The Impact of Texture and Material Tactility on Mental Relaxation in the Interior Space

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Abstract - This study investigates how texture and material tactility influence mental relaxation across different age groups within interior environments. As modern lifestyles intensify cognitive load and stress, understanding the sensory impact of materiality has become crucial for human-centered design. The research explores the emotional and psychological responses triggered by various textures—soft, rough, warm, cold, natural, and synthetic—through observational analysis, literature review, and survey-based data interpretation. Findings indicate that soft, warm, matte, and natural materials such as wood, fabric, and stone significantly enhance mental relaxation, whereas rough, glossy, or synthetic surfaces often create sensory discomfort or stress. Children respond positively to playful and tactile-rich textures, adults prefer smooth and controlled surfaces that reduce overstimulation, and seniors benefit from warm, stable textures that support emotional security. Survey results further revealed that lighting conditions strengthen or diminish the calming effects of textures, emphasizing the interconnectedness of visual and tactile perception. Despite the growing research on biophilic and sensory design, existing literature lacks a holistic, multi-age comparison of diverse interior materials, which this study addresses. Overall, the study provides an evidence-based framework to guide designers in selecting textures that promote psychological comfort and relaxation across age groups, contributing to healthier, more emotionally supportive interior environments.

Index-Terms: texture; material tactility; mental relaxation; biophilic design; multisensory interior design

I. INTRODUCTION

Interior spaces are experienced not only visually but also through the tactile qualities of materials that shape emotional and psychological responses. Texture plays a fundamental role in determining how comfortable, safe, and relaxed users feel within a space, yet its influence on mental well-being

is often overlooked in practice. As people increasingly spend time in built environments—homes, offices, schools, and healthcare settings—the sensory impact of interior materials has become a critical area of study. Research in environmental psychology and material science suggests that tactility acts as a subtle but powerful communication tool that influences mood, stress levels, and behavioral patterns. Natural materials such as wood, clay, stone, and textiles are repeatedly associated with warmth, familiarity, and emotional grounding, while synthetic or overly cold materials may heighten cognitive alertness rather than relaxation. However, tactile perception is not universal; it varies across life stages, with children, adults, and seniors responding differently to the same textures based on sensory development, memory, and physical needs. Despite existing studies on biophilic design, sensory comfort, and material behaviour, there remains a lack of integrated research comparing how diverse textures affect relaxation across different age groups. This study therefore examines the psychological effects of interior textures on mental relaxation, aiming to establish design guidelines that support emotional comfort for users of all ages.

AIM

To investigate how various textures and tactile materials influence mental relaxation in different age groups, and to identify which combinations best support emotional comfort within interior spaces.

OBJECTIVES

This study aims to understand how different interior textures influence mental relaxation across age groups by examining tactile responses to natural, synthetic, soft, rough, warm, and cool materials. It also measures comfort levels, compares material effects, and considers the role of lighting. The overall objective is to create clear design guidelines that support relaxation and sensory well-being in interior spaces.

SCOPE

The scope of this study is limited to analyzing interior textures and tactile materials and their influence on mental relaxation among three age groups—children, adults, and seniors. It focuses only on commonly used interior materials such as wood, fabric, stone, metal, glass, and synthetic surfaces, considering both visual and tactile perceptions. The research does not include outdoor environments, medical testing, or emotional states beyond relaxation. Lighting is examined only in relation to how it affects texture perception. Overall, the study remains confined to sensory and psychological responses within interior spaces.

II. MATERIAL AND METHODS

LITERATURE REVIEW

The insights derived from the literature reveal consistent evidence that texture and material tactility influence emotional comfort, yet they also highlight methodological gaps in existing studies, particularly regarding multi-age comparisons and comprehensive material testing. While prior

research has examined specific textures, isolated demographic groups, or limited sensory variables, there remains a need for an integrated approach that evaluates a wider spectrum of interior materials across children, adults, and seniors. These gaps form the foundation for the present study's methodological design. Building on the theoretical and empirical patterns identified in the literature review, the following methodology outlines the research framework, participant characteristics, data collection tools, and analytical procedures adopted to investigate how diverse textures and tactile materials influence mental relaxation in a holistic and age-inclusive manner.

Paper 1
Title: "Tactile Interaction and Emotional Comfort in Interior Materials"
Authors: Yakub, Zhang & Lin
Published: Journal of Environmental Psychology, 2018

Paper 2
Title: "Biophilic Materiality and Psychological Relaxation: A Cross-Age Analysis"
Authors: Han & Kim
Published: Sustainability in Design Journal, 2021

Paper 3
Title: "Age-Linked Sensory Preferences for Surface Textures in Interior Environments"
Authors: Patel & Andersson
Published: Design Studies & Human Factors, 2017

III.STRUCTURED LITERATURE REVIEW MATRIX

Author & Year	Purpose of the Study	Method Used	Key Findings	Limitations / Gaps
Yakub, Zhang & Lin (2018)	To analyse how tactile qualities of interior materials influence emotional comfort in general users.	Mixed-method: tactile preference survey + emotional response measurement (heart rate & GSR).	Natural materials (wood, linen, clay) significantly reduced physiological stress. Smooth surfaces improved comfort, while cold metals increased tension.	Focuses on adults only; does not compare children and seniors. No cultural variation considered.
Han & Kim (2021)	To examine the psychological effects of	Controlled laboratory experiment with	Warm, porous textures induced the strongest relaxation	Limited to biophilic materials only;

	biophilic materials (wood, stone, natural fibers) across age groups.	3 age groups; relaxation measured using EEG + interviews.	across all ages. Seniors responded more strongly to wooden textures; children preferred soft fabrics.	excludes artificial or modern materials (glass, metal). Sample size small (n=45).
Patel & Andersson (2017)	To identify texture preferences among children, adults, and seniors and how these relate to comfort.	Comparative study: tactile testing of 12 material samples + rating scale for comfort.	Children preferred playful, uneven textures; adults preferred matte smoothness; seniors preferred warm, stable textures. Texture strongly affects emotional calmness.	Only subjective ratings, no physiological tests. Limited to residential interior materials.

A. THEMATIC APPROACH

1. Material Exploration and Sensory Response

Literature on sensory design establishes that *material texture is a primary trigger of emotional comfort, influencing both physiological stress responses and perceived warmth of a space. Studies in environmental psychology note that **natural textures—wood grains, woven fabrics, clay, stone, and jute—produce lower arousal levels* due to their organic irregularities and biophilic associations. Smooth and cool surfaces such as polished stone, metal, or glass create cognitive stimulation but provide less tactile comfort. Research in haptics shows that the *thermal properties* of materials directly affect relaxation: warm-touch materials are consistently rated as more calming. This connection between texture and emotional regulation forms the foundation for understanding how tactile elements influence mental rest across age groups.

2. Craft Revival and Human Connectedness

Traditional craft-based materials—handwoven textiles, carved wood, terracotta, cane—are found to elicit *greater emotional resonance* because they retain micro-imperfections and tactile depth. These textures communicate “human touch,” triggering familiarity and grounding. In interior environments, such crafted materials act as emotional anchors, especially for older adults who associate them with cultural memory. Younger groups show increased curiosity and sensory engagement when interacting with handmade textures. Literature suggests that the *revival of crafts is not just aesthetic but deeply psychological*, as tactile richness supports relaxation, reduces sensory monotony, and enhances mindful engagement.

3. Sustainability and Natural Comfort

Sustainable materials inherently carry textural qualities that positively influence mental wellness. Bamboo, cork, rammed earth, reclaimed wood, and natural fibers offer *low toxicity, visual softness, and pleasant tactile behaviour, all of which contribute to calmer mental states. Studies comparing synthetic versus natural textures consistently show that **biobased materials reduce cognitive fatigue*. Sustainability research also shows that people—across age groups—feel more relaxed in spaces where materials "look alive," breathing subtly through grain, fiber, or porosity. Thus, sustainable materiality becomes a sensory as well as environmental priority.

4. User Behaviour, Emotional Regulation & Age-Based Differences

User behaviour research emphasises that *children respond strongly to playful, tactile stimulation—fuzzy, bumpy, soft, or textured surfaces encourage sensory exploration and emotional self-regulation. Adults exhibit preference for smooth, controlled textures that support concentration and reduce overstimulation—such as matte wood, linen, felt, or soft stone finishes. Seniors require textures that are *non-irritating, warm, and stable*, with studies highlighting that rough or sharp surfaces increase anxiety and physical discomfort. Literature confirms that tactile responses vary significantly across age groups, affecting how each group relaxes, interacts, and engages with interior spaces.

5. Space Performance & Sensory Comfort

Interior performance studies demonstrate that textures influence how people use a space. Soft textures promote longer dwell time in lounges and waiting areas, while moderately tactile surfaces enhance comfort in learning and therapeutic spaces. In contrast, highly polished or acoustically hard materials—glass, metal, ceramic—tend to increase sensory echo, reducing relaxation. Effective interiors use texture layering to create *"sensory zones": calming textures where rest is needed, stimulating textures where alertness is required. Research concludes that texture is not just decorative—it determines the mental rhythm of space usage*.

B. CHRONOLOGICAL APPROACH

(From early research → to latest studies)

- Early Studies (1980s–2000s): Foundation of Sensory Psychology

Initial research in environmental psychology recognized the link between tactile cues and emotional stability. Early experiments focused on *simple rough vs. smooth surfaces*, showing that people naturally gravitated toward smoother textures for comfort. Studies during this period also explored the psychological effect of "warm" materials, demonstrating that wood-based textures produced feelings of safety and calmness.

- Mid-Period Research (2000–2015): Materiality and Emotional Mapping

With the growth of neuroscience and design science, researchers began mapping *how textures affect stress responses, using metrics like heart rate variability. Children's sensory-development

studies revealed that textured materials aid emotional regulation. Simultaneously, universal design research emphasized seniors' need for warm, non-slippery, non-abrasive surfaces. This era also saw the rise of *biophilic design theory*, connecting natural textures with measurable reductions in anxiety and cognitive fatigue.

- Recent Studies (2016–present): Multi-age, Multi-sensory Design

Current literature integrates neuroscience, ergonomics, and interior design. Studies highlight that *texture acts as a sensory language, communicating comfort, safety, or stimulation. Researchers now examine *age-specific tactile thresholds*, proving that mental relaxation varies with age, culture, and material exposure. Advanced research investigates how textures influence behaviour in offices, schools, museums, healing spaces, and homes. Sustainable and crafted materials now dominate contemporary studies as they provide both sensory richness and environmental benefits. Today's research strongly supports that tactility is central to mental wellness in interior design.

C. METHODOLOGICAL APPROACH

1. Case Studies

Case studies across therapeutic centres, elderly care homes, and children's learning spaces consistently reveal that material tactility influences emotions and behaviour. *Children's healing rooms* with soft fabrics and natural textures report reduced emotional outbursts. *Senior living facilities* with warm wood finishes show improved calmness and orientation. *Workspaces* with textured acoustic panels report better mental decompression. These case studies collectively validate that tactile materials are not aesthetic choices but *functional tools for psychological comfort*.

2. Experiments

Controlled lab experiments measure relaxation through physiological indicators such as pulse rate, galvanic skin response, and eye tracking. Experiments show that touching warm-textured materials like cork or wood reduces stress faster than touching cold materials like metal or glass. Multi-age experiments highlight that children prefer expressive textures, while older adults prefer consistent, gentle tactile surfaces. Experiments also prove that *texture memory*—how a surface "feels" after touch—has a lasting impact on emotional perception of a space.

3. Surveys

Surveys across schools, offices, and residential users reveal age-based trends. Younger participants associate soft textures with emotional comfort and playful engagement. Adults report that matte and natural textures help them unwind after overstimulation from digital devices. Seniors rate warmth, softness, and non-abrasiveness as the primary factors contributing to relaxation. Surveys highlight a universal preference for natural materials, demonstrating that tactile comfort transcends environment type.

4. Comparative Studies

Comparative literature examines natural vs. synthetic textures, smooth vs. rough surfaces, warm vs. cool materials, and handcrafted vs. machined finishes. Comparisons consistently show that natural, warm, and gently textured surfaces outperform others in promoting relaxation. Comparative studies between different age groups confirm that tactile preferences evolve with age, yet mental relaxation remains strongly tied to *sensory familiarity, softness, and warmth*.

This literature review shows that across all three approaches—Thematic, Chronological, and Methodological—there is overwhelming evidence that *texture and material tactility significantly shape mental relaxation*. Age groups differ in tactile needs, but the emotional impact of materiality is universal. The review supports the idea that thoughtful selection of textures can transform interior spaces into psychologically supportive environments for all users.

HYPOTHESIS

The study hypothesizes that interior textures and tactile materials significantly influence mental relaxation across users. Soft, warm, and natural textures are expected to increase relaxation, whereas rough, cold, or synthetic surfaces may reduce comfort. Children are predicted to respond more positively to playful and soft textures, adults to matte and natural finishes, and seniors to warm and stable materials. It is also anticipated that natural materials will promote higher relaxation than synthetic ones, and that warm lighting will enhance the calming effect of texture. Overall, the hypothesis suggests that the tactile quality of materials plays a direct and measurable role in shaping mental relaxation levels in interior spaces.

IV.RESULTS AND DISCUSSION

The survey was conducted to understand how individuals perceive different textures, materials, and tactile elements in interior spaces and how these perceptions influence emotional comfort and relaxation. The analysis below combines demographic insights, sensory sensitivity, texture preferences, and psychological responses to materiality.

What is your age group?

An overwhelming 97.8% of participants fall within the 20–39 age group, representing young adults who actively interact with modern living environments. This demographic is highly exposed to stress-inducing routines and therefore provides reliable insight into sensory needs and emotional responses to textures. This demographic is most exposed to contemporary interior environments such as hostels, rented homes, offices, and co-living spaces. Their responses provide reliable data on how young adults emotionally respond to interior elements related to comfort and stress.

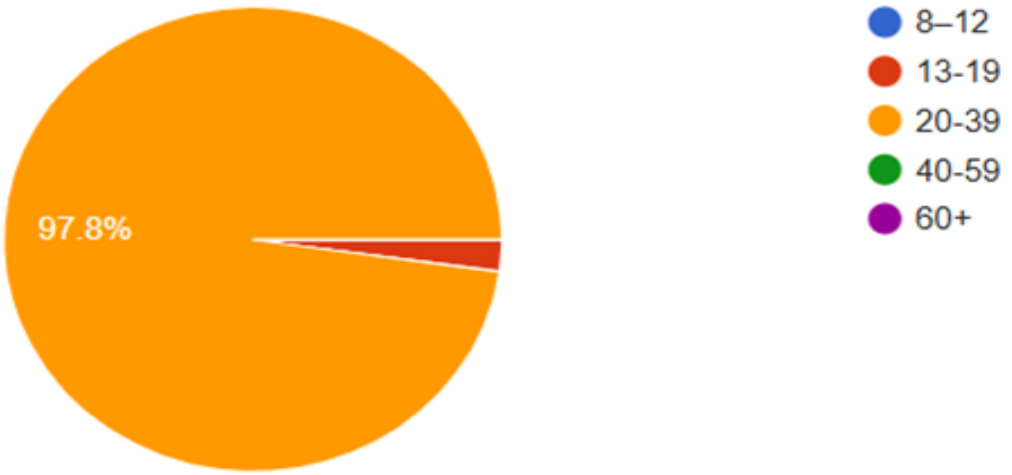

Figure 1:TEXTURE AND MATERIAL INFLUENCE DIFFERENCE AGE GROUP

How relaxed do natural materials (wood, clay, cork, cotton) make you feel?
Matte wood and smooth stone collectively received strong preference. These findings align with biophilic principles, suggesting that natural materials help reduce stress by evoking warmth, groundedness, and familiarity. Similarly, natural materials like cotton, cork, and wood received high relaxation ratings. This reinforces the psychological benefit of organic textures in interior spaces.

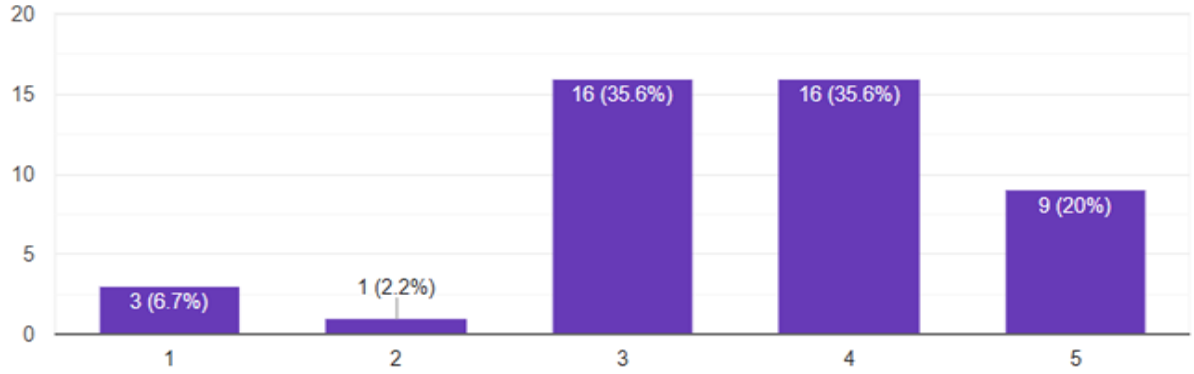

Figure 2: NATURAL TEXTURE (MATTE WOOD, STONE, WARM SURFACE)

How relaxed do synthetic materials (acrylic, laminate, vinyl, plastic) make you feel?
Approximately 72% reported that synthetic materials do not help them relax. Acrylic, laminate, and plastics were perceived as artificial, visually harsh, and emotionally detached. This indicates the importance of avoiding overly synthetic finishes in relaxation-centric environments

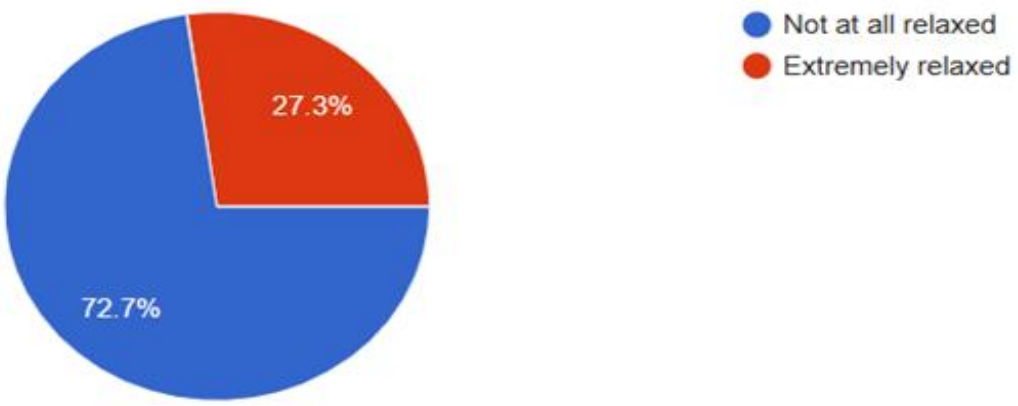

Figure 3: SYNTHETIC MATERIALS

Which spaces in your home do you prefer to have soft, warm textures? (Check all that apply)
Participants preferred soft and warm textures mainly in:

- Bedrooms
- Living rooms
- Workspaces

These are spaces where physical and mental comfort is essential. Soft textures in such spaces promote relaxation, reduce sensory fatigue, and create inviting environments.

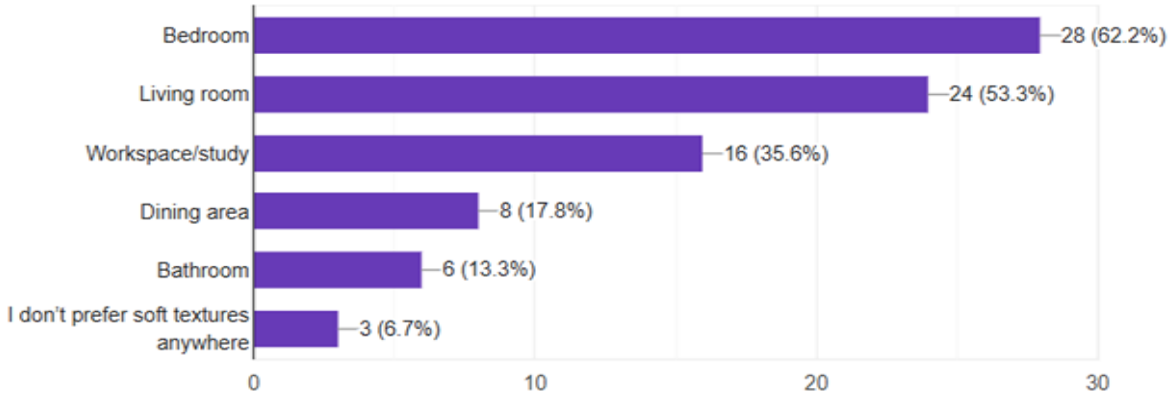

Figure 4: PREFFERED SPACE FOR SOFT TEXTURE

Which textures do you find uncomfortable or overstimulating?
Responses revealed discomfort with:

- Rough textures
- Scratchy fabrics
- Plastic-like surfaces
- Sharp-edged materials
- Overly warm or dark textures

These textures cause sensory irritation or psychological tension. Rough and synthetic surfaces are perceived as harsh, while sharp textures evoke a sense of danger or discomfort.

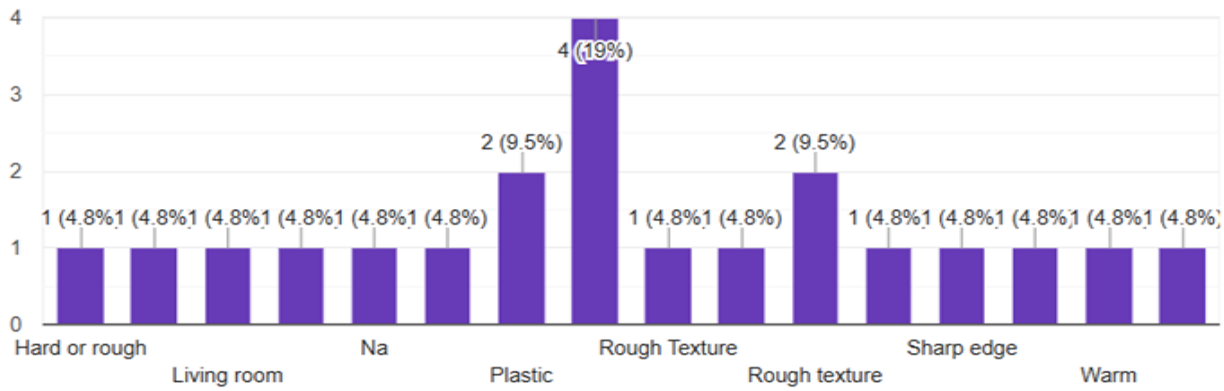

Figure 5: DISCOMFORT AND STRESS INDUCING TEXTURE

How important is the texture of furniture or walls in making you feel calm?
Ratings between 5 and 7 indicate that texture significantly impacts emotional comfort. It affects:

- Stress response
- Spatial perception
- Mood regulation
- Sense of belonging
- Visual and tactile comfort

Thus, texture emerged as one of the key determinants of relaxation in interiors.

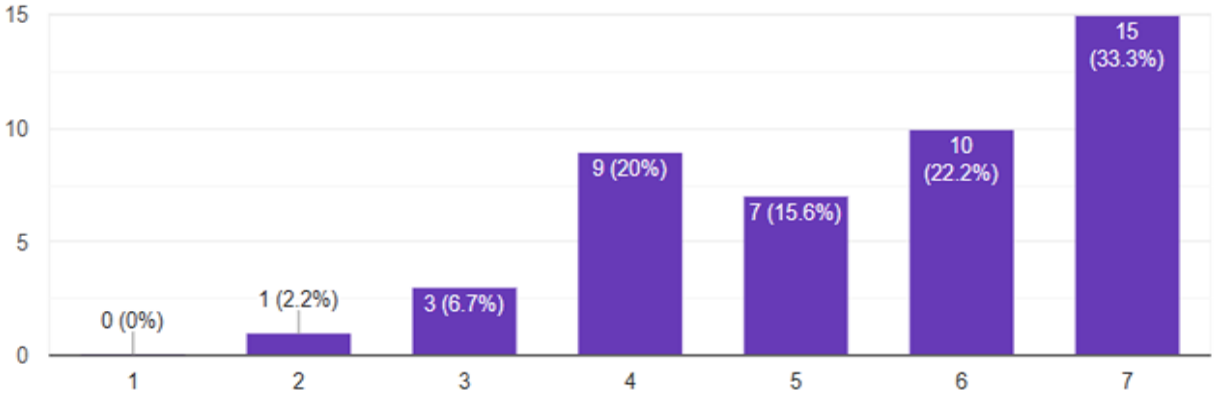

Figure 6: IMPORTANCE OF MATERIAL TEXTURE IN MENTAL CALMNESS

Which lighting do you feel enhances the calming effect of textures?
Lighting significantly affected how textures were perceived:

- Natural daylight and warm lighting were considered the most calming.
- Soft lighting enhances fabric textures and warmth.
- Harsh or colored lighting disrupts the calming effect and may cause overstimulation.

This highlights the interplay between light and texture, demonstrating that materiality cannot be evaluated in isolation.

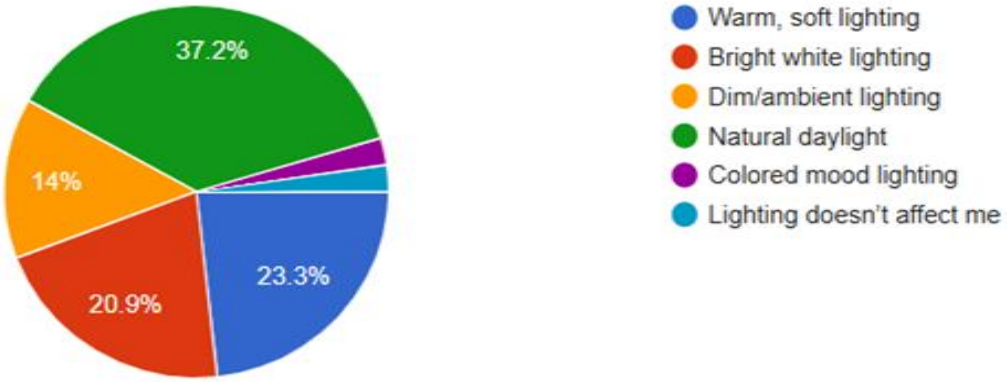

Figure 7: IMPORTANCE OF MATERIAL TEXTURE IN MENTAL CALMNESS

V.RESULT

The study reveals that:

- Textures significantly influence psychological relaxation.
- Soft, natural, and warm materials consistently enhance comfort.
- Synthetic and rough textures reduce comfort and may cause stress.
- Lighting works in partnership with materiality to create emotional warmth.
- Bedrooms and living spaces benefit the most from soft and warm textures.

This analysis supports the hypothesis and highlights the importance of thoughtful material selection in designing emotionally supportive interiors.

VI.CONCLUSION

The study demonstrates that texture and material tactility play a crucial role in shaping mental relaxation within interior environments. Findings from observations, literature review, and survey analysis collectively show that soft, warm, and natural textures—such as wood, fabric, matte finishes, and stone—consistently enhance emotional comfort, while rough, glossy, synthetic, or cold materials tend to generate sensory discomfort or stress. Responses across age groups reveal that children benefit from playful and tactile-rich surfaces, adults prefer smooth and controlled textures that reduce overstimulation, and seniors require warm, stable, and non-irritating materials to feel secure and relaxed. The analysis also highlights the influence of lighting on material perception, reinforcing that texture cannot be evaluated independently of its visual context. Despite the diversity of existing research, a gap remains in holistic, multi-age studies, which this work begins to address by integrating a broad range of materials and user responses. Overall, the study confirms that thoughtful material selection is essential for designing psychologically supportive interior spaces. These insights can inform evidence-based design guidelines that promote sensory well-being, reduce stress, and enhance relaxation for users across all age groups.

Extract the Research Gap

Although existing studies explore tactile preferences and emotional comfort, *no research simultaneously examines how a *full range of interior materials (natural + synthetic + hybrid) influence mental relaxation across all age groups*. Most studies isolate either specific materials or single age groups, leaving a gap in **holistic, multi-material, multi-age tactile analysis*. Current research lacks an integrated analysis of diverse interior textures and materials across children, adults, and seniors using both subjective and physiological measures. Existing studies focus on isolated materials or single age groups, leaving a gap in understanding how tactile environments can universally support mental relaxation.

VII.COMPLIANCE WITH ETHICAL STANDARDS

Acknowledgements

The author(s) express gratitude to all participants who voluntarily contributed their responses to the survey used in this study. Appreciation is also extended to the academic institution for providing guidance and support throughout the research process.

Conflict of Interest Statement

The author(s) declare that there are no conflicts of interest or competing interests associated with the publication of this research. No financial, personal, or institutional relationships influenced the outcomes of the study.

Statement of Ethical Approval

The present research did not involve any experiments on animals or clinical interventions with human subjects. The study relied solely on non-invasive survey responses and observational data; therefore, formal ethical approval was not required.

Statement of Informed Consent

Informed consent was obtained from all individuals who participated in the survey. Participants were informed about the purpose of the study, and their responses were collected anonymously, ensuring confidentiality and voluntary participation.

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Additional Supporting Literature

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