Art and Architecture Journal (2025) 6, (1) 213–236

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

Authors Names :
Sarah Nabih Nasif Farag

Lecturer –interior design department – Faculty of arts and design – October university for modern science and arts (MSA) -Egypt

Author E-mail :
Sara.n_nasif91@yahoo.com

Keywords:

Interior Hyperthyroid patients, Thermal sensitivity, Health-focused interior design, AI-generated interior design, Thermal comfort, User-centered design.

Designing for the Hidden Majority: Interior Solutions for Hyperthyroid Patients in Hot Climates

(From Theory to Practice—Real-World Testing via a Scenario-Based Visual Preference Survey)

ABSTRACT:

Hyperthyroid patients often suffer from heightened sensitivity to heat and stress, especially in hot climates where poor interior design can worsen symptoms. Despite the number of people having this immune disease increasing by the day, interior design rarely addresses their specific needs. This study builds on the author's previous research, which proposed interior design guidelines to support hyperthyroid patients. These guidelines were translated into real-world interior solutions, particularly for office spaces, and aligned with mood boards developed by the author. The designs were evaluated by hyperthyroid individuals and others with similar symptoms to identify preferred options and gather feedback. A mixed-method research approach was done, utilizing a Scenario-Based Visual Preference Survey to collect both quantitative ratings and qualitative responses. The findings revealed unexpected results and provided valuable insights into user-centered design tailored to this overlooked group.

التصميم للأغلبية المخفية: حلول داخلية لمرضى فرط نشاط الغدة الدرقية في المناخات الحارة

(من النظرية إلى التطبيق — الإختبار العملي عبر إستبيان بصري قائم على السيناريوهات)

ساره نبيه نصيف فرج

قسم التصميم الداخلى –كلية الفنون والتصميم – جامعة أكتوبر للعلوم الحديثة والآداب (MSA) – مصر

الملخص

غالبًا ما يعاني مرضى فرط نشاط الغدة الدرقية من حساسية مفرطة تجاه الحرارة والتوتر، خاصةً في المناخات الحارة حيث يمكن أن تؤدي التصاميم الداخلية غير الملائمة إلى تفاقم الأعراض. وعلى الرغم من تزايد عدد الحالات، نادرًا ما تراعي التصاميم الداخلية إحتياجاتهم الخاصة. تبني هذه الدراسة على بحث سابق للمؤلف إقترح إرشادات تصميمية لدعم مرضى فرط نشاط الغدة الدرقية، وقد تم تحويل هذه الإرشادات إلى حلول تصميم داخلي واقعية للحيزات المكتبية وتقييم التصاميم من قبل مرضى يعانون من فرط نشاط الغدة وآخرين لديهم أعراض مشابهة، بهدف تحديد الخيارات المفضلة وجمع الملاحظات. تم إعتماد منهج بحثي مختلط، بإستخدام إستبيان تفضيلات بصرية قائم على السيناريو لجمع بيانات كمية ونوعية. وكشفت النتائج عن معطيات غير متوقعة وقدّمت رؤى لوضعها فى الإعتبار مخصصة لهذه الفئة المُهمَلة.

الكلمات المفتاحية

مرضى فرط نشاط الغدة الدرقية، حساسية الحرارة، التصميم الداخلي للصحة، التصميم الداخلي المولد بالذكاء الاصطناعي، الراحة الحرارية في المساحات الداخلية، التصميم الموجه نحو المستخدم.

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

1.INTRODUCTION

Hyperthyroidism is more than just a medical condition—it's a daily struggle for many, particularly in hot climates where symptoms such as heat intolerance, anxiety, and persistent restlessness intensify. This condition comes from the overproduction of thyroid hormones—triiodothyronine (T_3) and thyroxine (T_4) by a small butterfly-shaped gland located at the base of the neck. These hormones regulate vital body functions such as metabolism, heart rate, and body temperature. Their excess can severely ruin general body balance and performance and contribute to a range of symptoms as a result (Lee & Pearce, 2023). While treatment is effective with medication or surgery in a lot of cases, environmental factors (including interior conditions) can significantly affect symptom intensity.

The current recorded general percentage of this immune disease ranges is not to be ignored and the actual percentage is a lot higher and in continues increase as this immune disease is associated with other diseases commonly spread between people. Globally, hyperthyroidism affects around 2.5% of the adult population and frequently coexists with other chronic diseases (Lee & Pearce, 2023). In Egypt alone, about 19.2% of individuals are diagnosed, with an additional 15.8% potentially undiagnosed (Rashad & Samir, 2020). Several health conditions linked to hyperthyroidism—such as heart disease, diabetes, hepatitis C, and iodine deficiency—highlights the importance of non-clinical management strategies (Fayed et al., 2020; Yamamah et al., 2013; Elsherbiny, 2023). And despite its widespread, hyperthyroidism has not been meaningfully addressed in the field of interior design. This is a huge problem especially in hot climates, where many sufferers rely heavily on energy-intensive mechanical cooling systems which is an unsustainable solution completely opposing to what we always talk about as a national and global vision "Sustainability". Considering that people spend up to 90% of their time indoors (Al Sayyed & Al-Azhari, 2025) and that buildings consume over 30% of global energy—with air conditioning alone accounting for up to 40% of residential energy use in hot climates (EIA, 2023 , Alghamdi & Krarti, 2025),the need to design indoor environments that do both support conditions like hyperthyroidism by helping to keep symptoms under control and at the same time contribute in saving energy indirectly is an essential need .

1.1. BACKGROUND , CONTEXT AND RESEARCH GAP

Research papers in interior design have long investigated the impact of various spatial features—such as lighting, materials, layout, and biophilic elements—on physical health and emotional well-being, particularly within healthcare settings. For example, incorporating natural elements like plants and natural light and its impact on reducing stress and improve recovery times for patients mostly in healthcare settings (Al Khatib et al., 2024). Other research has analyzed emotional responses to colors, textures, and forms, demonstrating that natural textures and warm lighting and its impact on promoting psychological comfort and reducing anxiety (Mostafavi et al., 2023). In addition, other papers focused on investigating Human body response to tactile interaction with materials, such as the texture and its percentage and their influence on different physiological responses including heart rate variability and stress levels, indicating that sensory

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

experience of materials plays a significant role in emotional regulation (Ikei, Song, & Miyazaki, 2017).

Till the most very recent studies, all confirm the same: well-designed interior spaces can significantly enhance users' emotional well-being and comfort through thoughtful use of colors, textures, and cultural elements (Rui & Firzan, 2025).

In the context of hyperthyroidism, numerous studies have been conducted, primarily focusing on clinical aspects. While some research has touched on symptoms related to hyperthyroidism clients, there are no studies examining how interior environments impact individuals living with this condition, except for a study the author conducted in 2024, where research addressing similar symptoms was analyzed to develop preliminary design guidelines tailored for hyperthyroid individuals. In that earlier research, the author proposed these guidelines as practical tools for interior designers. They were partially tested through an experimental study using Design Builder software, which aimed to determine the best combinations of materials and layouts to enhance thermal comfort without depending on mechanical systems—supporting more sustainable design practices. Thermal comfort was the central focus of the study, as other symptoms—such as stress, anxiety, and an elevated heart rate—result from heat discomfort. Therefore, improving thermal conditions can help alleviate multiple symptoms simultaneously. The experiment was applied to a managerial office interior, testing different materials, ratios, and orientations. Some guidelines were reached and mood boards are generated accordingly as per author's previous work but are yet to be applied in real contexts and tested by actual clients. These guidelines are summarized in the table below:

Table (1) _ Summary of Design Guidelines for Hyperthyroidism Based on the Author's Previous Work (Author 2025)

Element	Details	Recommendation usage
Materials (orientation and percentages)	-medium tone oak wood. - carara marble . paints . -Epoxy .	- **Medium-tone oak wood**: Apply primarily on ceilings, walls near windows, and high-touch surfaces such as tabletops. - Recommended usage: 30–45% of total surface area. - **Paints**: Use primarily on external walls that include or surround windows. Recommended color palettes: 1. Blue Chase (9149), Ice Grey (8259), Pampered Pink (8696) 2. Elm Grove (7453), Ice Grey (8259), Pampered Pink (8696) Mixing both palettes is also suitable. - **Flooring**: Use reflective white epoxy for a clean and cooling visual effect.
Lighting	-Combination of warm and blue lighting.	- Provide adjustable lighting options to accommodate gender-based preferences and individual comfort. - Use warm lighting to balance visual temperature and avoid making the space feel too cold. - Incorporate blue light to support relaxation and enhance cognitive performance, such as in negotiation or office work when needed..
Style	Minimalism	- Emphasize simplicity and order to reduce visual clutter and support psychological comfort. - Avoid overly decorative elements that may overstimulate sensitive users.
Furniture and extra items	Slim,non-bulky designs	-Use lightweight, streamlined furniture to support a sense of openness and reduce visual weight in the space. -Add green plants where suitable.

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

1.2.RESEARCH PROBLEM

- Despite the rising need , there is a complete lack of validated research addressing how interior spaces should be designed for individuals with hyperthyroidism except for Preliminary guidelines developed by the author (in a previous work) which remain untested in real-world scenarios and lack user feedback (Author 2025).
-Current building practices continue to rely on unsustainable approaches and energy intensive cooling methods which forms a major concern since already as per recent studies, Over 40% of global energy consumption is attributed to buildings, primarily due to interior heating and cooling demands with cooling loads in particular becoming critical especially in hot climates (Chetan et al., 2020).
- There is no existing framework for assessing spatial preferences of hyperthyroid patients using accessible evaluation tools—a gap that limits the ability to translate design theory into responsive, evidence-based practice (Author, 2025).

1.3.AIM AND OBJECTIVES

1.3.1.AIM

Moving beyond theoretical guidelines and evaluating how individuals with hyperthyroidism perceive and respond to spatial designs tailored to their needs, using visual scenarios based on previously proposed design strategies (through a designed survey) as real feedback for either approving or denying those previously concluded guidelines .

1.3.2. OBJECTIVES

-Assess users' emotional and thermal comfort responses to interior design scenarios.
-Identify which combinations of materials, lighting, color, and layout are most positively received by individuals with hyperthyroidism.
-Test the effectiveness of scenario-based visual preference surveys as a practical and accessible tool for evaluating spatial comfort and design efficacy.

1.4. IMPORTANCE

-Addressing a previously unexplored niche: interior design for individuals with hyperthyroidism.
-Validating design guidelines through direct user engagement and feedback.
-Introducing a practical and affordable method for gathering evidence on interior design preferences in medical contexts and testing its capability.
-Supporting sustainable design practices in alignment with global health and environmental goals.

1.5. RESEARCH QUESTIONS

1. How do different materials, color palettes, and spatial layouts influence patient comfort and emotional well-being?
2. How do hyperthyroid patients perceive comfort and usability in real-world design scenarios?
3. Can a Scenario-Based Visual Preference Survey effectively capture and interpret these perceptions?.

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

2. METHODOLOGY

This research adopts a mixed-method exploratory design, combining qualitative and quantitative insights through Scenario-Based Visual Preference Surveys (SBVPS). Multiple office spaces, designed according to previously established guidelines and mood boards, are presented to real hyperthyroid clients and individuals exhibiting similar symptoms, covering different ages and genders in order to collect detailed and accurate user feedback. The chosen method was carefully selected after a comprehensive evaluation of various available tools, as explained below.

2.1. THE ROLE OF SCENARIO-BASED VISUAL PREFERENCE SURVEYS (SVPS) IN SPATIAL EVALUATION

Given interior designers' growing understanding of the importance of immersive environments in evaluating how people perceive and respond to interior spaces (which is a must to the topic of this study) , the selection of the research method in this study was based on a careful filtering of the available immersive evaluation tools in specific . Generally it can be classified as follow:

Immersive tools categorization		
A.Digital Simulation Tools.	**B.**Hybrid or Physical Mock-Up Tools.	**C.** Behavioral and Environmental Tracking Tools
D. visual based preference tools		

Fig.(1)- Immersive Evaluation Tools for Interior Spatial Perception Categorization (Author 2025)

A.Digital simulation tools: This category includes Virtual Reality (VR), Augmented Reality (AR), 360° panoramic flythrough, spatial computing tools…etc. These technologies are now commonly used by interior designers and architects to create immersive design experiences and gather user feedback. They've been used in studies focused on sensory health conditions like anxiety, dementia, and overstimulation disorders (Heydarian et al., 2015; Yin et al., 2022).

B. Hybrid or Physical Mock-Up Tools: Those are full-scale prototypes used to test and refine interior design decisions through direct user interaction. Those mockups range from simple setups using tape and foam core to fully functional "live" environments (Peavey et al., 2012).

C. Behavioral and Environmental Tracking: This tool is mainly used in a built environment after it's already build by observing and recording user's movement and interactions in real environments (Zheng & Chen, 2019, Ng, 2016).

D. visual based preference tools: A tool widely used in interior design and architecture to assess users' emotional and aesthetic reactions to spatial elements such as color, lighting, and form. One of the most popular tools that fall under this category is the Visual Preference Survey (VPS), a type of survey used since the 1980s that employs images (e.g., photos, renderings) through which respondents rate visual appeal or comfort (Najar et al., 2024).

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

2.1.1. LIMITATIONS OF THOSE PREVIOUSLY MENTIONED EVALUATION METHODS

As per digital simulation tools: Despite VR tool being already used to gain feedback from users with different diseases, it may not be the best option to be used for individuals with hyperthyroidism in specific. Since those people already suffer symptoms such as anxiety, heat intolerance, elevated heart rate, and increased sensitivity to sensory stimuli—all of which may be even worse by VR exposure and this is for many reasons.

First of all, VR is known to cause cyber sickness, which includes symptoms like nausea, dizziness, disorientation, and eye strain. These effects are typically caused by a mismatch between visual input and the body's sense of movement (Weech et al., 2019). Hyperthyroid patients, who already experience heightened nervous system activity and discomfort, may be even more sensitive and irritated to those effects (Kourtesis et al., 2023). In addition, VR headsets generate heat and are worn close to the face which can trigger individuals with hyperthyroidism who often suffer from thermal sensitivity. This added heat can intensify the feeling of being overheated, making the experience unpleasant or even intolerable. And to not be ignored, immersive VR experiences can activate the autonomic nervous system, increasing heart rate and stress levels during and after immersion (Kourtesis et al., 2023) which can again activate symptoms hyperthyroid patients suffer from leading to an overall unpleasant experience and as a result an inaccurate evaluation result.

When it comes to Hybrid or Physical Mock-Up Tools: While this tool can help for a full immersive experience it's not the most practical or effective tool out there it's hard to make quick changes or compare options side by side, which is important when dealing with users who have heightened sensitivity to heat, light, or stress triggers (Zhang et al., 2020).In addition asking participants to physically visit and spend time inside these setups can be exhausting, especially for those already dealing with fatigue and discomfort making the evaluation not accurate as a result .

As per Behavioral and Environmental Tracking tools, they just doesn't fit in this case. They can only be used after a space is already built and people have been using it for a while, which clearly isn't the situation here. That makes it pretty impractical—especially if the aim is to gather insights early in the design process or develop design guidelines before anything is actually constructed to save time, money and effort. Last but not least, the visual based preference tools and from its name it's a tool based on displaying images on clients to take their feedback and insights, in which in most type of cases it's in form of interviews with stakeholders or focus group with both clients and colleagues to discuss particular topic or set of issues via visuals (Onwuegbuzie et al., 2009) or surveys.

And here, it's worth noting that questionnaires (surveys) have long played a role in the design process—starting from the empathy phase, where they help uncover real user needs, to what is known as Post-Occupancy Evaluation (POE). POE is a type of survey used to gather feedback from users after they have spent some time in a completed environment (Elsayed et al., 2023) and can be considered part of Behavioral and Environmental Tracking tools. This is in addition to fully visual-based surveys, such as the previously mentioned Visual Preference Survey (VPS). Despite it being a known tool used for the longest time, this type of survey has limitations in capturing how individuals visually and emotionally experience space (Drey, Rietzler, & Rukzio, 2021) despite it being a success method generally, it won't help especially in evaluating

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

hyperthyroid client preference as it needs a fully immersive experiment which lead the author to select an updated version of this survey which is scenario-based visual preference surveys.

2.1.2. ADVANTAGES OF SCENARIO-BASED VISUAL PREFERENCE SURVEYS (SBVPS)

Scenario-Based Visual Preference Surveys (SBVPS) take traditional image-based surveys a step further by pairing high-quality 3D-rendered interior images with carefully written descriptive scenarios. These narratives invite participants to mentally place themselves inside the space, encouraging them to imagine moving through it and experiencing it with their senses (for example, "Look at this image and picture yourself there…" followed by specific prompts). This combination of visuals and storytelling taps into deeper cognitive and emotional responses, creating a certain psychological state scientifically known as narrative transportation, where people become fully engaged and immersed in the experience (Green & Brock, 2000; Hsu, Conrad, & Jacobs, 2014). Other theories from other researches confirm the same idea .The Dual-coding theory suggests that verbal and visual information activate separate mental channels, which together improve understanding and memory retention (Paivio, 1986; Li & Zhang, 2023).Furthermore , cognitive load theory explains that using supportive narratives generally help organize information, making it easier to process by reducing mental effort and helping focus on what really matters (Sweller, Ayres, & Kalyuga, 2011) , making the survey easier understood and done with less stress and more accurate results as a result .

Even more recent research into immersive virtual environments supports these ideas, showing that adding narrative elements to visuals greatly enhances the sense of "being there," resulting in a more vivid and lifelike experience than just images alone (Baños et al., 2004; Bampouni et al., 2024). Additionally, findings from embodied cognition indicate that imagining oneself moving in a space activates brain areas linked to sensory and motor functions, which deepens immersion beyond simply looking at something (Barsalou, 2008; Bampouni et al., 2024). This kind of immersive experience is especially useful when working with people who are sensitive to environmental factors like heat, light, or sensory overload—such as individuals with hyperthyroidism making it the perfect choice. In addition to all this,, SBVPS provides a cost-effective, accessible alternative which make it the most practical method to use out of all previously mentioned .

2.2. SURVEY DESIGN AND IMPLEMENTATION (ACTUAL EXPERIMENT)

2.2.1. SURVEY STRUCTURE

To evaluate hyperthyroid patients' preferences and responses to previously concluded design guidelines in action, a Scenario-Based Visual Preference Survey was designed by the author and distributed online via Google Forms. The survey included a variety of question types—including structured Likert-scale items, multiple-choice, checkbox, ranking, and open-ended questionspaired with high-resolution 3D-rendered interior images. Each visual was contextualized through short storytelling scenarios for the previous explained reason. This multi-format approach was chosen to capture both measurable responses and deeper emotional feedback. All in all the survey consisted of 5 main sections as summarized in the following table (p.8):

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

Table (2) _ Survey structure (Author, 2025)

Survey section Number	**Content**	**Target**
Survey Introduction & Scenario Context	A welcoming message explaining the study's purpose, then Participants are guided into an immersive, imaginary setting—working in an office on a hot summer day in Cairo with no air conditioning. This sets the stage for perceptual responses to follow.	Prepare participants mentally and emotionally. Ensure immersion in the testing context. Clarify objectives and sensory focus of the survey.
Demographics (which is repeated in each section to ease the analyzing process after wards)	Include age group and gender mainly	Collect background information to analyze possible influencing variables.
Section 1 and 2 and 3	Three identical office designs (same layout and materials) presented with 3 different mood boards (main difference in color palette) Participants rate: visual comfort, thermal perception, emotional response, material comfort, color palette appeal, overall space suitability + one open-ended question (same set of questions repeated in each section).	To assess design perception based on the each of the color palette by fixing other variables. (general design and materials distribution) in order to make the analysis and conclusion easier and more clear . .
Section 4	Images of the same office design shown at different times of day (mainly morning 9.0o am , mid-day as peak heat 2.00 and afternoon 6.00 pm) to assess impact of sunlight on their perception of space and if it differs from their previous selection. Participants rate visual and thermal perceptions in each lighting condition.	To examine how natural light affects comfort and perception of design in different palettes. And to either confirm or deny conclusion from the previous section with their preference.
Section 5	Same three color palettes applied to different types of office spaces: enclosed home office, hybrid office setups. Participants compare full designs or before-and-after visuals.	Test if color palette preferences remain consistent across spatial typologies. Determine if earlier preferences were influenced by fixed design context.
Comparative Section	Participants asked to select their preferred overall design and explain why.	To identify the most appealing design overall and extract reasoning behind choices.
Final remarks	Open-ended section for optional suggestions or thoughts.	Allow space for deeper insights or additional feedback not captured by structured questions.

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

2.2.2. SURVEY PARTICIPANTS (TARGET AUDIENCE)

Although the survey was originally designed to target individuals with hyperthyroidism and although the condition is most commonly associated with middle-aged women, the author intentionally expanded participation to include a broader range of ages and genders. This decision was supported by growing evidence that, while hyperthyroidism has traditionally been more prevalent in women aged 30 to 60, it is increasingly being recognized in other demographic groups as well.

Recent studies suggest that although women are still more frequently diagnosed, the gender gap begins to narrow with age. Older men, in particular, have been shown to experience similar symptoms and environmental sensitivities, especially those related to temperature and spatial comfort. Samuels (2021) found that up to 3% of people over the age of 60 display signs of hyperthyroidism or subclinical thyroid dysfunction. In many of these cases, symptoms don't follow the classic pattern and may instead appear as cardiovascular issues, such as irregular heart rhythms, rather than heat intolerance. All these findings, along with even more studies, support the idea of broadening participant inclusion.

3.DATA PRESENTATION AND ANALYSIS (COLOR PALETTE PREFERENCES & MOOD BOARD TESTING)

The survey began with an introduction explaining the study's purpose, followed by the following scenario:

"Imagine it's a summer day in Cairo, exactly on the 15th of August. You've just started a 6-hour shift in this private office. You'll be working on focused tasks that require a lot of concentration. Consider that there is no air conditioning at all. You have to select the best space, from your point of view that can help you perceive the space as cooler— even if it is actually not—without any technical intervention. The space is quiet and reserved just for you. Take a moment to absorb the materials, colors, and general feel of the room, and answer the following.".

Then each of the three images presented to the participants corresponded to a different mood board. These images were shown one at a time within each survey section (fig 2).

Fig (2) _ identical office design presented with three different mood boards (Author,2025).

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

Table (3) summarizes the eight standardized questions used in all three sections of the survey(Author,2025).

Question no.	Theme	Question text	Response type
1	Visual Comfort	How visually comfortable is this space for you?	5-point Likert scale (1 = Very Uncomfortable, 5 = Very Comfortable)
2	Calm–Stress Perception	How calming or stressful is this space for you?	5-point Likert scale (1 = Very Stressful, 5 = Very Calming)
3	Thermal comfort	How thermally comfortable do you expect this space would feel? / to what extent would you feel cool in this space even cooler than the actual temperature by just seeing the colors and materials ?	5-point Likert scale (1 = Very Hot/Stuffy, 5 = Very Cool/Fresh)
4	Focus and Concentration	How easy would it be for you to focus in this space?	5-point Likert scale (1 = Very Difficult, 5 = Very Easy)
5	personal aesthetic preference	How well does this space match your personal aesthetic preferences?	5-point Likert scale (1 = Not at All, 5 = Completely)
6	Recovery from Fatigue/Anxiety	Does this space support both work and emotional recovery from fatigue or anxiety?	5-point Likert scale (1 = Not at All, 5 = Fully)
7	Sensitivity to Heat and Light	How sensitive do you feel to the heat and the natural light in this room?	5-point Likert scale (1 = Not at All, 5 = Extremely Sensitive)
8	Suggestions for Improvement	Is there anything you would change in this space to make it feel more relaxing, thermally comfortable, or less stressful for you? or may be wider in space ?	Open-ended (Paragraph Response)

3.1.RESPONDENT DEMOGRAPHICS

No of respondents to this survey was in total 34 with 82.4% of the respondents females and 17.6% males with 3 females aged 50+ , 9 females aged (35-45),13 females aged (25-35) and 4 females aged (15-25). While as per males 1 male aged 50+ , 2 males aged (35-45),1 male aged (25-35) and 1 male aged (15-25) as shown in figure (2)

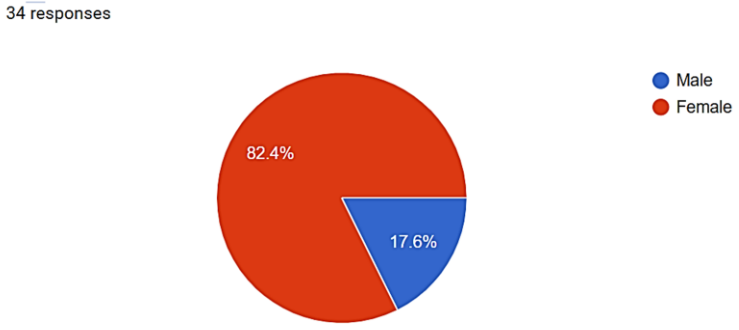


Fig (3) _ shot from survey showing no. of respondents and gender participation percentage.

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

3.2.DATA ANALYSIS METHOD

The analysis was conducted in two stages:

A.General Evaluation: The mean score for each question was calculated across all participants for each of the three office designs. This helped identify the most preferred space overall.

B.Demographic Comparison: In the second stage, preferences were analyzed in relation to participants' gender and age groups. The author compiled this data into a comparative schedule to identify any correlations or patterns.

3.3.ACTUAL DATA ANALYSIS

Regarding the general evaluation step (A), the results are summarized in the following table

Table (4)_ Comparing mean results from questions from the 3 mood boards Generally,(Author 2025)

Question no.(as per table 3 reference)	Office with Mood 1 (General mean)	Same Office with Mood 2(General mean)	Same Office with Mood 3 (General mean)	Observations by author
1	3.68	3.18	2.84	**Regarding Visual comfort :** Mood 1 rated highest—Mood 3 least comfortable visually.
2	3.54	3.36	2.84	**Calm/Stressful :** Mood 1 perceived as most calming.
3	3.60	3.30	2.84	**Thermal comfort :** Participants expect to feel cooler in Mood 1.
4	3.84	3.48	3.12	**Focus :** Mood 1 strongly supports concentration.
5	3.48	3	2.63	**Aesthetic Match:** Mood 1 aligns best with personal taste.
6	3.48	3.15	2.84	**Work + Emotional Recovery:** Mood 1 is the best
7	3.06	3.06	3.09	Heat/Light Sensitivity: Almost average for all with the third mood to be the worst and first 2 moods to be the better option

▪Author analysis and conclusion: By comparing the results it is clear that Mood 1 was by far the best performing in all parameters followed by the second Mood. And by analyzing the responses written by respondents for the open question 8 (as referred in table 3, p.10), some of the participants highlighted their preference of using a lighter blue color and less contrast in the space generally (Author , 2025).

As per step (B), The author started clustering responses as per age and gender and calculating means and gathering the info in a table which is shown as follow:

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

Table (5)_ Comparing mean results from questions from the 3 mood boards as per age and gender, (Author 2025)

Detailed Question feedback as per gender and age group	Office with Mood 1 (General mean)	Same Office with Mood 2(General mean)	Same Office with Mood 3 (General mean)	Observations by author
3Females (50+)	3.6	2.80	3.04	Preference for Mood 1
9 females aged (35-45)	3.66	3.32	2.57	Strong drop in satisfaction for Mood 3 , for the best selection to be for mood 1 as well followed by mood 2
14 females aged (25-35)	3.69	3.08	2.83	Same with this age group
3 female aged from (15-25)	2.9	2.80	2.66	Same with this age group
1 male aged (50+)	3	3	4	Mood 3 unexpectedly favored by older male.
2 males aged (35-45)	3.33	2.21	2.57	Mood 2 is significantly disliked with the best option to be for Mood 1 as well .
1 male aged (25-35)	3.42	3.85	2.14	Highly prefers Mood 2 followed by mood 1
1 male aged (15-25)	2.42	3.57	5	Mood 3 gets perfect score—but this is a single data point and may be anomalous.

▪Author analysis and conclusion:

Generally females of all age groups preferred Mood 1 as well despite the comment issued by some about preferring a lighter blue tone and a palette in more harmony. As per males the results are more inconsistent with extreme preference .A general observation is that younger participants (15–25) tend to score all moods lower (except one male who gave Mood 3 a 5), possibly indicating less engagement or different expectations.

To assess whether participants' design preferences remained consistent throughout the day under different natural lighting conditions, this section presented the same mood boards at three distinct times: 9:00 AM (morning light), 2:00 PM (peak sunlight and heat), and 6:00 PM (afternoon light) as Natural light influences how wall colors and materials are visually perceived throughout the day, often altering their appearance in terms of brightness, warmth, and tone completely. This change can affect not only aesthetic perception but also how individuals feel thermally within the space which is a core issue for people suffering from hyperthyroidism**,** even when the actual temperature remains constant (Chinazzo et al., 2021) and as a result influencing the overall experience and this moves us to the importance of the following section .

4.DATA PRESENTATION AND ANALYSIS (LIGHTING & TIME-OF-DAY IMPACT ON PERCEPTION)

The section started with an explanation to participants as follow:

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

"Imagine your self-working all day from 9.00 in the morning to 6.pm where light affect the space in different hours of the day ."Based on the image attached, which office would you finally select to feel most relaxed and least fatigued throughout the different hours of a hot summer day?"- Select your preferred mode".

Followed by asking participants to choose their preferred mode accordingly.

Fig (4) _ same office in 3 different hours of the day (Author, 2025)

The results confirmed the first conclusion with a preference yet to Mood board 1 with a total percentage of 54.5% as shown in figure (5)

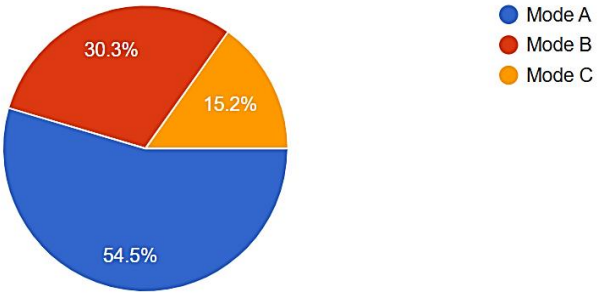


Fig (5) _ Screen shot from the survey showing mood preference in different hours of the day (Author, 2025)

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

It's worth mentioning that this section included an additional question where two images were displayed using the same mood boards—one with paler colors compared to the original approved mood board (specifically Mood Board 2), and the other aligned with Mood Board 3 but with the majority of the wall color shifted to a green tone instead of blue. This was done as part of testing alternatives to the original schemes (fig.6). Once again, the results highlighted participants' preference for paler tones with a percentage of 72.7%, while the switch from blue to green made

Fig (6) _ showing the merged figure showing different tones from the same mood boards (Author, 2025)

little difference in their perception as shown in figure (7).

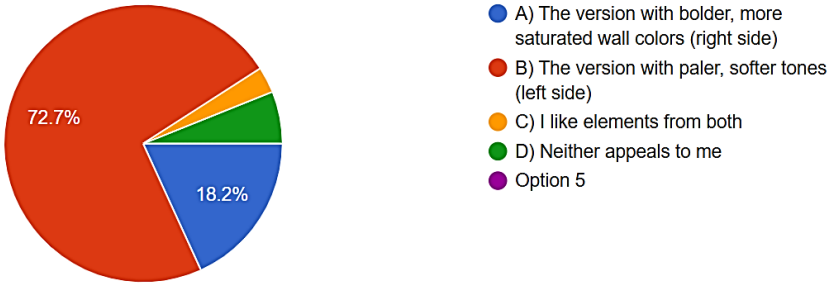


Fig (7) _ Screen shot from survey results showing respondents preference (Author, 2025)

To conclude this section, the author asked one final question stated as "All in all , please mention your absolute favorite that can make you feel cool less stressed and at the same time focused and why? . The goal was to include all three mood board office designs along with the last two alternatives to gather a definitive overall preference. Since this was an open-ended paragraph question, the responses were manually reviewed and analyzed and the response proved the conclusion reached till now.

Given the surprising results—where respondents' preferences seemed to contradict the findings of the author's 2024 study, which emphasized that blue tones were consistently favored—the author was pushed to reflect more deeply. In this study, the blue-toned mood board was again

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

rated highest overall, yet several participants commented that they found the specific shade of blue too dark. This was unexpected, especially considering that, based on RGB analysis previously done by the author, the particular tone in the mood board was chosen for its cooler visual effect.

Despite its theoretically calming and thermally cool appearance, participants still suggested lighter shades of blue. The fact the pushed the author for more and deeper investigation. And by this finding answers to some questions that came to the author mind (from the very beginning) .Some of the prominent questions:
-Was the feedback due to the specific design context in which the color was applied?.
-Did the spatial size of the room influence how the color was perceived?.
-Was the contrast between the wall color and other elements (like flooring or furniture) really too strong for a hyperthyroid patient or does the same distribution on a wider area do not have the same effect?.
-Could individual cognitive associations or emotional experiences with darker shades have overridden the intended thermal perception?.
These reflections pushed the author to explore further where all those scenarios and assumptions were kept in consideration when first the survey was designed from the very beginning. In response, the same color palettes were tested in different office settings (enclosed home offices, hybrid offices, multipurpose room) including office space varying in layout, size, orientation, and usage scenario to check if there are changes in preferences, the fact that moves us to next section in the survey .

5.DATA PRESENTATION AND ANALYSIS (PERCEPTUAL TESTING ACROSS VARYING OFFICE LAYOUTS AND CONTEXTS).

As all sections, this section as well includes an intro as follow: “Now it’s time to imagine yourself in other format of offices with different orientations using the same mood boards. Would it change you’re feeling about the space? .Let us see. Imagine starting your workday in a dedicated home office space. This particular area is designed to help you stay focused, calm, and refreshed. Looking at the two design options”. Then a group of images are displayed first a before and after. An original image and another after applying the design guide lines, before showing the rest of the room treatments.

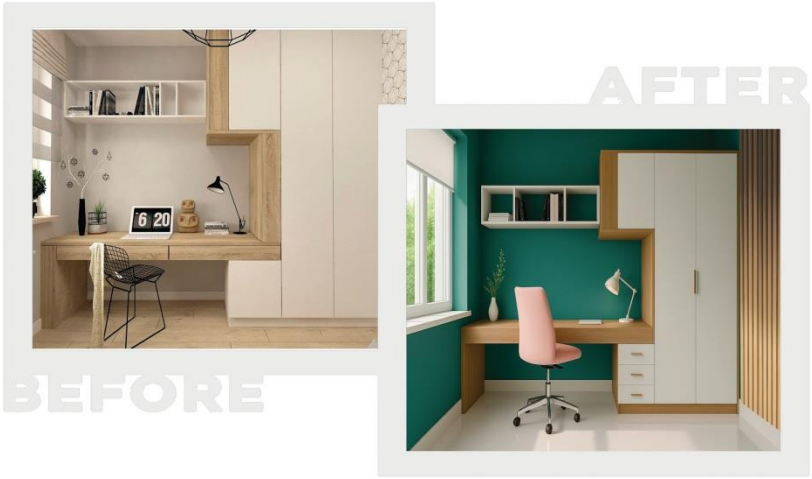


Fig (8) _ showing a hybrid office space before and after- (Author, 2025)

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

After displaying both images, participants were asked about their preference to work for long facing the wall where to the surprise 73.5% of the people preferred the before image as opposed to prior studies done by the author as well as shown in fig(9) .

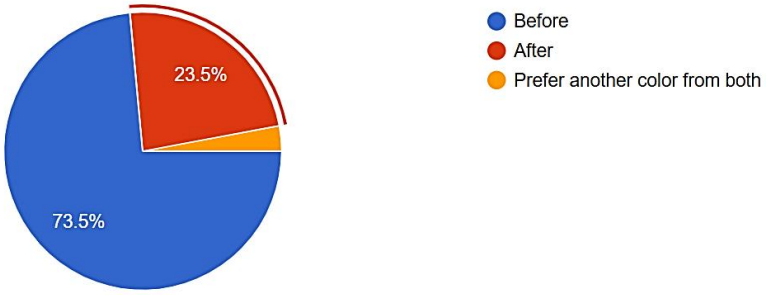


Fig (9) _ showing a screen shot from the survey showing people preference for the before and after (Author, 2025).

Trying to make sure that the evaluation is accurate and there won't be any change by showing shots from the rest of the space. The rest of the space was shown including a plan as shown in fig(10) then participants were asked again :

"Imagine yourself tired from office work and taking a break on the sofa near the window. How well do the other parts of the room (seating area, décor wall, and natural lighting) contribute to a sense of calm and emotional balance?"

Fig(10) A package including 2 shots and plan showing furniture orientation to the same space (Author,2025)

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

The results got a little better most of the participants rated it as average with a score of 3 on a scale out of 5 as shown in the fig.(11) and the orientation of furniture Being liked with a percentage of 42.4% scoring 4 from a scale one to 5 as shown in fig(12).

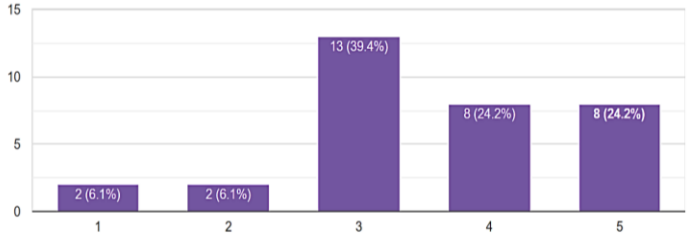


Fig.(11)_showing participants response after showing fig(10)

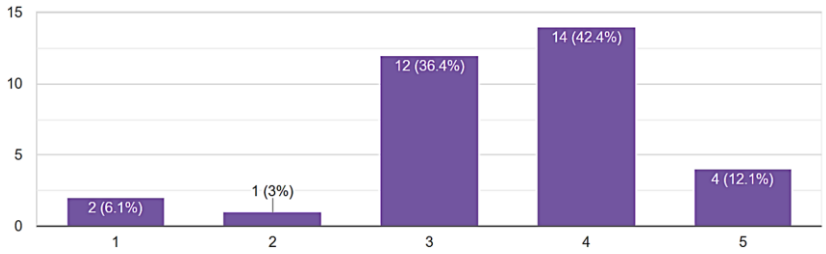
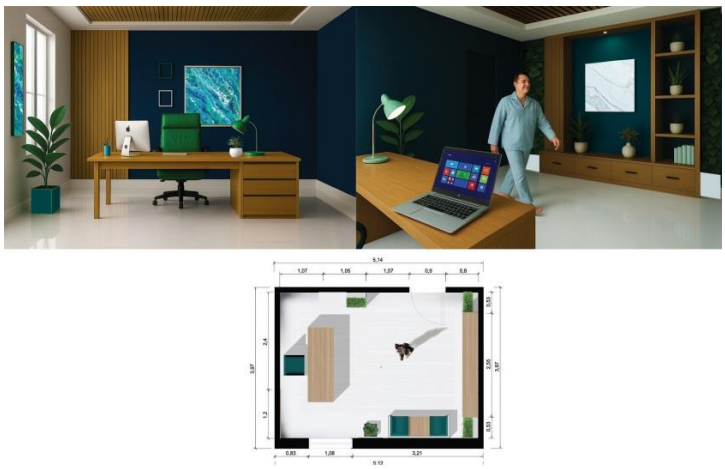


Fig.(12)_showing participants response after on showing general orientation of space

After that , another enclosed home office was shown using Mood board (3) color palette and stating the following scenario :

"The attached is an enclosed home office as well like the previous one but with the other Mood. Imagine your self-working in this office all day as well but from home where you are sitting with blue paints around and a simple minimal library and green plants facing you and natural light coming in from your left side .Rate to which extent does it feel cool , relaxing and at the same time feel focused to work in for hours "

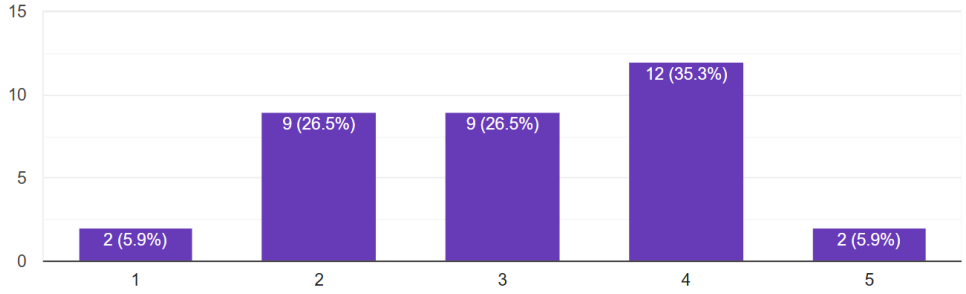
Then shots of the room as well as the plan was attached to have an immersive experience.



Fig(13)_shots and plan showing enclosed office 2 aligned with mood board 3,(Author , 2025)

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

Then participants were asked to Rate to which extent does it feel cool , relaxing and at the same time feel focused to work in for hours with a scale from 1 to 5 .
The results were very near with majority scoring 4 from a scale of 1 to 5, yet people not liking it and scoring 2 is more than the previous option as shown in figure (14)



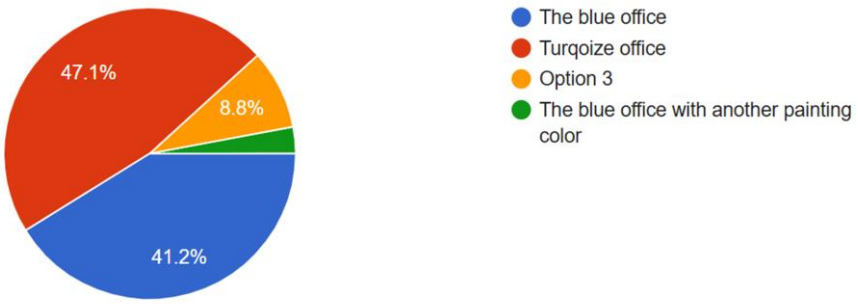
Fig(14)-showing participants' scoring (Author ,2025)

And when asked "Would you like anything in this space to be changed to help you out with your routine ?" , most of the comments mentioned that they consider the walls as dark and want lighter colors .

A final question was asked to make sure about the results stating:

If you had the chance to choose between the previously shown office designs — the blue-toned one and the turquoise-toned one — which would you prefer, based on how the colors and furniture arrangement affect your ability to feel cool, less stressed, and mentally focused?

The results showed almost balanced results with both blue and turquoise office scoring near results, yet the turquoise office in general scored a little bit higher with a percentage of 47% as shown in fig.(15) and when people were asked to explain their preference in an open ended question ,The majority commented that darker colors make them feel more stressed and that turquoise tone is more of a nature tone .



Fig(15) – A screen shot from the survey summarizing people preference of the last 2 offices.

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

Last question in this section was for a multipurpose room that had mostly the dark blue color in walls .As each section , it started with a scenario explanation for an immersive experiment stating the following :

You've just stepped into the blue-toned multifunctional room shown above — a space where you'll spend your day working, taking breaks, and eventually winding down to rest either by sleeping or having a good read or a yoga exercise in the void area infront of the window . On a scale of 1 to 5, how cool and physically comfortable do you imagine you'd feel spending long hours in this space?. Rate this On a scale of 1 to 5, how cool and physically comfortable do you imagine you'd feel spending long hours in this space?. (Consider the colors, layout, furniture, and natural lighting.).

Several shots and the plan were displayed as follow :

Fig(16) – A package of shots and plan aligned with mood board (3)-(Author,2025)

By analyzing the results, it is shown that most of responses scored 4 from a scale from 1 to 5 , with a good portion scoring 5 as well which is a very good result as shown in fig(17)

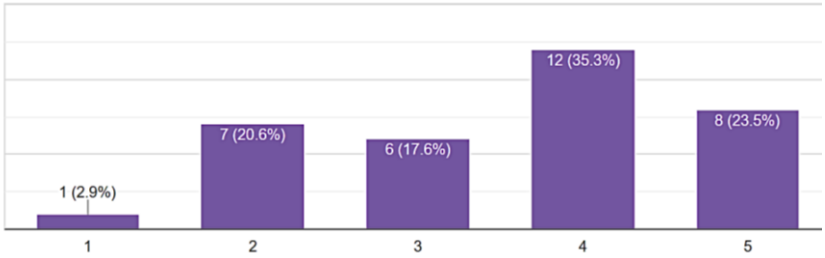
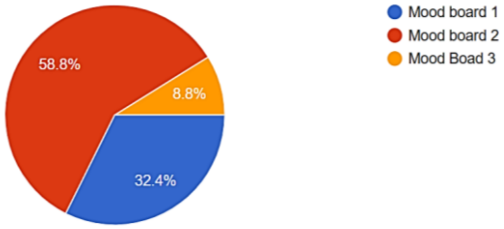


Figure (17)_ showing participants' scoring (Author ,2025)

Then the section was finalized with 2 questions.
First: Which of the previous offices Did you like the most and why?.
By scanning all the comments. Most of the comments went to the last multipurpose blue and white room .some stressing the colors and other stating its large and comfy.

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

After finalizing all the survey, it was enclosed by showing the actual mood boards from which the paints and materials were extracted .stating: Each of the previous offices was designed based on one of the three mood boards. Now, imagine you're in any kind of interior space—not just an office—where you want to feel cooler and more at ease just by looking around.
Which of the three mood boards would you choose to help create that calming, visually refreshing atmosphere?
To another surprise most of the responses stated the second mood board (Turquoise one) with a percentage of 58.8% and that despite the blue option scoring higher within the first 3 offices and the last one .



Fig(18) – A screen shot from the survey summarizing people preference of mood boards (Author,2025)

6. RESULTS DISCUSSION

This study revealed surprising insights. As expected, cooler color palettes like turquoise and pale blue were associated with thermal comfort and emotional calmness, especially in scenarios involving heat sensitivity. However, the assumption that blue tones universally promote relaxation was challenged. While blue initially scored highest across several criteria, participants later reported that its darker shades made the spaces feel heavy, even stressful—particularly in more enclosed settings. This aligns with growing evidence that perceived coolness is influenced not only by hue, but also by brightness and contrast (Zhang et al., 2020). In some contexts, strong contrast—despite using cool-toned paints—was not favored, indicating that it may increase psychological stress.

Interestingly, participants' emotional responses fluctuated based on spatial function, lighting conditions, and layout, suggesting that color preferences are not fixed but context-dependent. For example, darker blues were better received in large, open rooms with natural light, but evoked discomfort in compact offices. This contradicts prior assumptions that blue tones are always optimal for perceived cooling. In addition, the findings clearly reflect how pre-existing ideas and personal associations with color influence individual preferences and decisions—sometimes overriding scientifically expected outcomes.

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

7. CONCLUSION

This study built upon earlier design research by directly involving individuals with hyperthyroidism in a scenario-based visual preference survey. Their feedback offered deeper insight into how specific colors, spatial layouts, and environmental cues influence both emotional well-being and perceived thermal comfort. It was concluded that (Author, 2025):

- Participants consistently favored light, muted tones especially turquoise—which they associated with calmness and relief in hot, uncomfortable environments. These color preferences, when combined with open layouts and minimal visual clutter, proved to be particularly supportive in managing daily thermal discomfort.

-While blue was initially assumed to be the most effective color for perceived coolness, the results revealed a more complex picture. Darker shades of blue, although theoretically "cool," were not universally appreciated—particularly in small or enclosed spaces. However, these same tones were better received in larger, naturally lit settings, underscoring the importance of spatial context in shaping user experience.

-Hyperthyroid patients preferred multifunctional spaces that combine a work area with a rest zone.

All in all, findings emphasize that designers should look beyond general color theory. People's emotional responses to space are shaped by their lived experiences, cultural background, and the physical characteristics of the environment (which is more of a personal experience). These factors collectively influence how interior spaces are perceived and experienced—especially in terms of comfort, stress, and thermal relief.

8. FINAL DESIGN GUIDELINES (Post-Experiment)

These final guidelines differ slightly from the 2024 version. While the material and spatial suggestions remain mostly aligned, the color preferences have shifted significantly based on user feedback making the attached table the final guideline post experiment, which are summarized as follow:

Table (6)_ Approved design guidelines as per experiment (Author , 2025)

Element	Updated Guideline
Color Palette	Prioritize soft, desaturated tones—especially light turquoise, muted creams, and off-whites. Use darker blues sparingly, and only in large, naturally lit spaces where they won't feel heavy or enclosed.
Material Use	Maintain use of reflective materials such as white epoxy and medium-tone woods. Ensure visual harmony by avoiding high contrast that may increase stress.
Lighting	Allow for dynamic lighting across the day. Natural light should be complemented by adjustable warm and cool LEDs.
Furniture Layout	Favor minimal, slim-line furniture in zoned spaces (work/rest/meditation). Avoid bulky or visually heavy items.
Spatial Planning	Encourage open, flexible layouts. Multi-functional spaces should support psychological restoration and thermal balance, especially in home or hybrid office settings.
Greenery	Add natural plants to reinforce biophilia and psychological calmness.

9.LIMITATIONS

This research had a limited sample size (34 responses) and focused on one cultural context (Cairo), which may not reflect broader responses.

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

10. RECOMMENDATIONS AND FUTURE DIRECTIONS

Based on both participant feedback and observed patterns, several key recommendations and directions for future work emerge and this as follow (Author, 2025):

-Incorporate Scenario-Based Visual Preference Surveys (SBVPS) early in the design process particularly when working with clients affected by sensory related conditions. Unlike traditional questionnaires, this immersive approach captures hidden emotional reactions that would otherwise be overlooked.

Interior design Researches should shift their focus toward often-overlooked groups, which truly reflects the profession's social responsibility as there are some diseases that are overly researched and investigated and others that are not looked at (like the hidden majority mentioned in this study).

-To improve the generalizability of results, future studies should aim to involve larger and more demographically diverse samples. Since this study focused on participants in Cairo, cultural context likely shaped how colors and layouts were perceived and despite it helping into achieving some surprising results, it could differ a bit for other nationalities and cultures. Testing across other climates and cultures would help refine the guidelines further and dig deeper in the matter and find the link.

-Using Technologies like heart rate monitors, skin temperature sensors, or wearable EEG along with the survey for deep testing on the actual impact of those spaces on bodies and not only based on how users perceive for deeper and more accurate results .

-developing an AI-powered design assistant, capable of interpreting real-time emotional and physiological feedback during client design reviews to gather instant feedback . This tool could generate layout or color suggestions on the spot, adapting in response to each user's reactions helping personalize design at an unprecedented level.

11.REFERENCES

1.Al Khatib, I., Samara, F., & Ndiaye, M. (2024). A systematic review of the impact of therapeutical biophilic design on health and wellbeing of patients and care providers in healthcare services settings. *Frontiers in Built Environment, 10*. https://doi.org/10.3389/fbuil.2024.1467692
2.Al Sayyed, H., & Al-Azhari, W. (2025). Investigating the role of biophilic design to enhance comfort in residential spaces: Human physiological response in immersive virtual environment. *Frontiers in Virtual Reality, 6*. https://doi.org/10.3389/frvir.2025.1411425frontiersin.org
3.Alghamdi, F., & Krarti, M. (2025). Review Analysis for the Energy Performance of Integrated Air-Conditioning Systems. *Energies, 18*(7), 1611. https://doi.org/10.3390/en18071611
4.Baños, R. M., Botella, C., Alcañiz, M., Liaño, V., Guerrero, B., & Rey, B. (2004). Immersion and emotion: Their impact on the sense of presence. *CyberPsychology & Behavior, 7*(6), 734–741. https://doi.org/10.1089/cpb.2004.7.734

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

5. Bampouni, E., Ahmad, A., Xi, N., & Zampeta Legaki, N. (2024). Effects of immersion and embodiment on memory in virtual reality. In *Proceedings of the 27th International Academic Mindtrek Conference* (pp. 205–212). https://doi.org/10.1145/3681716.3681724

6.Chetan, V., Nagaraj, K., Kulkarni, P. S., Modi, S. K., & Kempaiah, U. N. (2020). Review of passive cooling methods for buildings. *Journal of Physics: Conference Series, 1473*(1), 012054. https://doi.org/10.1088/1742-6596/1473/1/012054

7. Chinazzo, G., Chamilothori, K., Wienold, J., & Andersen, M. (2021). Temperature–color interaction: Subjective indoor environmental perception and physiological responses in virtual reality. *Human Factors, 63*(1), 135–150. https://doi.org/10.1177/0018720819892383

8.Drey, T., Rietzler, M., & Rukzio, E. (2021). Questionnaires and qualitative feedback methods to measure user experience in mixed reality. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (pp. 1–14). https://doi.org/10.48550/arXiv.2104.06221

9.Elsayed, M., Pelsmakers, S., Pistore, L., Castaño-Rosa, R., & Romagnoni, P. (2023). Post-occupancy evaluation in residential buildings: A systematic literature review of current practices in the EU. *Building and Environment, 236*, 110307. https://doi.org/10.1016/j.buildenv.2023.110307

10. Elsherbiny, T. M. (2023). Characterization, treatment preferences, and outcomes of 390 Egyptian Graves' disease patients: A retrospective study. *The Egyptian Journal of Internal Medicine, 35*(57). https://doi.org/10.1186/s43162-023-00244-x

11. Fayed, A., Soliman, A., Naguib, M., & Ali, H. M. (2020). Thyroid dysfunction in Egyptian patients with hepatitis C virus: Prevalence and possible triggering. *The Egyptian Journal of Internal Medicine, 31*(4), 678–682. https://doi.org/10.4103/ejim.ejim_64_19

12. Green, M. C., & Brock, T. C. (2000). The role of transportation in the persuasiveness of public narratives. *Journal of Personality and Social Psychology, 79*(5), 701–721. https://doi.org/10.1037/0022-3514.79.5.701

13. Heydarian, A., Carneiro, J. P., Gerber, D., Becerik-Gerber, B., Hayes, T., & Wood, W. (2015). Immersive virtual environments versus physical built environments: A benchmarking study for building design and user-built environment explorations. *Automation in Construction, 54*, 116–126.

14. Hsu, C. C., Conrad, M., & Jacobs, A. M. (2014). Fiction feelings in Harry Potter: Haemodynamic response in the mid-cingulate cortex correlates with immersive reading experience. *NeuroReport, 25*(17), 1356–1361. https://doi.org/10.1097/WNR.0000000000000272

15. Ikei, H., Song, C., & Miyazaki, Y. (2017). Physiological effects of touching coated wood. *International Journal of Environmental Research and Public Health, 14*(7), 773. https://doi.org/10.3390/ijerph14070773

16. International Energy Agency. (2023). *Energy system: Buildings*. https://www.iea.org/energy-system/buildings

17. Kourtesis, P., Papadopoulou, A., & Roussos, P. (2023). Examination of cybersickness in virtual reality: The role of individual differences, effects on cognitive functions and motor skills, and intensity differences during and after immersion. *arXiv Preprint*, arXiv:2310.17344. https://arxiv.org/abs/2310.17344

18.Lee, S. Y., & Pearce, E. N. (2023). Hyperthyroidism: A review. *JAMA, 330*(15), 1472–1483. https://doi.org/10.1001/jama.2023.19052

19. Li, X., & Zhang, Y. (2023). Impact of dual coding strategy to enhance students' retention of scientific concepts in middle schools. *Annals of Human and Social Sciences, 4*(4), 660–670. https://doi.org/10.11648/j.ahss.20230404.16

ISSN : 2805-2838 (Print) ; 2805-2846 (Online)
Art and Architecture Journal
Available online at : https://aaj.journals.ekb.eg/

20. Mostafavi, A., Xu, T. B., & Kalantari, S. (2023). Assessing the effects of illuminance and correlated color temperature on emotional responses and lighting preferences using virtual reality. *arXiv*. https://doi.org/10.48550/arXiv.2307.10969
21. Najar, K., Nylander, O., & Woxnerud, W. (2024). Public's visual preferences survey facilitates community-based design and color standards creation. *Buildings, 14*(9), 2929. https://doi.org/10.3390/buildings14092929
22. Ng, C. (2016). Behavioral mapping and tracking. In S. Roaf (Ed.), *The handbook of sustainable building design and engineering: An integrated approach to energy, health and operational performance* (2nd ed., Chapter 3). Wiley-Blackwell. https://doi.org/10.1002/9781119162124.ch3
23. Onwuegbuzie, A. J., Dickinson, W. B., Leech, N. L., & Zoran, A. G. (2009). Toward more rigor in focus group research: A new framework for collecting and analyzing focus group data. *International Journal of Qualitative Methods, 8*(3), 1–21. https://doi.org/10.1177/160940690900800301
24. Paivio, A. (1986). *Mental representations: A dual coding approach*. Oxford University Press.
25. Peavey, E. K., Zoss, J., & Watkins, N. (2012). Simulation and mock-up research methods to enhance design decision making. *Health Environments Research & Design Journal, 5*(3), 133–144. https://doi.org/10.1177/193758671200500313
26. Rashad, N. M., & Samir, G. M. (2020). Prevalence, risks, and comorbidity of thyroid dysfunction: A cross-sectional epidemiological study. *The Egyptian Journal of Internal Medicine, 31*(4), 635–641. https://doi.org/10.4103/ejim.ejim_22_19
27. Rui, L., & Firzan, M. (2025). Emotional design of interior spaces: Exploring challenges and opportunities. *Buildings, 15*(2), 153. https://doi.org/10.3390/buildings15020153
28. Samuels, M. H. (2021). Thyroid disease in older adults: Subclinical hyperthyroidism and overt disease. *Journal of Geriatric Endocrinology, 15*(1), 20–28. https://doi.org/10.1016/j.jgerend.2020.10.003
29. Sweller, J., Ayres, P., & Kalyuga, S. (2011). *Cognitive load theory*. Springer Science & Business Media. https://doi.org/10.1007/978-1-4419-8126-4
30. Weech, S., Kenny, S., & Barnett-Cowan, M. (2019). Presence and cybersickness in virtual reality are negatively related: A review. *Frontiers in Psychology, 10*, 158. https://doi.org/10.3389/fpsyg.2019.00158
31. Yamamah, G. A. E. N., Kamel, A. F., Abd-El Dayem, S., Hussein, A. S., & Salama, H. (2013). Thyroid volumes and iodine status in Egyptian South Sinai schoolchildren. *Archives of Medical Science, 9*(3), 548–554. https://doi.org/10.5114/aoms.2012.30952
32. Yin, J., Yuan, J., Arfaei, N., Catalano, P. J., Allen, J. G., & Spengler, J. D. (2020). Effects of biophilic indoor environment on stress and anxiety recovery: A between-subjects experiment in virtual reality. *Environment International, 136*, 105427. https://doi.org/10.1016/j.envint.2019.105427
33. Zhang, H., Arens, E., & Huizenga, C. (2020). Thermal sensation and comfort models for non-uniform and transient environments: Literature review and model development. *Building and Environment, 45*(2), 193–210. https://doi.org/10.1016/j.buildenv.2009.06.020
34. Zheng, M. C., & Chen, Y. S. (2019). Behavioral mapping and post occupancy evaluation of meeting-point design in an international airport. *International Journal of Psychological and Behavioral Sciences, 13*(3), 259–268. https://doi.org/10.5281/zenodo.2643510
▪**Survey link used in the study :** https://forms.gle/jBPHZauFA9dqzQuL6