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Perceived Restorativeness, Viewing Engagement, and Cultural Credibility of AIGC-Generated Central Asian Silk Road Cultural Landscape Images

-- A paired-image evaluation across three types of cultural landscapes

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Abstract: As cultural exchanges between China and Central Asia continue to deepen, artificial intelligence-generated content (AIGC) is creating new opportunities for the digital dissemination of Silk Road cultural heritage. This study examines differences in audience perceptions of photographs and AIGC-generated images of Central Asian Silk Road cultural landscapes. Three settings were selected: Registan Square in Samarkand, Lyabi-Hauz in Bukhara, and the ancient city of Khiva. Using a paired-image questionnaire experiment, we compared the two image sources across three dimensions: perceived restorativeness, viewing engagement, and cultural credibility. The results show that photographs received significantly higher ratings for perceived restorativeness and cultural credibility than AIGC-generated images, whereas AIGC-generated images received significantly higher ratings for viewing engagement. Significant interactions between image source and landscape setting were found for viewing engagement and cultural credibility, but not for perceived restorativeness. These findings indicate that audience evaluations of AIGC-generated cultural landscape images differ across dimensions: their advantage in visual engagement does not translate into greater perceived restoration or cultural credibility. This study provides empirical insights for the digital dissemination of Central Asian cultural and creative resources and the practical use of AIGC-generated heritage imagery in the context of a digitally connected Silk Road.

Keywords: AIGC, Central Asian Silk Road cultural landscapes, perceived restorativeness, viewing engagement, cultural credibility.

1. Introduction

Cultural landscapes are not merely visual objects to be viewed; they also embody historical memory, local knowledge, and cultural symbols. The Central Asian Silk Road cities of Samarkand, Bukhara, and Khiva are distinguished by their architectural forms, spatial organization, and decorative features. Their digital representation is relevant not only to heritage dissemination but also to how audiences understand and evaluate these places. Generative artificial intelligence (AIGC) can rapidly produce cultural landscape images with coherent compositions, idealized lighting, and intensified atmospheres, providing new visual resources for exhibitions, tourism communication, and digital storytelling. However, generated images may contain inaccuracies in architectural details, spatial relationships, or historical context. Their dissemination value therefore cannot be judged solely by visual attractiveness.

Environmental psychology has long examined how environments influence stress recovery and attentional restoration. Attention Restoration Theory, proposed by Kaplan and Kaplan, emphasizes that certain environmental characteristics can support the recovery of attention [1]. Ulrich and colleagues examined the stress-reducing effects of natural and urban environments from the perspectives of emotional and physiological responses [3]. Restorative potential is not limited to natural environments: historically significant built environments may also provide restorative experiences, although the pathways involved may differ from those associated with nature [8, 9]. Related work on heritage and built environments further indicates that restorative experiences are shaped by contextual and cultural cues[7]. Accordingly, evaluations of cultural landscape images should not simply be equated with evaluations of natural landscape images.

Since the China–Central Asia Summit, cooperation between China and Central Asian countries in culture and technology has continued to deepen. AIGC offers new opportunities for the digital recreation and international dissemination of Central Asian Silk Road heritage. Generative AI can rapidly produce visually polished and atmospheric images of Central Asian cultural landscapes for tourism promotion, digital exhibitions, and cross-cultural creative storytelling[31]. At the same time, AIGC-generated heritage images face practical risks, including the misuse of cultural symbols, mismatches in architectural forms, and distorted spatial logic. Visual refinement does not necessarily indicate cultural credibility [23]. Research on AIGC and cultural heritage has begun to examine audiences' aesthetic responses, authenticity judgments, and willingness to accept generated content. Feng and Hu conducted an experiment using AI-generated images of Wuxi clay figurines and found that visual information quality, technological novelty, and the salience of cultural symbols were associated with aesthetic evaluations; aesthetic evaluations and symbol salience were, in turn, related to perceived authenticity [20]. Interview research by Luo and colleagues on images of Dunhuang cultural heritage likewise suggests that visual fluency alone does not determine authenticity judgments; audiences' prior cultural experience and information about image sources also matter [21]. These studies provide an important foundation,

but paired comparisons of Central Asian architectural landscapes that simultaneously examine restorativeness, viewing engagement, and cultural credibility remain limited.

Against this background, this study selected three representative Central Asian Silk Road cultural landscape settings as experimental stimuli. A paired-image questionnaire experiment compared photographs with AIGC-generated images in terms of perceived restorativeness, viewing engagement, and cultural credibility. It also examined the interaction between landscape setting and image source. The study aims to provide empirical insights for AIGC image creation, cultural and creative content development, and digital storytelling about Central Asian culture in the context of a digitally connected Silk Road.

2. Literature Review

2.1. Restorative Environment Theory and Cultural Landscape Images

Restorative Environment Theory (ART) proposes that environments characterized by fascination, being away, extent, and compatibility may support the restoration of directed attention [1, 2]. It provides a core framework for explaining how environments promote psychological and physical recovery. Kaplan and Kaplan's Attention Restoration Theory holds that environments with four characteristics-being away, extent, fascination, and compatibility-can alleviate directed-attention fatigue through "soft fascination" [1]. Ulrich's Stress Reduction Theory, from an evolutionary psychology perspective, explains the emotional improvement and stress relief elicited by environmental stimuli [3]. These two theories explain environmental restoration through cognitive recovery and physiological regulation, respectively. Early research on restorative environments focused primarily on natural settings, but has expanded in recent years to cultural spaces such as museums and historical sites. A comparison of natural environments and historic places by Scopelliti and colleagues showed that historic places may also have restorative value [8], although their mechanisms should not be assumed to be identical to those of natural environments. Research on museums as restorative environments by Kaplan and colleagues likewise found that cultural environments may support restorative experiences, while visitors' familiarity with a place can influence their evaluations [9].

In empirical research on restorative environments, using still photographs and digital images as environmental stimuli is an established and widely used approach. Berto's classic experiment demonstrated that viewing nature images on a screen can restore directed attention [5]. Berman and colleagues further found that viewing nature images can significantly improve executive attention, suggesting that static images can elicit restorative psychological responses similar to those associated with real environments [6].

In the measurement of restorative environments, the Perceived Restorativeness Scale (PRS), developed by Hartig and colleagues, has been widely applied to different landscape types [4,[10]], and subsequent scale-development research has further specified the dimensional structure of restorative-environment perception in tourist settings[32].The Chinese version of the PRS was validated by Wang Xinxin and colleagues and demonstrated good reliability and validity in the assessment of urban park restorativeness [28]. For flow experience, the Flow State Scale (FSS), developed by Jackson and Marsh, was tested among Chinese university students by Yuan Qinghua and colleagues, with an overall internal consistency coefficient of 0.93 [15, 30]. These established scales provide a reliable foundation for the measures used in this study. When applying restorative environment theory to static digital images, the limits of the medium must be acknowledged. Screen-based images can convey visual cues such as architectural outlines, spatial order, color, and light, but cannot fully reproduce the enclosure of a physical space, bodily movement, sound, or weather. Therefore, this study measures self-reported perceived restorativeness after viewing images, rather than physiological restoration in actual places.

2.2. Flow, Micro-Flow, and Viewing Engagement

Flow theory, proposed by Csikszentmihalyi, refers to a state in which individuals become fully absorbed in an activity and experience intense concentration and intrinsic enjoyment. Classic flow research identifies clear goals, immediate feedback, and a balance between skills and challenges as important preconditions for flow [34]. Process-related psychological characteristics, such as intense concentration, time distortion, and reduced self-consciousness, may emerge when these conditions are met [13].

However, many low-intensity, passive observational activities, such as viewing paintings or browsing static images, are unlikely to satisfy all the preconditions of a full flow experience. Csikszentmihalyi later introduced the concept of micro-flow to describe mild involvement in activities with low skill requirements and low levels of challenge, making it relevant to fragmented everyday aesthetic activities such as passive viewing [14]. Nevertheless, micro-flow still centers on positive and pleasurable experience. It represents only one subset of viewing-related psychological involvement and cannot capture the full range of responses that may occur when browsing images.

To suit the experimental conditions in this study-passive viewing of a single static image without an operational task or immediate feedback-we adopted the construct of "viewing engagement." Originating in visual communication and empirical aesthetics, viewing engagement refers to a brief state of psychological involvement elicited by a static visual image, grounded in attentional capture and accompanied by cognitive processing and emotional responses [18,[29]]. The Short Flow State Scale (Short-FSS) developed by Jackson and colleagues provides methodological support for this type of adaptation. Their work suggests that, in constrained experimental settings, it may not be necessary to measure all nine dimensions of flow; instead, process-related items relevant to the research context may be selected to represent involvement in a specific situation. This abbreviated adaptation strategy has been adopted in studies of aesthetic viewing [15, 16]. In a comparable experiment involving the viewing of graffiti art, Husselman did not use the full flow scale, but selected process-related items concerning concentration, time distortion, and pleasure to represent subjective involvement during image viewing, while explicitly noting that this approach did not measure the complete flow experience [19]. Following this approach, the items in the present study were adapted from the Chinese version of the FSS [30]. Items representing preconditions for full flow (skill–challenge balance, clear goals, and immediate

feedback) were removed. Only process-related items concerning attentional capture, concentration, subjective pleasure, and temporary changes in time perception were retained. The construct is therefore termed "viewing engagement," rather than flow or micro-flow, and is used only to characterize the brief involvement of viewers' attention, cognition, and emotion when browsing static images.

2.3. AIGC-Generated Cultural Heritage Images: Visual and Cultural Perceptions and Cultural Credibility

AIGC has expanded the pathways through which cultural heritage can be digitally recreated. It can rapidly generate visually polished and atmospheric cultural landscape images, with broad potential applications in tourism promotion, digital storytelling, and cross-regional cultural communication [20]. However, generative images have inherent limitations: when processing historic architecture, ethnic patterns, and traditional spatial layouts, AI may produce detailed inaccuracies. Visual quality and cultural credibility do not necessarily coincide [23]. This gives rise to two important dimensions of perception: audiences' general visual and aesthetic responses, and their subjective perceptions of cultural credibility.

Cultural credibility has two dimensions. The first concerns subjective audience perception: whether the impression conveyed by an image is consistent with viewers' existing understanding of the cultural landscape. The second concerns objective historical accuracy: whether the architecture, patterns, and spatial layout correspond to the original features of the historical remains. It is important to note that audience judgments and assessments of historical accuracy from an architectural-history perspective do not always coincide.

The S–O–R model developed by Feng and Hu suggests that, when audiences encounter AI-generated cultural heritage images, both visual processing and cultural cognition are involved. A favorable visual impression alone does not necessarily translate into cultural identification with the image content [20]. Luo and colleagues found that audiences may experience a perceptual bias in which something false is taken to be true. Even when an image is visually impressive, the overall subjective evaluation of cultural credibility may decline sharply if viewers identify errors in cultural details [21]. Galindo-Durán and colleagues proposed that dedicated evaluation procedures should be established for AI-generated cultural heritage content, with a clear distinction between "creative artistic recreation" and "documentary representation of heritage," as these applications require different evaluation criteria [23].

In related research in China, Jin Fan and colleagues examined digital-human images on social media and demonstrated that visual features can significantly alter audiences' recognition of authenticity and trust [24]. Studies of AIGC advertising images by Li Bingcan and Yang Chao and colleagues found that perceived authenticity mediates the effects of visual stimuli on audience attitudes and behavioral intentions [25, 26]. Zeng Jingfang also noted in research on historic urban landscapes that the forms of landscape elements and their spatial relationships are important cues through which audiences judge cultural authenticity [27].

Overall, empirical studies of AIGC cultural images have mainly focused on domestic intangible cultural heritage, historic districts, and digital human images. Audience-perception studies specifically addressing Central Asian Silk Road cultural landscapes remain scarce. Central Asian Silk Road heritage combines features of Islamic architecture, oasis civilizations, and nomadic cultures. General audiences in China tend to have limited familiarity with this heritage, and the differences between photographs and AIGC-generated images in visual perception and cultural credibility require further empirical examination.

The literature review reveals two gaps. First, most empirical studies of audience perceptions of AIGC-generated cultural heritage images use domestic cultural subjects. Research on Central Asian Silk Road cultural landscapes remains limited, and the multidimensional perceptual differences between photographs and AIGC-generated images within Central Asia's distinctive architectural and cultural-symbolic systems require testing. Second, existing studies often examine aesthetic evaluation or perceived authenticity in isolation. Few incorporate perceived restorativeness, viewing engagement, and cultural credibility into a single experimental framework to compare photographs and AIGC-generated images while also examining the interaction between image source and different landscape settings.

Accordingly, this study uses three representative Central Asian Silk Road cultural landscapes as stimuli and conducts a questionnaire-based experiment with paired photographic and AIGC-generated images. The paired design is intended to reduce stable individual differences, while comparisons across settings are used to examine whether the observed differences are consistent.

3. Research Hypotheses

Attention Restoration Theory identifies "soft fascination" and "being away" as central features of restorative environments [2]. Berto's classic experiment demonstrated that viewing nature images on a screen can restore directed attention [5]. Berman and colleagues further found that viewing nature images can significantly improve executive attention, suggesting that static images can elicit restorative psychological responses similar to those associated with real environments [6]. Photographs preserve the lighting, weather, and on-site details of a particular moment. These "imperfect" traces of reality may facilitate psychological detachment. By contrast, AIGC images may weaken the perceived reality and naturalness of an environment through idealized reconstruction, thereby reducing restorative experience. In a human–AI comparison experiment, Fu and Wu found that AI-generated images exhibited a "high aesthetics but low logic" pattern, with significantly lower ratings for physical plausibility and naturalness of movement than human-created images. Such a lack of logical coherence may place viewers in an evaluative rather than an immersive state [22]. Visual attractiveness has also been shown to shape perceived restorativeness in both natural and built environments [33], which makes it necessary to test whether the idealized visual appeal of AIGC images enhances or weakens restorative experience. Thus, we propose:

H1: Perceived restorativeness differs significantly between photographs and AIGC-generated images.

Flow theory emphasizes concentration and intrinsic enjoyment [13]. However, the viewing of static images involves a weak task structure and does not meet the preconditions required for a complete flow experience. This study therefore adopts the construct of "viewing engagement,"

defined as a brief state of psychological involvement elicited by static visual images, grounded in attentional capture and accompanied by cognitive processing and emotional responses [18]. Qin and colleagues suggest that AIGC images may have stronger visual appeal because of systematic optimization of color, lighting, and composition, thereby increasing attention and pleasure during viewing [17]. Thus, we propose:

H2: Viewing engagement differs significantly between photographs and AIGC-generated images.

Evaluations of cultural heritage images involve judgments about the credibility of architectural forms, decorative symbols, spatial relationships, and historical context [21]. Research by Jin Fan and colleagues on the recognition and trustworthiness of digital-human images on social media found that visual features significantly affect users' perceived authenticity, which in turn increases the credibility of image-text content [24]. Based on the Elaboration Likelihood Model (ELM), Yang Chao and Wei Xiangming found that the perceived authenticity of AI-generated advertising images has a significant positive effect on consumers' purchase intentions, with brand trust and perceived value playing partial mediating roles [26]. These studies suggest that AIGC may generate mismatched architectural forms, misplaced decorative patterns, or distorted spatial proportions, reducing audiences' judgments of cultural authenticity. Photographs, in contrast, retain the architectural outlines and spatial relationships of real environments. Thus, we propose:

H3: Cultural credibility differs significantly between photographs and AIGC-generated images.

The three settings differ in spatial structure, architectural outlines, vegetation and water features, and cultural-recognition cues. Registan Square is characterized by monumental building façades and a symmetrical square layout. Lyabi-Hauz combines water, trees, and surrounding architecture, whereas the ancient city of Khiva is distinguished by city walls, towers, and a continuous historic urban fabric. Fu and Wu found systematic biases in the way AI-generated images represent physical causality and spatial logic; such biases may manifest differently across settings of varying complexity [22]. Scopelliti and colleagues also suggest that the restorative potential of historic and built environments, as well as audience evaluations, is context-dependent [8]. Thus, we propose:

H4: The effect of image source on viewer evaluations varies across cultural landscape settings; that is, image source interacts with setting.

4. Research Design and Methods

4.1. Stimulus Materials and Research Settings

Three Central Asian Silk Road cultural landscape settings were selected: Registan Square in Samarkand, Lyabi-Hauz in Bukhara, and the ancient city of Khiva. Each setting included one photograph and one AIGC-generated image, yielding six stimulus images in total. The questionnaire presented them in the following order: Image 1 (photograph of Registan Square), Image 2 (AIGC image of Registan Square), Image 3 (photograph of Lyabi-Hauz), Image 4 (AIGC image of Lyabi-Hauz), Image 5 (photograph of Khiva), and Image 6 (AIGC image of Khiva).



Figure 1. Photograph of Registan Square

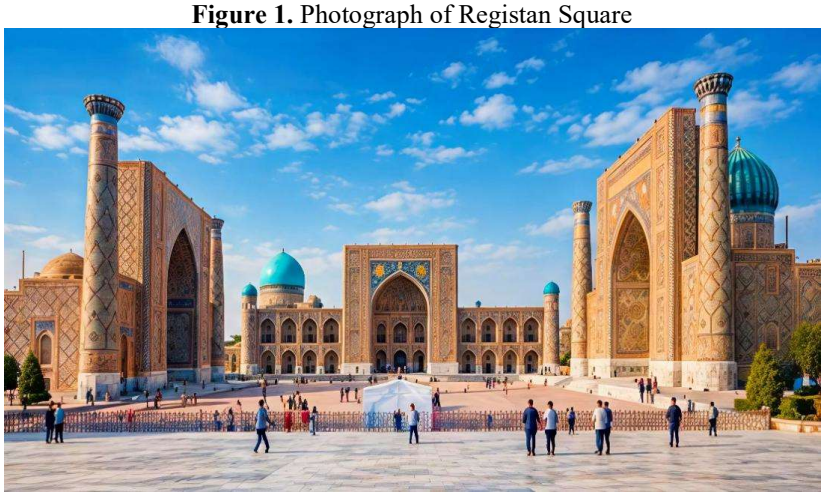


Figure 2. AIGC-generated image of Registan Square

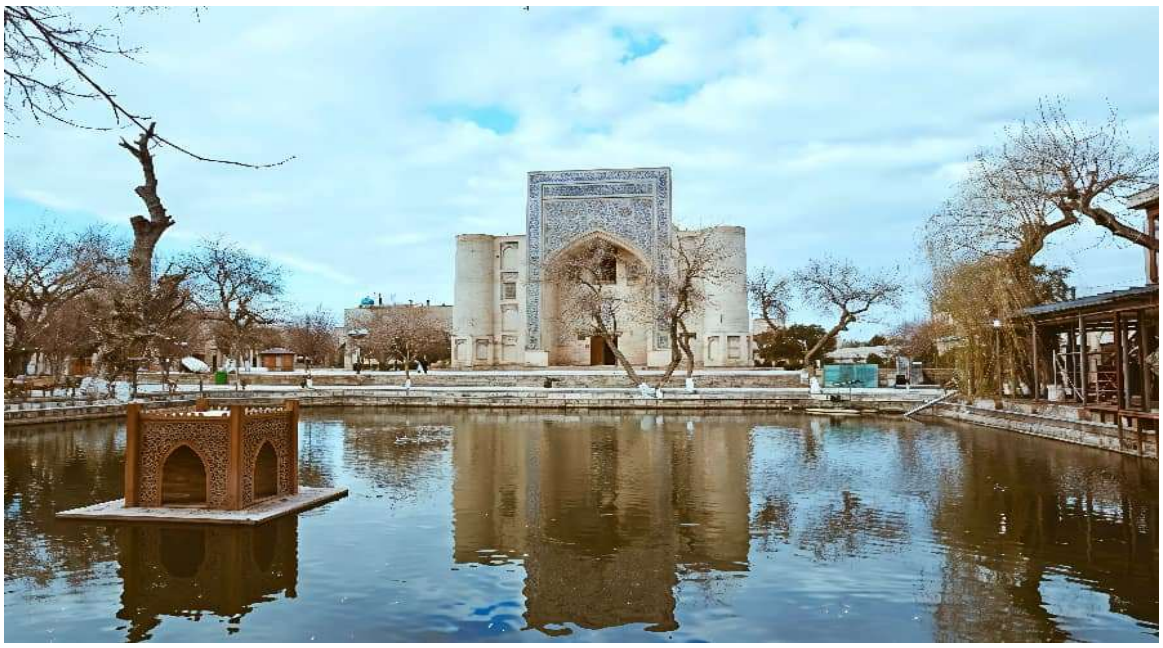


Figure 3. Photograph of Lyabi-Hauz

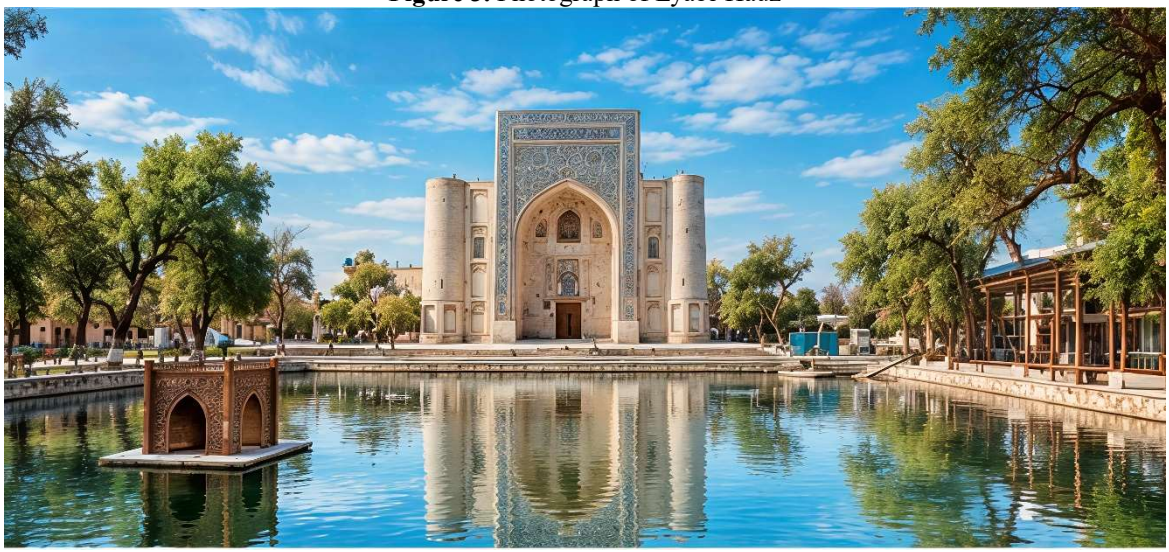


Figure 4. AIGC-generated image of Lyabi-Hauz

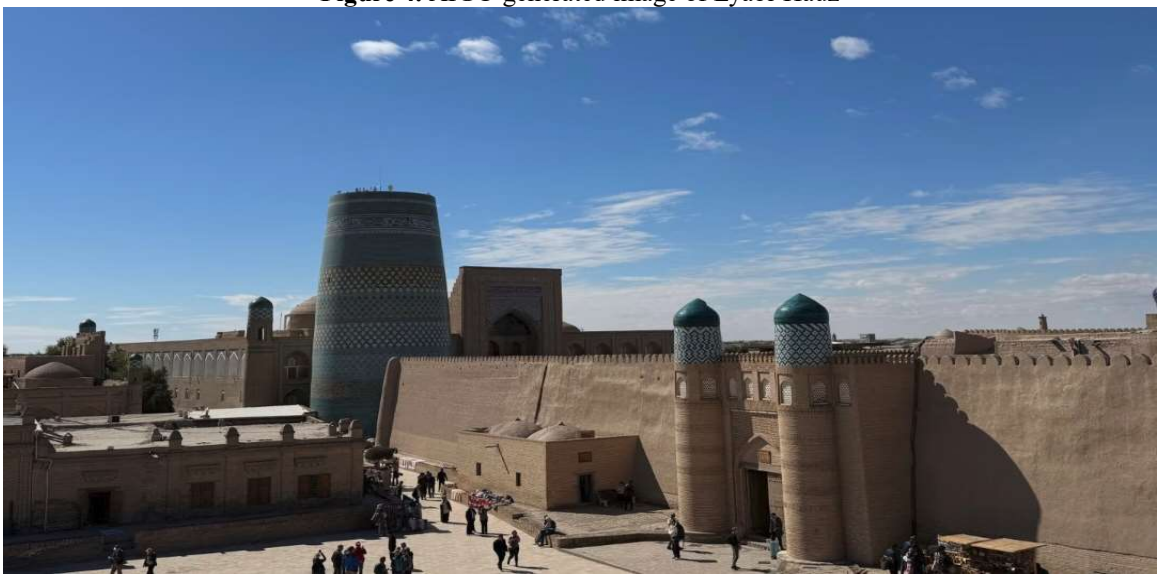


Figure 5. Photograph of Khiva



Figure 6. AIGC-generated image of Khiva

4.2. Measures

All scales used a five-point Likert response format (1 = strongly disagree; 5 = strongly agree). The three main outcome variables were perceived restorativeness, viewing engagement, and cultural credibility. The questionnaire also collected demographic information (age, gender, and education). Familiarity with Central Asian Silk Road culture was included as a control variable, and an attention-check item was used to screen questionnaire quality.

The established scales were shortened for the following reasons. First, the adaptation was necessary for the experimental context. This study used a static-image viewing task without an operational task or immediate feedback and therefore could not meet preconditions for full flow, such as a "balance between skills and challenges" [13]. Although Csikszentmihalyi's concept of micro-flow can describe mild involvement in low-intensity activities, it remains centered on positive and pleasurable experience and cannot fully capture psychological responses to viewing static images [14]. Second, there are precedents for scale reduction. Qin and colleagues note that "a shortened version of the FSS can reduce respondent burden while maintaining acceptable psychometric properties, particularly in applied contexts such as leisure, tourism, and sport psychology" [17]. Negrín and colleagues specifically compared the original PRS developed by Hartig and colleagues with a shorter version in distinguishing urban spaces with different levels of restorativeness; both versions showed appropriate reliability [11]. Third, the reduction in this study was guided by prior measurement practice. Previous research has used a three-item Restoration Outcome Scale to measure perceived restoration, reporting a Cronbach's alpha of 0.92 [12]. Perceived restorativeness was measured using a shortened version of Hartig and colleagues' PRS, with three core items assessing relaxation, psychological detachment, and mental restoration [4]. Viewing engagement drew on the "concentration of attention" and "autotelic experience" factors of the FSS developed by Jackson and Marsh, and on Cian and colleagues' operationalization of visual viewing involvement; three process-related items concerning attentional capture, concentration, and pleasure were retained [15, 18]. Cultural credibility was measured with reference to Feng and Hu's approach to assessing perceived authenticity in AI-generated heritage images [20]. The shortened scales showed good internal consistency in the pilot test. Perceived restorativeness included: "Viewing this image makes me feel relaxed"; "This image allows me to temporarily detach from daily tasks or worries"; and "After viewing this image, I feel mentally restored." Viewing engagement included: "This image captures my attention"; "I can concentrate while viewing this image"; and "I find viewing this image enjoyable." Cultural credibility included: "The architectural or landscape elements in this image are culturally credible"; "The image as a whole looks authentic and credible"; and "I think this image accurately represents the characteristics of Central Asian Silk Road cultural landscapes." The mean of the three items in each dimension was used as the score for that dimension for the corresponding image.

4.3. Sample and Data Processing

The export from the Wenjuanxing survey platform contained 110 responses. Of these, 102 respondents selected "agree" on the informed-consent item, while 8 selected "disagree." The preliminary analysis included only the 102 responses from participants who explicitly consented. Item data for the included responses were complete, with no missing ratings across the nine items and six images. The median completion time was 205 seconds, and the shortest was 67 seconds; no response took less than 60 seconds. Completion time was used only as an auxiliary indicator for data-quality screening and cannot, on its own, establish that responses were attentive. The original responses, screening criteria, and analysis records should be retained for the subsequent full study.

4.4. Analytical Strategy

First, Cronbach's alpha was calculated for each of the three dimensions across the six images to assess the internal consistency of each three-item short scale. Second, for each image source, corresponding items across the three settings were averaged, followed by the Kaiser–Meyer–Olkin (KMO) test and Bartlett's test of sphericity. Principal component extraction with varimax rotation was then used for exploratory factor analysis to examine the clustering structure of the items. This factor analysis is exploratory and is not equivalent to confirmatory factor analysis (CFA). Next, means and standard deviations were calculated for each dimension of each image, followed by paired-samples t-tests. Mean differences, 95% confidence intervals, and Cohen's dz were reported. Finally, a 2 (image source: photograph/AIGC)

× 3 (setting) repeated-measures analysis of variance (ANOVA) was conducted to test the main effects of source and setting and their interaction.

5. Data Analysis and Results

5.1. Descriptive Statistics

A total of 110 questionnaires were collected. Eight were excluded, leaving 102 valid responses and a valid-response rate of 92.73%. No image-evaluation items were missing among the included responses.

Women accounted for 62.75% of the sample and men for 37.25%, indicating a higher proportion of female respondents, consistent with participation patterns in online surveys. In terms of age, 78.43% were aged 18–30 and 21.57% were aged 31–50, indicating that the sample was primarily composed of young adults. Regarding education, 87.25% had an undergraduate degree or below, while 12.75% had a master's degree or above. The sample was generally well educated, which may facilitate understanding of the visual information and cultural symbols in the landscape images. Regarding familiarity with Central Asian Silk Road culture, the largest group selected "moderately familiar" (41.18%), followed by "familiar" (35.29%) and "not familiar" (23.53%). This suggests that most respondents had some, but not extensive, knowledge of Central Asian Silk Road culture. The distribution provides an opportunity to examine image-evaluation differences across levels of cultural familiarity.

The sample characteristics are presented in Table 1.

Table 1. Demographic Characteristics of the Sample

Variable	Category	n	Percentage (%)
Gender	Male	38	37.25
	Female	64	62.75
Age	18–30 years	80	78.43
	31–50 years	22	21.57
Educational background	Undergraduate or below	89	87.25
	Master's degree or above	13	12.75
Cultural Familiarity	Familiar	36	35.29
	Moderately familiar	42	41.18
	Not familiar	24	23.53

Scores for the three photographs and the three AIGC images were averaged separately to obtain overall descriptive statistics for the two image sources across the three dimensions. The minimum values across dimensions ranged from 1.33 to 1.67, while all maximum values were 5.00, indicating a broad response range and considerable individual variation in image perception. In terms of means, photographs received higher ratings for perceived restorativeness (M = 3.71) and cultural credibility (M = 3.74), whereas AIGC images received a higher mean rating for viewing engagement (M = 3.75). Standard deviations ranged from 0.60 to 0.74, indicating relatively concentrated score distributions. The results are presented in Table 2.

Table 2. Descriptive Statistics by Image Source and Dimension

Image source	Dimension	Minimum	Maximum	Mean	SD
Photograph	Perceived restorativeness	1.67	5.00	3.71	0.66
Photograph	Viewing engagement	1.67	5.00	3.52	0.60
Photograph	Cultural credibility	1.67	5.00	3.74	0.63
AIGC	Perceived restorativeness	1.33	5.00	3.04	0.72
AIGC	Viewing engagement	1.67	5.00	3.75	0.60
AIGC	Cultural credibility	1.33	5.00	3.29	0.74

5.2. Reliability Analysis

Cronbach's alpha was used to examine the internal consistency of the items in each dimension across the six images. As shown in Table 3, alpha coefficients ranged from 0.873 to 0.903, all exceeding 0.80. This indicates good internal consistency for the three-item short scales. The highest alpha coefficients were observed for perceived restorativeness of photographs (0.892–0.903), while the coefficients for cultural credibility of photographs were comparatively lower (0.873–0.881), although they remained well above the commonly accepted threshold of 0.70.

Table 3. Reliability Analysis

Image source	Dimension	Cronbach's α
Photograph	Perceived restorativeness	0.892–0.903
Photograph	Viewing engagement	0.879–0.889
Photograph	Cultural credibility	0.873–0.881
AIGC	Perceived restorativeness	0.887–0.901
AIGC	Viewing engagement	0.889–0.896
AIGC	Cultural credibility	0.886–0.894

5.3. Validity Analysis

The KMO measure and Bartlett's test of sphericity were used to determine whether the data were suitable for factor analysis. As shown in Table 4, the KMO values were 0.837 for photographs and 0.843 for AIGC images, both above 0.80. Bartlett's tests of sphericity were significant at $p < 0.001$, indicating that the correlation matrices were suitable for factor analysis.

Table 4. KMO and Bartlett's Test of Sphericity

Image source	KMO	Bartlett's χ^2	df	p
Photograph	0.837	745.735	36	<0.001
AIGC	0.843	804.241	36	<0.001

Exploratory factor analysis was conducted using principal component extraction and varimax rotation. As shown in Table 5, three components with eigenvalues greater than 1 were extracted for each image source. The cumulative variance explained was 86.72% for photographs and 87.81% for AIGC images, indicating that the three components explained the item information well.

Table 5. Total Variance Explained in the Exploratory Factor Analysis

Image source	Component	Eigenvalue	Variance explained (%)	Cumulative (%)
Photograph	1	4.942	54.91	54.91
Photograph	2	1.607	17.86	72.77
Photograph	3	1.256	13.95	86.72
AIGC	1	5.318	59.09	59.09
AIGC	2	1.321	14.68	73.77
AIGC	3	1.263	14.04	87.81

The rotated component matrix shows that all items loaded above 0.82 on their expected dimensions, while cross-loadings were generally low (Table 6). This pattern is consistent with the proposed three-dimensional structure.

Table 6. Rotated Component Matrix

Item	Photograph-Restorativeness	Photograph-Engagement	Photograph-Credibility	AIGC-Restorativeness	AIGC-Engagement	AIGC-Credibility
Restorativeness item 1	0.884	0.222	0.218	0.909	0.154	0.192
Restorativeness item 2	0.926	0.172	0.128	0.856	0.247	0.290
Restorativeness item 3	0.886	0.308	0.168	0.880	0.247	0.214
Viewing engagement item 1	0.215	0.871	0.194	0.168	0.888	0.272
Viewing engagement item 2	0.242	0.904	0.138	0.265	0.890	0.125
Viewing engagement item 3	0.271	0.833	0.239	0.222	0.822	0.324
Cultural credibility item 1	0.175	0.166	0.876	0.241	0.221	0.875
Cultural credibility item 2	0.114	0.186	0.914	0.234	0.185	0.895
Cultural credibility item 3	0.233	0.178	0.872	0.210	0.266	0.884

5.4. Paired-Samples t-Tests

The scores for the three photographs and the three AIGC images were averaged separately, and paired-samples t-tests were conducted. The results are shown in Table 7.

Table 7. Paired-Samples t-Test Results by Image Source and Dimension

Dimension	Photograph M ± SD	AIGC M ± SD	Difference	95%CI	t(101)	p	Cohen's dz
Perceived restorativeness	3.71 ± 0.66	3.04 ± 0.72	−0.66	[−0.80, −0.53]	−9.58	<0.001	−0.95
Viewing engagement	3.52 ± 0.60	3.75 ± 0.60	0.23	[0.11, 0.34]	3.88	<0.001	0.38
Cultural credibility	3.74 ± 0.63	3.29 ± 0.74	−0.45	[−0.59, −0.30]	−6.01	<0.001	−0.60

As shown in Table 7, photographs received significantly higher ratings for perceived restorativeness than AIGC images (difference = −0.66, $p < 0.001$, Cohen's dz = −0.95). Photographs also received significantly higher ratings for cultural credibility (difference = −0.45, $p < 0.001$, Cohen's dz = −0.60). In contrast, AIGC images received significantly higher ratings for viewing engagement than photographs (difference = 0.23, $p < 0.001$, Cohen's dz = 0.38). The three dimensions therefore show a clear divergence: photographs perform better in restorativeness and cultural credibility, whereas AIGC images perform better in viewing engagement. H1, H2, and H3 were supported.

5.5. Differences Across Settings

To further examine whether the source effect varied by setting, paired-samples t-tests were conducted separately for the three settings. The results are shown in Table 8.

Table 8. Paired-Samples t-Test Results by Setting

Dimension	Setting	Photograph M ± SD	AIGC M ± SD	Difference	t	p
Perceived restorativeness	Registan Square	3.72 ± 0.89	2.93 ± 0.96	−0.79	−7.52	<0.001
	Lyabi-Hauz	3.69 ± 0.95	3.10 ± 1.00	−0.59	−4.90	<0.001
	Khiva	3.72 ± 0.92	3.11 ± 1.01	−0.61	−5.67	<0.001
Viewing engagement	Registan Square	3.72 ± 0.87	3.74 ± 0.88	0.02	0.19	0.853
	Lyabi-Hauz	3.86 ± 0.87	3.79 ± 0.89	−0.07	−0.58	0.561
	Khiva	2.98 ± 1.00	3.71 ± 0.90	0.73	6.55	<0.001
Cultural credibility	Registan Square	3.71 ± 0.88	3.78 ± 0.93	0.07	0.60	0.549
	Lyabi-Hauz	3.78 ± 0.88	3.04 ± 1.00	−0.74	−6.30	<0.001
	Khiva	3.73 ± 0.89	3.07 ± 1.08	−0.67	−5.02	<0.001

As shown in Table 8, source differences in perceived restorativeness were significant in all three settings and were consistent in direction (photograph > AIGC), with differences ranging from −0.59 to −0.79. Source differences in viewing engagement were clearly setting-dependent: in the ancient city of Khiva, AIGC images were rated significantly higher than photographs (difference = 0.73, $p < 0.001$), whereas no significant differences were found for Registan Square or Lyabi-Hauz ($p > 0.05$). Cultural credibility also showed setting dependence: photographs were rated significantly higher than AIGC images at Lyabi-Hauz and in Khiva (differences = −0.74 and −0.67, respectively; $p < 0.001$), whereas no significant difference was found at Registan Square ($p = 0.549$).

5.6. Repeated-Measures ANOVA

A 2 (image source: photograph/AIGC) × 3 (setting) repeated-measures ANOVA was conducted to test the effects of source, setting, and their interaction. The results are shown in Table 9.

Table 9. Results of the Repeated-Measures ANOVA

Dimension	Effect	F	df	p
Perceived restorativeness	Setting	0.58	2, 202	0.562
	Image source	91.79	1, 101	<0.001
	Setting × source	1.14	2, 202	0.322
Viewing engagement	Setting	21.19	2, 202	<0.001
	Image source	15.02	1, 101	<0.001
	Setting × source	13.46	2, 202	<0.001
Cultural credibility	Setting	14.00	2, 202	<0.001
	Image source	36.17	1, 101	<0.001
	Setting × source	14.34	2, 202	<0.001

As shown in Table 9, the main effect of image source on perceived restorativeness was significant ($F = 91.79$, $p < 0.001$), whereas the source × setting interaction was not significant ($F = 1.14$, $p = 0.322$), indicating that the difference in restorativeness was relatively consistent across the three settings. The source × setting interactions were significant for viewing engagement and cultural credibility ($F = 13.46$, $p < 0.001$; $F = 14.34$, $p < 0.001$, respectively), indicating that source differences in these two evaluations varied across settings. H4 was supported for viewing engagement and cultural credibility, but not for perceived restorativeness.

5.7. Hypothesis Testing Results

The results of the hypothesis tests are summarized in Table 10.

Table 10. Summary of Hypothesis Testing

Hypothesis	Statement	Result
H1	Photographs and AIGC images differ significantly in perceived restorativeness.	Supported
H2	Photographs and AIGC images differ significantly in viewing engagement.	Supported
H3	Photographs and AIGC images differ significantly in cultural credibility.	Supported
H4	Image source interacts with landscape setting.	Partially supported

6. Discussion

6.1. Higher Viewing Engagement with AIGC Images Does Not Necessarily Mean Greater Restorativeness

One of the most noteworthy findings is that viewing engagement and perceived restorativeness moved in different directions. Overall, AIGC images received higher ratings for viewing engagement, but lower ratings for perceived restorativeness than photographs. This finding reminds us that visual appeal, viewing pleasure, and restorative experience are related but distinct constructs. More vivid colors, idealized lighting, or more orderly compositions may increase attention and pleasure during viewing, but may not make viewers feel relaxed or temporarily detached from everyday concerns. Restorative experience may also involve perceived naturalness, spatial credibility, familiarity, and psychological compatibility, none of which can be replaced simply by visual polish.

This finding is consistent with a basic distinction in restorative-environment research: environmental preference, aesthetic appeal, and restorativeness are related but not identical. We further speculate that the "idealization" of AIGC images may activate an aesthetic-evaluation mode rather than a relaxation mode. The core of restorative experience may not be "being attracted," but rather "being able to relax."

This interpretation also receives indirect support from research on AIGC advertising images. In a study based on the Elaboration Likelihood Model (ELM), Yang Chao and Wei Xiangming [26] found that perceived authenticity in AI-generated advertising images had a significant positive effect on consumers' purchase intentions, with brand trust and perceived value playing partial mediating roles. This suggests that, in the context of AI-generated content, audiences' subjective judgments of authenticity remain important drivers of attitudes and behavior, rather than visual refinement alone. The present findings are consistent with this view: greater viewing engagement does not necessarily entail greater restorativeness or cultural credibility.

6.2. Cultural Credibility as a Key Boundary for the Dissemination of AIGC Cultural Landscape Images

The overall advantage of photographs in cultural credibility indicates that audiences judge not only whether an image is attractive, but also whether it appears to represent genuine cultural heritage. For cultural landscapes with well-established historical forms, architectural outlines, decorations, tower proportions, spatial layouts, and environmental cues may provide important evidence through which audiences recognize cultural authenticity. Even when AIGC-generated images are visually appealing, their credibility ratings may decline if details or spatial relationships conflict with viewers' historical reference points. Research by Feng and Hu and by Luo and colleagues similarly indicates that the perceived authenticity of AIGC cultural content cannot be explained by visual quality alone [20, 21].

AIGC should therefore be positioned as a supplementary visual tool for heritage communication, rather than as an unverified representation of historical fact. In practical applications, generated content should be clearly labeled, source information should be retained, and architectural features and cultural symbols should be reviewed by heritage professionals. Creative reinterpretations of historical settings should be distinguished from documentary representations of actual heritage sites in terms of communication objectives.

6.3. Setting Dependence Means that Generation Quality Should Be Evaluated for Each Cultural Subject

The source × setting interactions for viewing engagement and cultural credibility indicate that the same generative technology may not produce the same effects across all cultural landscapes. As shown in Table 8, the viewing-engagement advantage of the AIGC image was greatest for the ancient city of Khiva (+0.73), whereas the difference for Registan Square was negligible (+0.02). This pattern suggests that the value of AIGC may lie in "compensating for limitations in photographs" rather than "surpassing the strengths of photographs." The photograph of Registan Square already had a monumental and symmetrical composition, and its viewing-engagement score was 3.72. By contrast, the photograph of Khiva received a viewing-engagement score of only 2.98, which increased to 3.71 for the AIGC image through improvements in color and composition. This suggests that AIGC may offer limited gains when the quality of the photograph is already high, but may have a stronger compensatory effect when the photograph has limitations in composition, lighting, or weather conditions.

The setting differences in cultural credibility also deserve attention. The AIGC image of Lyabi-Hauz showed the largest decline in cultural credibility (−0.74). This may be because the complex spatial relationships among the pool, trees, reflections, and surrounding buildings place greater demands on AIGC's handling of local details. At Registan Square, no significant difference was found between the two image sources, possibly because its architectural outlines and symmetrical composition are relatively standardized and therefore easier for AIGC to reproduce at an overall recognizable level.

6.4. Theoretical and Practical Implications

Theoretically, this study incorporates restorative experience, viewing engagement, and cultural credibility into a unified image-comparison framework. The findings show that evaluations of AIGC-generated cultural landscape images are multidimensional and that visual appeal alone is insufficient to characterize the overall experience. In practical terms, cultural institutions and tourism communicators should consider viewing experience, psychological responses, and

cultural credibility together when selecting AIGC images. Generated images may offer advantages when the objective is to create an imaginative atmosphere; when the objective is to accurately introduce historic architecture or cultural heritage, priority should be given to historical verification and disclosure of image sources.

7. Conclusion and Limitations

Based on 102 valid responses from participants who explicitly consented, this study compared photographs and AIGC-generated images across three Central Asian Silk Road cultural landscape settings: Registan Square in Samarkand, Lyabi-Hauz in Bukhara, and the ancient city of Khiva. The results show that: (1) photographs received higher overall ratings for perceived restorativeness than AIGC images; (2) AIGC images received higher overall ratings for viewing engagement, although this difference varied by setting; and (3) photographs received higher overall ratings for cultural credibility, with the source effect depending on the setting. These findings indicate that the experiential advantages of AIGC-generated cultural landscape images are not unidirectional: increased viewing engagement does not necessarily lead to greater restorativeness or cultural credibility.

This study has several limitations. First, the sample was recruited online using convenience sampling, which limits its representativeness. Second, the images were always presented in the order photograph followed by AIGC for each setting; therefore, order effects cannot be separated from source effects. Only one pair of images was used for each setting, and image-specific features such as lighting, composition, season, and details may have influenced ratings. Third, the study used self-reported items. Cronbach's alpha supports internal consistency only; the construct validity of the measures requires further examination with a larger sample. Fourth, viewing engagement was developed by shortening and adapting the FSS for static-image viewing. It is an adaptation for this specific context, not the complete original FSS. Future research could develop a dedicated measure of viewing engagement for Central Asian cultural images.

Future research may proceed in three directions. First, sample size should be increased and balanced, presentation order should be counterbalanced or randomized, and more stimulus images should be included for each type of setting. Second, expert evaluations of cultural accuracy, open-ended interviews, or eye-tracking could be combined to distinguish subjective audience experience from more objective cultural verification. Third, different narrative prompts, image labels, and interaction formats could be compared to examine the conditions under which AIGC cultural content can balance appeal, understanding, and credibility.

8. Conclusion

AIGC is profoundly changing the ways in which cultural heritage landscapes are digitally represented, opening up new possibilities for the visual communication and creative design of Silk Road culture. Through paired-image evaluations of three Central Asian Silk Road cultural landscapes, this study reveals an important finding: the visual-appeal advantage of AIGC images does not necessarily translate into psychological restoration or cultural credibility. This suggests that tensions may exist between the visual refinement enabled by generative technologies and audiences' authentic experiences in the digital dissemination of cultural heritage.

Looking ahead, the application of AIGC in cultural heritage should move beyond the production of visual spectacle and seek a balance between creative expression and cultural responsibility. For Silk Road cultural landscapes, which embody intercultural dialogue and historical memory, AIGC design and application should be grounded in cultural accuracy and guided by audience experience, pursuing both cultural continuity and improved experience in digital spaces. This is both a practical requirement for cultural and creative design in the context of a digitally connected Silk Road and an important principle for using AIGC to support heritage communication.

References

[1] Kaplan, R., & Kaplan, S. (1989). The experience of nature: A psychological perspective. Cambridge University Press.

[2] Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. Journal of Environmental Psychology, 15(3), 169–182.

[3] Ulrich, R. S., Simons, R. F., Losito, B. D., et al. (1991). Stress recovery during exposure to natural and urban environments. Journal of Environmental Psychology, 11(3), 201–230.

[4] Hartig, T., Korpela, K., Evans, G. W., et al. (1997). A measure of restorative quality in environments. Scandinavian Housing and Planning Research, 14(4), 175–194.

[5] Berto, R. (2005). Exposure to restorative environments helps restore attentional capacity. Journal of Environmental Psychology, 25(3), 249–259.

[6] Berman, M. G., Jonides, J., & Kaplan, S. (2008). The cognitive benefits of interacting with nature. Psychological Science, 19(12), 1207–1212. https://doi.org/10.1111/j.1467-9280.2008.02225.x

[7] Han, K. T. (2003). A reliable and valid self-rating measure of the restorative quality of natural environments. Landscape and Urban Planning, 64(4), 209–232. https://doi.org/10.1016/S0169-2046(02)00241-4

[8] Scopelliti, M., Carrus, G., & Bonaiuto, M. (2019). Is it really nature that restores people? A comparison with historical sites with high restorative potential. Frontiers in Psychology, 9, 2742. https://doi.org/10.3389/fpsyg.2018.02742

[9] Kaplan, S., Bardwell, L. V., & Slakter, D. B. (1993). The museum as a restorative environment. Environment and Behavior, 25(6), 725–742.

[10] Pasini, M., Berto, R., Brondino, M., et al. (2014). How to measure the restorative quality of environments: The PRS-11. Procedia – Social and Behavioral Sciences, 159, 293–297.

[11] Negrín, F., Hernández, B., et al. (2017). Discrimination of urban spaces with different levels of restorativeness based on the original and a shorter version of Hartig et al.'s Perceived Restorativeness Scale. Frontiers in Psychology, 8, 1735.

[12] Schaupp, A., et al. (2025). Psychophysiological effects of walking in urban green spaces. [Publication details to be completed.]

[13] Csikszentmihalyi, M. (1990). Flow: The psychology of optimal experience. Harper & Row.

[14] Csikszentmihalyi, M. (1998). Finding flow: The psychology of engagement with everyday life. Basic Books.

[15] Jackson, S. A., & Marsh, H. W. (1996). Development and validation of a scale to measure optimal experience: The Flow

State Scale. Journal of Sport and Exercise Psychology, 18(1), 17–35.

[16] Qin, Q., Chai, J., & Zhong, W. (2025). The measurement of tourism involvement and flow experience in sports tourism. Scientific Reports.

[17] Qin, Q., Chai, J., & Zhong, W. (2026). Dual-pathway processing of AI-generated Chinese ink painting: Evidence from eye-tracking, EEG, and artistic expertise. Frontiers in Psychology, 17, 1966943.

[18] Cian, L., Krishna, A., & Schwarz, N. (2014). A sign of things to come: Behavioral and neural evidence for effects of advertising icons on consumer cognition. Journal of Consumer Research, 41(2), 331–346.

[19] Husselman, M. (2020). Viewing graffiti art: An exploration of aesthetic engagement and flow. [Publication details to be completed.]

[20] Feng, L., & Hu, W. (2026). From aesthetics to authenticity: A stimulus–organism–response model of audience responses to AI-generated intangible cultural heritage design. Scientific Reports.

[21] Luo, D., Chen, Z., & Zhang, W. (2026). When false is taken for true: AI-generated images are challenging the authenticity perceptions of cultural heritage. Kybernetes. https://doi.org/10.1108/K-12-2025-3170

[22] Fu, J., & Wu, J. (2026). Cultural representation in the practice of image generation: A comparative study of human–machine creation based on Shaoxing Cangqiao Straight Street. In Proceedings of the ACM [conference details to be verified].

[23] Galindo-Durán, A., Prego de Oliver-López, C., & Bernal-Bravo, C. (2026). A methodological protocol for the generation and evaluation of AI-generated cultural heritage content. Journal of Cultural Heritage, 81, 370–381. https://doi.org/10.1016/j.culher.2026.08.010

[24] Jin, F., Song, Y., & Zhang, P. (2025). Perceived authenticity of anthropomorphic images: Recognition and trust in digital human images on social media. [In Chinese]. Knowledge of Library and Information Science, 42(6), 51–61.

[25] Li, B. (2026). The effects of AIGC advertising appeals on consumer attitudes: The roles of perceived novelty and perceived authenticity. [In Chinese]. New Media and Society.

[26] Yang, C., & Wei, X. (2026). The effect of perceived authenticity of AI-generated advertising images on consumers' purchase intention. [In Chinese]. Journal of Hubei University of Technology, 41(3), 35–40.

[27] Zeng, J. (2026). The influence mechanism of perceived authenticity in digital storytelling at cultural heritage attractions on tourists' place attachment: A case study of Pingyao Ancient City. [In Chinese]. Business Exhibition Economy, (17), 42–45.

[28] Wang, X., Wu, C., & Yan, J. (2019). An experimental study of the Chinese version of the Perceived Restorativeness Scale (PRS) in the assessment of urban park restorativeness. [In Chinese]. Chinese Landscape Architecture, 35(2), 45–48.

[29] Ye, L., Zhang, F., & Wu, J. (2010). Development of a restorative environment scale. [In Chinese]. Chinese Journal of Health Psychology, 18(12), 1515–1518.

[30] Yuan, Q., Hu, J., & Wang, Y. (2009). A trial use of the Chinese version of the Flow State Scale (FSS) among Chinese university students. [In Chinese]. Chinese Journal of Clinical Psychology, 17(5), 559–561.

[31] Guo, Y., Zhang, J., Lu, S., et al. (2014). The structural model and perceptual differences in tourists' perceptions of restorative environments. [In Chinese]. Tourism Tribune, 29(2), 93–102.

[32] Wang, L., Huang, J., & Li, X. (2020). Dimensions of tourists' perceptions of restorative environments in natural tourist destinations: A scale-development perspective. [In Chinese]. Journal of Xinjiang University of Finance and Economics, (6), 580–586.

[33] Lu, J., Liu, Q., Li, C., et al. (2025). The mechanism of visual attractiveness in perceived restorativeness of urban natural and built environments. [In Chinese]. Journal of Southwest Forestry University (Social Sciences), 9(2), 111–118.

[34] Wang, X. (2019). The relationships among tourists' flow experience, pleasure, and revisit intention at Henan Yuntai Mountain. [Doctoral dissertation]. Central South University of Forestry and Technology, Changsha. [In Chinese]