



Chromatic Zoning for Restorative Wellness Interiors: A Mixed-Methods Framework for Tonal-Green Colour Strategy, Perception and Behaviour in Commercial Wellness Centres

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Abstract

Background. Colour is routinely specified in interiors as a mood tool, yet the evidence base is fragmented: studies typically treat colour as a coarse warm/cool category, test short exposures in laboratories or virtual environments, and focus on offices, schools, retail and restaurants. Commercial wellness settings, where emotional regulation is the product, are comparatively under-examined.

Aim. This paper (i) critically synthesises current evidence on colour, light and biophilic effects in interiors; (ii) identifies five research gaps; (iii) proposes *Chromatic Zoning*, a design framework in which tonal variations of a single hue family (green) are assigned to spatial functions along a user journey; and (iv) specifies a mixed-methods protocol to test the framework in a 4,000 sq. ft urban yoga and mindfulness centre.

Method. A sequential explanatory design is proposed: a within-subject experiment across four zone conditions (reception, studio, breathwork/meditation, lounge) using calibrated renderings, followed by structured interviews. Outcomes include perceived restorativeness, valence–arousal–dominance (PAD) ratings, perceived function-fit and behavioural intention.

Contribution. The framework moves beyond "green is calming" to a testable, function-specific specification covering hue, saturation, lightness, material, light temperature and biophilic layering, with a context-sensitive Indian focus.

Keywords: colour psychology; restorative environments; tonal-green palette; biophilic design; wellness architecture; environmental psychology; user experience; India

1. Introduction

People in urban India spend most waking hours indoors, and demand for wellness spaces such as yoga studios, meditation rooms and mindfulness clinics has grown alongside awareness of stress and burnout. In these settings the interior is not a backdrop: it is part of the service. A reception that feels welcoming, a studio that supports attention and a lounge that allows recovery are design outcomes, not by-products.

Colour psychology is the standard vocabulary designers use to justify these choices. However, much practitioner literature, including the original version of this study, relies on broad statements such as "red increases appetite" or "blue reduces stress". A critical review of about 200 environmental-colour studies concluded that there are no hard-wired links between environmental

colours and particular emotional states, that responses depend on hue, saturation and brightness together, and that colours should first be specified by what they are meant to *do* (Wise & Wise, NASA NTRS 19890006161). This paper adopts that function-first stance.

1.1 Problem statement

Designers of wellness interiors lack an evidence-based method to select *which shade* of a calming hue belongs in *which room*, under *which light*, for *which user*.

1.2 Research questions

- **RQ1.** Do tonal-green interiors produce higher perceived restorativeness than a neutral-only reference?
- **RQ2.** Within one hue family, how do saturation and lightness shift arousal, enclosure and focus?
- **RQ3.** Does function-matched tone allocation (e.g., pale sage for arrival, deep green for meditation) improve perceived fit and behavioural intention?
- **RQ4.** How do lighting colour temperature, material texture and biophilic elements moderate these effects?
- **RQ5.** Do age, prior wellness practice and cultural background change responses?

1.3 Significance

Findings would give designers a replicable specification, give operators evidence for investment decisions and give users spaces that support the outcome they came for.

2. Literature Review and Theoretical Framework

2.1 Colour–emotion associations

A study of 4,598 participants in 30 nations found highly similar colour–emotion associations (average similarity $r = .88$) while also showing that nation, language and geographic closeness explained additional variation (Jonaskaite et al., 2020). Implication: broad associations (green with calm, nature and balance) are a sound starting point, but local calibration is necessary. A semantic review of colour in design similarly reports dualistic meanings (red as passion and danger; blue as trust and sadness) moderated by context, culture, individual differences, saturation and brightness.

2.2 Dimensions of colour: hue is not enough

Reviews of colour in work environments distinguish hue, saturation and brightness as separate variables, and findings differ across them. A recent study of interior colour and lighting reports that medium-saturation warm tones evoke positive emotion whereas high saturation, regardless of hue, can provoke negative responses, and notes that one hospitality study found no significant emotional difference between warm and cool palettes (Buildings, 2025, 15(19), 3511). These results undermine the simple "warm = stimulating, cool = calming" rule in the original paper and motivate studying *within-hue* variation.

2.3 Light changes colour

A 2025 systematic review (PRISMA 2020) found that most lighting–emotion studies examined illuminance, correlated colour temperature, light colour and distribution on pleasure, arousal and dominance (PAD), mainly in administrative, commercial or educational spaces, and called for work on natural light, residential settings and behavioural or neurophysiological indicators (Mohammad-Moradi et al., 2025). Colour and light must therefore be modelled together.

2.4 Restorative and biophilic design

Two foundations underpin restorative environments: Stress Reduction Theory (Ulrich, 1983) and Attention Restoration Theory. Biophilic design, systematised by Kellert et al. (2008), applies these ideas through plants, natural materials, light and views. Evidence includes:

- Rooms with greenery were rated more restorative with more positive affective qualities, though plants built into furniture were more fascinating but also more chaotic than potted plants (Bellini & Miola, 2025).
- Participants in biophilic indoor environments recovered better from stressors than those in a non-biophilic environment, with effects differing by element type (Yin et al., 2020).
- Brief exposure to a vegetation-covered room reduced prefrontal oxygenation and lowered fatigue and anxiety in nurses (Int. J. Environ. Res. Public Health, 2025, 22(10), 1571).
- Not all results are positive: one immersive-VR study found no significant stress recovery from green walls versus baseline and no effect of wall size (Louisiana State University repository).
- A scoping review of 136 studies (2000–2025) highlights moderate greenery levels, high-visibility placement, multi-sensory integration and combined interventions, and notes that guidance remains largely conceptual (preprint; proposes the Biophilic Intensity Matrix).

2.5 Age and cultural context

A Malaysian study of cool colours across fifteen intensities and work on elderly users report a preference for light green and calming effects of light blue-green. In India, colours carry strong religious, regional and ritual meanings, and a study of young adults in Ahmedabad showed that colour associations are structured by culture (Bonnardel, NID). Cross-cultural interior work also shows that preference varies by culture, gender and age (Baniani, University of Tsukuba).

2.6 Conceptual model

This study uses a Stimulus–Organism–Response logic with PAD as the affective layer:

Stimulus (hue family, saturation, lightness, material, light temperature, biophilic layer) → **Organism** (valence, arousal, dominance, perceived restorativeness, individual moderators: age, practice experience, culture) → **Response** (dwell intention, return intention, perceived service quality, practice quality).

3. Research Gap Analysis

#	Gap observed in the sources reviewed	How this study responds
G1	Colour often coded as warm vs cool categories	Treats hue, saturation and lightness separately inside one hue family
G2	Hue studied in isolation from light and material	Crosses tone with CCT and material texture
G3	Evidence concentrated in offices, schools, retail, restaurants and hospitals	Targets commercial wellness (yoga and mindfulness) settings
G4	Single-room, short-exposure or VR tests	Tests a sequenced journey (arrival → destination), not one isolated room
G5	Limited Indian context and age-stratified evidence	Samples Indian users across age bands and levels of practice

Scope caution: this table reflects the sources I could access, not an exhaustive systematic search. Before claiming novelty in your submission, run a documented search (Scopus, Web of Science, Google Scholar; terms such as "tonal", "monochromatic", "green", "wellness", "yoga studio", "restorative") and update the table.

4. The Chromatic Zoning Framework

Definition. Chromatic Zoning assigns a graded range of one hue family to spatial functions according to the *behavioural intent* of each zone, and coordinates it with light temperature, material and biophilic density.

Principles

1. **Function before hue:** specify what the zone should do.
2. **Gradient with purpose:** lightness and saturation rise or fall along the user journey.
3. **Light-coordinated:** colour is specified with its lighting condition.
4. **Material-softened:** matte, tactile finishes avoid glare and visual harshness.
5. **Biophilic layering:** planting and natural materials support, not replace, colour.
6. **User-calibrated:** age, culture and experience adjust intensity.

Design hypotheses (to be tested, not established facts)

Zone	Intended behaviour	Proposed tone	Material and light	Predicted response
Arrival and reception	Orientation, welcome	Pale sage, high lightness, low saturation	Warm timber, 2700–3000 K	Low threat, higher approachability
Transition / courtyard	Decompression	Olive and mid-green with daylight	Stone, planting, daylight	Moderate arousal, high fascination

Zone	Intended behaviour	Proposed tone	Material and light	Predicted response
Active practice (yoga studio)	Energy with ease	Olive-leaning mid-tone	Bamboo and wood, 3000–3500 K	Alert yet comfortable
Breathwork and meditation	Focus, inward attention	Deep green, lower lightness	Linen and matte finish, dimmable warm light	Enclosure, concentration, calm
Relaxation lounge	Recovery, socialising	Soft moss with warm neutral	Soft furnishings, indirect light	High restorativeness

5. Hypotheses

Each hypothesis is directional and testable. The null (H_0) is no effect for each.

- **H1.** Perceived restorativeness is higher in the tonal-green condition than in a neutral-only reference.
- **H2.** Within green, higher saturation and lower lightness increase perceived enclosure and focus but not arousal; pale tones reduce arousal.
- **H3.** Function-matched tone allocation scores higher on perceived fit and behavioural intention than mismatched allocation.
- **H4.** Warmer light (2700–3000 K) increases valence relative to cooler light (4000 K) under the same paint.
- **H5.** Adding biophilic elements produces incremental restorativeness beyond colour alone.
- **H6 (exploratory).** Age group and prior practice experience moderate saturation preference.

6. Methodology (Proposed Protocol)

6.1 Design

Sequential explanatory mixed methods: quantitative within-subject experiment, then semi-structured interviews to explain the patterns.

6.2 Site and stimuli

Case design: a 4,000 sq. ft (50 × 80 ft) urban wellness centre with reception, consultation desk, yoga studio, breathwork room, meditation room, relaxation lounge and courtyard (VERDANT, Bhopal). Existing wellness centres in the city can serve as field comparators and site references. Stimuli are calibrated, consistently lit renderings of each zone in four palette conditions: (A) neutral reference; (B) single mid-green; (C) tonal-green zoning; (D) tonal-green with mismatched allocation. Lighting is crossed at 2700 K versus 4000 K for selected zones.

6.3 Participants

Purposive-stratified sample of adults in three age bands (18–30, 31–50, 51+), with a target of about 30 per band [$N = ___$]. Power analysis (e.g., G*Power, medium effect $f = 0.25$, power .80) should be reported before data collection. Screen for colour-vision deficiency.

6.4 Instruments

Construct	Instrument
Affect	Self-Assessment Manikin (valence, arousal, dominance)
Restorativeness	Perceived Restorativeness Scale
Atmosphere	Semantic differential (calm–tense, warm–cold, spacious–enclosed, focused–distracted)
Fit and intention	Custom 5-point items: zone-function fit, dwell and return intention
Optional physiology	Heart-rate variability and electrodermal activity in a sub-sample
Qualitative	Semi-structured interviews, 15–20 participants

6.5 Analysis

Linear mixed-effects models or repeated-measures ANOVA for within-subject effects, with age and experience as between-subject factors; non-parametric alternatives if assumptions fail; effect sizes with confidence intervals; thematic analysis of interviews; triangulation across data types.

6.6 Ethics and quality

Informed consent, anonymity, institutional ethics approval, pre-registration of hypotheses, randomised stimulus order to limit order effects, and a pilot ($n \approx 10$) to test instruments.

7. Results and Discussion

[Insert your data here. Suggested structure: descriptive statistics by zone and condition; tests of H1–H6; qualitative themes; convergence or divergence between methods.]

If results are mixed, report them honestly. The literature already shows mixed results (for example, green-wall VR studies with null effects), so a null finding on one hypothesis still adds to the evidence.

8. Application Scenarios

The framework is designed to transfer to other situations in which emotional regulation is a design requirement.

Situation	Colour-psychology challenge	How the framework applies
Urban professional on a lunch-break session	Needs fast down-regulation	Short journey from pale arrival tone to restorative lounge
First-time, anxious visitor	Unfamiliar space feels intimidating	Low-saturation, high-lightness arrival; clear wayfinding



Situation	Colour-psychology challenge	How the framework applies
Older adults	Declining light sensitivity, glare risk	Lighter greens, matte finishes, higher luminance contrast for safety
Instructors and staff (occupational exposure)	Long hours in one room	Rotation of tone intensity; balance of focus and relief zones
Corporate wellness programmes	Employer wants measurable outcomes	Zone-level KPIs, such as dwell time and self-reported restoration
Clinic and hospital waiting rooms	Stress at entry	Tonal-green arrival with daylight and planting
School counselling or quiet rooms	Young users prefer more vibrant colour	Calibrated mid-saturation accents within a calm base
Co-working quiet pods	Cognitive load	Deep-green focus pod versus light-green break area
Home meditation corner	Small area, limited budget	Single tonal accent wall with warm light and one plant
Hospitality and spa	Cross-cultural guests	Universal green associations plus locally meaningful materials
Cultural and spiritual spaces	Colour carries ritual meaning	Consult local symbolism before applying any tone

9. Advantages to Market and Users

Stakeholder	Potential benefit	Proposed indicator
Wellness operators	Differentiated experience; evidence for design spend; fewer costly repaints	Repeat visits, dwell time, satisfaction/NPS
Interior designers and architects	Replicable, function-first specification	Brief-to-design time, client approval rate
Paint, material and lighting manufacturers	Tone-by-function product systems, matte natural finishes	Palette adoption, specification rates
Real-estate and hospitality developers	Wellness amenities as a premium feature	Occupancy, amenity ratings
Healthcare and corporate clients	Low-cost stress-support environments	Self-reported stress, absenteeism (long term)

Stakeholder	Potential benefit	Proposed indicator
End users	Spaces matched to their purpose: calm arrival, focus, recovery	Perceived restorativeness, comfort
Educators and researchers	Open protocol for replication in Indian contexts	Replication count, shared datasets

These are *potential* benefits and measurable indicators. They become claims only after the validation study.

10. Limitations

- Rendered stimuli cannot reproduce multisensory real-world experience (sound, scent, air quality).
- Self-report is vulnerable to demand effects; physiological sub-samples help.
- A single-session design cannot show long-term habituation.
- Findings from one city and one design language require replication.
- The evidence base for biophilic and colour effects is uneven, and some studies show null results.

11. Conclusion

Colour is a powerful but context-dependent design variable. The evidence supports treating it as an interaction of hue, saturation, lightness, light, material and nature rather than as a single mood lever. Chromatic Zoning offers a function-first, testable framework for wellness interiors, and the proposed protocol would turn design intuition into evidence. For practitioners, the take-home message is to specify tone by intended behaviour, validate under real light, and calibrate for the people who will use the space.

12. Future Research

- Field studies in built centres with longitudinal follow-up.
- Neurophysiological measures (HRV, EEG, eye-tracking).
- Cross-city and cross-cultural comparisons within India.
- Interaction of colour with acoustics and scent.
- Comparisons of tonal-green with other single-hue strategies.

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