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The Tactile Sensory Experience in Interior Design: Exploring the Impact of Touch on Emotional Responses

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Abstract: ***Touch or the tactile sense is a important element of human interaction, and it has the power to generate emotional responses in individuals. The presence of heavy objects can give the impression of importance to job candidates, rough objects can make social interactions appear more challenging, and hard objects can lead to a more rigid approach in negotiations [1]. In the context of interior design, touch can be used to create a sensory experience and influence the emotional responses of those who inhabit a space. In this paper, we explore the role of touch or tactile sense in interior design and its impact on emotional experience. Through experiments, this study will examine the effects of different types of touch surfaces, such as smooth versus textured, . Our results show that to how much degree, the touch can significantly impact emotional response in interior spaces, with certain types of touch surfaces generating specific emotional responses. These findings will have important implications for the use of touch in interior design and suggest that designers should consider to incorporate the role of touch based on these findings to create a sensory based experience for the users of space.***

Keywords: Interior design, touch, emotional response, sensory experience, touch surfaces, smooth, textured, experiments, emotional experience, designers, tactile, users, space

I. TACTILE SENSORY EXPERIENCE

Touch is an important part of how people interact with our space and it can make people feel certain emotions. In the field of interior design, touch can be used to create a special feeling in a space. But not much research has been done to understand how touch can be used to create emotions in interior design. This study looks at the role of touch in interior design and how it affects people's emotions. We will be doing experiments to see the effects of different types of surfaces, like smooth and rough, on people's emotions. The results of this study will help us understand how touch can be used in interior design to create a certain feeling for people in a space. The aim is to Approach to understand touch-based sensory responses and the various responses both emotional and physical generates in the context of interior design. And objectives are to define terms or acknowledge terms that play a role in touch, and the various responses it generates. Objectives are to Make a list of attributes linked with touch sensation with respect to interior context. Texture (rough-smooth, temperature cold-warm), To study a set of emotional responses generated from tactile properties and link them with functional purpose as well as sensory experience purpose. As well as includes survey of different sets of materials and textures on similar materials to note which tactile properties are generating which kind of emotional responses.

II. BACKGROUND

The sense of touch is one key part of how we interact with the world around us, and haptic touch, or the sense of touch through the skin, is an important side of this. In the field of interior design, with the use of different materials, we can have a significant impact on the emotions and feelings of those who touch them. There have been a number of research on the role of haptic touch in design and the emotions it elicits in people. These studies have shown that the texture, temperature, and other physical characteristics of materials can influence how people perceive and interact with their surroundings and how certain characteristics of materials can likely alter judgment and decisions. For example, some research has found that softer, smoother materials are generally associated with positive emotions, while rougher, harder materials are often associated with negative emotions. However, much of the existing research on haptic touch has not focused on the context of interior design. This study aims to fill this gap by examining the emotional responses based on tactile characteristics of materials based on various attributes and properties as participants touch various materials used in interior design, and exploring how these responses may be useful in interior applications. The research question for this study is: How do different materials used in interior design affect the emotional response of participants through haptic touch, and how is this response related to a characteristic of the materials?

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By answering this question, this study aims to contribute to our understanding of the role of haptic touch in interior design and how it can be used to create positive emotional experiences for people as well as an opportunity for exploring materials for non-traditional applications

III. NEED OF STUDY

A. *Need*

There are principles, and elements of design in both Architecture and Interior Design, however, these are primarily visual-based guidelines. We not only process the visual character we get to see but also experience other things in space based on other sensory experiences like smell, sound, taste even, and touch. Possibly we are more active with visual sense, however, our touch interactions shape our experiences further for example we would walk on the carpet instead of directly on the floor during winter for comfort, and walking on grass barefoot has a different experience from walking on pebbles. These properties of touch sensation can be divided into 2 parts, a functional requirement and secondly as an experience requirement. Function like comfort walking on the carpet during winters. Experience sensation for example walking on dry leaves which gives a crispy satisfaction Hence, we need a guideline or known phenomena related to touch for touch-based design since touch has a lot of roles to play both functional and experience-wise. Once we have these guidelines not only it can be made possible to accurately design functions but also accurately develop the space for emotional experience.

B. *Why Touch is Important?*

"When we are forced to keep distant from a painting or a sculpture, and thus seemingly allowed only a visual experience, our brain builds a representation of the observed object that goes beyond every single sensory modality. This occurs because our perceptual experience is fundamentally integrative, binding together in a seamless way inputs from multiple sensory stimuli with motor plans and action executions. At any given moment our brain processes multisensory and motor inputs, and forges a representation of the environment in which each contribution is weighted as a function of its reliability [2].Thus, we can evoke touch through sight or audition and our bodies anticipate the sensation of touch when we are particularly close to the object that we are about to stroke. We can activate our vestibular sensations through sight, or feel a sensory-motor impulse when confronted with moving artworks (or even just artworks which refer to or imply motion)." (Levent & Pascual-Leone, 2014) "In six experiments, holding heavy or light clipboards, solving rough or smooth puzzles, and touching hard or soft objects non-consciously influenced impressions and decisions formed about unrelated people and situations. Among other effects, heavy objects made job candidates appear more important, rough objects made social interactions appear more difficult, and hard objects increased rigidity in negotiations. Basic tactile sensations are thus shown to influence higher social cognitive processing in dimension-specific and metaphor-specific ways." [1] In the same paper, another study found that sitting in a hard wooden chair versus a soft cushioned chair had an impact on participants' perceptions of an employee and their willingness to change their decisions in a negotiation task. Participants who sat in hard chairs judged the employee to be more stable and less emotional, but not more positive overall, compared to those who sat in soft chairs. In the negotiation task, participants who sat in hard chairs made less change in their offer prices compared to those who sat in soft chairs. These findings suggest that haptic sensations, or the sense of touch through the skin, can influence social judgments and decision-making, with hard surfaces being associated with perceptions of strictness, rigidity, and stability. the third study found that haptic sensations involving texture can influence impressions of social interactions. Participants who completed a puzzle with rough pieces rated the interaction as less coordinated, or more difficult and harsher, than those who completed a puzzle with smooth pieces. Tactile sensations can impact judgment and decisions, hence studying tactile properties can result in a deeper understanding of the interior and knowing the guideline to recreate certain responses to a certain possible degree. With this knowledge of how tactile touch can impact judgment, emotions, and functionality at the same time we aid designers to create sensory and emotionally accurate sensory spaces.

IV. ATTRIBUTE OF MATERIAL VERSES RESPONSES

Attribute is a characteristic or quality that belongs to someone or something. It is a feature or aspect that defines or distinguishes something from other things. Attributes can be physical, such as size, shape, colour, or texture, or they can be more abstract, such as personality traits, abilities, or values. In the context of sensory response, attributes might refer to the characteristics or qualities of an object or experience that are perceived through the senses, such as the texture of a surface or the colour of a object. Understanding and describing the attributes of something can help us to better understand and describe it, and can also help us to distinguish it from other things.

Attribute type	Ranges/values it can hold
Temperature based	Warm, cold, neutral
Weight based	Heavy/dense-light
Pressure based	Stiff-hard, soft-suppressing, liquid -jelly type,
Surface geometry based	Rough(variations), smooth, texture patterns (smooth, rough)
Surface based 2	Wet (moist), dry

Table 1: Attributes distribution, Source: Author

V. SENSORIAL RESPONSES

A. *Sensorial Words*

1) *Joy, Excitement*

Positive emotions that are often characterized by feelings of happiness and pleasure. Joy is a deep and intense feeling of happiness and contentment. Excitement is a feeling of enthusiastic anticipation or eagerness. It is often accompanied by physical symptoms such as a racing heart or butterflies in the stomach, and it can be triggered by events or experiences that are anticipated as being enjoyable or thrilling.

2) *Calm*

Calm, in a sensory context, refers to a state of tranquility or freedom from disturbance or agitation. It can also refer to a physical state, such as a period of time without storms or high winds.

3) *Comfort*

Comfort, from a sensory context, refers to the feeling of physical ease and relaxation that comes from the stimulation of the senses. This can include warmth, softness, and other tactile sensations that promote relaxation and well-being.

4) *Pain*

Pain is a complex experience that involves a physiological and psychological response to a noxious stimulus. Pain can be described in different ways, such as throbbing, stabbing, aching, or shooting, and can be localized to a specific area of the body or more widespread. Pain is the body's way of signaling that something is wrong and that the person should take care to protect themselves from further injury.

5) *Fear, danger*

Response to situations that are perceived as potentially harmful or dangerous, and it is often accompanied by physical symptoms such as a racing heart, sweaty palms, or a feeling of panic. It can range in intensity from mild to severe. Fear can be triggered by a wide range of stimuli, including actual or perceived dangers, unfamiliar or uncertain situations, or even memories or thoughts of past traumatic experiences.

6) *Anxious*

Anxious feelings are a feeling of unease or worry that may be accompanied by physical symptoms, such as increased heart rate and perspiration. These feelings can be triggered by perceived threats or dangers, or by anticipating uncertain or negative outcomes. Anxious feelings may also be triggered by sensory stimuli that are perceived as threatening or overwhelming.

7) *Satisfaction*

Satisfaction is a feeling of contentment or fulfilment that is often accompanied by a sense of accomplishment or pleasure. It is a positive emotion that is typically experienced when a person's needs, desires, or expectations have been met or exceeded. Satisfaction can be triggered by a wide range of stimuli, including achieving a goal, receiving a reward, or experiencing something that is enjoyable or fulfilling.

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8) Discomfort, unease

Discomfort refers to an uncomfortable or painful feeling in the body, or a feeling of being somewhat worried, unhappy, or embarrassed. It can also refer to an absence of comfort or ease, uneasiness, hardship, or mild pain4. Discomfort can be caused by various factors such as physical injury, illness, or emotional distress. It is a subjective experience and can vary from person to person.

9) Engaging

Interacting with something in a way that is active and engaging. When something is engaging to the sense of touch, it may be interesting or satisfying to touch or manipulate in some way. Engaging touch stimuli may be textured, smooth, soft, hard, or have other physical characteristics that make them interesting or pleasing to the sense of touch.

10) Curious

Desire to explore or investigate something through the sense of touch. When someone is curious about something, they may want to feel it, touch it, or manipulate it in order to learn more about it.

11) Dead

Gives no particular sensation, very plain and limited to only just touch,
The term "dead" is more commonly used to refer to something that is deprived of vital force or has lost any attribute suggesting life, such as energy, activity, or radiance. In terms of emotions, "dead" can refer to a feeling of numbness or detachment

B. Sample Collection

Collection of sample material are decided based on

1) Commonly Used materials used in daily life in residential interior context
2) These categories further divided on basis of their material types. Decided on basic material types
3) Further 3 classifications of same material based on their surface finish characteristics

C. Material Types

Each Material Type has been divided into 3 distinct properties surface characteristic

1) Fabric

a) Cotton Smooth
b) Cotton Rough
c) Cotton Velvet

2) Wood

a) Smooth Polished
b) Rough Unprocessed
c) Seasoned

3) Metal

a) Steel Smooth
b) Rusted
c) Bumpy Textured

4) Glass

a) Smooth Plain
b) Frosted/Matte
c) Reed Textured

5) Stone

a) Marble Polished (Glossy)
b) Marble Honed (Matte)
c) Marble Sandblasted

6) Ceramic

a) Tile Glossy
b) Tile Matte
c) Pot Hammered

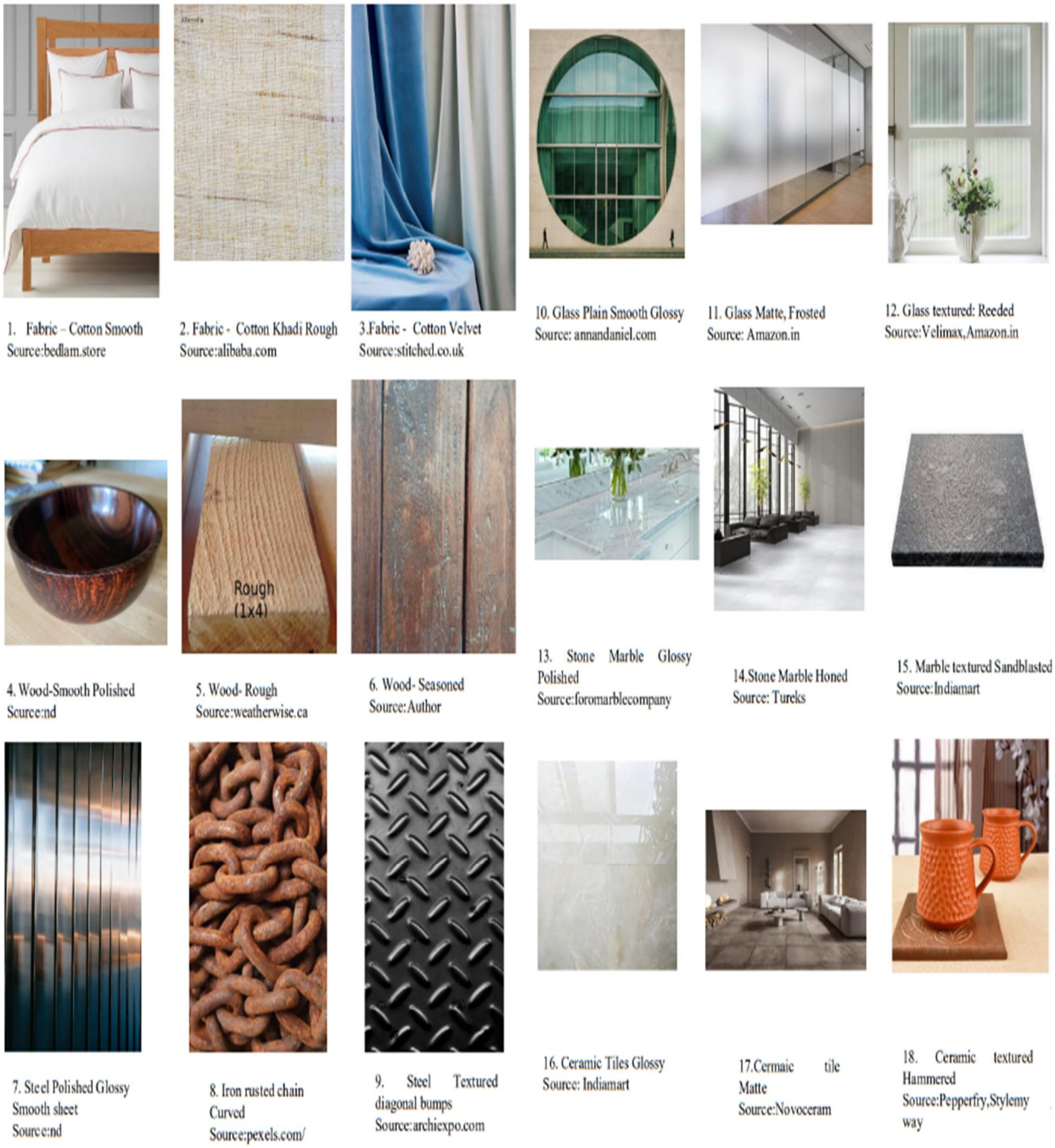


Figure: Selected Samples for the Survey

D. Collected Data from Survey

Data of 56 respondents were recorded. Respondents were asked to select which emotion from the list of 8 defined emotions triggered them if they recall their past experience from particular material on touching them.

		JOY/EXCITEMENT	CALM / COMFORT	SATISFACTION	DISCOMFORT / UNEASE	FEAR / DANGER/ ANXIOUS	PAIN	DEAD (NO FEELING)	CUROSITY /ENGAGING	Total
1	FABRIC COTTON SMOOTH	7	**39**	8	1	0	0	0	1	56
2	FABRIC COTTON ROUGH	3	7	**20**	16		2	3	5	56
3	FABRIC COTTON VELVET	**23**	12	12	5	1	0	0	3	56
4	WOOD SMOOTH	9	**17**	16	2	1	0	3	8	56
5	WOOD ROUGH	5	2	3	**22**	8	7	2	7	56
6	WOOD SEASONED	5	9	9	11	4	3	**12**	3	56
7	METAL SMOOTH GLOSSY STEEL SHEET	12	12	**13**	4	4	0	3	8	56
8	METAL STEEL RUSTED	2	1	1	**18**	17	5	10	2	56
9	METAL STEEL TEXTURED(CROSS)	6	2	8	**13**	9	1	5	12	56
10	GLASS PLAIN GLOSSY	**23**	7	11	3	1	1	2	8	56
11	GLASS MATTE FROSTED	10	**17**	14	4	0	0	3	8	56
12	GLASS TEXTURED(REEDED)	**14**	13	12	4	3	2	0	8	56
13	STONE MARBLE GLOSSY POLISHED	**16**	15	14	3	2	1	2	3	56
14	STONE MARBLE MATTE: HONED	6	**25**	15	4	1	0	4	1	56
15	STONE MARBLE TEXTURED: SANDBLASTED	4	**14**	**14**	**14**	1	1	4	4	56
16	CERAMIC GLOSSY	**18**	13	8	3	6	0	3	5	56
17	CERAMIC MATTE	10	**19**	13	4	3	0	7	0	56
18	CERAMIC TEXTURED HAMMERED	12	10	**13**	6	2	2	1	10	56

Table: Survey of 56 respondents, Source: Author.

E. Break down Analysis of Each Material chart

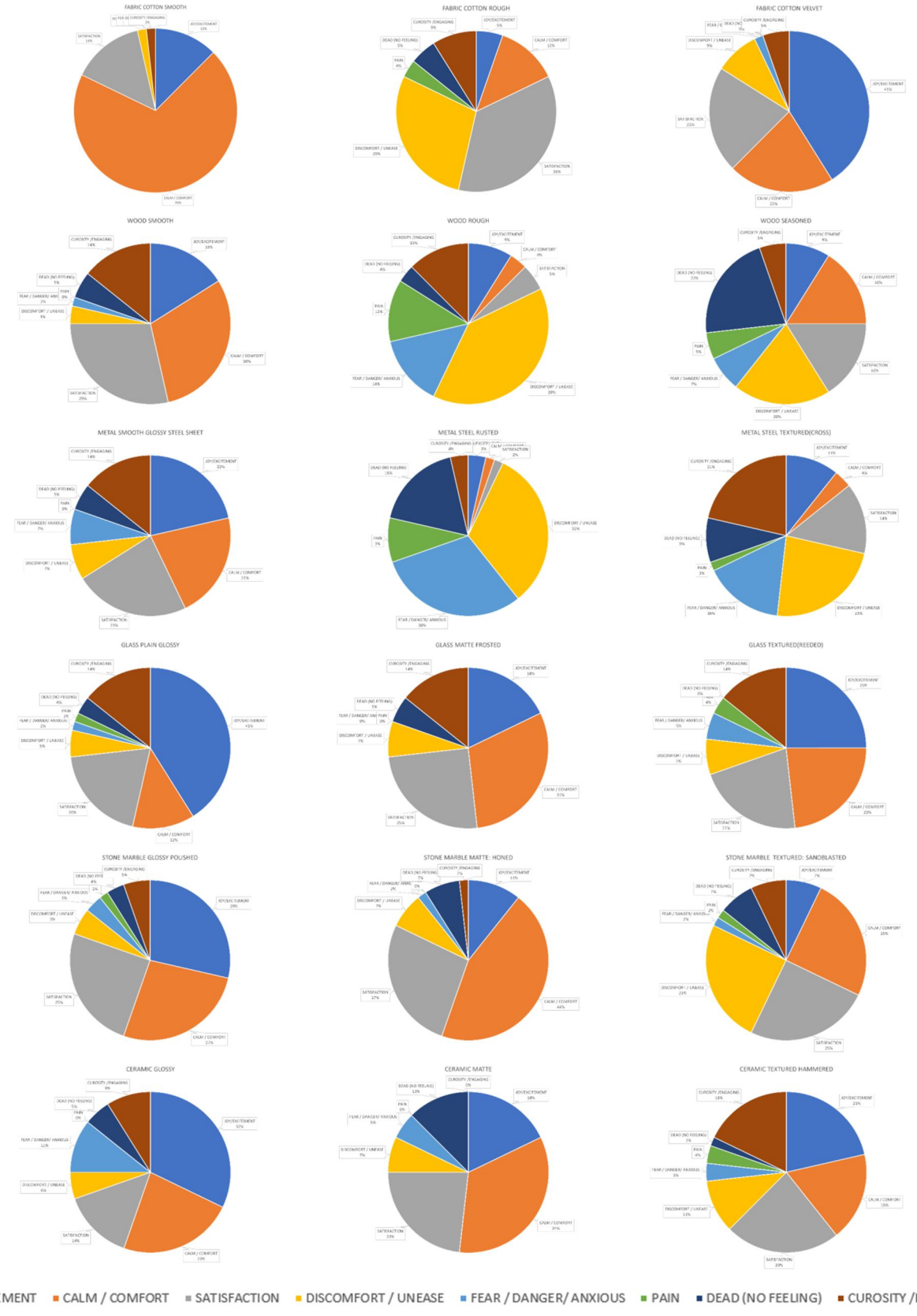


Figure: Pie chart showing Sensory Emotion data generated by 56 respondents

VI. RESULT

A. Material Wise Results

1) Fabric

i.) Cotton smooth.
-gives calm and comforting experience
ii.) Cotton rough
-majorly gives satisfaction, however can also trigger discomfort to significant population types. Suggested to avoid where pleasant experience is planned.
iii.) Cotton velvet
-gives the most positive response in the list, the joy or excitement experience being the most dominant, satisfaction and comfort noticed in others.

2) Wood

i.) Smooth
-touching smooth gives sense of satisfaction and calmness. Can be used for meditation or spiritual places, as being natural and inducing calmness experience.
ii.) Rough
-rough wood induces Reponses of discomfort, as rough wood can possibly cause injuries. Can be used for creating sense of discomfort in atmosphere, e.g., horror themed room's backdrop. And should be avoided where discomfort to be avoided e.g., kid's bedroom.
iii.) Seasoned
-seasoned wood mostly generated "dead" feeling, as well as "discomfort" as second major response.

3) Metal

i.) Smooth glossy steel sheet
- "satisfaction" is the major response, being smooth sliding, it evokes sense of satisfaction, likely due to how perfect smooth it can feel in touch.
ii.) Steel rusted
-rusty material gave responses as "discomfort" and "fear",
iii.) Steel textured (cross patterned)
-causes discomfort, bumpy cross textures on metal are hard and may cause injury, however it also produced significant responses of "engaging" which is likely due to the bumpy patterns.

4) Glass

i.) Plain glossy
-gives high sense of joy/excitement, likely due to smooth plain surface, slipping fingers gives evokes joy.
ii.) Matte frosted
-majority respondents find it evokes calmness.
iii.) Textured(reeded)
¬-joy and calm/comfort are major responses. It maybe said, glass engages person's touch and due to its smooth surface properties even if it has textures, gives positive experience

5) Stone

i.) Marble glossy polished
-evokes joy, comfort and satisfaction in closely majority of the responses, marble is a stone yet it has some softness which makes it positive experience when blended in smooth surface.
ii.) Marble matte: honed
-matte marble evoked calmness in majority among respondents. Suitable for meditative spaces for its functional and this calm experience association.
iii.) Marble textured: sandblasted

-in response, it equally created experience of calm, satisfaction and discomfort as well. It is concluded that sandblasted texture may be more of personal choice, and best to avoid using it in public places. Some people would like its experience and some find it discomforting significantly.

6) Ceramic

i.) Glossy

-glossy ceramic evoked joy in majority of respondents. Likely its smooth plain surface makes it likeable.

ii.) Ceramic matte

-matte variant evoked more of calmness than joy.

iii.) Ceramic textured hammered

-evoked "satisfaction" in majority, also to note, it evoked significant number of "engaging" experience, which is likely to bumps in hammered textures, gives person to explore the depths. It also created other positive responses like calm and joy.

VII. CONCLUSION

Fine, Smooth-Plain, and Slippery tend to give positive responses while being free from negative responses. On the other hand, rough and uneven materials tend to give negative responses also alongside positive responses in some cases. The rest of the materials show mixed responses.

Overall Inference of all mentioned attributes shows that Texture or Surface based properties create the major variations and can be considered an important factor in determining the response type. To add more, Warm, smooth, fine, and slippery kinds of attributes of materials are likely to give positive sensory emotional responses.

Other findings are that different individual has their own set of emotional triggers from certain materials. It could be linked to personal life experience or some instincts. For example, one respondent finds velvet to be causing the fear response, here reasons are uncertain. Moreover, Glossy marble is also found to be triggering pain in one of the respondents, it likely could be because of past experience of slipping and hazards. Always, however, it should be kept in mind for residential or individual users' space during design about their personal preference of the material and its finish.

In conclusion, surface properties or texture types can be worked upon with their various types to evoke distinct kinds of emotions which will enormously help in creating a tactile sensory-rich experience by designers for the users of the space.

Here is a short table on attribute and emotional link derived from the analyzed results:

Attribute	*Senosory Emotion it Evokes*
Smooth Plain/Glossy	Joy
Matt Finish	Calmness
Bumpy uniform texture	Engaging
Rough	Discomfort

Table: Attribute- Sensory Emotion pattern observed, Source: Author

A. Recommendation for Future Research

There are certain limitations in this research, overcoming these limitations like limited number of material sample and handful of texture variation will help us in getting more broader understanding of how various attributes can impact emotional responses in detail. With these findings it will be possible to create more sensory rich emotional experiences by deciding the texture or tactile properties, especially this would be beneficial when number of types of material is limited. This would also be aiding in designing theme-based design, for example a bamboo made interior, it can somehow be used to craft mattress with softness and also it can be used as reeded textured handle bar for grip holding promoting vernacular and sustainable design at the same time

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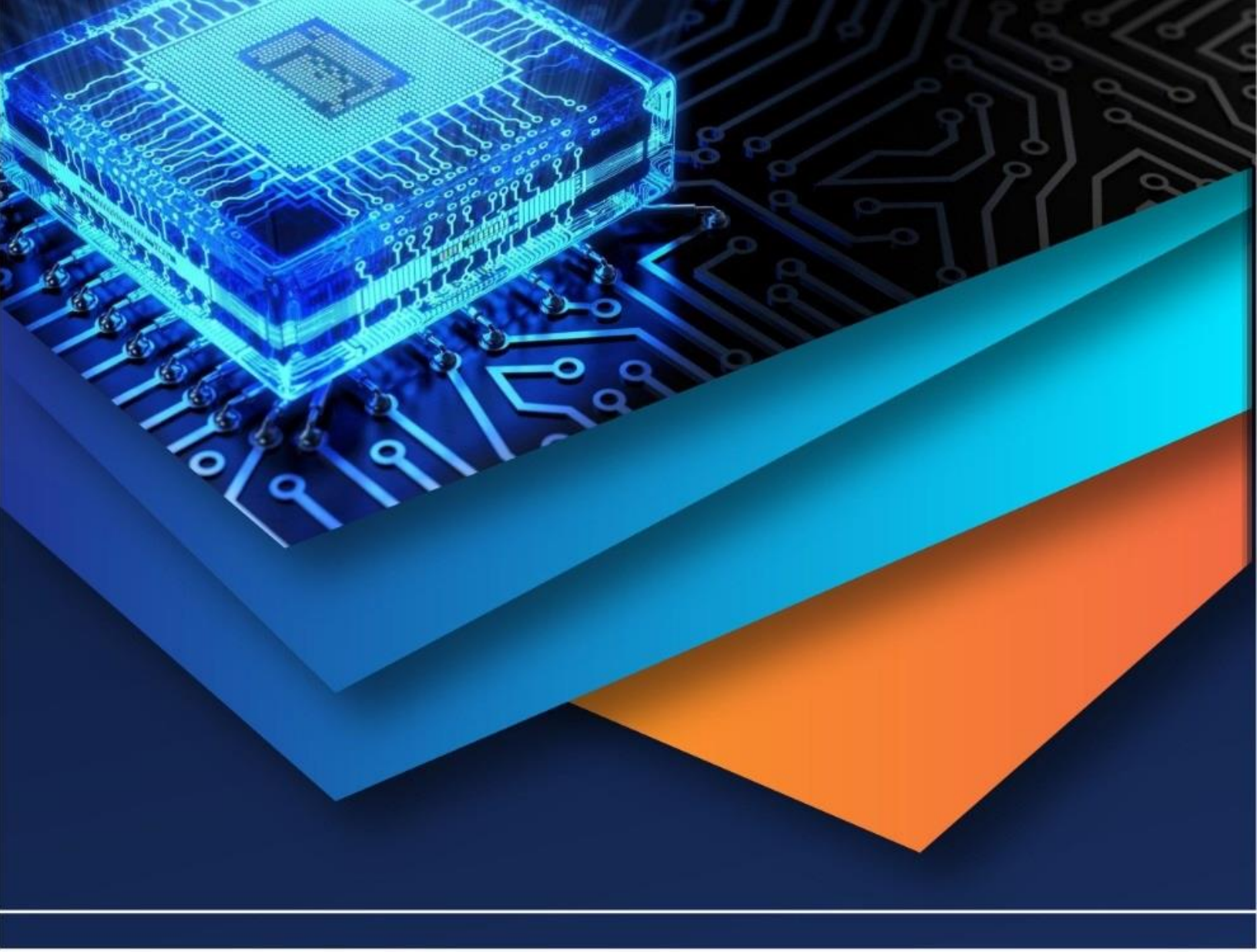
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