travel satisfaction and travel emotions, but its impact on travel happiness remains unclear. Therefore, this study first examines the relationship between perceived service quality and travel satisfaction and emotions. If the results are significant, further analysis will explore the relationship between service quality and travel happiness. Based on the establishment of the structural equation model, the definition of the indicator system, and relevant literature reviews, the following hypotheses are proposed regarding the impact of the five dimensions of perceived service quality on travel satisfaction and emotions among elderly bus users:

(1) Perceived Service Quality and Travel Satisfaction

H1: "Convenience of urban conventional buses" has a positive impact on "elderly travel satisfaction.";H2: "Comfort of urban conventional buses" has a positive impact on "elderly travel satisfaction.";H3: "Reliability of urban conventional buses" has a positive impact on "elderly travel satisfaction.";H4: "Attentiveness of urban conventional buses" has a positive impact on "elderly travel satisfaction.";H5: "Safety of urban conventional buses" has a positive impact on "elderly travel satisfaction."

(2) Perceived Service Quality and Travel Emotions

H6: "Convenience of urban conventional buses" has a positive impact on "elderly travel emotions.";H7: "Comfort of urban conventional buses" has a positive impact on "elderly travel emotions.";H8: "Reliability of urban conventional buses" has a positive impact on "elderly travel emotions.";H9: "Attentiveness of urban conventional buses" has a positive impact on "elderly travel emotions.";H10: "Safety of urban conventional buses" has a positive impact on "elderly travel emotions."

(3) Cognitive Satisfaction and Travel Emotions

H11: "Elderly travel emotions" have a positive impact on "elderly travel satisfaction."

The path coefficients for the five dimensions of service quality (convenience, comfort, reliability, attentiveness, and safety) on travel satisfaction and emotions among elderly bus users are shown in Table 4.

From Table 4, the path coefficient results can be observed. Convenience ($b=0.192$, $p<0.001$), comfort ($b=0.118$, $p<0.01$), and safety ($b=0.216$, $p<0.001$) significantly affect satisfaction. Reliability and attentiveness do not have a significant impact on satisfaction.

Convenience ($b=0.097$, $p<0.05$), comfort ($b=0.119$, $p<0.05$), reliability ($b=0.138$, $p<0.01$), attentiveness ($b=0.161$, $p<0.001$), and safety ($b=0.098$, $p<0.05$) significantly affect emotions.

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Emotions (b=0.485, p<0.001) significantly affect satisfaction. The following conclusions can be drawn:

Table 4. Analysis of Standard Coefficients of Hypothetical Path Relationships

Path			Non-Standardized	S.E.	C.R.	P	Standardized
Emotions	<---	Convenience	0.106	0.049	2.156	0.031	0.097
Emotions	<---	Comfort	0.137	0.053	2.589	0.010	0.119
Emotions	<---	Reliability	0.150	0.051	2.933	0.003	0.138
Emotions	<---	Attentiveness	0.174	0.051	3.408	***	0.161
Emotions	<---	Safety	0.101	0.039	2.567	0.010	0.098
Satisfaction	<---	Convenience	0.191	0.040	4.747	***	0.192
Satisfaction	<---	Comfort	0.124	0.043	2.896	0.004	0.118
Satisfaction	<---	Reliability	-0.009	0.041	-0.208	0.835	-0.009
Satisfaction	<---	Attentiveness	-0.025	0.041	-0.604	0.546	-0.025
Satisfaction	<---	Safety	0.204	0.033	6.170	***	0.216
Satisfaction	<---	Emotions	0.444	0.035	12.601	***	0.485

1. The convenience, comfort, and safety of bus services have a direct and significantly positive impact on the travel satisfaction of elderly bus users. Therefore, H1, H2, and H5 are supported, while H3 and H4 are not supported.
2. The convenience, comfort, reliability, attentiveness, and safety of bus services have a direct and significantly positive impact on the travel emotions of elderly bus users. Therefore, H6, H7, H8, H9, and H10 are supported.
3. The travel emotions of elderly bus users have a direct and positive impact on travel satisfaction. Therefore, H11 is supported.

In conclusion, the service quality of urban conventional buses significantly affects the travel emotions of elderly passengers and, to some extent, their travel satisfaction. Moreover, the impact of service quality on satisfaction is mediated through travel emotions.

Model of Service Quality, Satisfaction, and Emotional Relationship

3.3. Relationship Model Between Service Quality and Bus Travel Happiness

Previous findings have confirmed the significant impact of perceived service quality on travel satisfaction and emotions among elderly bus users. Since travel happiness can be represented by the two latent variables of travel satisfaction and travel emotions, a model of urban conventional bus travel happiness for the elderly based on service quality is established. The following hypotheses are proposed:

- **M1**: Convenience positively affects travel happiness.
- **M2**: Comfort positively affects travel happiness.
- **M3**: Reliability positively affects travel happiness.
- **M4**: Attentiveness positively affects travel happiness.
- **M5**: Safety positively affects travel happiness.

3.4. Calculation of Travel Happiness

The path coefficient relationships of the second-order confirmatory model are transformed into corresponding mathematical expressions. First, the variables are defined: Y, Z1, and Z2 represent travel happiness, satisfaction, and emotions, respectively. The results are as follows:

$$O1 = 0.79Z1,\quad O2 = 0.83Z1,\quad O3 = 0.82Z1 \tag{4}$$

$$P1 = 0.82Z2,\quad P2 = 0.80Z2,\quad P3 = 0.81Z2 \tag{5}$$

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Table 5. Analysis of the Standardized Coefficients of Service Quality and Travel Happiness

Path			Non-Standardized	S.E.	C.R.	P	Standardized
Travel Happiness	<---	Convenience	0.206	0.042	4.875	***	0.234
Travel Happiness	<---	Comfort	0.178	0.045	3.937	***	0.191
Travel Happiness	<---	Reliability	0.090	0.043	2.099	0.036	0.103
Travel Happiness	<---	Attentiveness	0.094	0.043	2.192	0.028	0.108
Travel Happiness	<---	Safety	0.213	0.035	6.132	***	0.255
Satisfaction	<---	Travel Happiness	1.000				0.883
Emotions	<---	Travel Happiness	0.862	0.072	11.952	***	0.697
A4	<---	Convenience	1.000				0.808
A3	<---	Convenience	0.885	0.040	22.001	***	0.703
A2	<---	Convenience	1.116	0.038	29.424	***	0.889
A1	<---	Convenience	1.032	0.038	27.307	***	0.832
B6	<---	Comfort	1.000				0.715
B5	<---	Comfort	1.112	0.048	23.324	***	0.826
B4	<---	Comfort	1.082	0.047	23.246	***	0.823
B3	<---	Comfort	1.080	0.047	22.867	***	0.810
B2	<---	Comfort	1.103	0.047	23.257	***	0.824
B1	<---	Comfort	1.004	0.047	21.493	***	0.761
C3	<---	Reliability	1.000				0.832
C2	<---	Reliability	0.834	0.043	19.230	***	0.642
C1	<---	Reliability	1.055	0.042	25.175	***	0.872
D4	<---	Attentiveness	1.000				0.800
D3	<---	Attentiveness	0.972	0.039	25.008	***	0.810
D2	<---	Attentiveness	0.934	0.040	23.370	***	0.764
D1	<---	Attentiveness	0.954	0.039	24.256	***	0.788
F3	<---	Safety	1.000				0.816
F2	<---	Safety	0.841	0.050	16.744	***	0.682
F1	<---	Safety	0.894	0.053	17.024	***	0.707
O1	<---	Satisfaction	1.000				0.784
O2	<---	Satisfaction	1.008	0.041	24.506	***	0.831
O3	<---	Satisfaction	1.007	0.041	24.317	***	0.823
P1	<---	Emotions	1.000				0.818
P2	<---	Emotions	0.962	0.036	26.530	***	0.802
P3	<---	Emotions	0.973	0.036	26.793	***	0.807
P4	<---	Emotions	0.960	0.037	25.641	***	0.782
P5	<---	Emotions	0.889	0.038	23.695	***	0.736
P6	<---	Emotions	0.800	0.039	20.424	***	0.655

Note: *** indicates $P < 0.001$, ** indicates $P < 0.01$, * indicates $P < 0.05$.

From the table, the path coefficient results can be observed. Convenience ($b = 0.234$, $p < 0.001$), comfort ($b = 0.191$, $p < 0.001$), reliability ($b = 0.103$, $p < 0.05$), attentiveness ($b = 0.108$, $p < 0.05$), and safety ($b = 0.255$, $p < 0.001$) significantly affect travel happiness. Based on the model results, the theoretical hypotheses are validated as follows:

- Convenience positively affects travel happiness; thus, hypothesis M1 is supported.
- Comfort positively affects travel happiness; thus, hypothesis M2 is supported.
- Reliability positively affects travel happiness; thus, hypothesis M3 is supported.
- Attentiveness positively affects travel happiness; thus, hypothesis M4 is supported.
- Safety positively affects travel happiness; thus, hypothesis M5 is supported.

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$$P4 = 0.78Z2,\quad P5 = 0.74Z2,\quad P6 = 0.65Z2 \tag{6}$$

Therefore, the perceived service quality of the elderly significantly and positively affects their bus travel happiness.

$$Z1 = 0.81Y,\quad Z2 = 0.76Y \tag{7}$$

By calculating the above formulas, the following expressions are obtained:

$$Z1 = 0.343O1 + 0.326O2 + 0.330O3 \tag{8}$$

$$Z2 = 0.155P1 + 0.159P2 + 0.156P3 + 0.163P4 + 0.172P5 + 0.195P6 \tag{9}$$

$$Y = 0.484Z1 + 0.516Z2$$

In elderly bus travel, emotions have a relatively large impact on travel happiness. Among the three indicators of bus travel satisfaction, the differences in their influence are not significant. However, the experience indicator (O1) has a relatively greater impact. Among the emotional indicators, the "endurance-enjoyment" process (P6) significantly affects elderly travel emotions, while the "stress-calm" indicator (P1) has a smaller impact.

4. Conclusion

This study focuses on the elderly as a special group, exploring their perception of bus service quality and the composition of travel happiness, and establishes a theoretical model. Using elderly individuals aged 60 and above in Chongqing as the research subjects, exploratory and confirmatory factor analyses were conducted to confirm that travel satisfaction and emotions can be used to measure travel happiness. A structural equation model was then applied to study the relationship between service quality and travel happiness, and a travel happiness model was constructed. Based on the above research, the following conclusions are drawn:

1. The relationship between elderly bus travel happiness, travel satisfaction, and travel emotions was validated. Travel satisfaction and emotions were confirmed as two sub-dimensions of travel happiness, used to measure travel happiness.
2. The relationship between elderly bus travel service quality, travel satisfaction, and travel emotions was validated. The results show that all five dimensions of service quality significantly affect travel emotions, while convenience, comfort, and safety significantly affect travel satisfaction. However, reliability and attentiveness do not significantly affect travel happiness.
3. The relationship between elderly bus travel service quality and travel happiness was validated. The results indicate that all five dimensions of service quality significantly affect travel happiness. Among these, the convenience of accessing bus information, the waiting environment at bus stops, air quality inside buses, the standardization of bus stops, barrier-free facilities, care for vulnerable groups, satisfaction with epidemic prevention measures, and driving smoothness have relatively lower impacts on travel happiness.

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