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BIOPHILIC DESIGN IN OFFICE INTERIORS FOR EMPLOYEE STRESS ALLEVIATION: A QUALITATIVE STUDY

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Abstract:

In today's fast-paced office environments, employees commonly face high-intensity workloads, leading to increasingly severe stress and anxiety issues that impact their physical and mental well-being. Research indicates that biophilic design principles, which integrate natural elements into indoor spaces, offer an innovative approach to optimising office environments and alleviating employee stress. Previous biophilic design research has focused on the presence or absence of natural elements rather than spatial interface variations. Little is known about the Stress-relieving effects of biophilic elements on various spatial interfaces within office spaces, including ceilings, floors, walls, and desktops. Therefore, this study introduces an interface-based analytical perspective (ceiling, walls, floor, and tabletop). A total of eight experts were invited to form two four-person focus groups, each comprising an architect, an interior designer, a psychological counsellor, and a landscape designer. Data analysis utilised NVivo software to identify biophilic elements suitable for office interiors: green plants, natural materials, natural colours, the presence of water, natural forms, and natural imagery. The results indicate that biophilic elements exhibit specific interface distribution patterns, reflecting design priorities for particular interfaces(dominated by walls at 37.5%, followed by floors at 31.3%, with desktops at 17.5% and ceilings at 13.8%). Furthermore, distinct experiential mechanisms were identified for different surfaces: ceilings (indirect experience), desktops

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(direct experience), and walls/floors (dual experience). The study not only revealed the Stress-relieving effects weight of key elements such as 'green plants on desktops' (13.1%), 'natural wall colours' (11.9%), 'green wall coverings(10.6%)', 'natural wall imagery(10.6%)', 'ground-level greenery(10.6%)', natural materials(9.4%), and Ground-level water features(7.5%), Provides employers and designers with interface-based and user-specific resource allocation strategies, proposing future research directions to explore the stress-relieving effects of biophilic elements within diverse spatial interface combinations. To provide evidence-based design insights for optimising employee mental well-being through spatial interventions.

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Keyword:

Biophilic Design; Office Spaces; Employee Stress; Qualitative Research; Spatial Interfaces

Introduction

With the acceleration of urbanisation and intensifying social competition, psychological pressures on citizens have significantly increased, and mental health issues among employees in the workplace have become increasingly prominent. Data from China's National Health Commission indicates that, as work pressures mount, statistics show that in 2023, 15% of surveyed workers in China reported experiencing negative emotions such as depression, tension, and anxiety (DESIGN, 2014). Individuals spend up to 90% of their daily lives within buildings. Excluding sleep, the workplace occupies the majority of waking hours, frequently placing occupants in a state of chronic stress. This predisposes them to various health issues, including anxiety, depression, and insomnia (Wilson, 1986). This trend reflects a growing disconnection from nature, suggesting that reduced exposure to natural elements within the built environment may contribute to rising workplace stress rates.

In 1984, Harvard biologist E.O. Wilson proposed the biophilia hypothesis, positing that humans possess an innate biological connection to nature. Integrating natural elements into architectural spaces exerts a significant influence on psychological well-being, physical health, and quality of life (DESIGN, 2014; Wilson, 1986). Implementing biophilic design within workplace interiors facilitates recovery from employee stress and anxiety (Roskams & Haynes, 2020; Yin et al., 2019) whilst providing access to natural elements within indoor environments, which alleviates pressure (Yin et al., 2018).

Previous biophilic design research has focused on the presence or absence of natural elements rather than spatial interface variations, primarily concentrated in specific biophilic elements (Fukumoto et al., 2024; Roskams & Haynes, 2020) (Burnard & Kutnar, 2020; Yeo et al., 2023) within indoor environments, or the combined effect of several biophilic elements (Demirkol &

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Önaç, 2024) (Tan et al., 2024) within indoor settings, predominantly employing quantitative methodologies. Therefore, this study introduces an interface-based analytical perspective (ceiling, walls, floor, and tabletop). Biophilic elements manifested through the interior interface may exert restorative effects on employee stress and anxiety within office environments. There is a study indicated that in a visual biophilic interior design experiment conducted in a virtual residential setting, 40% of participants cited walls as their primary design priority (Bettaieb et al., 2023); however, the study focused on residential spaces, explored element preferences, and did not focus on investigating employee stress and anxiety within office environments.

Hence, the core research questions for this study are: what biophilic elements are commonly employed in office spaces, and how should specific biophilic elements be configured across different spatial interfaces (ceiling, floor, walls, desktops) to effectively alleviate employee stress? This study aims to identify and synthesise concrete biophilic design strategies and guidelines applicable to all office space interfaces through the collective wisdom of interdisciplinary experts, utilising qualitative focus group discussions.

Research Methodology

Research Paradigm and Design

This study employed a qualitative research paradigm. Compared to the statistical generalisation of quantitative research, qualitative research places greater emphasis on exploring the underlying logic, meaning construction, and process mechanisms behind phenomena. Given that this study aims to uncover the process-oriented question of 'how biophilic elements can be utilised on walls, floors, ceilings, and desktops within indoor office environments to alleviate employee stress and anxiety,' and involves interdisciplinary fields such as architecture and psychology, the focus group discussion method within qualitative research is most appropriate. As focus group discussions represent a well-established and effective method for gathering collective data, the nature of these methods, which draw upon expertise or experience across various facets of the built environment, facilitates a deeper understanding of issues related to the built environment (Aini, 2025). Compared to individual interviews, expert focus groups can generate more systematic and consensus-driven professional judgements through the collision of perspectives, mutual supplementation, and cross-validation, thereby avoiding the limitations inherent in relying solely on a single expert's viewpoint. Before data collection, researchers adhered to and completed all ethical guidelines, obtaining approval from the UMK-FSE-REC(HUMAN) Ethics Committee (Ref. No. PG002/2025). During data collation and analysis, personally identifiable information will be redacted, and expert identities and opinions will be anonymised.

Participant Recruitment

To ensure the professionalism and multidimensionality of perspectives, this study employs purposive sampling (Hennink et al., 2019). Employing the saturation principle to determine sample size(Hennink et al., 2019), four to ten participants suffice for discussing the selected topic, whilst exceeding twelve participants becomes difficult to manage. A total of eight experts with extensive industry experience were invited to participate, divided into two groups. Biophilic office design constitutes an interdisciplinary practice requiring the integration of spatial creation, natural element configuration, psychological mechanisms, and built environment dimensions. Multidisciplinary experts can cross-validate perspectives, ensuring

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research conclusions possess both theoretical rigour and practical applicability. Each group comprised four specialists: an interior designer (specialising in office spaces), a landscape designer (versed in plant configuration), a psychological counsellor (holding a clinical psychology background), and an architect (focusing on office building environments). All participants possessed at least eight years of relevant professional experience and had contributed to at least three large-scale office space projects or related psychological research. Each focus group session lasted 120 minutes and was conducted in Chinese. Researchers facilitated the discussions while acting as group facilitators, with assistants taking notes, recording proceedings via audio devices, and transcribing these into approximately 30,000 words of raw data.

Data Collection and Analysis

Focus group discussions were conducted on 18th and 25th October 2025 at the conference room on the 5th floor of Tower A, Triumph Plaza, 36 Deshengmenwai Avenue, Beijing. Questions were designed around three core dimensions:

i. Element Identification: Which specific biophilic elements within indoor office environments prove most effective in alleviating employee stress and anxiety?

ii. Interface Application: Considering cost, maintenance complexity, and implementation feasibility, which elements are most suitable for wall application? Floor application? Ceiling application? Desktop application?

iii. Interface Combination: Which combination of interfaces is effective in creating a biophilic indoor office environment that alleviates employee stress and anxiety?

Data analysis utilised NVIVO software employing directed summarising content analysis. This involved transcribing data, conducting sentence-by-sentence textual analysis, exporting codes, and grouping these codes into sub-themes and themes. Finally, summarising content analysis was performed by identifying recurring codes, sub-themes, and themes for biophilic elements across different spatial interfaces. The quantitative presentation methods employed in this study, such as percentages and frequencies, are not intended for inferring population characteristics, conducting hypothesis testing, or statistical significance analysis. Rather, they serve as visual aids to complement qualitative findings, providing an intuitive representation of the frequency of expert opinions, the degree of consensus, and the central tendency.

Results and Analysis

Table 1 shows the demographic characteristics of participants for the focus group discussion.

Table 1 : Demographic Characteristics of Participants

Participant (n=7)	Gender	Years of service	Position Title	Age	Field of expertise
A	Male	16-20	Engineer	31-40	Landscape Design
B	Female	6-10	Associate Professor	31-40	Architecture

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C	Female	21-30	Professor	41-50	Psychologist
D	Male	21-30	Senior Engineer	41-50	Interior Design
E	Male	retirement	Professor	61-70	Interior Design
F	Female	6-10	Engineer	31-40	Architecture
G	Male	16-20	Associate Professor	41-50	Landscape Design
H	Female	21-30	Lecturer	41-50	Psychologist

Eight participants were divided into two groups of four (two males and two females each), specialising in landscape design, interior design, architecture, and psychology. Participants ranged in age from 31 to 70 years old, with continuous professional experience spanning 6 to 30 years. One participant was retired (aged 60), three held engineer status, three held associate professor (senior engineer) status, and two held professor status (Table 1).

Biophilic Elements in Indoor Office Environments

Through in-depth analysis of focus group discussion data, this study identified biophilic elements specific to different spatial interfaces. Green plants ranked highest in priority at approximately 26.97%, followed sequentially by natural materials14.61%, natural colours13.48%, the presence of water12.36%, and natural shapes and forms11.24% (Table 2). It is noteworthy that some disagreement existed within the group regarding natural materials and the presence of water. Furthermore, although natural light and air (aromas) were also considered key biophilic elements, they were excluded from this evaluation system due to the study's boundary being confined to the interior of indoor office environments. Greening is one of the most commonly employed biophilic design attributes in office spaces (Lei et al., 2022), and indoor plants have been shown to have a significant effect in alleviating stress(Ahmad et al., 2018).

Table 2 : Frequency of Biophilic Elements and Their Codes in Indoor Office Environments

Biophilic Elements In Indoor Office Spaces	Focus group discussion			
	Focus Group 1	Focus Group 2	Summary	Proportion
⑧Does not support biophilic elements (natural materials and water)	3	1	4	4.49%
⑨Air (fragrance)	1	0	1	1.12%
①Green plants	11	13	24	26.97%
④The presence of water	5	6	11	12.36%
③Natural colour	2	10	12	13.48%

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②Natural materials	3	10	13	14.61%
⑦Natural light	1	4	5	5.62%
⑥Natural images	5	4	9	10.11%
⑤Natural shapes and forms	6	4	10	11.24%

Table 3: Bioactive Secondary and Tertiary Elements in Spatial Interfaces and Focus Group Code Frequency

Spatial Interface	Experiential attributes	Secondary element	Tertiary elements	Focus Group 1	Focus Group 2	Summary
				60	59	119
Floor (★★★★ 31.3%)		Biophilic elements on the ground		28	22	50
	Direct experience	①Floor-standing green plants	Floor-standing green plants	13	4	17
			②Live green plants or vertical greening (considering growth space and structural modification costs, with leasing options)	5	0	5
			①Small potted plants (such as pothos, rhapis palm, and other shade-tolerant plants and flowers)	6	2	8
			③Medium to large plants (tall in stature, large leaves, substantial in build)	2	2	4
		③Ground-level water features	Ground-level water features	9	3	12
			②Abstract Water Feature (Karesansui)	3	0	3
			②Dynamic Water Feature	1	2	3
			①Static water features	2	2	4
			④Maintenance costs	1	0	1
			②Small (micro) water features	3	0	3
	Indirect experience	②Natural materials	Natural materials	5	10	15
			③PVC imitation wood grain or stone texture	0	2	2
			The use of stone is not supported.	0	1	1
			①Carpet	4	4	8
			②Wooden flooring (ash, oak)	0	5	5

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			Soft upholstery (velvet or leather)	1	0	1
			③Natural stone flooring	1	1	2
		⑤Natural images	Natural images	0	3	3
			②PVC flooring with natural wood grain	0	1	1
			①Natural carpet texture	0	2	2
		④Natural colour	Natural colour	3	5	8
			①earth tones	3	1	4
			②Light wood colour	0	2	2
			③Light-coloured	0	1	1
Ceiling (★★13.8%) Wall	Biophilic elements on the ceiling			12	10	22
	Direct experience	④Ceiling-mounted greenery	Ceiling-mounted greenery	2	2	4
			①Cost maintenance	0	2	2
			②Due to high maintenance costs, it is not supported.	0	1	1
			①Maintenance of living space, lighting, etc.	2	0	2
	Indirect experience	①Biophilic natural forms	Biophilic natural forms	5	5	10
			①Bionic Ceiling Design	5	5	10
		③Natural materials	Natural materials	0	5	5
			Wood-effect metal ceiling panels	0	5	5
		②Natural images	Natural images	4	2	6
			①Perspective painting with open views from above (natural landscapes, flowers and birds, vines and other plants)	3	0	3
			②Soft membrane ceiling with natural imagery	0	1	1
			②Forests, skies, etc.	0	1	1
			②Implementation (soft membrane ceiling)	0	1	1
			②Image of a Crane	1	0	1
		⑤Natural colours (warm tones, green, light blue)	Natural colours (warm tones, green, light blue)	1	1	2
			warm colours, green, light blue	1	0	1

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The walls and ceiling merge seamlessly (★)	Integrate biophilic elements into the overall design			2	1	3
	Indirect experience	Painting Natural Images (Plants)	Painting natural subjects (plants)	1	0	1
surface (★★★★★37.5%)	Biophilic wall elements			32	28	60
	Direct experience	②Green Plant Wall	Green Plant Wall	6	11	17
			①Green wall	5	9	14
			Does not support artificial green walls.	0	1	1
			③Artificial green walls (high maintenance and cost constraints)	0	2	2
			③Philodendrons are less expensive.	1	1	2
			Mosses, ferns, and succulents are low-cost.	0	1	1
			②Climbing plants (requiring sunlight)	1	2	3
			Medium to large (bulky) plants	1	0	1
		③Wall-mounted window view	Wall-mounted window view	4	3	7
			②Simulated window forms (fan-shaped, crabapple-shaped)	2	1	3
			①Simulated natural window views (landscapes, blue skies with white clouds, outdoor scenery)	2	2	4
		Wall-mounted Water Feature	Wall-mounted Water Feature	0	1	1
	Indirect experience	Biophilic Natural Form	Biophilic Natural Form	2	0	2
			Bionic Device Artistic Form	1	0	1
			Curved organic forms	1	0	1
		③Natural materials	Natural materials	4	3	7
			③Not suitable for use with stone	0	1	1
			③Curtain Colour Coordination	1	0	1
			②Wood-effect natural material	2	0	2
			①Wood (solid wood veneer ash oak)	1	2	3
			③fabric	0	1	1

			Natural images	11	6	17
		②Natural images	③Animal and plant elements	2	0	2
			③Bionic imagery	1	1	2
			①Bionic nature wallpapers (such as plants, birds, etc.)	1	5	6
			②Wall painting (bamboo, green plants, magpies)	4	0	4
			③Encourage staff to create wall art through painting	2	0	2
		①Natural colour	Natural colour	7	12	19
			②Low saturation	1	2	3
			③Composite green	2	0	2
			②Blue	1	2	3
			①Green	6	5	11
			④Natural colours and natural imagery are considered as one	0	1	1
Desktop (★★17.5%)	Desktop biophilic elements			9	19	28
	Direct experience	①Green Plant Desktop	Green Plant Desktop	5	16	21
			④Does not support artificial plants	1	1	2
			①Potted plants (such as succulents, cherry tomatoes, and mint)	2	9	11
			③Miniature landscapes (plants, water features, fish)	0	5	5
			②Small plants (flowers)	2	4	6
	Indirect experience	③Biophilic natural forms	Biophilic natural forms	1	0	1
			Furniture (with scrollwork motifs)	1	0	1
		②Natural materials	①Natural materials	3	4	7
			Light wood colour	1	0	1
			②Solid wood veneer (genuine wood veneer)	2	2	4
			fabric	0	1	1
			Natural wood colour	0	1	1

Note: ★ denotes the percentage value and level of importance.

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Research findings indicate (see Table 3) that among the consensus levels of experts on biophilic elements in spatial interfaces, wall elements were identified as the most prioritised strategy for stress reduction. The importance of walls and ceilings outweighs that of floor and table elements. An interior designer said "The walls and ceiling must not be completely separated; numerous theories exist, such as the *Baroque theory, which advocates for the unification of walls and ceiling, merging them into a single entity "*. An psychologist said *" The wall-to-ceiling continuity is rather good; within the space, I won't stand out or feel detached, achieving greater harmony"*. An landscape designer said, *"Focus on the interplay between walls and ceilings to create a sense of spatial immersion".* but rather integrated under the principle of holistic design. It is noteworthy that while the application of biophilic elements on ceilings was mentioned, it faces constraints due to high construction complexity and maintainability. For instance, excessive vegetation on ceilings would incur substantial long-term maintenance costs and present significant implementation challenges(Chabada et al., 2023). Another expert cautioned against overly dramatic forms (biomorphic shapes) with pronounced curves, arguing that such designs are impractical for office spaces due to high construction costs and limited cost-effectiveness in stress recovery.

Biophilic Elements on Wall Surfaces

Based on experiential approaches and expert discussions, wall-based biophilic elements can be categorised into two dimensions: ‘direct experience’ and ‘indirect experience’. Biophilic elements account for the highest proportion on walls (37.5%).In terms of priority ranking, natural colours were identified as the primary strategy, carrying significantly higher weight than green walls and natural imagery (which share comparable weight). This is followed by natural material walls, wall-mounted window views, and natural form elements. Among these, green walls, wall-mounted window views, and wall-mounted water features fall under direct experience, while natural colours, natural imagery, natural materials, and biophilic natural forms belong to the indirect experience category. Regarding specific implementation strategies, natural colour schemes (indirect experience) advocate the use of low-saturation green and blue tones, or composite green hues. Some experts emphasise the need for integrated design combining colour with natural imagery. For creating green walls (direct experience), plant physiology and spatial conditions must be balanced: climbing plants require specific light thresholds for survival, while pothos, mosses, ferns, and succulents are prioritised for their low cost and maintenance. In tall spaces, though artificial green walls significantly reduce upkeep, their ecological validity is questioned by some experts. The application scope of natural imagery (indirect experience) encompasses biomimetic wallpaper (featuring animal and plant motifs) and thematic wall paintings (such as bamboo or magpies). Research specifically highlights that ‘employee-participatory creation’ enhances the space's biophilic perception. Furthermore, window views serve as a key visual intervention for direct experience. Implementation strategies include simulating natural vistas (blue skies, clouds, landscapes) and reconfiguring non-rectangular window openings (e.g., fan-shaped, cabbage-shaped) to strengthen visual connectivity between indoor and outdoor spaces.

Biophilic Elements of the Floor Interface

Ground-level biophilic elements may be categorised into two dimensions: ‘direct experience’ and ‘indirect experience’. Ground vegetation and ground-level water features fall under direct experience, while natural materials, natural colours, and natural imagery constitute the core of indirect experience. Ground-level biophilic elements accounted for 31.3% of mentions, second

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only to wall surfaces. Ground vegetation is designated as the primary intervention strategy, followed by natural materials, then ground-level water features, with natural colours and natural imagery ranking next.

Regarding implementation strategies for direct experience elements like ground vegetation, it is recommended to prioritise small potted plants, medium-to-large plants, or vertical greening solutions. However, a comprehensive assessment of plant growth space thresholds and full lifecycle maintenance costs is essential. Experts shared a case study where a student alleviated personal depression through plant cultivation; landscape specialists highlighted the effective mind-body benefits derived from creating or maintaining bonsai.

For ground-level water features, the design scope encompasses static water features, dynamic water features, miniature water features, and abstract kare-sansui forms, aiming to alleviate stress through dual auditory and visual perception. Regarding material and colour applications for indirect sensory experiences, interior specialists recommended carpets or wooden flooring for ground surfaces to create a warm, comfortable texture. Genuine solid wood flooring was deemed impractical for long-term maintenance, with high-fidelity PVC imitations of wood or stone textures suggested instead to replicate natural material textures.

While natural stone is favoured by some experts for its texture, others question its ‘cold and rigid’ tactile warmth, advising cautious use. Natural colour palettes should prioritise earth tones and light wood hues to establish a stable visual foundation. Additionally, natural imagery, though not a high-priority element, remains valuable for reinforcing visual continuity with the biophilic floor theme.

Biophilic Elements in Desktop Interfaces

Desktop biophilic elements can be categorised into ‘direct experience’ and ‘indirect experience’ dimensions. The frequency of mention of biophilic elements on desktops accounted for 17.5 per cent. Desktop greenery is defined as the core vehicle for direct experience, while natural materials and biophilic natural forms fall under indirect experience. Based on the frequency and weight of design interventions, desktop greenery is prioritised as the primary strategy, followed by the application of natural materials and abstract expressions of natural forms.

Regarding implementation strategies for direct experience elements, potted plants, compact standalone specimens, and miniature landscape arrangements are recommended for desktop greenery. These aim to create intimate, natural encounters within constrained desktop spaces; landscape specialists note that miniature landscapes prove highly effective in alleviating stress and anxiety. For indirect experience materials, psychologists advocate natural wood veneer finishes to restore timber's inherent grain and tactile warmth, enhancing material authenticity and affinity. Additionally, biophilic forms serve as non-figurative complements, enriching the ecological semantics of desktop interfaces through simulated organic curves and biomimetic shapes.

Biophilic Elements on Ceiling Interfaces

Within the interior interfaces of office spaces, the proportion of mentions of biophilic elements on the ceiling surface was the lowest at approximately 13.8%. The ceiling holds the lowest priority in the hierarchy. Its constituent elements encompass biophilic natural forms, natural

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imagery, natural materials, ceiling-mounted greenery, and materials in natural colour palettes. These primarily influence the spatial ambience through indirect experiential pathways.

In practical implementation strategies, biophilic natural forms advocate biomimetic ceiling designs to emulate the structural aesthetics of organic organisms. Natural imagery applications focus on extending visual depth through techniques such as perspective panoramic murals (featuring themes like forests, skies, vines, and cranes) and soft membrane ceiling technology, aiming to reconstruct spatial visual height and openness via virtual vistas. Regarding natural materials, constrained by ceiling load-bearing capacity and construction techniques, highly realistic wood-grain metal finishes are predominantly used to substitute solid timber, balancing natural texture with structural integrity. Notably, while ceiling-mounted greenery possesses direct experiential qualities, its implementation in conventional office spaces is not recommended due to prohibitively high-altitude maintenance costs, complex irrigation systems, and associated safety risks.

Discussion

Research Findings

Through coding and frequency analysis of focus group discussion data, this study preliminarily identified 90 biophilic design elements (21 secondary elements and 65 tertiary elements). To ensure the universality and representativeness of the element system, data purification employed a combined strategy of 'case exclusion' and the 'Pareto principle': First, specific descriptions mentioned by only 1–2 participants (case interference items) were excluded, retaining 16 secondary elements and 29 tertiary elements. Subsequently, low-frequency descriptions were filtered using a 5% mention rate threshold, ultimately establishing a core biophilic design indicator library comprising 9 secondary elements and 21 tertiary elements.

Table 4: Focus Group Discussion Data Coding and Frequency Statistics

Space Interface	Experiential Attributes	Secondary element	Tertiary elements	Focus Group 1	Focus Group 2	Summary	Proportion
Floor (★★★★★ 31.3%)	Direct experience	①Floor-standing green plants	Floor-standing green plants	13	4	17	10.6%
			②Live green plants or vertical greening (considering growth space and structural modification costs, with leasing options)	5	0	5	3.1%
			①Small potted plants (such as pothos, rhapis palm, and other shade-tolerant plants and flowers)	6	2	8	5.0%

			③Medium to large plants (tall in stature, large leaves, substantial in build)	2	2	4	2.5%
		③Ground-level water features	Ground-level water features	9	3	12	7.5%
			②Abstract Water Feature (Karesansui)	3	0	3	1.9%
			②Dynamic Water Feature	1	2	3	1.9%
			①Static water features	2	2	4	2.5%
			②Small (micro) water features	3	0	3	1.9%
	Indirect experience	②Natural materials	Natural materials	5	10	15	9.4%
			①Carpet	4	4	8	5.0%
			②Wooden flooring (ash, oak)	0	5	5	3.1%
		④Natural colour	Natural colour	3	5	8	5.0%
			①Earth tones	3	1	4	2.5%
Ceiling (★★13.8 %)	Indirect experience	①Biophilic natural forms	Biophilic natural forms	5	5	10	6.3%
			①Bionic Ceiling Design	5	5	10	6.3%
Wall surface (★★★★★★37.5%)	Direct experience	②Green wall	Green wall	6	11	17	10.6%
			①Green wall	5	9	14	8.8%
			②Climbing plants (requiring sunlight)	1	2	3	1.9%
	Indirect experience	②Natural images	Natural images	11	6	17	10.6%
			①Bionic nature wallpapers (such as plants, birds, etc.)	1	5	6	3.8%
			②Wall painting (bamboo, green plants, magpies)	4	0	4	2.5%
		①Natural colour	Natural colour	7	12	19	11.9%
			②Low saturation	1	2	3	1.9%
			②Blue	1	2	3	1.9%
			①Green	6	5	11	6.9%

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Desktop (★★ 17.5%)	Direct experience	①Green Plant Desktop	Green Plant Desktop	5	16	21	13.1%
			①Potted plants (such as succulents, cherry tomatoes, and mint)	2	9	11	6.9%
			③Miniature landscapes (plants, water features, fish)	0	5	5	3.1%
			②Small plants (flowers)	2	4	6	3.8%

In the hierarchical distribution of spatial interfaces (see Table 4), Descriptive analysis reveals pronounced variations in interface design, with biophilic elements on walls receiving the highest frequency of mention and the largest proportion (37.5%). Research employing virtual reality (VR) technology to identify preferences for indoor biophilic elements indicates that walls are the primary spatial interface sought in design [14]. Second are ground-level biophilic elements and tabletop biophilic elements; ceiling elements received the lowest proportion of mentions.

In terms of perceptual experience dimensions, distinct interactive logics emerge across interfaces: ceiling elements provide solely ‘indirect experience’ through visual extension; desktop elements encompass only the ‘direct experience’ dimension; while walls and floors, as transitional interfaces, possess dual attributes of both ‘direct experience’ and ‘indirect experience’.

From the perspective of elemental composition ratios, experts' frequency of mention, degree of consensus, and central tendency are evident at the secondary element level. ‘Greenery on surfaces’ received the highest frequency of mention, accounting for approximately 13.1%, followed by ‘natural wall colours’. ‘Greenery on walls’, ‘natural imagery on walls’ and ‘greenery on floors’ were mentioned with equal frequency, followed by natural materials and water features on floors. A descriptive analysis at the tertiary element level revealed that ‘greenery on walls’ was mentioned most frequently. From an implementation perspective, landscape specialists advise that green walls are currently popular, recommending combinations of mosses and ferns with a small proportion of succulents. This approach offers relatively low cost with highly effective results. For the most economical solution, pothos is suggested. Indoor specialists note that artificial green walls may be employed for areas at greater visual distances or non-touch zones, facilitating maintenance. Subsequent priorities include ‘green walls’, ‘potted desktop plants’, ‘bionic ceiling designs’, floor carpets, and small potted plants on the ground (shade-tolerant species like pothos or monstera, alongside flowers). Incorporating greenery on walls alleviates employee fatigue and represents the most economical implementation. Landscape specialists recommend layered green compositions to create visual depth, effectively reducing stress and anxiety for greater mental and physical well-being. Architectural experts suggest providing each employee with a weekly bouquet of randomly selected flowers or succulents for personal care, as research indicates this is an effective method for alleviating employee stress and anxiety.

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Based on the aforementioned frequency distribution and interface weighting, this study ultimately developed a biophilic design guideline for indoor office environments, encompassing interface hierarchy, experience types, and specific elements (see Table 4).

Synergistic Effects of Interfaces

Analysis indicates (see Table 5) that biophilic interventions within a single interface exhibit diminishing marginal returns, whereas synergistic multi-interface design significantly enhances the ecological perception of a space. Wall-Ceiling Integration holds the highest design priority. By establishing vertical visual continuity between suspended vegetation interfaces and ground-level planters, combined with the material extension of timber finishes across walls and ceilings, a strongly enveloping 'Natural Envelope' is formed. This immersive spatial definition not only deepens visual corridors but also amplifies stress-reduction benefits. In contrast, the Wall-Floor Combination strategy, while ranked as a secondary priority, remains valuable for establishing interface continuity and guiding visual focus points.

Table 5： Spatial Interface Combinations and Focus Group Code Frequency

Space Interface Integration/Expert	A	B	C	D	E	F	G	H	Summary
Spatial Interface Combination	1	1	1	1	2	0	1	1	8
Wall and Floor Combination	0	1	0	1	0	0	0	0	2
Wall, ceiling and floor combination	0	0	1	0	0	0	0	0	1
Wall surfaces and tabletops	0	0	0	0	0	0	1	0	1
The ceiling and walls blend seamlessly	1	0	0	0	2	0	0	1	4
Desktop	0	0	0	1	0	0	0	0	1

Research Limitations and Reflections

Whilst this study offers valuable insights, the following limitations exist: only eight experts participated. Although this meets the depth requirements of qualitative research, the sample size may not adequately cover perspectives across all geographical cultures or enterprise types. This study is expert-based rather than grounded in employees' actual physiological feedback (e.g., heart rate variability HRV, skin conductance response). The absence of end-user data means experts' perceptions of effectiveness may diverge from employees' actual experiences.

Given these limitations, future research should explore cultural differences in preferences for natural elements (e.g., Eastern versus Western contexts). Empirical studies combining virtual reality (VR) technology to simulate office environments with varied interface combinations could measure participants' physiological stress indicators, thereby validating the proposed model. Investigating the application of biophilic elements within diverse spatial interface configurations to alleviate employee stress warrants further examination.

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Conclusions

Through systematic refinement and frequency analysis of 90 initial biophilic elements, this study established a core framework comprising 9 secondary and 21 tertiary indicators. It achieved three primary objectives: validating the applicability of biophilic theory in office contexts, quantitatively revealing interface synergistic effects and demographic moderation, and constructing design guidelines. The research revealed an uneven distribution of biophilic elements within office interfaces: walls dominate (37.5%), followed by floors (31.3%), with desktops and ceilings exhibiting diminishing presence. It further defined the distinct perceptual mechanisms of ceilings (indirect experience), desktop (direct experience), and wall-floor interface (dual experience). This provides a robust theoretical foundation and practical pathway for creating refined office environments based on user profiles and interface weighting. The study offers actionable, evidence-based design recommendations for architects, interior designers, and corporate managers, achieving its primary objective: clarifying the interface distribution of biophilic elements in office spaces and their stress-reduction logic. Through cross-validation by multidisciplinary experts, it enriches the theoretical framework of biophilic design while providing robust scientific grounding for constructing future healthy office environments. Against the dual backdrop of the 'Healthy China' initiative and the post-pandemic era, promoting biophilic design centred on interface dimensions represents a crucial pathway for enhancing workplace humanism and sustainable development.

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