ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202505_8(5).0020

A Study on the Psychological Restorative Benefits of the "Plantain in Rain" Soundscape

Boyang Xu[1], Yiding Chen[2], Shunkang Wang[1], Zhuqiang Hu[1], Jinglun Wang[1] and Sheng Li[1]

[1] School of Landscape Architecture, Zhejiang Agriculture and Forestry University, Hangzhou 311300, China

[2] School of Art, Zhejiang Normal University, Jinhua 321004, China

Abstract

The "Rain Falling on Banana Leaves" soundscape, historically embedded in classical Chinese garden soundscape design, has been celebrated by literati through dynastic eras. Contemporary applications extend to sleep assistance and therapeutic interventions, yet the synergistic mechanisms of its audio-visual components in shaping holistic restorative benefits remain underexplored. This investigation combines field-collected audiovisual materials with an online survey (N=182) to quantify objective and subjective determinants of restorative effects. Key findings demonstrate that: 1) The psychological restorative dimensions comprise immersion, dissociation, fascination, being away, and compatibility, with visual and auditory modalities explaining distinct variance proportions. 2) Not all configurations exhibit restorative potential - light rainfall demonstrates significant positive effects, whereas heavy rainfall intensity may induce adverse outcomes. 3) Visual perception critically mediates restoration, where sunny conditions enhance immersion/dissociation, clustered banana plantings amplify immersion, and visual tranquility emerges as the paramount visual restorative predictor. 4) Demographic variables (gender, age, occupation) show non-significant impacts, while educational attainment, regional background, personality traits, and life satisfaction significantly predict restorative outcomes, with noise-sensitive individuals exhibiting enhanced environmental adaptability.

Keywords

Plantain in Rain, Audio-visual environment, Restorative benefits, Predictive factors.

1. Introduction

The creation of soundscapes has been integral to the development of classical Chinese gardens, with "Plantain in Rain" being one of the most iconic auditory experiences widely incorporated into garden design [1]. For instance, in the Tingyu Pavilion of the Humble Administrator's Garden, the interplay between plantain leaves and raindrops outside the pavilion windows produces a pleasant and distinctive natural soundscape. Shen Zhou, in Listening to the Plantain, remarked: "The plantain, with its broad and hollow leaves, resonates with the rain. The variations in rainfall intensity and density elicit precise auditory responses." This suggests that the density of raindrops and the morphological characteristics of plantain leaves influence the diversity of the soundscape, thereby shaping different auditory experiences [2]. To this day, "Plantain in Rain" remains highly cherished and is often used as background music for meditation or sleep, with its playback volume on the Himalaya app reaching 32.41 million times. The cultural resonance of this soundscape has been deeply embedded in the collective consciousness of the Chinese people. Investigating the restorative properties of classical garden

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202505_8(5).0020

soundscapes not only aids in preserving traditional soundscape design techniques but also provides theoretical support for their restorative potential.

Numerous studies have demonstrated that natural soundscapes, such as water sounds [3], birdsong [4], and rustling leaves, have restorative benefits that facilitate attention and memory recovery. Individual natural attributes (e.g., age, gender, noise sensitivity) [5] and social attributes (e.g., life experiences, educational background, auditory experience) influence the restorative effects of soundscapes [6]. Therefore, in the process of soundscape design, it is essential for designers to acquire more theoretical support to identify the restorative needs and preferences of different demographic groups and to assess the restorative potential of various sound sources.

Although classical Chinese gardens emphasize soundscape creation, studies specifically examining the restorative properties of classical garden soundscapes remain scarce. In light of this, the present study aims to explore the construction techniques and variations in audiovisual elements of the "Plantain in Rain" soundscape in classical gardens, analyzing how demographic characteristics, personality traits, and noise sensitivity influence the perception of its restorative benefits. This study seeks to quantify the restorative effects of the "Plantain in Rain" soundscape on individuals, thereby providing theoretical guidance for enhancing the restorative aspects of classical garden soundscapes. The specific research questions include: (1) Does the "Plantain in Rain" soundscape exhibit significant restorative effects? (2) How do audiovisual elements and individual characteristics influence the restorative benefits of the "Plantain in Rain" soundscape?

2. Research Methods

2.1. Collection and Selection of Audiovisual Materialss

This study collected visual images from classical gardens in Suzhou, Jiangsu Province, and audio recordings from areas near the West Lake Scenic Area in Hangzhou. As significant UNESCO World Cultural Heritage sites, Suzhou's classical gardens and Hangzhou's West Lake contain numerous locations featuring the "Plantain in Rain" soundscape, providing a diverse and abundant source of audiovisual materials for this research. Based on the characteristics of the "Plantain in Rain" soundscape and preliminary investigations, five locations in Suzhou's classical gardens were selected for capturing plantain-related visual environments: Tingyu Pavilion in the Humble Administrator's Garden, Chengqu Caotang in the Couple's Retreat Garden, Renlan Hall in the Couple's Retreat Garden, and Lixue Hall in the Lion Grove Garden. Additionally, three locations in Hangzhou were chosen for collecting plantain-related sound environments: Hangzhou Botanical Garden, Guozhuang, Gushan, and Shuyuan. The data collection was conducted in June 2024, using a Nikon Z 5 camera (24-70mm f/4.0s lens) for image acquisition and a TASCAM X8 recorder (set to 32-bit and a sampling rate of 44.1 kHz) for sound recording.

2.2. Questionnaire Design

The survey questionnaire consisted of seven sections: sociodemographic variables, personality traits scale, recent life satisfaction scale, noise sensitivity scale, noise annoyance scale, visual perception and restoration scale, and auditory perception and restoration scale. Given individual variations in the time required to perceive soundscapes and the potential differences in perception across geographic regions, the study employed an online survey format for data collection. A 7-point Likert scale was used to evaluate the "Plantain in Rain" soundscape. The visual stimuli were categorized into six images, while the auditory stimuli were divided into three types of sounds. Each audio clip was set to a duration of 90 seconds using the Adobe Audition digital audio workstation.

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202505_8(5).0020

2.3. Data Analysis

The online survey was conducted between June and July 2024. Data collection was carried out with the informed consent of participants. A total of 212 questionnaires were distributed, of which 182 valid responses were collected, yielding a response rate of 85.8%. The sample consisted of an equal number of male and female participants (91 each). Among them, 96% had attained a bachelor's degree or higher, ensuring their ability to fully comprehend the experimental content and meet the study's requirements.

The collected data were imported into SPSS software for reliability analysis. The results indicated that the Cronbach's alpha values for all scale components, except for auditory annoyance and auditory expansiveness—both of which contained only a single item—ranged from 0.837 to 0.983, demonstrating high data reliability. Since Cronbach's alpha cannot be calculated for single-item dimensions, the reliability coefficient for these two dimensions was unavailable. According to the theoretical framework, despite the lower reliability, a single-item measure can still effectively assess the intended dimension. Considering the importance of the expansiveness dimension, this study decided to retain the expansiveness item for further analysis while removing the annoyance item.

3. Results and Analysis

3.1. Psychological Restorative Characteristics of the "Plantain in Rain" Soundscape

To analyze the restorative characteristics of the "Plantain in Rain" soundscape in detail, a factor analysis was conducted on 16 variables from the visual restorative scale and 19 variables from the auditory restorative scale (Table 1). The Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity results indicated that the visual variables had a KMO value of 0.980, exceeding the critical threshold of 0.6, with a Bartlett's Test p-value of 0.000 ($p < 0.05$). Similarly, the auditory variables had a KMO value of 0.972, with a Bartlett's Test p-value of 0.000. These results confirmed that the selected audiovisual restorative indicators were suitable for factor analysis.

Factor loadings revealed that the auditory dimension consisted of three primary factors, explaining 56.73%, 70.06%, and 76.00% of the variance, respectively. Factor 1, defined as "Attractiveness," describes the degree to which auditory stimuli capture attention and enhance pleasure, emphasizing focus and relaxation. Factor 2, defined as "Detachment," reflects the ability of the soundscape to help individuals disengage from disturbances and create psychological space, highlighting activation effects. Factor 3, defined as "Adaptability," represents the ability of individuals to quickly adjust to preferred activities, alleviate mental burden, and maintain balance.

For the visual dimension, Factor 1 explained 52.07% of the variance, while Factor 2 explained 77.09%. Factor 1, defined as "Immersion," showed strong loadings across all four original dimensions—detachment, expansiveness, fascination, and compatibility—indicating a comprehensive experience in which individuals sustain prolonged attention, enter a focused state, and experience psychological relaxation and emotional regulation. Factor 2, defined as "Dissociation," had strong loadings on detachment, reflecting how the visual environment helps individuals escape from everyday stress, reduce mental burden, and create a sense of psychological separation.

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202505_8(5).0020

Table 1. Rotational component matrix of audio-visual recovery factor analysis of "Plantain in Rain"

(Hearing) dimension	Project	Rotary component matrix (factor load)			(Visual) dimension	Project	Rotary component matrix (factor load)	
		Factor 1 (56.73%)	Factor 2 (70.06%)	Factor 3 (76.00%)			Factor 1 (52.07%)	Factor 2 (77.09%)
	1	0.897				1		0.872
	2	0.678			Stay away from	2		0.733
Charm	3	0.897				3	0.626	
	4	0.680				4	0.641	
	5	0.885				5	0.702	
	6		0.883		Ductibility	6	0.772	
Stay away from-go	7		0.875			7	0.725	
	8	0.696				8	0.789	
	9	0.872				9	0.794	
Stay away from-from	10	0.909			Charm	10	0.793	
	11	0.889				11	0.814	
	12	0.863				12	0.800	
	13	0.903				13	0.738	
Compatibility	14	0.878			Compatibility	14	0.775	
	15			0.882		15	0.803	
	16	0.617				16	0.802	
Sequence	17	0.801						
	18	0.862						
Ductibility	19	0.655						

3.2. Analysis of Differential Characteristics

Subsequently, a differentiation analysis was conducted (Table 2). In the visual dimension, weather significantly influenced visual factors, with immersion and dissociation being higher on sunny days than on cloudy days. Favorable external visual conditions contributed to enhanced immersion. Additionally, the planting method of plantains exhibited a significant

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202505_8(5).0020

effect, as rows of plantains led to higher immersion and dissociation levels compared to solitary plantings.

In the auditory dimension, significant differences were observed in the attractiveness and adaptability of different sound sources. Light rain exhibited higher attractiveness and adaptability than heavy rain, while a noisy environment weakened the sense of being away.

At the perceptual subject level, gender, age, and occupation had minimal impact on visual and auditory factors. However, educational background significantly influenced the sense of being away, attractiveness, and adaptability. Undergraduate participants exhibited the highest sense of being away, while attractiveness and adaptability increased with higher levels of education. The participants' hometowns also had a significant effect on visual restoration, with those from the northwest region showing the highest immersion and dissociation levels, whereas participants from the northeast had the lowest. The frequency of visits to classical gardens significantly affected immersion and dissociation, with individuals who visited more than eight times reporting the highest immersion, while those who had never visited reported the lowest. Furthermore, the level of familiarity with the soundscape of Plantain in Rain influenced immersion, where greater familiarity led to a stronger sense of immersion, although dissociation exhibited minimal variation.

Table 2. Analysis of group differences between audiovisual recovery and subject-object dimensions

	Vision		Hearing		
Perceived factor	Immersion	Dissociation	Attractiveness	Detachment	Adaptability
Weather	0.000	0.001	/	/	/
Planting method of P plantain	0.000	0.000	/	/	/
Different sources of sound	/	/	0.000	0.182	0.007
Gender	0.109	0.567	0.578	0.955	0.100
Age	0.737	0.729	0.722	0.169	0.366
Record of formal schooling	0.125	0.783	0.371	0.003	0.693
Occupation	0.974	0.205	0.377	0.092	0.170
Hometown	0.153	0.003	0.436	0.048	0.752

3.3. Correlation Analysis

Building upon the differentiation analysis, Pearson correlation coefficients were employed to further examine the relationships between continuous independent variables and dependent variables (Figure 1).

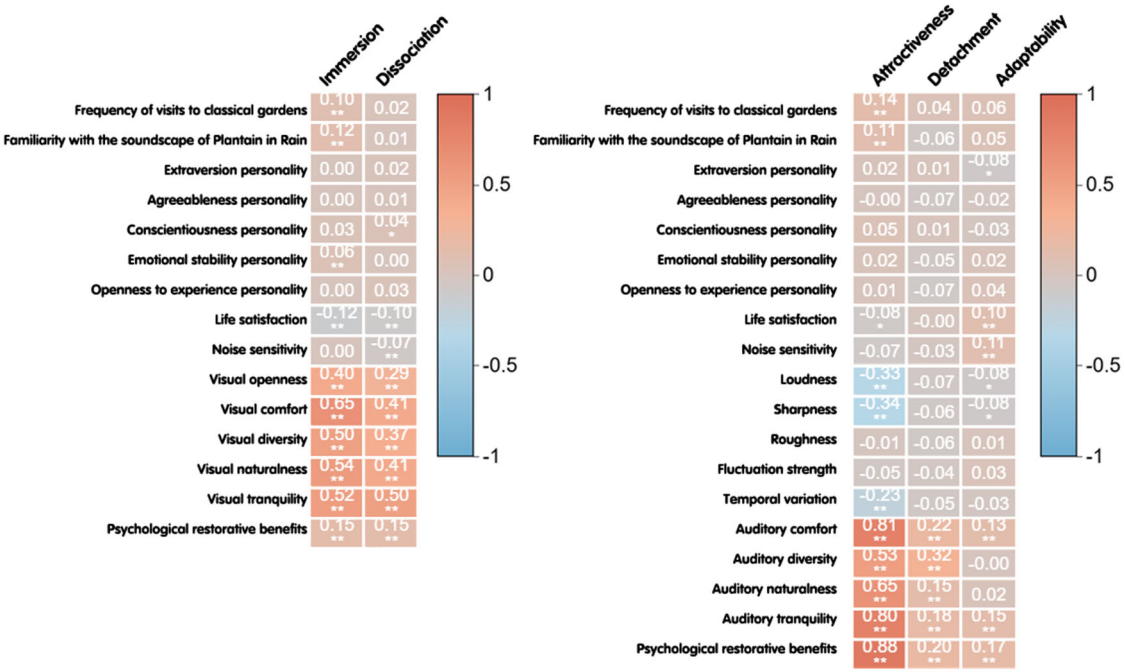
In the auditory dimension, attractiveness was significantly and positively influenced by auditory comfort, psychological restorative benefits, and tranquility, indicating that comfort and restoration are key factors in shaping the experience of attractiveness. The sense of being away was correlated with auditory diversity and comfort, highlighting the importance of dynamic sound sources and a pleasant acoustic environment. Psychological restorative benefits and tranquility positively influenced adaptability, although to a lesser extent. Loudness and sharpness were negatively correlated with both attractiveness and adaptability, while transience exhibited a significant negative correlation with attractiveness.

In the visual dimension, psychological restorative benefits, comfort, and naturalness were the primary drivers of immersion, underscoring the crucial role of a comfortable and natural visual

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202505_8(5).0020

environment in fostering immersion. Visual tranquility, psychological restorative benefits, comfort, and naturalness significantly enhanced dissociation, suggesting that tranquility and natural attributes in the visual domain contribute to psychological restoration.

Additionally, cultural background significantly affected restorative experiences. The frequency of visits to classical gardens and familiarity with the soundscape of Plantain in Rain enhanced visual immersion and auditory attractiveness. Life satisfaction was positively correlated with adaptability, indicating that individuals with higher life satisfaction were more likely to relieve stress through soundscapes. However, life satisfaction was negatively correlated with immersion, dissociation, and attractiveness. Noise sensitivity was positively correlated with adaptability, suggesting that highly sensitive individuals were more likely to experience restoration in natural sound environments, yet it was negatively correlated with dissociation.



*Significant correlation at the 0.05 level (two-tailed).
** Significant correlation at the 0.01 level (two-tailed).
Figure 1. Heatmap of audiovisual recovery correlation

3.4. Audiovisual Restoration Model Construction

The construction of the "Plantain in Rain" audiovisual restoration model divides the various dimensions of both visual and auditory restoration equally to form the total scores for visual and auditory restoration. Multiple stepwise regression was used for model construction (Table 3). The "Plantain in Rain" auditory restoration regression model is as follows:

$$B = 0.304A_1 + 0.117A_2 - 0.071A_3 + 0.058A_4 + 0.085A_5 + 1.120. \quad (1)$$

In the equation, B represents "Plantain in Rain" auditory restoration, A1 represents auditory psychological restoration benefits, A2 represents auditory comfort, A3 represents life satisfaction, A4 represents auditory diversity, and A5 represents noise sensitivity. Except for life satisfaction, which is negatively correlated, all other factors are positively correlated, with the degree of impact in descending order: auditory psychological restoration benefits, auditory comfort, life satisfaction, auditory diversity, and noise sensitivity. The F-values for the

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202505_8(5).0020

audiovisual models are 1077.273 and 153.936, and the adjusted R-squares are 0.798 and 0.513, indicating that approximately 79.8% and 51.3% of the variation in the dependent variables can be explained by the independent variables in these two models, demonstrating strong statistical significance. The establishment of these models provides a better understanding of the role mechanism of the "sound (auditory restoration) - setting (visual restoration) - people (demographic characteristics)" triad in the "Plantain in Rain" soundscape, offering a theoretical framework for psychological restoration research. The "Plantain in Rain" visual restoration regression model is as follows:

$$Y==0.414X_1+0.077X_2+0.096X_3+0.063X_4+0.069X_5+0.036X_6-0.051X_7-0.021X_8+0.5. \quad (2)$$

In the equation, Y represents "Plantain in Rain" visual restoration, X1 represents psychological restoration benefits, X2 represents visual diversity, X3 represents visual tranquility, X4 represents visual naturalness, X5 represents visual comfort, X6 represents life satisfaction, X7 represents noise sensitivity, and X8 represents kinship personality traits. Except for noise sensitivity and kinship personality traits, which are negatively correlated, all other factors are positively correlated. The degree of influence, from highest to lowest, is as follows: visual psychological restoration benefits, visual tranquility, visual diversity, visual comfort, visual naturalness, and life satisfaction.

Table 3. Multiple stepwise regression analysis of the audiovisual restorative model

Hearing	B	Standard error	Beta	t	Significance	Allowance	VIF
(constant)	1.120	0.122		9.168	0.000		
Psychological restorative benefits	0.304	0.029	0.502	10.356	0.000	0.285	3.504
Auditory comfort	0.117	0.030	0.192	3.948	0.000	0.284	3.520
Life satisfaction	-0.071	0.021	-0.090	-3.356	0.001	0.942	1.061
Auditory diversity	0.058	0.021	0.090	2.809	0.005	0.651	1.535
Noise sensitivity	0.085	0.037	0.060	2.274	0.023	0.967	1.034
F values for the entire model：153.936							
The adjusted R square：0.513							
Vision	B	Standard error	Beta	t	Significance	Allowance	VIF
(constant)	0.500	0.079		6.302	0.000		
Psychological restorative benefits	0.414	0.013	0.570	31.821	0.000	0.289	3.462
Visual diversity	0.077	0.01	0.108	7.910	0.000	0.5	1.999
Visual tranquility	0.096	0.011	0.131	8.928	0.000	0.43	2.328
Visual naturalness	0.063	0.011	0.087	5.975	0.000	0.432	2.314
Visual comfort	0.069	0.012	0.100	5.839	0.000	0.316	3.160
Life satisfaction	0.036	0.008	0.043	4.300	0.000	0.946	1.058
Noise sensitivity	-0.051	0.015	-0.034	-3.470	0.001	0.972	1.029
Agreeableness personality	-0.021	0.011	-0.019	-1.988	0.047	0.988	1.012
F values for the entire model：1077.273							
The adjusted R square：0.798							

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202505_8(5).0020

4. Discussion

4.1. The Psychological Restorative Dimensions of the "Plantain in Rain" Soundscape

Through factor analysis, this study conducted dimensionality reduction on both visual and auditory restorative scales, deepening the understanding of the restorative characteristics of the "Plantain in Rain" soundscape. The results align with existing multisensory restoration studies on visual [7] and auditory [8] restorative scales, while also demonstrating certain distinctions. This study specifically focuses on the "Plantain in Rain" soundscape, maintaining control over the types of research subjects; hence, the analytical approach is relatively narrow, leading to potential differences.

Three factors were extracted from the auditory dimension: attractiveness, escape, and adaptability, explaining 56.73%, 70.06%, and 76.00% of the variance, respectively. The attractiveness factor highlights the ability of sound stimuli to sustain individual interest and attention, revealing the unique auditory appeal of the "Plantain in Rain" soundscape. The escape factor describes how sound aids individuals in alleviating environmental stress through masking effects, consistent with studies demonstrating how natural sounds reduce noise interference in urban environments [9]. The adaptability factor emphasizes individuals' rapid acclimatization to the sound environment, further revealing its impact on psychological restoration. However, as this factor comprises only one item, its explanatory power is weak, necessitating further exploration of its predictive role in future research.

For the visual dimension, two factors were extracted: immersion and dissociation, explaining 52.07% and 77.09% of the variance, respectively. The immersion factor integrates escape, expansiveness, fascination, and compatibility, reflecting an individual's focused engagement and emotional relaxation in response to visual stimuli, akin to the attentional restoration mechanism in restorative environment theories [9]. Furthermore, immersion incorporates elements of fascination and escape, offering an emotional "immersive experience" [10]. The dissociation factor emphasizes the psychological detachment effects induced by the visual environment, extending the functional attributes of visual environments in attentional recovery.

Overall, the dimensionality reduction results expand the understanding of multisensory restorative environments. Visual restoration is categorized into immersion and dissociation, emphasizing retention and recovery as well as arousal, while auditory restoration is divided into attractiveness, escape, and adaptability, respectively emphasizing focus, activation, and balance.

4.2. The Influence of Perceived Sound Sources

This study classified "Plantain in Rain" into light rain, moderate rain, and heavy rain, revealing significant restorative differences among these sound sources. The three auditory factors were positively evaluated under light rain conditions but negatively under heavy rain, indicating that the "Plantain in Rain" soundscape does not always exhibit positive restorative effects.

Correlation analysis of psychoacoustic indices revealed that, except for a weak positive correlation between roughness and fluctuation strength with the adaptability factor, all other indices were negatively correlated with the three auditory restorative factors. This finding suggests that controlling psychoacoustic indicators contributes to enhancing the restorative potential of sounds, aligning with conclusions from other studies [12]. Although the relationship of roughness and fluctuation strength remains unclear, future research with larger sample sizes could further investigate their influence.

In the auditory restorative model of "Plantain in Rain," auditory comfort and diversity significantly influenced restoration. The former promotes pleasantness and relaxation through

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202505_8(5).0020

soft sound quality and appropriate volume [13], while the latter enhances the escape experience through rich rhythms and dynamic variations. Although other studies have shown that tranquil natural soundscapes reduce background noise and enhance psychological security, this study found a negative correlation between tranquility and the escape factor, failing to establish a definitive positive contribution to restoration [14]. The highest coefficient of auditory psychological restorative benefits in the model indicates it as the core mechanism. This finding aligns with perspectives suggesting that psychological restorative benefits are crucial for evaluating the effectiveness of natural soundscapes [15].

Additionally, questionnaire feedback confirmed that, consistent with previous studies, natural sounds in virtual environments can also facilitate psychological restoration [16], further validating the restorative value of the "Plantain in Rain" soundscape in virtual settings.

4.3. The Influence of Perceived Sound Sources

As a crucial factor in soundscape evaluation, visual perception in this study was categorized into weather conditions and planting methods. Results indicated that overcast weather was less effective than sunny weather in enhancing immersion and dissociation. Combined with other studies, it is inferred that adverse weather conditions weaken individuals' positive perceptions of natural environments [17], consequently reducing restorative effects. This conclusion aligns with previous research suggesting that sunlight enhances positive responses to nature and mitigates psychological stress. The influence of plantain planting methods on restorative experiences was minimal, yet clustered planting significantly increased immersion, corroborating findings that greenery visibility is associated with restoration [18].

Correlation analysis demonstrated that the five visual perception evaluation indices were significantly positively correlated with immersion and dissociation, particularly the positive effect of visual openness on restorative experiences. This supports the concept of "extent" in ART theory, which posits that greater visual openness enhances immersion and dissociation [19]. Visual comfort significantly strengthened restorative experiences, confirming its importance in psychological recovery [20]. Furthermore, visual diversity promoted psychological restoration by increasing environmental attractiveness and interest. The positive effects of visual tranquility and naturalness on restorative experiences suggest that tranquil visual attributes help reduce disruptive information, enhancing psychological relaxation and emotional recovery. This conclusion strongly supports the idea that serene and natural visual elements alleviate urban life stress and are particularly critical for psychological restoration [21].

4.4. The Influence of Perceived Sound Sources

Analysis of variance revealed no significant influence of gender, age, or occupation on the auditory and visual restorative factors. The non-significance of age and occupation may be attributed to the demographic distribution of the sample, with 95% aged 18–30 and 89.5% being students. Undergraduate students exhibited significantly higher escape scores than graduate students, possibly due to the heavier workload and lower life satisfaction of the latter.

Hometown regions significantly influenced dissociation and escape. The highest levels of attractiveness and escape were reported in the northwest region, whereas the lowest were in the northeast. Additionally, adaptability was highest in the southern region and lowest in the northwest, suggesting that childhood environments shape individuals' understanding and acceptance of the "Plantain in Rain" soundscape. People from regions with abundant plantain cultivation (e.g., southern China) adapted more readily to this soundscape, whereas those from the northwest exhibited greater curiosity, enhancing psychological restoration. This aligns with previous studies indicating a strong relationship between attentional restoration and psychological recovery [22].

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202505_8(5).0020

Moreover, the frequency of classical garden visits and familiarity with the "Plantain in Rain" soundscape were significantly positively correlated with immersion and attractiveness, indicating that greater exposure to gardens enhances the restorative potential of the soundscape, consistent with existing research [23]. In the visual restorative model, agreeableness exhibited a negative impact on restoration, whereas conscientiousness positively influenced both auditory and visual restorative factors, consistent with previous findings [24]. Life satisfaction differed from other studies, positively correlating with visual restoration factors but negatively with auditory restoration factors. Noise sensitivity was positively correlated with adaptability, indicating that highly sensitive individuals could better engage in activities within the "Plantain in Rain" soundscape, thereby reducing psychological stress.

5. Conclusion

This study aims to construct a model of the audiovisual restorative properties of Plantain in Rain, employing reliability and validity analysis, difference analysis, correlation analysis, and multiple stepwise regression. Ultimately, the study explores the psychological restorative effects of Plantain in Rain from the perspectives of "sound-space-human." The main conclusions are as follows:

1. The psychological restorative dimensions of Plantain in Rain soundscapes, from an audiovisual perspective, can be categorized into five aspects: immersion, dissociation, attraction, detachment, and adaptability. These dimensions account for 52.07% and 77.09% of visual restoration and 56.73%, 70.06%, and 76.00% of auditory restoration, respectively.

2. Not all Plantain in Rain soundscapes contribute positively to psychological restoration, with auditory perception playing a dominant role in restorative effects. Specifically, small raindrop sounds exhibit a stronger positive restorative effect, whereas heavy rain sounds exert a negative impact. Auditory perception attributes, particularly comfort and diversity, jointly enhance auditory restoration, with comfort being the core factor. Moreover, the benefits of auditory restoration hold a predominant position in the prediction of overall restorative outcomes, serving as a critical indicator for assessing the restorative efficacy of natural soundscapes.

3. Visual restorative benefits also play a significant role in predicting overall restoration. Sunlight on a clear day enhances positive emotions, significantly increasing immersion and dissociation, while overcast conditions diminish restorative effects due to their negative emotional influence. The clustered planting of plantains, due to its high green view index, significantly enhances immersion. Among visual perception attributes, comfort, diversity, naturalness, and tranquility all contribute positively to visual restoration, with tranquility being the most crucial factor.

4. Demographic factors such as gender, age, and occupation do not exhibit significant effects on audiovisual restorative dimensions, though undergraduate students demonstrate a higher degree of detachment. Regional differences significantly influence dissociation and detachment, with individuals from Northwestern China exhibiting stronger attraction and detachment toward Plantain in Rain soundscapes. Increased frequency of visits to classical gardens and a deeper understanding of them enhance immersion and attraction, thereby improving overall restoration. Regarding personality traits, agreeableness negatively correlates with visual restoration, while conscientiousness positively influences both audiovisual restoration. Life satisfaction is positively associated with visual restoration but negatively related to auditory restoration. Furthermore, individuals with higher noise sensitivity tend to develop greater adaptability, thereby enhancing overall restorative effects.

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202505_8(5).0020

References

[1] Li, Song. "Research on the Design of Rain Scene Aesthetic in Chinese Classical Gardens." [D] Hubei University of Technology, 2010.

[2] Xu, Bo. "On the Image of 'Rain Beating on Banana Leaves' in Ancient Literature." [J] Journal of the School of Chinese Language and Literature, Nanjing Normal University, 2011, (03): 79-83.

[3] Ji, Rui, et al. "Are natural soundscapes always beneficial? Evaluating the restorative qualities and influencing mechanisms of natural water soundscapes." Applied Acoustics 227 (2025): 110205.

[4] Ge, Tianji. "Research on the Soundscape of Birdsong in Urban Parks Based on Perceived Restoration." [D] Harbin Institute of Technology, 2018.

[5] Zhang, Yuan. "Study on the Restorative Effects of Soundscapes in Urban Public Open Spaces." [D] Harbin Institute of Technology, 2016.

[6] Kang, Jian, and Yang, Wei. "Soundscapes in Urban Public Open Spaces." [J] World Architecture, 2002, (6): 76-79.

[7] Wu, Tianjie. "Research on the Enhancement Design of Restorative Effects of Pocket Parks Based on Visual Perception." [D] Fujian Agriculture and Forestry University, 2023. DOI: 10.27018/d.cnki.gfjnu.2023.000737.

[8] Zhao, Xin. "Research on the Restorative Soundscape and Optimization Design of Office-type Pocket Parks." [D] Shandong Jianzhu University, 2023.

[9] Bai, Zhengkang, and Shuangquan Zhang. "Effects of Different Natural Soundscapes on Human Psychophysiology in National Forest Parks." Scientific Reports 14.1 (2024): 17462.

[10] Zhou, Yanhui, Wang, Yifan, Jin, Hexian. "Research on the Restorative Benefits of Campus Green Spaces under Visual and Olfactory Perception." [J] Chinese Landscape Architecture, 2023, 39(11): 36-41.

[11] Kaplan, Stephen. "The Restorative Benefits of Nature: Toward an Integrative Framework." Journal of Environmental Psychology 15.3 (1995): 169-182.

[12] Han, Zhihui, Jian Kang, and Qi Meng. "A Time Series Analysis Model of the Relationship Between Psychoacoustic Parameters of Urban Soundscape Spatial Sequences and Emotional Changes." The Journal of the Acoustical Society of America 152.4 (2022).

[13] Wei, Lanqing. "Research on the Relationship Between Bamboo Scenery and Preference, Perceived Restoration under Audiovisual Interaction." [D] Sichuan Agricultural University, 2019.

[14] Bai, Yuping. "Research on the Restorative Environment of Micro Public Spaces in Urban Industrial Communities Based on Perceived Dimensions." [D] Sichuan Agricultural University, 2023.

[15] Payne, Sarah R., and Catherine Guastavino. "Exploring the Validity of the Perceived Restorativeness Soundscape Scale: A Psycholinguistic Approach." Frontiers in Psychology 9 (2018): 2224.

[16] Shi, Xian, Zhenyu Guo, and Yuezhe Zhao. "Influence of Virtual Audio System on Psychological Restoration Effects of Soundscapes: Investigating Water Sounds of a Chinese Classical Garden." Applied Acoustics 221 (2024): 109991.

[17] Ulrich, RS. "Biophilic Theory and Research for Healthcare Design." In SR Kellert, JH Heerwagen, and ML Mador, editors. Biophilic Design: The Theory, Science, and Practice of Bringing Buildings to Life. Hoboken, NJ: John Wiley (2008): 87–106.

[18] Liu, Shudan. "Research on the Characteristics and Psychological Impact Mechanisms of Winter and Summer Green Visual Rate in Residential Areas of Hangzhou." [D] Zhejiang Agriculture and Forestry University, 2024.

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202505_8(5).0020

[19] Kaplan, Rachel. "The Role of Nature in the Context of the Workplace." Landscape and Urban Planning 26.1-4 (1993): 193-201.

[20] Ulrich, Roger S. "View Through a Window May Influence Recovery from Surgery." Science 224.4647 (1984): 420-421.

[21] Van den Berg, Agnes E., Terry Hartig, and Henk Staats. "Preference for Nature in Urbanized Societies: Stress, Restoration, and the Pursuit of Sustainability." Journal of Social Issues 63.1 (2007): 79-96.

[22] Wang, Shiqi. "Research on Environmental Design Strategies for Campus Spaces in Cold Regions under the Goal of Attention Restoration." [D] Harbin Institute of Technology, 2020.

[23] Fang, Xingyue, et al. "Soundscape Perceptions and Preferences for Different Groups of Users in Urban Recreational Forest Parks." Forests 12.4 (2021): 468.

[24] McClelland, Laura E., and James H. Brads. "The Five Factor Model and Life Satisfaction: Examining the Predictive and Mediatory Role of Restorativeness Indoors." Journal of Environmental Psychology 92 (2023): 102150.