

Visual Aesthetic Quality Assessment (VAQA) with Photo Sampling Method for Healing Garden in Office Environments

Murni Zainal^{1*}, Nur Dalilah Dahlan¹, Firdaus Mukhtar², and Mohd Nazri Saidon³

¹*Department of Architecture, Faculty of Design & Architecture, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia*

²*Department of Psychiatry, Faculty of Medicine & Health Sciences, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia*

³*Department of Landscape Architecture, Faculty of Design & Architecture, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia*

ABSTRACT

Growing mental fatigue among adults has increased the need for restorative office environments. However, limited research has examined the visual aesthetics of nature-based features integrated with healing gardens across various spatial categories. The Visual Aesthetic Quality Assessment (VAQA), using photo sampling, aims to systematically document seamless spatial integration with healing gardens in Malaysian offices. Two offices in Peninsular Malaysia were selected based on four predefined criteria. Data collection involved case selection, on-site observations, and environmental evaluation. Observations occurred from 24th March to 2nd April 2025, with photographic inventories on 17-18 April 2025 for Office Setting 1 and on 25 April 2025 for Office Setting 2. Grounded in a unified psychological framework integrating Attention Restoration Theory (ART), Stress Reduction Theory (SRT), and the Perceived Restorativeness Scale (PRS), VAQA required nature-based features, integrated with healing gardens, across outdoor, semi-outdoor, and

indoor spaces, because restorative experiences depend on visual and physical connections to nature. Eight restorative scenes were selected by experts to represent the eight visual descriptor variables: being away, fascination, coherence, compatibility, sense of control, social support, physical movement, and natural engagement. The findings revealed strong visual restoration qualities and improved understanding of human-environment interaction via photographs. Features like visibility, accessibility, proximity, layered vegetation, openness, and seamless indoor, semi-outdoor, and outdoor integration

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E-mail addresses:

murni.career@gmail.com (Murni Zainal)
nurdalilah@upm.edu.my (Nur Dalilah Dahlan)
drfirdaus@upm.edu.my (Firdaus Mukhtar)
mnazri@upm.edu.my (Mohd Nazri Saidon)

* Corresponding author

with healing gardens support attentional and emotional restoration. This study advances knowledge by offering a systematic VAQA with a photo sampling method, based on an integrated psychological framework, to document and evaluate restorative visual environments in offices, improving research methods.

Keywords: Healing gardens, nature-based features, office environments, photo sampling method, soft fascination, Visual Aesthetic Quality Assessment (VAQA)

INTRODUCTION

A healing garden is conceptualised as a nature-based environment characterised by a predominance of plants and other natural elements, designed to promote health and well-being through restorative experiences without therapeutic activities (Ibrahim et al., 2015; Jer & Ibrahim, 2014). Such environments promote both bodily health and mental well-being (Cao & Huang, 2023). Office premises are designated for administrative and clerical work, including communication-related operations (UBBL, 2021). Office environments may be understood through several dimensions, including: (i) physical outdoor and indoor spaces, (ii) environmental quality, (iii) location and accessibility, and (iv) amenities (Mohora, 2019). Soft fascination is derived from Attention Restoration Theory (ART) and refers to natural environmental qualities that gently engage involuntary attention, allowing recovery from directed-attention fatigue (Kaplan, 1995). Within the integrated psychological framework, soft fascination is operationalised through the visibility, accessibility, and proximity of healing gardens to indoor office spaces. These spatial characteristics shape occupants'

opportunities for visual and physical interaction with nature, supporting attentional restoration, stress reduction, and perceived restorativeness (Berman et al., 2008; Kaplan & Berman, 2010; Ohly et al., 2016; Ulrich, 1991)

Natural elements in a healing garden, such as trees, leaves, and other vegetation, provide distinct benefits for mental refreshment (Bamberg et al., 2018). The integration of healing gardens into office environments is grounded in the integrated psychological framework adopted in this study, which synthesises Attention Restoration Theory (ART), Stress Reduction Theory (SRT), and the restorative dimensions measured by the Perceived Restorativeness Scale (PRS). This framework posits that exposure to natural environments promotes attentional restoration and stress reduction, thereby enhancing mood, restorative experiences, and sustained attention (Pasanen et al., 2018). This integration also established its theoretical foundation and identified key soft-fascination criteria, providing a framework for understanding how biophilic office design can enhance cognitive performance and reduce attention fatigue through features such as plants and natural

light (Rodríguez et al., 2023). Furthermore, it established the characteristics of a healing garden in office environments, including: (i) the integration of natural elements, (ii) a view of tranquil scenes, (iii) layout design of office settings, and (iv) psychosocial, psychological, and physiological benefits (Zainal et al., 2025). Building upon these characteristics and the integrated ART, SRT, and PRS framework, visibility, accessibility, and proximity were identified as key soft-fascination criteria. These criteria facilitate visual and physical engagement with nature, thereby supporting cognitive restoration, stress reduction, and psychological well-being through exposure to natural elements and restorative views (Berman et al., 2008; Herzog et al., 2010; Kaplan, 1995; Ohly et al., 2016; Ulrich, 1993).

Rapid urbanisation in Malaysia is expected to reach 80% by 2030 (Ministry of Housing and Local Government Malaysia, 2020), reducing opportunities for contact with nature and contributing to growing mental health concerns (Xingrui & Ibrahim, 2024). Consistent with this trend, the National Health and Morbidity Survey 2023 reported that 4.6% of Malaysian adults (approximately one million people) experienced depression, while the prevalence of mental health problems increased from 7.9% in 2019 to 16.5% in 2023 (Institute for Public Health, 2024).

Despite growing evidence that exposure to nature-based features in the built environment promotes psychological restoration, limited research has evaluated the visual characteristics of healing

gardens across outdoor, semi-outdoor, and indoor office spaces. The methodology gap arises from a lack of modelling of the impact of real-world nature exposure on occupants for sustainability (Bringslimark et al., 2007; Colley et al., 2017), and existing empirical studies that do not address nature exposure in both outdoor and indoor office environments (Sadick & Kamardeen, 2020). This gap points to two issues. First, current research often examines either outdoor or indoor spaces in isolation, limiting understanding of the spatial transitions that affect users' perceptions and well-being. Second, visual aesthetic quality is seldom integrated into a full range of spatial categories, including outdoor, semi-outdoor, and indoor spaces. Realising the importance of nature and tranquil scenes is essential to enhance a restorative environment (Frumkin, 2001; Kaplan, 1984; Ulrich, 1991), indicating that visual aesthetic quality assessment plays a crucial role in improving mental well-being among office workers in cities (Yanru et al., 2020). Addressing these limitations is important because systematic visual evaluation of healing gardens across outdoor, semi-outdoor, and indoor office spaces can provide evidence to support restorative workplace design and improve understanding of human–environment interactions. To address these limitations, this study employed Visual Aesthetic Quality Assessment (VAQA) using real-colour photographs of healing gardens integrated within office environments. Through standardised photo

sampling and eight visual descriptors derived from the unified psychological framework, VAQA enabled systematic and comparable assessments of nature-based features across outdoor, semi-outdoor, and indoor spaces.

In this study, a case study is essential for VAQA using photo sampling, indicating that the visual aesthetics of nature-based features play a crucial role in improving mental well-being. Furthermore, in environmental psychology research, photographic presentations of environments are often used and considered a valid method of study (Korpela, 2013). The photo sampling method aids understanding of human-environment interaction (Cleland & MacLeod, 2021; Glaw et al., 2017) and provides visual data for design feedback and to enhance mental well-being (Yanru et al., 2020). In the late 1970s, Ulrich was among the earliest researchers to experimentally demonstrate that visual exposure to natural scenes using colour photographic slides could positively influence emotional states and stress recovery (Ulrich, 1979, 1981). His studies also demonstrated that colour photographic slides could accurately represent real environments, enabling standardised visual evaluation of psychological responses (Ulrich, 1979). Building on this approach, Ulrich (1981) systematically photographed outdoor environments and selected representative slide samples before evaluating psychophysiological responses. This methodological approach subsequently informed the photo sampling method adopted in VAQA.

METHODS

The methodology integrated real-colour photos of case studies in two office environments and the Visual Aesthetic Quality Assessment (VAQA).

Case Study

The case study is well-suited for in-depth exploration of specific environments and complex issues and has gained recognition in the academic community as a reliable and valid qualitative research approach (Ratnasari & Sudradjat, 2023). It is essential in environmental psychology to provide empirical insights into how natural environments influence human behaviours. Therefore, the case studies' data collection followed a three-stage process: (i) applying selection criteria based on the four predefined criteria, (ii) conducting on-site observation, and (iii) evaluating environmental features. These processes ensure that cases are appropriately selected, empirically verified in real-world settings, and systematically evaluated using theoretically informed criteria for consistent analysis (Groat & Wang, 2013; Yin, 2018).

The selection of a case study for the photographic inventory is determined based on the four predefined criteria as follows:

1. Their location in tropical Malaysia settings
2. Recognition through awards such as Pertubuhan Arkitek Malaysia (PAM), Green Building Index (GBI), Federation Internationale des Administrateurs de Bien-Conseils Immobiliers (FIABCI)

- or Aga Khan Award for Architecture (AKAA)
3. With nature-based features (e.g., courtyards, roof gardens and office buildings are adjacent to parks or urban forests) integrated with healing gardens
 4. Their potential to support restorative experiences.

The observation began with site visits to selected office environments to verify whether they met the four predefined selection criteria. Two office environments in Peninsular Malaysia, Office Settings 1 (OS1) and 2 (OS2), satisfied the selection criteria and were selected as case studies. The natural environments of their healing gardens throughout the various spatial categories were documented through a photographic inventory, as shown in Table 1.

Table 1
Office environments and their uses

Office Environments	Uses
Office setting 1 (OS1)	Photographic inventory for outdoor and semi-outdoor spaces.
Office setting 2 (OS2)	Photographic inventory for outdoor, semi-outdoor, and indoor spaces.

Then, the environmental features of these two office environments were examined in relation to the four characteristics of a healing garden (i.e., integration of natural elements, view to tranquil scenes, spatial design of office settings, and psychosocial and psychological benefits), and three main

soft fascination criteria (i.e., visibility, accessibility, and proximity of their indoor spaces to the healing gardens).

The healing garden in office environments is characterised as a nature-based features that provide restorative effects to the office worker, which is grounded in the psychological theories: Attention Restoration Theory (ART) (Kaplan, 1995; Kaplan & Kaplan, 1989) and Stress-reduction Theory (SRT) (Ulrich et al., 1991), and the psychological psychometric: Perceived Restorativeness Scale (PRS) (Hartig et al., 1997). These integrated psychological frameworks are linked by core concepts in environmental psychology that examine natural environments as restorative environments supporting psychological well-being. Furthermore, the frameworks provide a solid foundation for empirical research on human–natural environment interaction in office settings (Xuan & Zhang, 2024).

The soft fascination criteria for visibility, accessibility, and proximity to the healing gardens were derived from deductive reasoning within the integrated psychological frameworks studied. Visibility and proximity to the healing garden led to exposure to nature and views through the windows, which will help reduce mental fatigue and restore cognition (Herzog et al., 2010; Kaplan, 1995; Kaplan & Berman, 2010; Kaplan & Kaplan, 1989; Ohly et al., 2016). The proximity criterion was informed by Gehl's (2010) human-scale design principles, which indicate that destinations within approximately 100 m are

comfortably accessible at normal walking speed (i.e., ≈ 83 m/min). This criterion was operationalised into five graded proximity levels: poor (no green space), fair (≥ 90 m), good (≥ 60 m), very good (≥ 30 m), and excellent (≤ 9 m). Shorter distances were assumed to enhance accessibility, visual

connection, and restorative engagement with the healing garden.

A criteria-based descriptive analysis was conducted for OS1 and OS2 to assess their quality as restorative environments, as summarised in Table 2.

Table 2
Criteria-based descriptive analysis across the office environments

Office Environments	Characteristics of Healing Gardens	Soft Fascination Criteria
Office Setting 1 (OS1)	Nature-based features: A park located at the centre of an office complex, pocket gardens between the office blocks, and close to a forest reserve. Integration of natural elements: plant arrangement that immerses the space in the natural environment; plant prominence; water features; natural ventilation; and daylight.	Visibility: Healing gardens are visible through glass openings.
	View to tranquil scenes: Clear, extensive, visible layers of healing gardens.	Accessibility: Accessible to the healing garden through open staircases, wide corridors, terraces, and walkways. Clear signage leads to the garden, and it is easy to move around.
	Spatial design: Integration of outdoor, semi-outdoor, and indoor spatial categories to experience nature.	
Office Setting 2 (OS2)	Psychosocial and psychological benefits: Opportunities for enhanced social interaction, communication, workplace morale, attentional restoration, stress reduction, and psychological well-being.	Proximity: The distance between the office rooms and the healing gardens ranges from 9m to 30m.
	Nature-based features: Courtyards, roof gardens, and garden terraces. Integration of natural elements: plant arrangement that immerses the space in the natural environment; plant prominence; water features; natural ventilation; and daylight.	Visibility: Healing gardens are visible through glass openings.
	View to tranquil scenes: Clear, extensive, visible layers of healing gardens.	Accessibility: Accessible to the healing garden through open staircases, escalators, lifts, wide corridors, courts, and terraces. Clear signage leads to the garden and is easy to move around.
	Spatial design: Integration of outdoor, semi-outdoor, and indoor spatial categories to experience nature.	
	Psychosocial and psychological benefits: Opportunities for enhanced social interaction, communication, workplace morale, attentional restoration, stress reduction, and psychological well-being.	Proximity: The distance between the office rooms and the healing gardens ranges from 9m to 30m.

Both office environments met the quality criterion of restorativeness due to their selection criteria, observations, and evaluations. The study investigated office environments, and the identified variables were subsequently embedded in the assessment of adults' perceptions and experiences using real photographs. Due to confidentiality considerations, the identities of the participating organisations remain undisclosed to protect the real case and its participants (Yin, 2018).

Visual Aesthetic Quality Assessment (VAQA) with Photo Sampling Method

VAQA involves four sequential stages: (i) field study by initial observation, (ii) photographic inventory, (iii) representational validity studies, and (iv) scenic features assessment (Clay & Daniel, 2000; Clay & Smidt, 2004). The objective of VAQA, using photo sampling methods, is to systematically evaluate the visual characteristics of three spatial categories (i.e., outdoor, semi-outdoor, and indoor) across case studies. Furthermore, the real-colour photographs were used to control extraneous variables and ensure consistency in visual stimuli, as previous

studies indicate that image-based stimuli yield outcomes comparable to those of virtual environments and are effective at differentiating subjective evaluations (Cho et al., 2025; Kim et al., 2025). Such standardised visual assessment also supports the evaluation of biophilic design characteristics associated with workplace restoration and performance.

Before the initial observation of the OS1 and OS2, researchers prepared a research checklist and guidelines for photographers. The checklist and guidelines were derived from a conceptual framework that integrated three key components: (i) an integrated psychological framework, (ii) soft fascination criteria and (iii) restorative attributes (e.g., plant prominence, plant diversity, natural ventilation and daylight) (Zainal et al., 2025). The purpose of both the checklist and the guidelines is to ensure that photographic documentation is systematic, standardised, and aligned with the study's conceptual framework, while capturing relevant visual cues related to restorative perceptions, nature-based features, and soft-fascination design interventions. Researchers' checklists covered 4 items related to VAQA with photo sampling, as shown in Table 3.

Table 3
Researchers' checklist

Items	Checklist	Instrument Used
1	Presence of a healing garden within the OS1 and OS2	Observation
2	Indoor office environments with poor, fair, and good window views in OS2	Observation
3	Four subgroups (i.e., being away, fascination, coherence, and compatibility) of PRS	Conceptual framework
4	Four areas (i.e., sense of control, social support, physical movement and exercise, and natural engagement) of SRT	Conceptual framework

Table 4
Guideline for photographers

Items	Guidelines
1	Capture a full range of spatial categories, including outdoor, semi-outdoor, and indoor, from a standing eye-level perspective.
2	Layout plans of OS1 and OS2 with specific point locations corresponding to observation clearly marked, used to coordinate where photos will be taken.
3	Usage of daylight.
4	Office workstation with poor, fair, and good window views.
5	Diverse photographic angles and perspectives.
6	Includes ambience of being away, fascination, coherence, and compatibility.
7	Includes nature-based features of sense of control, social support, physical movement and exercise, and natural engagement.
8	Used a digital camera for storage and flexibility.
9	No post-editing performed on the photographs.
10	Involved in early representational validity studies.

The guidelines for photographers cover 10 items, as shown in Table 4. This guideline was forwarded to photographers a week before the photographic inventory to help them understand the guidelines and the study’s expectations.

Field Study by Initial Observation

Initial field observations were conducted by a researcher on OS1 and OS2 from 24th March to 2nd April 2025. In addition to observing and identifying the characteristics of healing gardens and soft fascination criteria, this process helped identify potential incremental photographic positions (points) for the photographic inventory. However, the management of OS1 allowed photographic inventory only in their outdoor and semi-outdoor spaces. They are not allowed to enter the indoor office space due to corporate and private confidentiality. Only two private office managements at

OS2 allowed photographic inventory in their indoor offices.

Photographic Inventory

A photographer with experience in photography and knowledge brings an understanding of how to capture the ambience of restorative environments and nature-based features, as highlighted in the guidelines in Table 4. The experiences bring technical expertise, such as choosing the right angles and appropriate focal lengths to avoid distortion, thereby enhancing depth and realism. The photographic inventory suggested a controlled and deliberate process (Cortese et al., 2020)

To ensure consistent, contextually rich photographic data across two office environments, two photographers were assigned to conduct photographic inventories at separate study locations in Peninsular Malaysia. Photographer A was

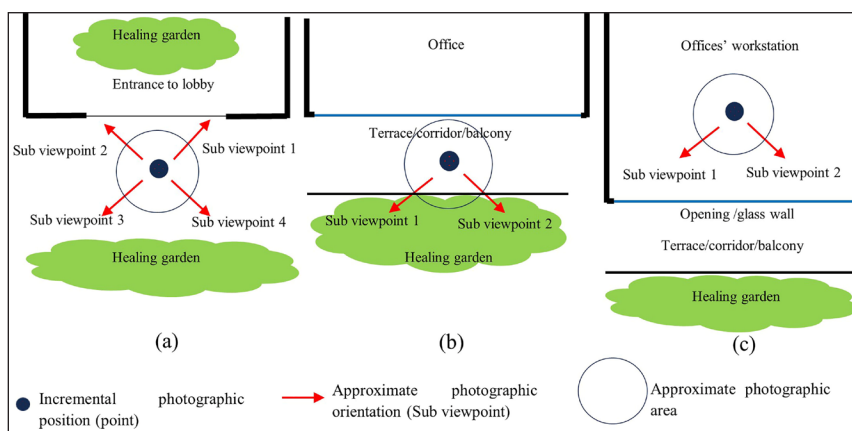


Figure 1. Schematic of photographic sampling procedures

Note. This figure demonstrates a schematic of the photographic sampling procedure for: (a) the outdoor spatial category, which contained four sub-viewpoints; (b) the semi-outdoor spatial category, which contained two sub-viewpoints; and (c) the indoor spatial category, which contained two sub-viewpoints. The schematic photographic sampling procedures were adapted from Clay and Smidt (2004) and Clay and Daniel (2000) and modified for application to outdoor, semi-outdoor, and indoor office spaces

assigned to OS1, while Photographer B was assigned to OS2. Before fieldwork, each photographer was briefed using a guideline manual and schematic of photographic sampling procedures. The procedure for each point of spatial categories, including outdoor, semi-outdoor, and indoor, was modified from Clay and Smidt (2004), and Clay and Daniel (2000) as shown in Figure 1. No photographs were taken from positions that include any solid wall or structure obstructing the healing garden. Photographic inventory for OS1 was conducted on 17th and 18th April 2025, and for OS2 on 25th April 2025. The photos were taken on a clear day during a typical working day (i.e., Monday to Friday), during regular working hours (9.00 am to 6.00 pm) and during break time (1.00 pm to 2.00 pm), using a digital camera.

Incremental photographic positions (points) covered three spatial categories: (i) outdoor, (ii) semi-outdoor, and (iii) indoor spaces. In total, the spatial category has fourteen spaces: entrance to the office lobby, healing garden, lobby, corridor, staircase, terrace, balcony, and office workstations with poor, fair, and good visibility, accessibility, and proximity to the healing garden. These fourteen spaces provide a total of thirty-nine incremental photographic positions (points), with eighty-nine sub-viewpoints as shown in Table 5. The objective is to systematically document environmental and perceptual variations across outdoor, semi-outdoor, and indoor spatial categories, thereby enabling consistent comparisons of nature-based features and restorative qualities within office environments (Gomes et al., 2021; Shibata et al., 2024).

Table 5
Spatial categories, spaces, incremental photographic position, and sub-viewpoints

Spatial Categories	Spaces	Incremental Photographic Position (Points)	Sub Viewpoints
Outdoor spaces	Entrance to office lobby	2	6
	Healing garden	9	24
Semi-outdoor spaces	Lobby	1	4
	Corridor	4	8
	Staircase	3	6
	Terrace	4	9
	Balcony	8	16
Indoor spaces	Office workstation with poor visibility to the healing garden.	1	2
	Office workstation with fair visibility to the healing garden.	1	2
	Office workstation with good visibility to the healing garden.	2	4
	Office workstation with fair accessibility to the healing garden.	1	2
	Office workstation with good accessibility to the healing garden.	1	2
	Office workstation with fair proximity to the healing garden.	1	2
	Office workstation with good proximity to the healing garden.	1	2
Total		39	89

Representational Validity Studies

Representational validity studies have more recently been extended to computer visualisations, where high-resolution, high-realism visualisations have supported landscape aesthetic quality assessments that correlate highly with photographic representations, reflecting the experience of observing a landscape (Daniel, 2001).

Before transferring all photos to the computer, researchers and photographers would review them together to remove any that were significantly over- or under-exposed, out of focus, or taken directly against the sun (Clay & Daniel, 2000; Clay & Smidt, 2004). A total of eighty-nine coloured photos has been reviewed, transferred, and saved to the computer.

Then the photos were arranged into eight visual descriptors' variables (i.e., four subgroups of PRS and four areas of SRT), each with sub-descriptors, and presented in Microsoft PowerPoint as test scenes for the experts' assessment.

Scenic Features Assessment

The scenic features assessment involved three procedures: (i) preparing the test scenes, (ii) selecting the experts, and (iii) presenting the test scenes for evaluation and selection of the photos by the experts.

The Test Scenes

The test scenes will undergo an expert-based assessment of eight visual descriptors' variables (i.e., being away, fascination, coherence, compatibility, sense of control, social support, physical movement and exercise, and natural engagement). These variables are derived from PRS's subgroups (Hartig et al., 1997) and SRT's areas (Ulrich et al., 1991) and are intended to achieve psychological, physiological, and social benefits. The meanings of each variable are described as follows:

1. Being away is defined as an opportunity to escape and interact with nature.
2. Fascination is defined as the interesting elements in a natural setting.
3. Coherence is defined as components that support being away, where a setting is sufficiently rich and coherent so that it can engage the mind and promote exploration.
4. Compatibility is defined as a natural setting (i.e., healing gardens integrated

- into a built environment) that allows people to meet their needs and desires.
5. Sense of control is defined as healing gardens that are visible from a main entry or another gathering or waiting area and should have a variety of types of spaces for users to choose.
6. Social support is defined as a variety of opportunities for interaction, gathering, and spending time together to build social connections.
7. Physical movement and exercise are defined as structured opportunities for exercise and interaction with gardens.
8. Natural engagement is defined as opportunities to engage with nature.

The eight visual descriptor variables comprised four or five sub-descriptors, as shown in Table 6. These descriptors provided a structured set of criteria for expert evaluation of the test scenes. The expert paradigm emphasises highly skilled, trained observers who judge specific landscape characteristics based on 'principles of art, design, ecology and resource management', with the aim of generating a final 'statement of landscape quality' for the spaces being assessed (Clay & Daniel, 2000). The slide computer methods (Daniel, 2001) of test scenes will be presented to experts for assessment of scenic features. In this study, the preparation of the test scenes includes two stages of photograph arrangement in Microsoft PowerPoint, as follows:

- Stage 1: There are 39 total incremental photographic positions (points) and

- 89 sub-viewpoints (photos) inserted in the test scenes.
- Stage 2: From 89 test scenes, the photos were arranged into eight visual descriptor variables, completed with their sub-descriptors (Table 6), which reduced the test scenes to a total of 60 test scenes.

These final test scenes were presented to the two experts in visual landscape and visual impact assessment under controlled conditions (i.e., at the same time and place). Every test scene is completed with visual descriptors' variables and sub-descriptors, so experts can conveniently evaluate and select photos during the presentation.

Table 6
The eight visual descriptors' variables are derived from an integrated psychological framework

Framework	Eight Visual Descriptors' Variables	Sub-Descriptors
PRS	Being away	An escape experience
		A good break
		To relax
		To get relief
	Fascination	Fascinating qualities
		Interesting things
		Get to know
		Explore and discover
	Coherence	Spend more time
		Suit each other
		Is legible space
		A great deal
	Compatibility	Harmonious space
		Do things
		Belong here
		Oneness
		Suit my personality
		Enjoy myself
SRT	Sense of control	The healing garden is visible
		The healing garden is accessible
		Clear signages
		Garden facilities
	Social support	Outdoor communal space
		Semi-outdoor communal space
		Indoor communal space
		Conducive environments
	Physical movement and exercise	Open staircases
		Wide corridors
		Active biophilic design
		Outdoor fitness
	Natural engagement	Plant arrangement in an immersive nature
		Plant coverage
		Water elements
		Ventilation and lighting

Expert's Selection

The experts within the same institution often share common institutional goals and engage in dynamic collaboration (Duede et al., 2024). These will ensure that the research aligns with the institution's strategic priorities and supports responsive collaboration among researchers and experts, enabling quick discussions, feedback sharing, and decision-making to accelerate the research process. Furthermore, experts within the same institution possess a deep understanding of its culture due to familiarity with its context, practices, and expectations (Lister et al., 2022).

In this study, the experts for scenic feature assessment should have expertise in visual landscape assessment. The experts should have a background in professional landscape architecture or be professors (academician) (Dell'acqua et al., 2011). Potential experts are sourced from the same institution due to shared institutional goals, dynamic collaboration (Duede et al., 2024), and familiarity with the institutional context, practices, and expectations (Lister et al., 2022). Universiti Putra Malaysia (UPM) was selected because the Department of Landscape Architecture has established expertise in landscape assessment and professional landscape architecture relevant to the Malaysian context (UPM, 2025). Then, the experts' pursuit has been conducted through the official website of the Department of Landscape Architecture, Faculty of Design and Architecture, Universiti Putra Malaysia (UPM). There are 27 academic staff listed

in the department in 2025. Initially, three of those academic staff were listed as meeting the criteria. However, only two are selected due to their availability.

Photos' Evaluation by the Experts

Before the scenic feature assessment, the experts were informed of its objective and the evaluation descriptors. The test scenes were presented to two experts simultaneously at the same location.

In clinical research, standardisation will improve the quality, consistency, and reproducibility of photography. The protocols streamline communication by providing clear, standard guidelines that reduce variability and enhance mutual understanding between researchers and practitioners (Geel et al., 2020). In landscape research, for example, the Landscape Assessment Protocol (LAP) emphasises the need for a standardised procedure for visual landscape assessments to ensure consistent evaluations across assessors (Vlami et al., 2019). Vlami et al. (2019) explained that, with a standardised approach, the subjectivity inherent in visual assessments can be minimised because assessors follow the same procedures and use the same scoring card, resulting in high agreement among assessors.

In this study, the entire process of Visual Aesthetic Quality Assessment (VAQA) using the photo sampling method employed standardisation with a sequential approach, as shown in Figure 2. Before the photographic inventory began, the researchers prepared a checklist and guidelines.

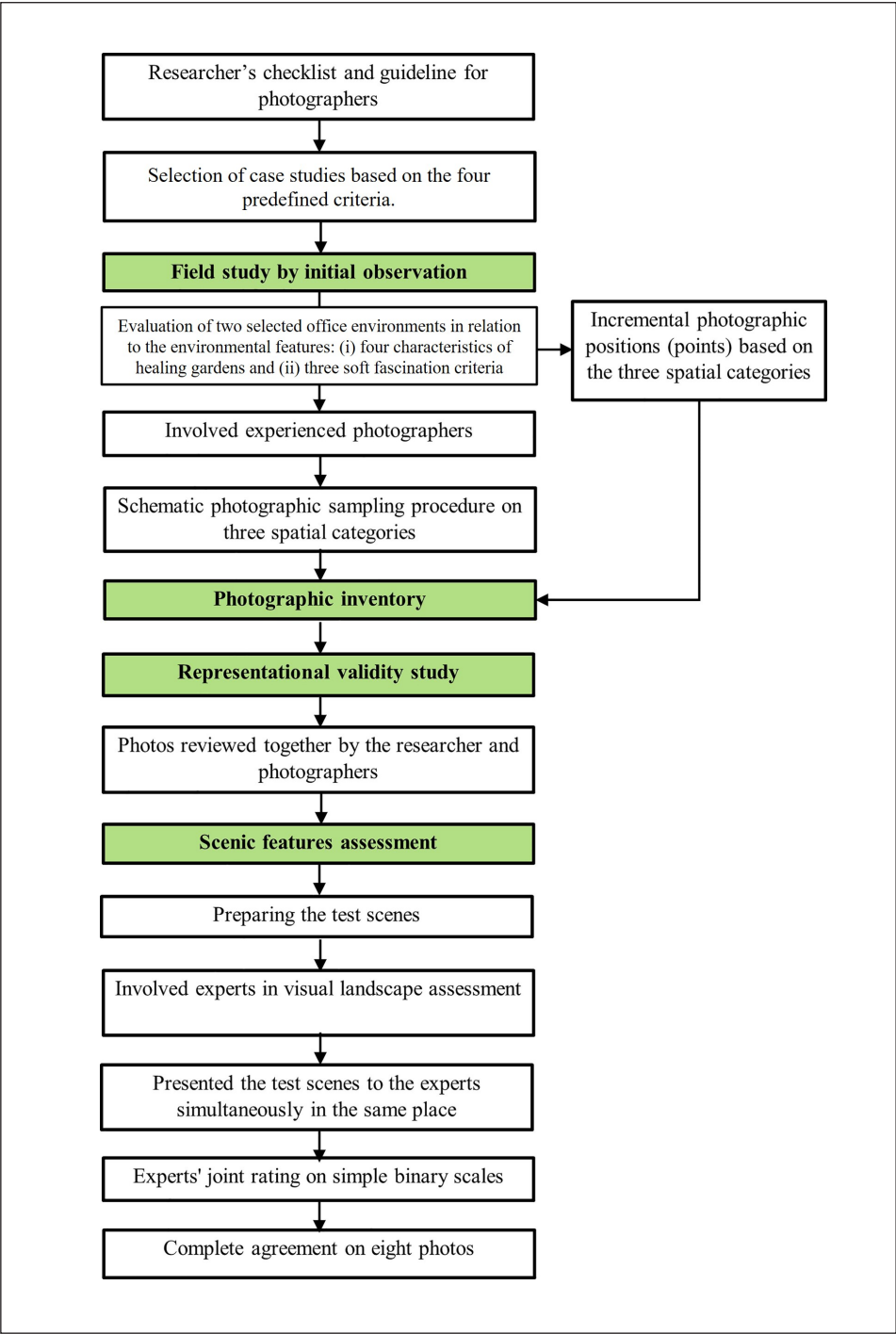


Figure 2. Standardisation with a sequential approach for VAQA using the photo sampling method across three spatial categories

Then, the case studies were based on four predefined selection criteria, followed by field observations of the two office environments to validate them and help determine the incremental photographic points across three spatial categories. The processes involved two experienced photographers and provided them with a schematic outlining photographic sampling procedures to ensure visual consistency. After the photographic inventory was completed, both the researcher and the photographer reviewed all the photos, and the researcher then prepared the test scenes. The test scenes incorporated visual descriptors for experts' evaluations. Two expert raters with the same background of expertise were invited. Finally, the test scenes were presented under controlled conditions (i.e., simultaneously and in the same place) to two experts. This qualitative structured method aims to achieve complete agreement between two expert raters.

The assessment of the final test scenes used expert joint ratings on simple binary scales (i.e., agree and disagree) to achieve complete agreement between the two expert raters. The two expert raters discussed and agreed on each decision under controlled conditions, pooled their expertise to produce

a consensus evaluation of all 60 photos, and reached complete agreement on the final 8 photos based on 8 visual descriptors. Their agreements were reached through both face-to-face and online group discussions and were not independent. A binary scale was used to identify the most suitable photograph for each of the eight visual descriptor variables and their sub-descriptors, rather than a multi-point Likert scale. This allowed a clear consensus, with only photographs receiving complete agreement from both experts selected to represent the four PRS restorative constructs and four SRT design considerations within the framework.

RESULTS

The Perceived Restorativeness Scale (PRS) and Stress Reduction Theory (SRT) are linked by core concepts in environmental psychology that explore how natural environments serve as restorative spaces that contribute to psychological well-being (Zainal et al., 2025). However, there are differences in aims, constructs, and outcomes between PRS and SRT visual descriptor variables, as summarised in Table 7.

Table 7
Differences in aims, constructs, and outcomes between PRS and SRT visual descriptor variables

	PRS	SRT
Aims	Assessed the perceived restorativeness of natural environments on individuals through real-colour photos, which helps in understanding human-environment interaction and needs.	Assessed the perceived stress reduction of natural environments on individuals through real-colour photos, which helps in understanding human-environment interaction and needs.
Restorative constructs	Four visual descriptor variables represent four subgroups of PRS: (i) being away, (ii) fascination, (iii) coherence, and (iv) compatibility.	Four visual descriptor variables represent four areas of SRT: (i) sense of control, (ii) social support, (iii) physical movement and exercise, and (iv) natural engagement.
Outcomes	Attentional restoration	Emotional restoration

Initially, 39 photographic positions produced 89 photographs across outdoor, semi-outdoor, and indoor spaces. After screening, the photographs were organised into 60 test scenes based on the eight visual descriptor variables derived from the integrated psychological framework. Two experts in scenic feature assessment evaluated the 60 test scenes using a binary agreement assessment for each visual descriptor variable and its corresponding sub-descriptors. Photographs that received agreement from both experts were selected as the most representative photo for each visual descriptor variable, resulting in the final eight photographs presented in Figures 3 and 4. The remaining test scenes were not

selected because neither expert identified them as the representative photograph for their respective visual descriptor variables.

This finding is consistent with Ulrich's (1979, 1981) use of colour photographs to evaluate responses to natural scenes, demonstrating that visual exposure to nature can positively influence emotional states and stress recovery. In addition, Cleland and MacLeod (2021), and Glaw et al. (2017) confirmed that the photo sampling method aids in understanding human-environment interaction.

The four PRS photographs (Figure 3) illustrate 18 sub-descriptors corresponding to the 18 PRS subconstructs. A photo representing being away was taken on a

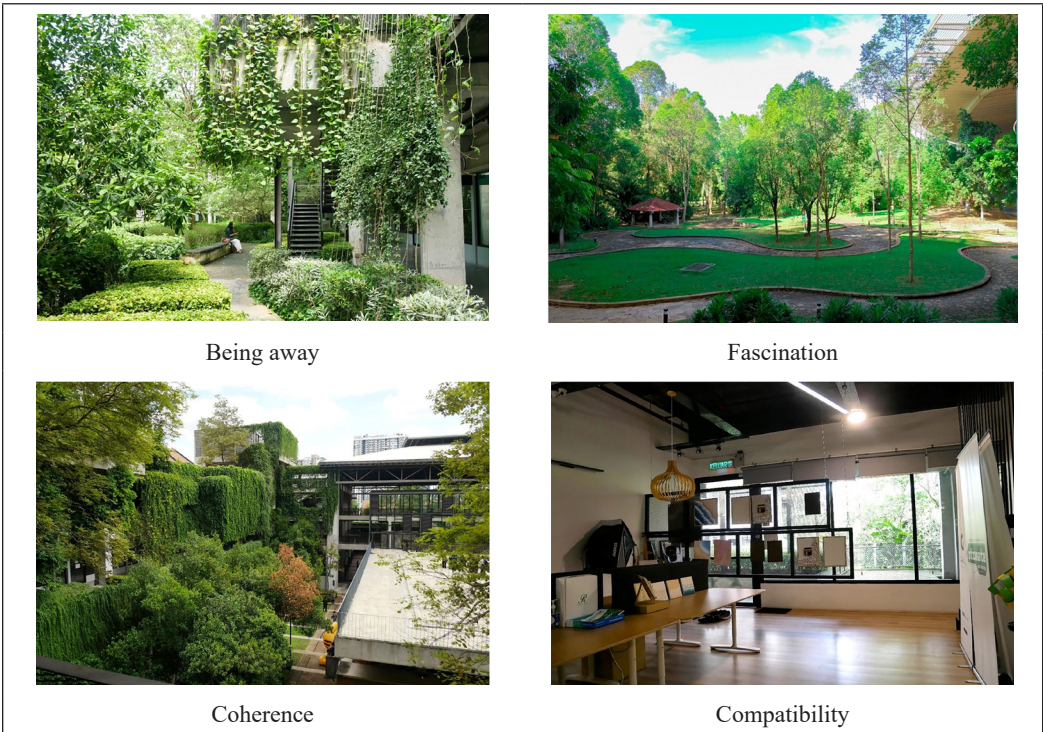


Figure 3. The selected photos by the expert raters for four PRS subgroups: being away, fascination, coherence, and compatibility

terrace with prominent plant features. This image aligns with all the sub-descriptors of being away, evokes a sense of escape, and provides a conducive environment in office environments for taking a good break, relaxing, and finding mental relief. A photo representing fascination was taken from the balcony towards the healing garden. This image aligns with all the sub-descriptors of fascination, including interesting garden elements that stimulate curiosity, encourage exploration, and invite more time in the space. A photo representing coherence was also taken from the balcony towards the healing garden. This image aligns with all the sub-descriptors of coherence, due to the spatial

richness, characterised by the diversity of natural elements and the layered textures of plant species, which convey a sense of legibility and harmony. A photo representing compatibility was taken from the indoor office toward the healing garden. The healing garden is at the front of the office, clearly visible, accessible, and proximate to the indoor workstations, and it promotes a sense of belonging and oneness among the office workers.

The four SRT photographs (Figure 4) illustrate 16 sub-descriptors that correspond to the 16 subconstructs. A photo representing a sense of control was taken along the corridor. This photo aligns with all sub-descriptors, in which the corridor functions



Figure 4. The selected photos by the expert raters for four SRT areas: sense of control, social support, physical movement and exercise, and natural engagement

as a continuous spatial link between office spaces. The healing garden is well integrated with corridors, making it clearly visible and accessible. The corridor is wide and fitted with garden facilities like benches and signage. A photo representing social support, taken from the terrace towards the central courtyard with the healing garden. This photo aligns with all the sub-descriptors of social support. The courtyard served as a central outdoor communal space, directly linked to semi-outdoor spaces such as the terrace and corridor, as well as to indoor communal spaces, including the hall. A photo representing physical movement and exercise was taken from the upper terrace towards the lower terrace with courts adjacent to the healing garden. This photo aligns with all the sub-descriptors of physical movement and exercise, as the spatial arrangement embodies principles of active biophilic design for leisure and exercise. The court features wide corridors and open staircases. A photo representing a natural engagement was captured from the office corridor towards the office's balcony. This photo aligns with most of the sub-descriptors of natural engagement. The balcony is dense with plants, which immerse the natural environment and provide natural ventilation and daylight, creating a sense of enclosure and allowing direct contact with nature.

DISCUSSION

Photo sampling was employed as part of the Visual Aesthetic Quality Assessment (VAQA) procedure to ensure systematic

visual documentation and enhance the consistency and comparability of visual materials used for evaluation (Clay & Daniel, 2000; Clay & Smidt, 2004). Standardised photographic conditions, including clear-sky weather, eye-level viewpoints, and comparable visual perspectives, were adopted to maintain methodological consistency (Silvennoinen et al., 2024). These procedures enabled the systematic capture of nature-based features integrated with healing gardens and restorative qualities across the two office environments.

The findings demonstrate that the selected photographs successfully represented restorative qualities associated with the integrated psychological framework adopted in this study. Office environments that incorporated nature-based features and healing gardens across outdoor, semi-outdoor, and indoor spaces provided visual stimuli that supported both attentional and emotional restoration. Consistent with Zhao et al. (2025), office spaces with high levels of biophilic integration, particularly through indoor and outdoor greenery, were associated with improved physical and mental health outcomes.

The four photographs representing the PRS subgroups of being away, fascination, coherence, and compatibility reflected environmental qualities associated with attentional restoration. These qualities provide opportunities for psychological distancing from routine demands, effortless engagement with natural elements, and the replenishment of directed attention (Hartig et al., 1997; Kaplan & Kaplan, 1989;

Korpela, 2013; Mangone et al., 2017; Sella et al., 2023; Sun et al., 2021; Yusli et al., 2021). The findings therefore support the proposition that visual exposure to restorative environments facilitates the restoration of directed attention and promotes cognitive recovery.

Similarly, the four photographs representing the SRT areas of sense of control, social support, physical movement and exercise, and natural engagement reflected environmental qualities associated with emotional restoration. Consistent with Stress Reduction Theory (SRT), exposure to natural elements may elicit positive affective responses and contribute to reductions in physiological and psychological stress (Berman et al., 2008; Korpela, 2013; Ulrich, 1983, 1991; Ulrich & Parsons, 1992). These nature-based features, integrated with healing gardens, can support emotional restoration by offering opportunities to engage with nature.

Together, attentional and emotional restoration contribute to mental well-being. Recent evidence suggests that attentional restoration enhances executive functioning, working memory, creativity, and cognitive performance, whereas emotional restoration improves mood and reduces symptoms associated with psychological distress (Holzman et al., 2025). These findings reinforce the importance of integrating nature-based features within office environments to support restorative experiences and promote mental well-being.

Although the findings support the restorative potential of nature-based features

integrated with healing gardens, their implementation in office environments should also consider practical design considerations. For example, increasing visual openness may reduce visual privacy, while accessible healing gardens may require additional maintenance in tropical office environments. These practical considerations should be taken into account when integrating healing gardens into office environments.

Furthermore, future studies could extend the present findings by quantifying perceived restorativeness and stress reduction using a self-administered survey instrument linked to the same photographic stimuli presented in Figures 3 and 4. Such an approach would enable visual stimuli to be translated into measurable psychological responses and provide complementary subjective evidence of perceived restorativeness and stress reduction (Surcinelli et al., 2023). Integrating objective visual assessments with subjective evaluations would provide a more comprehensive understanding of restorative environments and their practical application in office settings.

CONCLUSION

This study demonstrated the applicability of Visual Aesthetic Quality Assessment (VAQA), using a photo-sampling method, to systematically evaluate restorative qualities in office environments. Through standardised visual documentation, photographic procedures, and eight visual descriptor variables derived from the

integrated psychological frameworks (i.e., unified ART, SRT, and PRS), the selected photographs captured nature-based features integrated with healing gardens across outdoor, semi-outdoor, and indoor spaces. This standardised approach ensured the consistency and comparability of visual materials used for evaluation. The findings indicate that the photographs depicted environmental qualities associated with both attentional and emotional restoration, highlighting the importance of healing gardens as a nature-based intervention to promote mental well-being. The study highlights the potential of VAQA as a practical approach for assessing restorative environments and advancing understanding of human–environment interactions.

The study was limited to photographs captured under standardised clear-day daylight conditions and therefore did not represent changing weather conditions. Future research should incorporate field-based evaluations with office occupants under dynamic environmental conditions using physiological measurements to further validate restorative responses.

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