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Comparative Study of Cultural Landscape Perception in Historic Districts from the Perspectives of Tourists and Residents

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Abstract: From a human-centric perspective, improving the spatial quality of historical districts is a key focus in achieving their refined governance. Based on a public survey performed in Zhangzhou Ancient City, we explored the differences in the perception of cultural landscape genes (CLGs) between residents and tourists with different individual characteristics, utilizing non-parametric tests and box-plot analysis methods. The findings indicate the following: Tourists have a stronger perception of CLGs related to site layout and architectural features than residents, while residents have a stronger perception of cultural customs. Gender-related differences in the perception of CLG are only significant among tourists, with females showing a higher level of CLG perception than males. Residents of different age groups show a "U-shaped" distribution in their perception of CLGs related to site layout, whereas senior tourists have a lower cognitive perception level. People with lower educational backgrounds among residents tend to perceive cultural customs more significantly, whereas tourists with diverse educational backgrounds do not perceive them as having a significant impact. Residence location, visit frequency, duration of residence, and residence nature are key positive factors affecting the perception of CLGs. Our study highlights the significance of considering the users' characteristics in enhancing the refined governance of historical districts.

Keywords: cultural landscape gene; human-centric perspective; individual factors; historic district; distinctiveness

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1. Introduction

In the context of Goal 11 of the United Nations 2030 Agenda for Sustainable Development Goals (SDGs), UNESCO emphasizes the importance of achieving "inclusive, safe, resilient, and sustainable cities and human settlements" through specific provisions that enhance the "protection and preservation of world cultural and natural heritage [1]". The Athens Charter of 1933, proposed by the International Congress of Modern Architecture, articulates that "all buildings and neighborhoods of historical value should receive appropriate protection and should not be harmed." Historic districts, as integral components of cultural heritage, serve as important elements in the preservation and continuation of traditional cultural history. Simultaneously, they offer people unique cultural experiences and services, making them crucial spaces for recreation, leisure, and cultural perception [2]. However, in China, the planning and design of many historic districts often focus predominantly on the renewal of physical structures and the maximization of commercial value. This approach tends to overlook the perceptual experiences of the primary users—the residents and tourists—within these areas. In historic districts, the satisfaction of residents with the human environment can significantly enhance their subjective well-being [3]. The primary motivation for tourists visiting historic districts is to satisfy their desire to touch upon the historical memories of the area and to perceive the cultural essence embedded within the district [4]. Therefore, based on a human-centric perspective, analyzing the

perception characteristics of different user groups regarding the cultural landscapes in historic districts becomes a focal point in the renovation and management of these areas, with the aim of enhancing both the residents' happiness and the tourists' satisfaction.

To study the cultural perception characteristics of different user groups in historic districts, it is essential to employ a theoretical framework that characterizes the cultural landscape elements of these districts. The cultural landscape gene (CLG) theory is considered a comprehensive and rich theoretical system that can effectively support the operation of this complex endeavor [5]. Cultural landscapes, much like organic organisms in the natural world, often possess deep-seated genetic or transmission mechanisms. Due to their inherent nature and potential, they maintain "genetic" features of culture during the process of landscape transmission or dissemination and undergo genetic variations when adapting to their environments [6]. Utilizing the logical framework of gene identification, decoding, and expression, examining the characteristics and value of residential area landscapes within traditional Chinese settlements is of great significance. From a cross-regional perspective, extracting the genomic map of settlement patterns contributes significantly to the development of sustainable habitats [7].

Individual factors refer to characteristics that can highly summarize or describe a group, typically including demographic attributes, motivations, and behavioral patterns of users [8]. To promote the enhancement of urban space quality and the rational allocation of resources, studies on how individual factors lead to perceptual differences in landscapes have been widely conducted in the field of spatial quality improvement [9–11]. Examining demographic attributes, such as age, gender, and place of residence, to differentiate park users is a prevalent focus in urban park studies [11], with aims of exploring different users' primary areas of activity, landscape preferences, soundscape perception, intensity of physical activity, etc. Additionally, the impact of individual factors is also extensively involved in research topics such as soundscape perception characteristics [12], place attachment, and community interaction [13].

In research on perceptual experiences in historic districts, researchers have increasingly clarified the relationship between the perception of historic district landscapes, tourist satisfaction, and place attachment. For example, Zhu et al. found that tourists' evaluation of the cultural heritage value and authenticity of landscapes has a significant positive impact on the destination's image [4]. Li et al. conducted a survey and employed structural equation modeling (PLS-SEM) to study the significant influence of landscape perception on restorative benefits [14]. Liu et al. found that positive soundscape perception could contribute to the satisfaction degree of visiting experience [15]. These studies emphasize the importance of historic district landscape perception in attracting tourists, enhancing satisfaction, and fostering place attachment.

However, there has been limited attention paid to the perceptual differences among different individual characteristics within these groups. Research that systematically explores the differences in the perception of CLGs in historic districts among residents and tourists of different demographic characteristics is scarce. Filling this research gap is significant in the decision-making processes of urban planning and cultural heritage preservation. Policies and plans that do not take these differences into account may struggle to fully meet the needs and expectations of different user groups, thus limiting the sustainable development and preservation of historic districts.

The purpose of this study is to provide a theoretical basis for carrying out protection and renewal planning for historic districts from a human-centric perspective. Therefore, based on the theory of CLGs, the differences in the perception of cultural landscapes in historic districts among residents and tourists with various individual characteristics are explored through questionnaire surveys and statistical analysis. The study aims to address the following key questions:

(1) What is the difference in the perception of CLGs in historic districts between tourists and residents?

(2) How could their social/demographic/behavioral characteristics relate to the differences in the perception of the CLGs among them?

2. Literature Review

2.1. The Theory of Cultural Landscape Genetics

The extensive discussion regarding cultural genes began in 2012 when Liang Henian, through the study of Western civilization history, introduced the concept of Western cultural genes to China, aiming to explore cultural genes in the context of urban planning [16]. Similar concepts include Liu Peilin's concept of "cultural landscape genes" based on the characteristics of traditional village landscapes, both of which analyze highly representative cultural landscape features in various traditional settlements [17]. Duan Jin et al. analyzed and inherited the technological system of urban "space genes" to solve the technical problems of historical cultural inheritance from the perspective of urban space [18], thus continuously enriching the theoretical system of "cultural landscape genes" and redirecting it from the field of social sciences to the field of urban spatial morphology.

The theory of "Cultural Landscape Genes (CLGs)" is derived by Liu et al. from the concept of "genes" in biology, which are the fundamental units guiding the genetic traits of organisms [19]. CLGs refer to the smallest units of social–historical development that possess genetic characteristics similar to biological genes, influencing and controlling urban cultural phenomena and content (Figure 1) [20]. In the process of extracting biological genes, reverse transcription uses RNA as a template, catalyzed by reverse transcriptase to synthesize DNA, resulting in biological genes. Cultural landscape genetic engineering, much like biological genetic engineering, involves the reverse transcription of product genes, essentially extracting product genes from product instances in biological genetic engineering. Similarly, the reverse transcription of cultural genes in the culture of a historic districts is the extraction of cultural landscape genes from instances of product elements of the historical district. These genes stably maintain their basic attributes during the genetic process, while also evolving and adapting in response to changes in the era. This leads to recognition and replication activities by residents and tourists, ultimately sustaining and enriching the urban cultural conte nt. This study, based on the theory of CLGs, identified typical genes of the cultural landscape of Zhangzhou Ancient City and interpreted their inherent genetic connotations.

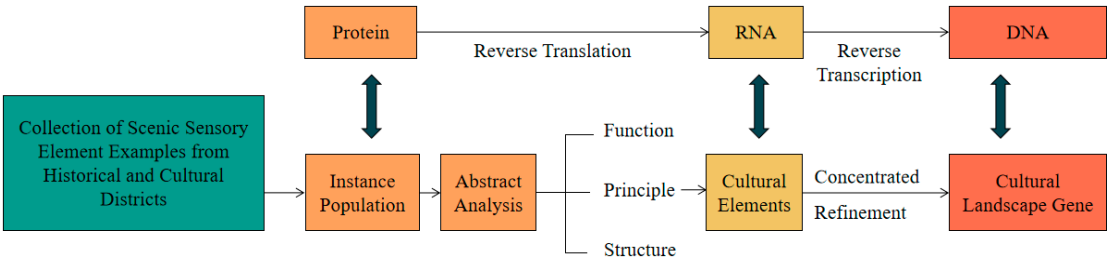

Figure 1. Process of extracting CLGs from historic districts.

Based on the research findings of cultural landscape genetics theory, the connotation of CLGs can be summarized as follows: identifying key information that distinguishes the uniqueness of historic districts; maintaining the bonds that preserve the cultural diversity of historic districts; the dual expression and abstraction of landscape material carriers and cultural connotations.

Liu Peilin proposed four principles for identifying landscape genes [19]. The principles for identifying landscape genes include intrinsic uniqueness, extrinsic uniqueness, local uniqueness, and overall superiority. Among them, intrinsic uniqueness refers to factors that other settlements do not possess internally; extrinsic uniqueness refers to landscape features that other settlements do not possess externally; local uniqueness refers to certain local but critical elements that other settlements lack; overall superiority means other settlements

may have similar landscape elements, but the landscape element in this settlement is particularly prominent. Based on these principles, landscape genes can be identified.

Hu Zui et al. introduced a feature deconstruction extraction method based on the Object-Oriented Cultural Landscape Gene Classification Model (OOCPLG), dividing landscape genes into four types: architectural features, cultural features, environmental features, and layout features [21]. The feature deconstruction extraction method mainly refers to categorizing the landscape features of traditional settlements using an object-oriented approach, establishing detailed indicators for landscape gene identification elements, and then merging the identification results of each element according to the principle of "similar categories should be merged". Finally, the identification results are classified into environmental feature genes, architectural feature genes, cultural feature genes, and layout feature genes. The extraction of CLGs in this study is based on these principles.

Considering that historic districts are typically surrounded by more newly built streets and alleys compared to traditional villages, fewer CLGs can be extracted from the environmental and layout feature dimensions. Therefore, in this study, environmental features and layout features are merged into a category called Site-Layout CLGs.

2.2. Study of Individual Factors

Expanding individual factor research is conducive to achieving more precise resource allocation and arrangement in the process of urban environmental construction. Similar studies have been conducted in resident samples and tourist samples.

In resident samples, existing research has confirmed that there is a correlation between the residents' sense of place attachment and individual attributes such as age, length of residence, experience of disasters, and education [22]. The distance between residential areas and landscapes, as well as differences in the residents' familiarity with places, can explain the differences in preferences for water landscapes between urban and suburban coastal residents [23]. Factors such as age, gender, marital status, income, and housing area among residents in large cities are significantly correlated with their subjective perception of health status [24]. For example, female residents generally perceive their health status to be worse than male residents [24]. A series of studies have shown that different individual factors can lead to significant differences in the residents' perceptions, which further arouses curiosity to explore the differences in perceived characteristics of local cultural landscapes among residents with different individual characteristics.

In tourist samples, scholars have investigated the influence of tourists' socio-demographic characteristics on their perceptions of a destination's personality and emotional experiences. They found significant differences in emotional experience perception based on factors such as education level, previous visits to the city, and travel companions [25]. Another study investigated the perceived crowding of visitors to geological parks based on personal factors and travel characteristics, finding that age, education level, and income level significantly influenced the perception of crowding [26]. This indicates that tourists with different individual characteristics perceive tourist destinations differently in the same tourism environment. Understanding the perceptual characteristics of different tourists in historic districts is more conducive to achieving user classification and targeted improvement strategies for historic districts.

For the same tourist landscape, the identity of residents and tourists can also lead to differences in spatial perception [27]. Scholars have used cognitive mapping to demonstrate differences in spatial perception of tourist landscapes among three social groups: domestic tourists, international tourists, and local residents. They found differences in the composition and structure of mental maps among different groups, which are also influenced by the personal factors of the map creators. The research results can serve as a basis for population classification for discussions on landscape management applications [27].

2.3. Study on the Perception of Historical Neighborhoods

Research on the perceptions of residents and tourists in historic districts is one of the important topics in the fields of urban sociology, cultural geography, and tourism studies. Scholars have widely studied aspects such as the sense of identity and belonging brought by living in historic areas [28,29], residents' willingness to protect and develop historic districts [30,31], and the impact of tourist interventions on historic districts [32]. Studies have shown that residents typically have a stronger sense of identity and belonging to historic districts, and they place greater emphasis on the cultural landscapes and heritage values in these areas. Tourists' spatial perceptions and usage behaviors may be more temporary: they may concentrate on major attractions without exploring the entire historic district as deeply as residents do.

3. Research Methodology

3.1. Study Area Overview

The study selected the historic district of Zhangzhou Ancient City in Fujian Province as the research case. According to the protection plan for the Tang and Song sub-city historical and cultural district in Zhangzhou (2015–2030), the research area is defined as the core area of the planned protection of Zhangzhou Ancient City (Figure 2) and covers an area of 53 hectares. With over a thousand years of urban construction history and cultural accumulation, the existing architectural heritage of the district reveals marks from different historical periods, creating a unique cultural character described as "Tang and Song ancient city, Ming and Qing districts, Republic of China style, Southern Fujian charm, and the combined glory of overseas Chinese and Taiwan" [33]. Some typical cultural landscape genes are shown in Figure 3. To make the results of the questionnaire survey more comprehensive and extensive, we distributed the questionnaires separately at 40 sample points shown in Figure 3. According to the administrative division in Zhangzhou, the jurisdiction of the historic district belongs to the Xiqiao subdistrict, which includes four residential neighborhoods. On the evening of 17 February, the Zhangzhou Municipal Bureau of Culture and Tourism released data stating that, during the 2024 Spring Festival holiday, Zhangzhou received a total of 3.3381 million tourists, with approximately 1.1527 million visitors exploring Zhangzhou Ancient City.

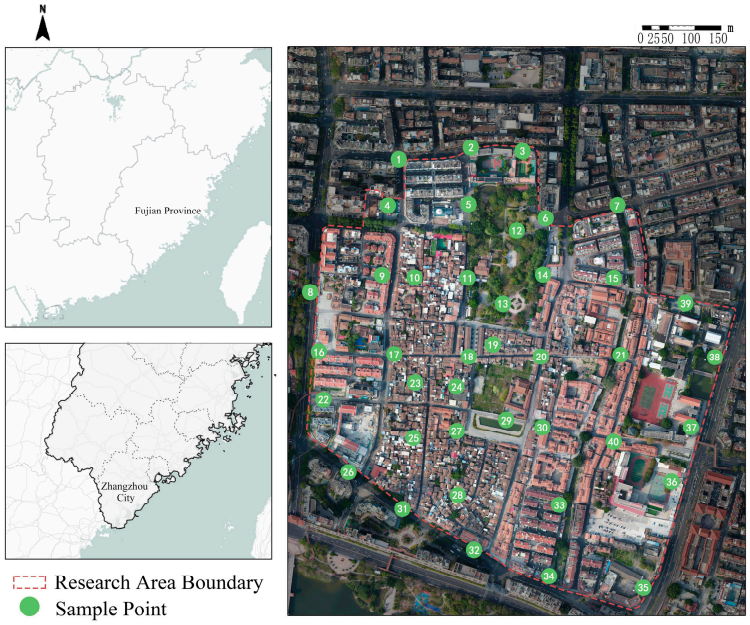

Figure 2. Research area and sample point distribution of Zhangzhou Ancient City. Source: Self-drawn.

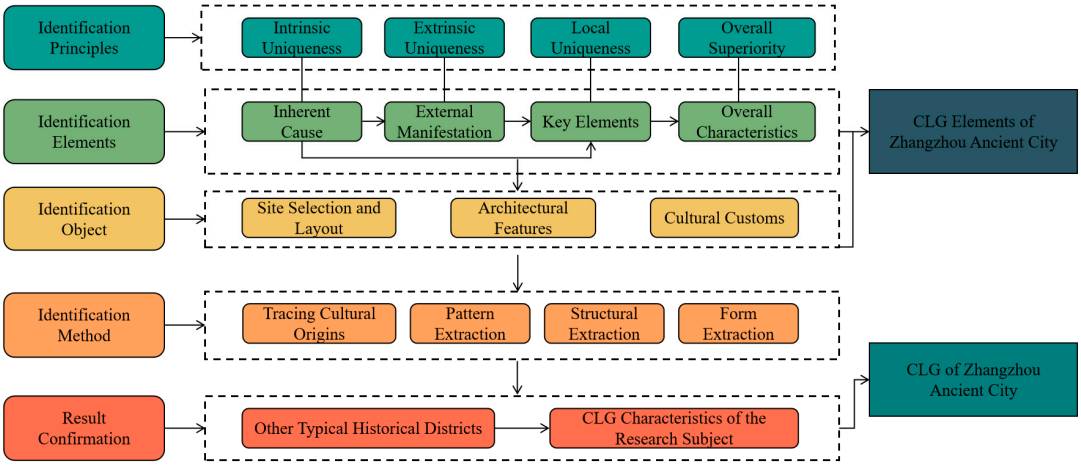

Figure 3. Method for identifying CLGs in Zhangzhou Ancient City.

Based on the principles of spatial homogeneity and randomness, 40 survey sites were selected to ensure that the public investigation covered respondents from areas with varying district scales, land uses, and CLG richness (Figure 2).

3.2. Identification and Evaluation of CLG

Based on the literature review, we have summarized the principles and methods for identifying CLGs. Following the pathway method depicted in Figure 2, we identified the CLGs of Zhangzhou Ancient City. We classified the CLGs of Zhangzhou Ancient City into two main categories: tangible and intangible, further divided into site layout, architectural features, and cultural customs, as shown in Table 1. Finally, using the feature deconstruction extraction method based on elements, structures, patterns, meanings, perceptions, and traces, we extracted the landscape gene elements of three types of CLGs in Zhangzhou Ancient City. The extraction method and process are illustrated in Figure 3, and the results of the extraction formed 19 assessment indicators for cultural landscape gene elements (see Table 1). Photos of some CLG are displayed in Figure 4.

Table 1. Evaluation indicator system for cultural landscape gene elements in Zhangzhou Ancient City.

Elements Layer	Criteria Layer	Factor Layer	Indicator Explanation
Material Cultural Landscape Gene	Site Layout	A1 Site Pattern	Zhangzhou, located behind the mountains and facing the sea, is an important area in Fujian Province. The great river flows southward and then eastward into the sea. Many peaks surround the north. Behind lies the Zizhi Mountain of Tianbao, while the famous Danxia Mountain is positioned in the front. He Feng Mountain stands on the left, and Yuan Mountain rises on the right.
		A2 Water Network Pattern	In the second year of the Xianping era (1009 AD), Zhangzhou began to dredge the ditch surrounding the sub-city of Zhangzhou. By the sixth year of the Xiangfu era (1013 AD), the channel of the Xi Liao was further deepened, and a water gate was carved out in the southwest corner to accommodate the tides and facilitate the passage of boats. The outer city was fortified with sturdy wooden fences, encompassing a perimeter of fifteen Li (approximately 7.5 km).
		A3 Street and Alley Space	The modern urban functions with a dispersed layout of multifunctional areas for commerce, finance, and culture.
		A4 Preservation of Ancient Trees	Several centuries-old trees, including mango, kapok, banyan, and camphor trees.

Table 1. *Cont.*

Elements Layer	Criteria Layer	Factor Layer	Indicator Explanation
Material Cultural Landscape Gene	Architectural Features	B1 Plan Layout	Zhangzhou Ancient City has preserved many traditional architectural styles, as well as common architectural forms today, including arcade buildings, bamboo pole houses, and Fujian-style buildings.
		B2 Building Structure	The architectural structures in Zhangzhou Ancient City primarily utilize traditional wood construction and brick–concrete structures.
		B3 Building Decoration	The architectural decorations in Zhangzhou Ancient City focus on detailed and exquisite carvings on door lintels, window grilles, beams, and columns, often featuring beautiful engravings.
		B4 Building Color	The architectural colors in Zhangzhou Ancient City are diverse and vibrant, with common hues typically characterized by red bricks, red tiles, and the red of Zhugan Cuo (bamboo pole houses).
		B5 Building Paving	The architectural paving in Zhangzhou Ancient City often employs traditional methods of stone slab or gray brick paving.
		B6 Public Space	Zhangzhou Ancient City features a rich variety of public spaces, including the Wenmiao (Confucian Temple), Dongqiaoting (East Bridge Pavilion), and nearby plazas, among others.
Intangible Cultural Landscape Genes	Cultural Customs	D1 Confucian Culture	Since the early Tang Dynasty, Zhangzhou Confucianism has directly inherited the central lineage of the Yellow River and Luo. In the late Ming Dynasty, Zhangzhou saw the emergence of a group of Confucian scholars represented by the "complete man of one generation," Huang Daozhou. During the Qing Dynasty, there was increased interaction between Confucianism in Zhangzhou and Taiwan.
		D2 Min-Taiwan Culture	"Min-Taiwan Culture" refers to the shared cultural heritage between the southeastern coastal region of Mainland China, particularly Fujian Province (known as "Min" for short), and Taiwan. In the late Ming Dynasty, a significant number of Han Chinese migrated to Taiwan, with a majority of them coming from the southern Fujian regions of Zhangzhou and Quanzhou. This migration left a profound influence of Minnan culture on the cultural landscape of Taiwan.
		D3 Maritime Silk Road Culture	"Maritime Silk Road Culture" relates to the historical sea route that connected China with Southeast Asia, the Arabian Peninsula, East Africa, and Europe. This culture encapsulates the exchange of goods, ideas, and cultural practices over centuries along this sea route. Zhangzhou Yuegang, as the largest foreign trade port in China during the mid to late Ming Dynasty, is an essential component of China's "Maritime Silk Road" culture.
		D4 Red Culture	"Red Culture" refers to the cultural heritage and legacy related to the Chinese Communist Revolution. During the revolutionary period, Tang and Song Sub-City served as a base for the Red Revolution in Zhangzhou. Existing historical sites include the former location of the Minnan Workers' and Peasants' Revolutionary Committee and the former site of the Longting Provincial People's Government.
		D5 Traditional Drama and Folk Art	Zhangzhou currently preserves various traditional theatrical and musical arts, including: Da Gu Liang San Dance (Big Drum and Cool Umbrella Dance), Zhangzhou Xiang Opera, Zhangzhou Nezha Drum Music, Zhangzhou Nan Ci (Southern Song), Jin Ge (Brocade Song), Zhangzhou Tie Zhi Xi (Iron Branch Play), Puppetry, Ge Zai Xi (Taiwanese Opera), and others.
		D6 Traditional Handicrafts	Zhangzhou's existing traditional handicrafts include: Pian Zai Huang (a traditional Chinese medicine), Zhangzhou woodblock New Year pictures, beige porcelain making, Zhang embroidery skills, Narcissus flower carving techniques, and seal paste making skills.

Table 1. *Cont.*

Elements Layer	Criteria Layer	Factor Layer	Indicator Explanation
Intangible Cultural Landscape Genes	Cultural Customs	D7 Festivals and Celebrations	Zhangzhou Ancient City hosts various festivals and celebrations, including the Mazu Culture Festival, the September Temple Fair, Opera Festival, and the Spring Festival celebration. These events provide both tourists and residents with a vibrant cultural experience.
		D8 Traditional Business	Tianyi Shou, Datong Stationery Store, Wanyuan Money House, and other century-old shops have become a unique commercial hub in Zhangzhou Ancient City, inheriting a long history and a distinctive commercial culture.
		D9 Local Folk Customs	Zhangzhou Ancient City also hosts a variety of local folk activities, such as wedding tea ceremonies, storytelling, stilt-walking, lion dancing, and sugar figure crafting.

Figure 4. Typical cultural landscape genes of Zhangzhou Ancient City. (**a**) Historical waterways of Zhangzhou; (**b**) intricate streets of Zhangzhou's Ancient City; (**c**) archway plaza of historical neighborhoods; (**d**) centuries-old commerce in Zhangzhou; (**e**) traditional culinary delights; (**f**) ancient cobblestone road.

3.3. Questionnaire Design

This study used a questionnaire survey method to obtain individual factors of tourists and residents and their perception evaluation of different dimensions of cultural landscape gene elements. We designed the survey questionnaire based on the identification results of the CLGs of Zhangzhou Ancient City. The questionnaire consists of two parts. With a clear understanding of the target audience, we crafted clear and concise questions ensuring coherence and relevance between them. The questionnaire was structured to facilitate ease of understanding and response comprehension for the respondents. Prior to its formal distribution, the questionnaire underwent a pretest with 15 professionals from the same field to ensure its effectiveness in conveying the research objectives.

Part 1: Social/demographic/behavioral characteristics of respondents.

Included in this section were gender (male, female), age (<18, 18–25, 26–30, 31–40, 41–50, 51–60, >60 years), educational background (Junior high school and below, High school and vocational school, College and above), residence location (within Zhangzhou city, within Fujian province, outside Fujian province) (tourist only), duration of residence (less than 6 months, 6 months to 3 years, 3–5 years, 5–10 years, more than 10 years) (resident only), residence nature (work only, residence only, both work and residence) (resident only), and visit frequency: (1 time, 2 times, 3 times or more) (tourist only).

Part 2: Perception evaluation.

To understand to which degree the respondents have cognitively perceived the CLGs of the historic district during their visits, a survey was conducted using a questionnaire designed based on the evaluation indicator system as established in Table 1. The questions in the questionnaire describe the objective state of the CLGs of the historic district. Tourists and residents were then asked to assess these questions using a Likert five-point scale (V = [strongly disagree, disagree, neutral, agree, strongly agree]). The higher the level they agree with the questionnaire, the deeper their cognitive perception and awareness of the CLGs are.

3.4. Data Collection and Analysis

The survey was conducted in May 2023, under favorable weather conditions, and randomly selected respondents at the sample points within a 20 m radius. The survey was conducted between 9:00 AM and 10:00 PM. After obtaining the consent of the respondents, survey personnel engaged in brief conversations with them, explained the purpose of the survey, and provided guidance on questionnaire completion. Initially collected questionnaires were processed using SPSS 24 software. Questionnaires with a response duplication rate greater than 60% and completion times less than 3 min were excluded. This resulted in a total of 860 valid questionnaires, consisting of 389 from residents and 471 from tourists, meeting the data analysis requirements (Figure 5). In terms of gender distribution, there was a slightly higher representation of females compared to males. The participants spanned various age groups, with each age bracket consisting of no fewer than 15 individuals. Within the local resident group, there was a larger proportion of individuals with lower levels of education, whereas among tourists, there was a higher prevalence of individuals with higher educational attainment. Additionally, among local residents, there was a considerable number of individuals who had resided in the area for over ten years, whereas among tourists, a significant portion were visiting for the first time.

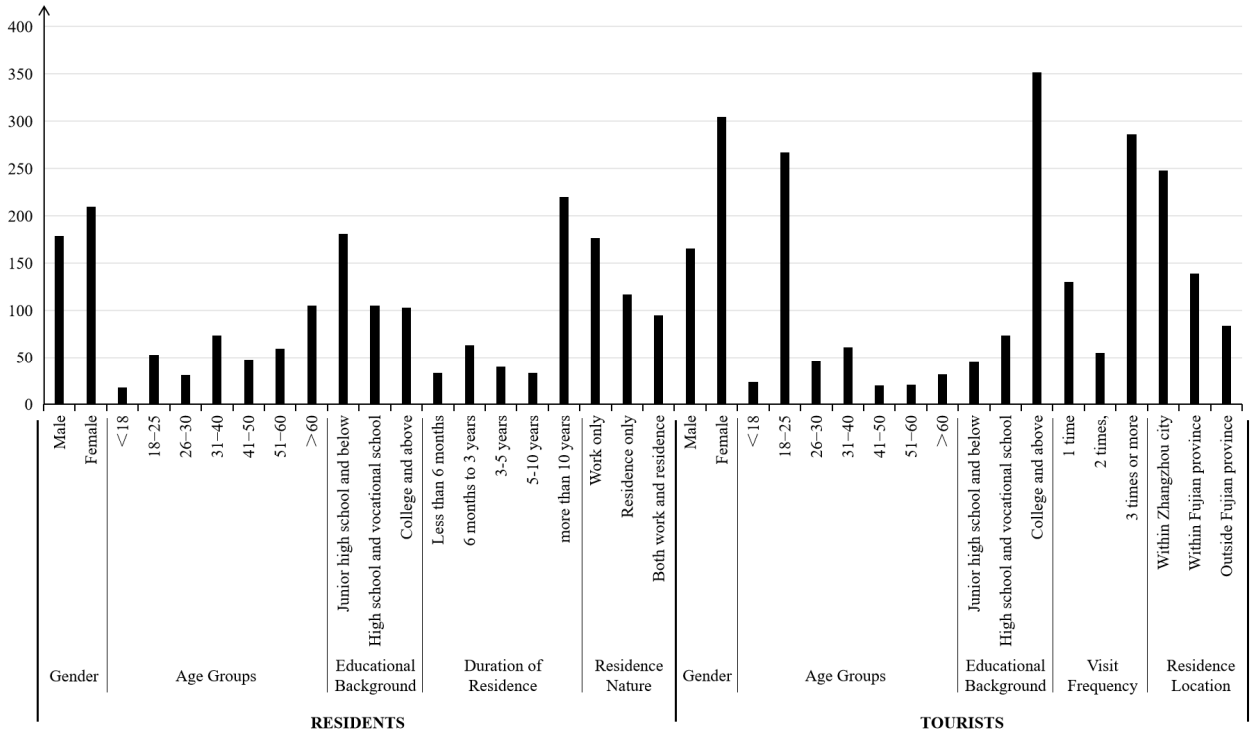

Figure 5. Basic statistics based on respondents' information (N = 860).

Reliability and validity tests were conducted on the database. The results indicated that the Cronbach's alpha values for all sections of the scale were greater than 0.7, and the KMO values were also greater than 0.7, indicating good data reliability and validity.

This study first calculates the average scores of the residents' and tourists' perceptions of each cultural landscape gene and compares the results to describe the overall status of the residents' and tourists' perceptions of CLGs. Then, individual factors, such as gender and age, are subjected to non-parametric tests against the scores of cultural gene perception in both resident and tourist samples. If the *p*-value of the test result is less than 0.05, it indicates a significant difference in the perception of cultural genes in the dimension of that individual factor. Finally, differences are described by plotting and observing box plots.

4. Results and Analysis

4.1. Analysis of the Cultural Landscape Gene Perception Characteristics of Residents and Tourists

4.1.1. Overall Characteristics of the Perceptions of CLGs in Different Dimensions

This study first conducted a comparative analysis of residents' and tourists' perceptions of the CLGs in three dimensions, i.e., site selection and layout, architectural characteristics, and cultural customs. The entropy weight method was used to calculate the weight of each indicator within the three dimensions, and then the scores for each dimension were calculated through weighted summation (Table 2).

Table 2. Statistical analysis results of the perception evaluation indicators of CLGs in different dimensions.

Cultural Landscape Genetic Dimensions	Residents			Tourists		
	Sample Size	Average Value	Standard Deviation	Sample Size	Average Value	Standard Deviation
Site Selection and Layout	389	2.921	1.097	471	3.129	1.033
Architectural Features	389	3.519	0.913	471	3.639	0.856
Cultural Customs	389	3.462	0.730	471	3.523	0.737

Both residents and tourists scored around 3.5 points in their perceptions of architectural features and cultural customs, indicating that these two types of CLGs were well perceived during their experience in the historical district. However, the score for site selection and layout is around three points, suggesting that this dimension is less noticed and felt by residents and tourists in their experience.

Residents and tourists both have a relatively deep perception of architectural features, followed by cultural customs, while site selection and layout are perceived to the least extent. This is in line with the results of a previous study on cultural perception media in historical districts, which indicated that tourists are most likely to perceive historical culture through architectural spaces [34].

4.1.2. Differences in the Perception of CLGs between Residents and Tourists

Comparing the scores of tourists and residents for the same perception dimensions (as shown in Table 2), tourists exhibit a higher degree of cognitive perception regarding architectural features and the selection and layout of sites in historic districts compared to residents. Conversely, residents demonstrate a higher degree of cognitive perception in cultural customs than tourists. The higher degree of cognitive perception scores among tourists indicates that the site selection, layout, and architectural features of the cultural landscape in Zhangzhou Ancient City have a strong appeal to tourists. The lower degree of cognitive perception scores of residents suggest that the development of the ancient city has changed its landscape space and regional characteristics. In the dimension of cultural customs, the tourists' lower cognitive perception scores imply that the tourism experience and interactivity in the cultural customs dimension of the ancient city are insufficient, leading to the traditional cultural values contained in the cultural landscape of the ancient city not being fully showcased and effectively disseminated [35].

By comparing the intensity of the perception of CLGs in different dimensions between tourists and residents (Figure 6), significant differences can be found in seven CLGs, e.g.site selection patterns, street space, preservation of ancient trees, Maritime Silk Road culture, festival celebrations, traditional commerce, and local folk customs. Regarding the three indicators for the site selection layout dimension, tourists have a higher degree of cognitive perception than residents. In regard to the indicators for Maritime Silk Road culture and festival celebrations, tourists show a higher degree of cognitive perception. However, in the dimensions of traditional commerce and local folk customs, residents have a higher degree of cognitive perception. The differences in these indicators further validate the research inferences previously mentioned.

4.2. Differences in the Perception of CLGs in Relation to Individual Factors

4.2.1. Data Processing

Given the numerous indicators of CLGs, to extract the perception differences in relation to individual factors more succinctly, the Principal Component Analysis (PCA) method was conducted to reduce the dimensionality of 19 indicators across three dimensions, which helps to synthesize and assess the data more effectively. Then, using a weighted formula that combines the scores of the principal components with their corresponding weights, the final scores for the three dimensions of site selection layout, architectural features, and cultural customs were calculated.

$$SV = F1 \times \sqrt{IFV} + F2 \times \sqrt{IFV} + \ldots\ldots + Fn \times \sqrt{IFV} \quad (1)$$

where SV represents the overall score of this dimension, IFV is the initial feature value of each dimension after dimension reduction, and $F1, 2 \ldots n$ is the variance explanation rate of each dimension after dimension reduction.

Since the data results do not satisfy the assumption of a normal distribution, a non-parametric test method was employed to explore the potential relationships between the results of each dimension and individual characteristics (such as gender, age, etc.) and to determine whether there are significant differences.

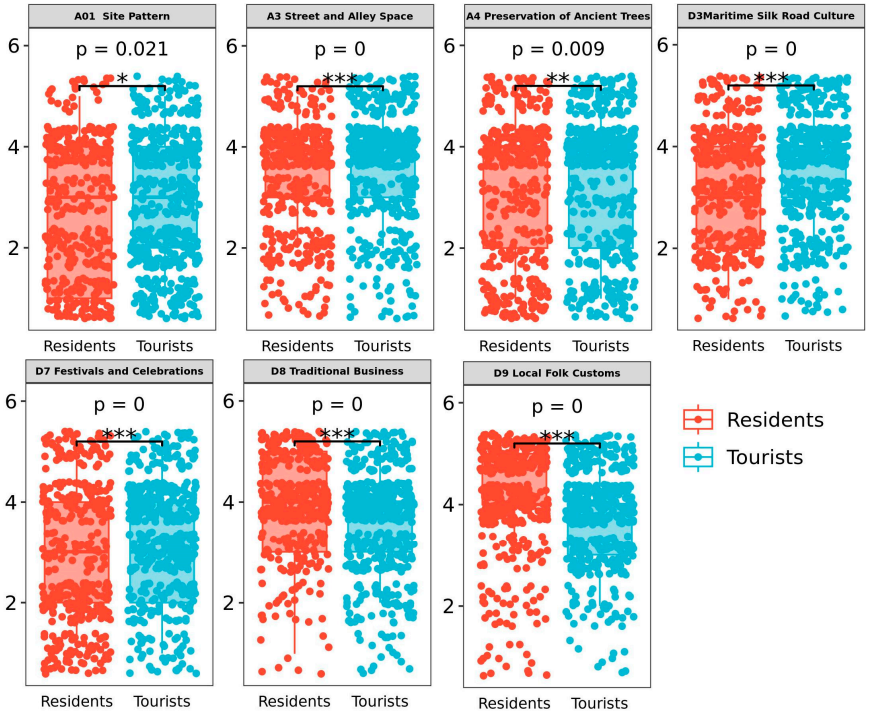

Figure 6. Differences in the perception of CLGs between tourists and residents. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

4.2.2. Differences in Dimensions of Cultural Landscape Gene Perception

In the non-parametric test results, a *p*-value of less than or equal to 0.05 (5%) is considered statistically significant, and the research findings are presented in Table 3. Among the tourist samples, significant differences are found in the perception of architectural features and cultural customs among tourists of different genders and ages. Frequent visitors and infrequent visitors show differences in their perception of cultural customs, as do tourists from different daily living backgrounds. In the resident samples, residents of different ages perceive site selection layout differently; residents with different educational backgrounds perceive cultural customs differently; and residents with different living properties and lengths of residence show differences in their perception of architectural features and cultural customs.

Table 3. Summary of non-parametric test results on the relationship between individual characteristics of residents and tourists and their perceptions of CLGs.

Tourist Sample Analysis (N = 471)				Resident Sample Analysis (N = 389)			
	Site Selection and Layout	**Architectural Features**	**Cultural Customs**		**Site Selection and Layout**	**Architectural Features**	**Cultural Customs**
Gender	0.722	0.029 *	0.001 **	Gender	0.925	0.121	0.549
Age	0.415	0.003 **	0.028 *	Age	0.002 **	0.139	0.167
Educational Background	0.971	0.202	0.205	Educational Background	0.667	0.749	0.007 **
Visit Frequency	0.58	0.445	0.023 *	Nature of Residence	0.115	0.023 *	0.012 *
Living Location	0.524	0.495	0.007 **	Duration of Residence	0.122	0.789	0.008 **

* $p < 0.05$, ** $p < 0.01$.

The results indicate that: (1) In both tourists and residents' samples, the impact of different individual factors varies by dimension. For example, gender factors show significant differences in the perception of CLGs among tourists but not among residents, while educational background factors show significant differences in the resident samples but not in the tourist samples. (2) There are few remarkable differences in the perception of the site selection layout of historical districts between tourists and residents, but residents of different age groups perceive it differently. (3) Educational background does not affect the perception of the CLGs in the material dimensions of site selection layout and architectural features for both residents and tourists. (4) Population behavioral factors, such as visit frequency, living location, residence nature and duration of residence, affect the perception of cultural customs by residents and tourists.

4.2.3. Differences in the Perception of CLG Indicators in Relation to Individual Demographic Sociological Factors

(1) Gender Perspective

There are differences in the perception of architectural features and cultural customs among tourists of different genders. We found that women have a higher degree of perception of CLGs than men, which is related to the differences in cultural perception between the sexes under the current social and cultural background (Figure 7).

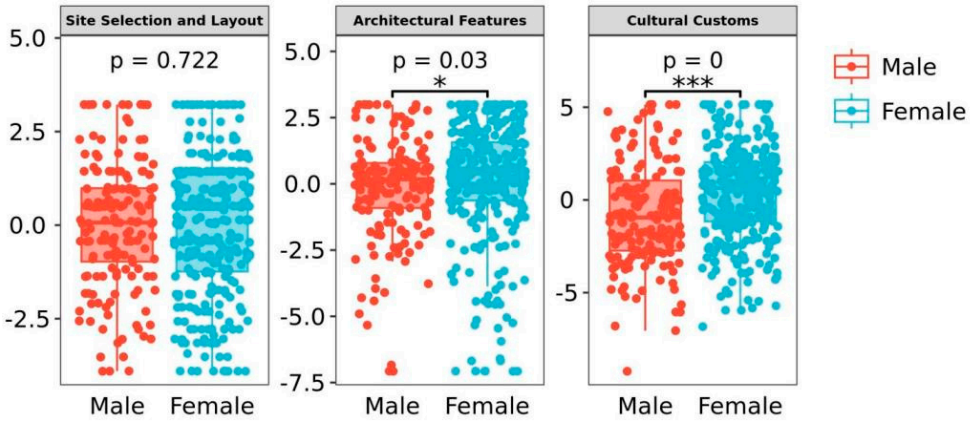

Figure 7. Differences in the perception of CLGs among tourists of different genders. * $p < 0.05$, *** $p < 0.001$.

(2) Age Group Perspective

Tourists of different age groups show significant differences in their perception of the CLGs related to architectural features and cultural customs (Figure 8). The perception of these CLGs in people over the age of 60 is significantly lower than in other age groups. The perception of CLGs in site selection layout by people of different ages shows a "U-shaped" pattern (Figure 9). People between the ages of 30–40 tend to have the weakest perception of CLGs, with the perception level increasing as the age gets higher or lower. This feature is particularly prominent in the type of CLG that is related to site selection layout, consistent with the situation observed in the survey interviews performed in Zhangzhou Ancient City. That is, in the nearly 50 years of urbanization in China, the landscape pattern of Zhangzhou Ancient City has been gradually dismantled, and the high-rise buildings have blocked the original landscape view, so the older residents can perceive the CLGs of the ancient city's site selection layout based on their original memories and life experiences. With the recent surge in the protection of historical buildings and the widespread dissemination and education of the cultural information regarding Zhangzhou Ancient City, younger residents can perceive the CLGs of site selection layout based on the historical information and education about the ancient city.

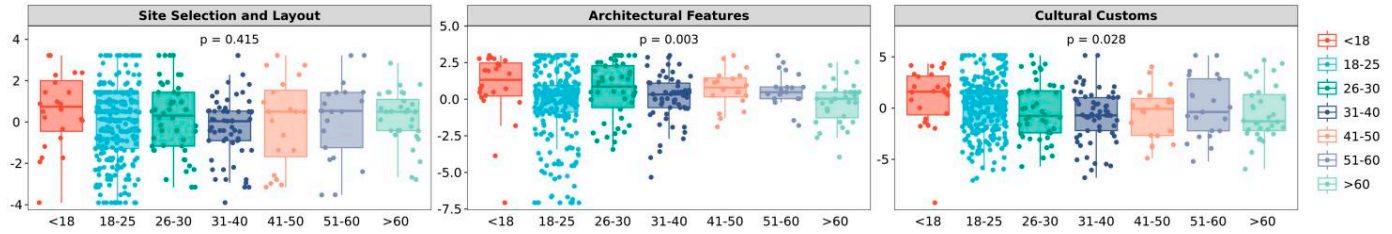

Figure 8. Differences in the perception of CLGs among tourists of different age groups.

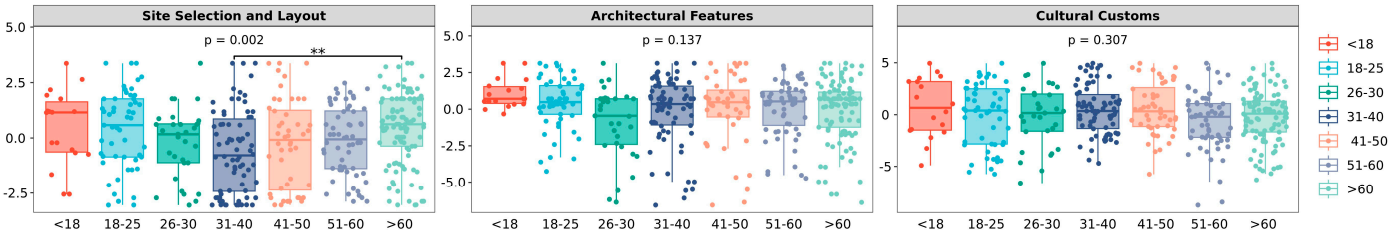

Figure 9. Differences in the perception of CLGs among residents of different age groups. ** $p < 0.01$.

(3) Educational Background Perspective

In the resident sample, the perception of cultural customs is significantly greater among those with junior high and vocational high school education compared to those with college education or above and junior high education or below (Figure 10). It is speculated that the group with junior high and vocational high school education may be more inclined towards traditional values, thus having a deeper identification and understanding of local cultural customs. On the other hand, those with a college education or higher might be influenced by a more diverse range of knowledge, and their interests and values may be more varied, possibly leading to a lower reliance on traditional culture.

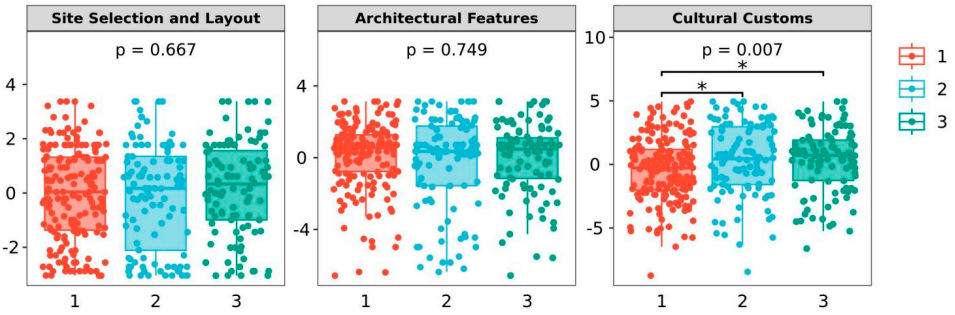

Figure 10. Differences in the perception of CLGs among residents with different educational background. The "1" represents the educational background of junior high school and below, "2" represents high school and vocational school, and "3" represents junior college and above. * $p < 0.05$.

4.2.4. Differences in the Perception of CLG Indicators in Relation to Individual Population Behavioral Factors

(1) Residents

The factor of duration of residence has been explored in the study of neighborhood relationships among the research population. Regarding the perception of cultural customs, residents who have lived in the area for over 10 years have a significantly higher level of perception than those with shorter residence durations (Figure 11). From the perspective of the nature of residence, residents who both live and work in Zhangzhou Ancient City have a stronger perception of architectural features and cultural customs compared to those who only live or only work there (Figure 12). This indicates that regular visits can enhance people's perception of environmental details and improve their overall evaluation

of the environment. Long-term residence and frequent visits provide more opportunities to experience, understand, and internalize local cultural customs. Residents who live and work in Zhangzhou Ancient City have a notably higher degree of cognitive perception of architectural features and cultural customs compared to those who only work or only live there.

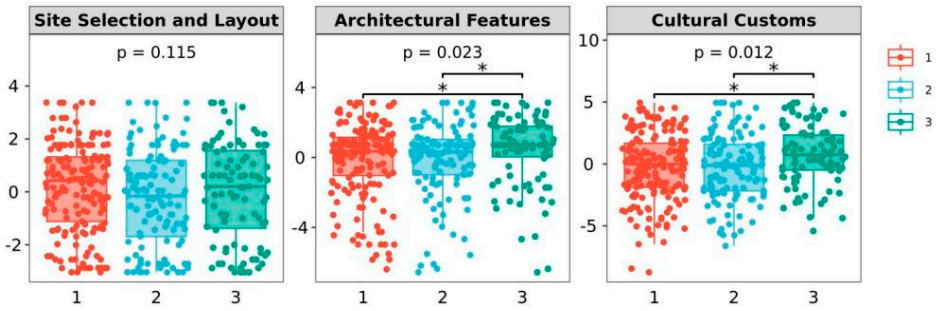

Figure 11. Differences in the perception of CLGs among residents with different living conditions. The "1" represents residing only in Zhangzhou Ancient City, "2" represents working only in Zhangzhou Ancient City, and "3" represents both living and working in Zhangzhou Ancient City. * $p < 0.05$.

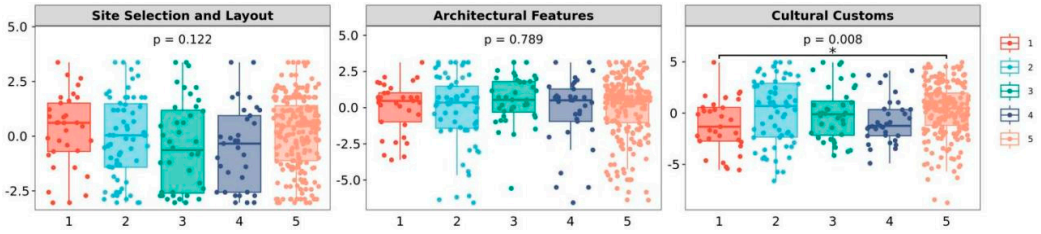

Figure 12. Differences in the perception of CLGs among residents with different durations of residence. The "1" represents Less than 6 months, "2" represents 6 months to 3 years, "3" represents 3–5 years, "4" represents 5–10 years, and "5" represents more than 10 years. * $p < 0.05$.

(2) Tourists

The frequency of visits is an essential factor affecting people's perception and experience in urban public spaces, such as historical districts and parks. Tourists who visit more than three times have a notably higher degree of cognitive perception than other tourists (Figure 13). Residents living in Zhangzhou city have an observably higher degree of cognitive perception of the cultural customs of Zhangzhou Ancient City compared to tourists from within Fujian province and other provinces in China (Figure 14), which is because residents living in Zhangzhou are more familiar with local culture and customs than tourists from other places.

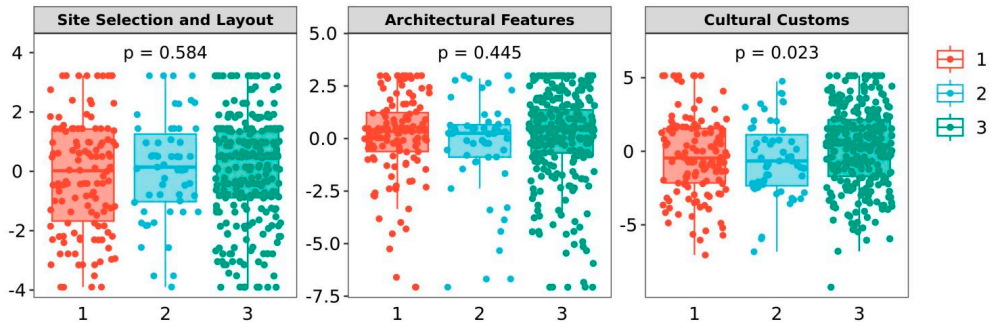

Figure 13. Differences in the perception of CLGs among tourists with different visit frequencies. The "1" represents the first visit to Zhangzhou Ancient City, "2" represents the second visit to Zhangzhou Ancient City, and "3" represents the third or more visits to Zhangzhou Ancient City.

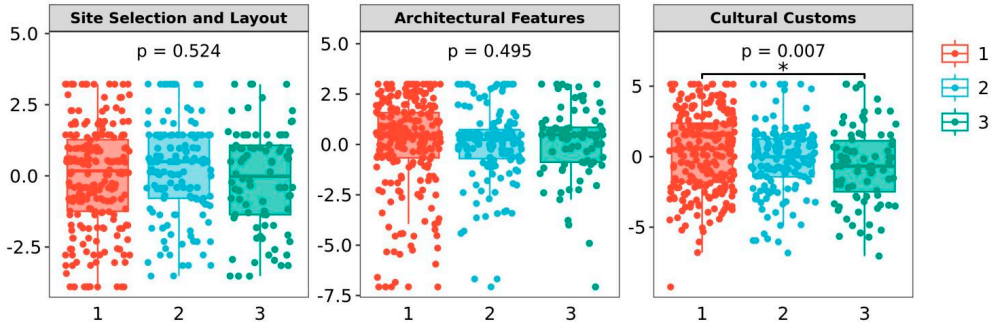

Figure 14. Differences in the perception of CLGs among tourists from different places of residence. The "1" represents residing in other districts within the city of Zhangzhou on a daily basis, "2" represents living outside the city of Zhangzhou but within Fujian Province, and "3" represents living outside Fujian Province. * $p < 0.05$.

5. Discussion

5.1. Analysis of the Differences in the Perception of CLGs

Based on the perception scores of different dimensions of cultural landscapes revealed in this study, residents and tourists have the highest perception of architectural features, followed by cultural customs, and then site selection layout as the lowest. This difference in perception coincides precisely with the developmental dilemmas of historical districts in China. Taking Zhangzhou Ancient City as an example, we can observe the following points from China's urbanization process over the past 50 years: (1) The rapid urban construction process has led to the continuous disappearance of the overall space of historical districts, leaving only a small part of the street space and natural environment which reflects the original central axis space and landscape pattern. Some of the original water systems were filled in during the last century, and some of the moat spaces were modernly developed, so the overall pattern is no longer intact. Therefore, the perception of site selection layout-type CLGs is generally weak. (2) The protection of historical buildings and the restoration of old buildings to their original forms have achieved effective results. The historical buildings inside the ancient city have been well preserved, and the buildings in the new districts also continue the architectural style of red bricks and tiles, maintaining the overall traditional Minnan characteristics of the district. Therefore, the satisfaction of residents and tourists is generally high. (3) Over-commercialization and the migration of original residents have led to the decline of intangible cultural heritage and traditional customs in historical districts. Therefore, it is necessary to go beyond the traditional approach of passive material space protection and active development and aim for a "humanistic revival of historical communities" as a new concept. Greater emphasis should be placed on protecting, continuing, and developing the social production and living practices of historical communities. Then, on account of the requirements of community protection and development, more conscious and systematic actions should be taken to protect the overall historical spatial elements and repair and enhance the supporting living environment of the community.

Comparing the levels of awareness between tourists and residents regarding the same dimensions, it can be seen that tourists exhibit a greater awareness of architectural features and site selection layout, whereas residents demonstrate a greater awareness of cultural customs. Tourists usually visit historical districts for sightseeing and to appreciate architectural features, so they pay more attention to the aesthetics and historical value of buildings. They may be more easily attracted by historical buildings, district layouts, and landscapes. Moreover, due to time constraints during visits, tourists do not have enough time to deeply understand cultural customs. Based on field research and visits, we have determined that, inside Zhangzhou Ancient City, there is also a lack of understanding. Residents living and working in historical districts have easier access to cultural customs and social activities through family heritage or participation in local events. Scene theory

suggests that the protection and enhancement strategies for historical districts should focus on the interrelationships between the environment, users, and activities. Therefore, owing to the differences in the perception of CLGs between tourists and residents in historical districts, different experiential zones should be created for tourists and residents during the conservation and renewal process of these districts. For tourists, the experiential zones should focus on showcasing the historical architecture and artistic characteristics of the district, enhancing their experience of architectural features and site layout through additional information boards, interactive exhibitions, and professional interpretation. For residents, the emphasis should be placed on community cultural activities and the convenience of daily life, such as setting up community centers and holding local festival celebrations, in order to strengthen their perception of cultural customs. Additionally, from the perspective of enhancing tourists' perception of the cultural customs of historical districts, activities and facility designs that promote interaction and communication between tourists and residents can also be considered. For example, organize local cultural experience activities for tourists, such as handicraft workshops, which not only increase the tourists' understanding of cultural customs but also enhance the residents' pride in their own culture.

5.2. Multiple Values and Personalized Enhancement Strategies for the Conservation and Renewal Planning of Historical Districts from a Human-Centric Perspective

The scope of conservation of urban heritage, such as historical districts, has been expanded beyond merely preserving their original value to more comprehensively protecting the "new" values that emerge as they adapt to urban development. This implies a more human-centered and landscape-based approach. Conservation and renewal of ancient towns based on the perspective of individual differences in cultural landscape gene perception have multiple significant advantages, which include the following. (1) Personalized design strategies: tailor personalized design strategies to precisely meet the aesthetic orientations and cultural needs of different groups [36]. (2) Optimizing living and visiting experiences: by deeply understanding the different characteristics of individual cultural perceptions, the layout, decoration, and activity planning of ancient town spaces can be optimized to ensure that different groups fully perceive and experience the CLGs. (3) Community integration and identity: by rationally designing ancient town spaces, residents can perceive their cultural roots, strengthen community cohesion, and thereby promote social harmony and stability. (4) Attracting tourists and promoting tourism development: designing based on the characteristics of tourists' perception of CLGs can attract more tourists, enhance their tourism experience, and drive the development of the tourism industry.

According to the data analysis results of demographic sociological factors, in the tourist sample, women and younger people have a stronger perception of the CLGs of the ancient city, while men and older individuals tend to have a lower cultural perception. Related research also found that, in historical districts, women pay more attention to the "artistic" atmosphere of the environment than men, and participate in a more diverse range of activities [37]. For example, Zhang et al., through analyzing data from Dianping, a popular review website, found that female tourists accounted for 70.4% of the total comments on historical parks, making women the main group providing feedback [38]. In a study on natural landscape preferences by Xu et al., it was found that men have a lower preference for natural landscapes compared to women [39].

In the tourist sample, the older the age group, the weaker the perception of cultural genes. Comparative studies on age differences have found that older people prefer blue spaces and partially enclosed green spaces, and such an environment has a better psychological recovery effect on them [40]. Comparison between adolescents and the elderly on the preference for natural landscapes found that the elderly also have a lower preference for natural landscapes [39]. Therefore, it can be speculated that the elderly's perception preferences for both natural and cultural landscapes are relatively lower than those of younger people.

In the resident sample, young and old people, as well as those with a medium level of education, show stronger cultural perception. A similar study found that the perception and evaluation of the soundscapes in forest temples were also lower than average among groups with elementary, junior high, and graduate school education [41].

From the data analysis results of population behavioral factors, the "degree of connection" to the ancient city is positively correlated with the perception of CLGs. For tourists, a "degree of connection" means a nearby residence and frequent visits, leading to a stronger understanding and recognition of the cultural customs of the historical district. For residents, it implies more interactions with the ancient city in terms of living and working, as well as the length of residence. Over the years, destination familiarity has been analyzed as a crucial factor influencing the attractiveness and image perception of a destination. Previous research has found a strong correlation between familiarity with specific attractions and the perceived attractiveness of a destination [42]. Similarly, some scholars argue that repeat tourism and recurring visitors demonstrate both behavioral and affective commitment to their special or familiar places. Moreover, this sense of familiarity with the destination spans decades or even generations [43]. Increased visit frequency tends to enhance the perception of the visit. For instance, as the frequency of visits rises, the tourists' perception of the dominance and harmony of birdsong increases, and their evaluation of the pleasantness of the soundscape improves [44].

Through the research presented in this paper, differences in the perception of cultural landscapes arising from various individual characteristics have been clarified. By comparing, for instance, differences based on gender and age, it has been found that perceptual disparities in aspects such as natural landscape perception and perception of the historical significance of historic districts are similar. This demonstrates that the results obtained from studying Zhangzhou Ancient City are equally applicable to the revitalization and transformation of other historic districts.

Urban managers and urban spatial planners can design the following measures for the management and development of historic districts based on the above conclusions, thus better serving various demographic groups with greater precision. For tourists with a weaker perception of CLGs (especially senior male tourists), the following strategies can be adopted: (1) Develop cultural experience tourism products suitable for senior tourists, such as arranging slow-paced cultural exploration tours, providing detailed historical background introductions, and organizing traditional handicraft experiences that are easy to participate in. (2) Use digital interactive tools, such as displaying the historical evolution of the district through augmented reality (AR) technology, or offering personalized tour services via mobile apps, to attract senior tourists and enhance their engagement. (3) Organize various cultural festivals and events, especially traditional celebrations that can attract older tourists, allowing them to experience and understand local culture through participation.

For residents with a weaker perception of CLGs (especially middle-aged residents and those with lower educational levels), the following strategies can be adopted: (1) Set up workshops within the community to teach skills related to local history and culture, such as traditional handicrafts, local history lectures, etc., specifically targeting middle-aged residents and those with lower educational levels. (2) Encourage residents to participate as cultural volunteers in the preservation and promotion of district cultural resources, enhancing their cultural identity and pride. (3) Regularly organize cultural exhibitions and events within the community, allowing residents to showcase their traditional cultural knowledge and skills, while also attracting people from both inside and outside the community to participate, and thereby enhancing cultural exchange.

5.3. Research Limitations and Future Prospects

While this study explores differences in CLG perception within historical and cultural districts, it also acknowledges its limitations and suggests avenues for future research. Firstly, the study primarily focused on the impact of individual factors on CLG perception,

overlooking potential influences, such as religious beliefs and socio-economic status. Future research could delve deeper into these factors for a more comprehensive understanding. Secondly, while this study provides descriptive analysis of CLG perception, it lacks a thorough investigation into underlying mechanisms and reasons. Future research could employ qualitative methods like in-depth interviews and focus group discussions to elucidate these pathways. Furthermore, it is worth noting that the potential reasons based on correlation analysis discussed in this article are speculative and lack empirical validation. Additionally, historic districts across the world not only differ in architectural forms, colors, and street layouts but also in cultural customs and traditions. Thus, we recommend conducting localized testing in other historical districts to acquire more universal knowledge.

6. Conclusions

As an important part of China's cultural heritage, historical areas have profound historical connotations and help protect and present traditional Chinese culture and history. Travel to historical areas can be categorized as heritage tourism, meaning that the journey is for experiencing places, activities, and artifacts that reflect cultural history and stories in an authentic way. The cultural perception of residents effectively promotes local attachment. Therefore, comparing the differences in the perception of CLGs between the two main users, i.e., residents and tourists, is particularly crucial. The findings are:

(1) The overall characteristic of the perception of CLGs by residents and tourists is that architectural features are the highest, while cultural customs and site selection layout are lower. This cultural perception characteristic coincides with the dilemma of the renewal of historical districts in China, where achievements have been made in the protection of individual buildings and parts of streets, but the overall spatial pattern has declined in the urbanization process. Over-commercialization and the migration of original residents have led to the decline of intangible cultural heritage and traditional customs in historical districts. Therefore, future directions for the renewal of historical districts should focus on protecting the overall restoration of spatial patterns and district textures, as well as valuing the creation of intangible CLGs.

(2) Residents and tourists of different genders, ages, educational backgrounds, occupations, durations of residence, and visit frequencies have significant differences in their perception of the CLGs in different dimensions, mainly characterized by the following features. In terms of the structural demographic characteristics, there are few significant differences in the perception of CLGs among residents of different genders, while tourists of different genders perceive various elements of cultural customs differently. In the resident sample, the age group shows a "U-shaped" pattern in the perception of CLGs related to site selection layout; residents with junior high and vocational education have significantly higher degree of cognitive perception of cultural customs. In terms of the functional demographic characteristics, tourists living close to Zhangzhou Ancient City and those who visit frequently, as well as residents who work and live in the ancient city for a long time, have a significantly stronger perception of cultural customs.

The research results can provide theoretical reference for more refined management solutions for the cultural administration of historical districts. Taking the study of Zhangzhou Ancient City as an example, based on the gender-related perception differences, we can focus on evoking emotional responses, fostering interpersonal connections, and exploring the historical roots of the destination for female tourists. Enhancing their experience can involve immersive cultural activities and storytelling. In contrast, male tourists may be more engaged by informative content such as historical backgrounds and architectural details, encouraging interaction and providing a deeper understanding and, ultimately, increasing participation. Based on the age-related perception differences, exclusive, guided services for elderly residents should emphasize the historical evolution and traditional culture of the ancient city to evoke their memories and identification. Based on the behavioral factors of the population that are related to perception differences, attention should be paid

to first-time tourists from outside and residents who have recently moved to Zhangzhou Ancient City for work or living, creating diverse cultural service forms to enhance the cultural perception experiences of these people.

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