

Fiber Materials as Mediators: Linking Enclosed Spaces to Human Behavior and Emotion

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Abstract

This paper will systematically study how fiber materials shape people's behaviour and emotions in indoor environments in houses and buildings. Traditional building design generally focuses on aesthetics and structure, but now the concept of environmental psychology requires considering all senses in the spatial experience of people. Fiber materials are natural fabrics, acoustic fabrics and woven dividers, etc., and they are responsible for delivering sensations of touch and hearing to the body from the hard-shelled structure. Through a large number of studies, this paper will explore the role of specific texture, acoustic absorption capacity and thermal properties of fibre materials in regulating stress levels and influencing emotions. Based on the above data, it can be seen that strategically integrating tactile textiles may reduce people's anxiety about noise and reduce echo in enclosed spaces; therefore, these spaces will be more pleasant. Fiber materials can also serve as indirect prompts for behaviour to guide people's movement and space. This study connects material science with the study of the human psyche, and it has been found that fibre-based materials also serve as a support system for our mental state. In short, this study proposes a people-centred, multi-sensory design idea for space and emphasizes how tactile materials should be incorporated into new buildings.

Keywords

Fiber Materials; Interior Space; Human Behavior; Emotional Regulation; Tactile Perception; Acoustic Textiles.

1. Introduction

The first purpose for the construction of enclosed architectural spaces has been the expression of beauty and the support of structures. Concrete, glass and steel have been the main components of modern buildings; thus, many such buildings have been built prioritizing economy and visual effect over the comfort of people's senses. However, people are not concerned only with the space we see. Environmental psychology clearly states that people's lives in built environments are often experienced with all five senses, including touch, hearing, temperature, sight and smell. When the spaces are entirely composed of hard, highly reflective surfaces, they often trigger subconscious feelings of hostility, acoustic fatigue and severe emotional detachment, and thus alter people's behaviour in that place.

In recent years, both materials science and psychological health have begun to draw attention from a certain angle. Recently, many scholars have started to believe that the materials of interior finishing will also have a negative impact on people's health. Determine the path of sound propagation, light absorption properties, etc., and assess their impact on people. Among these materials, fibre and textile elements are among the most unique and essential. Fiber materials are naturally flexible and have various surface textures; therefore, they need to be used as softeners to reduce the hardness of the structure and protect the people living inside from injury.

The main purpose of this paper is to explore the functions of fibre materials as essential psychological and behavioural mediators in closed environments in depth. By organising the existing studies in the areas of interior design, sensory psychology and acoustic engineering, this paper aims to find the direct links among different kinds of textiles and the resulting changes in people's emotions and behaviour. Section 2 investigates the importance of tactile sensation and emotional roots. Section 3 investigates the deep behavioural effects of acoustic regulation via fibre integration. Section 4 studies the role of textiles in space and behaviour. Section 5 concludes by discussing the future direction of multisensory architectural design. In the past, the structural shell and the interior finishing were divided too rigidly, and thus the psychological effect of materials was ignored. However, new research in neuroarchitecture has shown that the human brain constantly creates spatial maps of its environment and thus desires places with a good balance of strong structural safety and soft, tactile comfort. When this fine balance is abruptly upset by too many hard, inflexible surfaces, the body will be repeatedly in a stress response. Therefore, the selection of textured fibre materials can no longer be treated as an optional extra; they are now required components in creating environments that encourage both high-level thinking and rich emotions among the people. The financial and social costs of ignoring these sensory demands are very high; as a result, there is significant worker fatigue and stress among patients in hospitals, and the public is also very unhappy.

2. Tactile Perception and Emotional Grounding

The closest and most direct connection a person has with an indoor area is a sense of touch. Vision is used to observe a safe distance away, but touch requires direct physical contact and is thus more deeply felt emotionally [1]. With the construction of new buildings today being relatively simple and lacking warmth, materials with rich textures and textures have been gradually used to add a sense of life to them [6]. Textiles such as heavy wool, raw linen and plush velvet have complex micro-textures that may be associated with warmth, softness and a sense of physical comfort in multi-sensory space [1-3].

Researchers have found that many different textures are perceived as different by people and thus affect them differently. When human skin touches or is near the soft-fibre materials in a highly structured room, there is an observable decrease in physiological stress indicators [2]. Natural fibres have a relatively high tactile sensitivity and are thus more engaging for humans; they can create a sense of place rather than being dull and emotionless. Environmentally speaking, it has been shown that various environmental cues can help us relax and recover from stress, so the environment in the study will be taken into account [4]. The material properties of textiles are also relatively poor conductors of heat; therefore, they offer little emotional regulation. Fibre materials have good thermal inertia and form a small area of reduced temperature in a large, exposed building. This physical warmth can make people feel more secure mentally and reduce their sense of isolation or vulnerability in large open-plan spaces [1, 6, 9].

The Idea of 'material honesty' should also be considered in the choice of textiles for emotional effects. The human brain is very good at distinguishing between real, natural fibres and heavily processed, synthetic imitations unconsciously [5]. Natural fibres have slight, organic defects that can convey a sense of authenticity in both appearance and touch for people. As a result, designers have been using raw, unrefined textiles more and more often to address the deep emotional isolation that hyper-industrialised, all-synthetic architectural environments have created [2, 6]. By introducing deep tactile variation through the placement of fibres in a strategic way, architecture can effectively restore the sense of touch that people feel when close to them.

3. Acoustic Regulation and Behavioral Modulation

In addition to direct contact, fibre materials can also affect people's behaviour to some extent by changing the sounds in an unfamiliar way [7]. The sound environment in a room will determine what kind of behaviour people exhibit there. With a small space and hard, parallel walls, sound waves will be reflected repeatedly, resulting in a high degree of reverberation and thus noise. Although it cannot be seen, there are bad sounds in our environment; they can harm people's health by increasing cortisol and leading to stress and reduced ability to focus [6].

Fiber materials have a porous and tightly interwoven microscopic structure by nature, and thus are used as the main technology to absorb this harsh acoustic energy. When sound waves hit an acoustic fabric, the energy is spread out in the small air spaces between the fibers, and at the same time, a very small amount of heat is produced [7]. To reduce the reverberation time (RT60) of a particular area, heavy-duty sound-absorbing curtains, soft-furnishings and fabric wall panels can be added. The reduced amount of reflected sound may affect the comfort of communication and the behaviour of people in the room [7-8, 10].

In areas with a lot of noise, such as open-plan offices or busy hospital waiting rooms, sound-absorbing materials can be used to reduce the sensory stress of people and help them focus on speaking in a relatively quiet environment [6-8, 10]. When people cannot hear what they say due to the large amount of background noise, they are no longer motivated to speak loudly, and the social environment will be much more quiet and orderly [7]. In a place where one needs to focus intently, such as a university library or a special working area, fabric can be used to reduce noise and thereby help the brain pay attention for a long time [6]. By actively regulating the invisible environment of sound, fiber materials can directly modify the psychological and behavioural attributes of people in enclosed spaces; thus, excellent acoustics serve as an essential basis for emotional-spatial Design [7, 10].

In addition, these particular visual attributes of the tactile surfaces will also affect the sense of touch when they are touched. A person sees a fine and delicate weave of natural-wool tapestry or a rough, uneven texture of raw linen and then feels happy. This visual-tactile cross-modal interaction may set up an expectation for emotion prior to physical contact. Therapeutic and recovery-oriented spaces can be soft and comforting due to various textured fibre interventions; however, this feeling of safety should be considered part of an overall multisensory environment and not attributed to a single material cause [2, 3, 6]. In the areas that need to reduce strong emotions or deeply calm people, people have used textured fibers to quickly quiet aggressive behaviour and create a space where they feel safe enough to be vulnerable. The lack of all these materials forces the resident to be in a constant state of high alert, as the hard surfaces provide no sense of safety or physical comfort through sight or touch.

4. Textiles as Implicit Spatial Guides

Fiber materials are also highly capable of modulating the sensory information received by people, such as touch and sound; at the same time, they can also function as very subtle behavioural instructions for navigating and living in enclosed spaces [3]. Traditional buildings are relatively solid and unchanging; they have thick walls, heavy doors and large corridors, and do not allow much light and air to pass through. However, such a rigid style often leads to an environment that feels very confining and highly authoritarian to people [1].

At the same time, to achieve a soft yet lively division in the room, one can also place hanging fabric strategically, use sheer-fabric dividers and add rich-texture floor rugs. Woven partitions can divide spaces to provide different atmospheres for people without completely separating the areas [1-3, 9]. A "soft architecture" provides a certain degree of autonomy and control over life in the community for the people. For example, a thick, dark curtain can be pulled across to

create a very private and secluded place for studying or feeling alone; when one is ready to interact with the world, it can be quickly opened. This deep-seated structural flexibility can meet the high fluctuations in the emotional and behavioural demands of the people living here at different times and prevent a serious psychological stagnation that often occurs in rigid, unchanging floor plans [9].

Fiber materials can also create an area of very high-traffic use through subtle variations in touch and sight [5]. A sudden shift from a hard, high-reflectance concrete corridor to a deep, soft-woolen-carpet area can be perceived by the brain as an abrupt change in the required behaviour. Soft flooring can slow down the walking speed, change the way people walk unconsciously, and thus shift from a very public, transient mindset to a more stationary, private and relaxed behaviour [2, 5]. Designers can use textile transitions in commercial and public areas, such as hotel lobbies and retail showrooms, to direct the flow of people, slow them down, and have them stay in these areas for a longer time [1-5]. Therefore, the basic decorative function of fibre materials has been expanded; they are now a highly subtle and deeply psychological system for space that silently transmits precise behavioural rules and emotional expectations to the human nervous system [1, 10].

Fiber materials can also affect behaviour by modifying people's sense of scale and the boundaries of an enclosed space. A large-roomed building with a high ceiling and hard-surfaced materials is very grand to behold; however, it can also be emotionally sterile and rather forbidding to live in. Suspended fabrics, textile canopies and dense-woven installations can reduce the visual sense of height in a space without changing the original structure of the building. This reduction in the scale of space gives people a sense of being protected from the elements and can promote socialising. Rugs and other textile floor coverings serve as seats for sitting, resting and gathering, and by way of perception, define an area on the floor. These textile boundaries are not rigid; they can be adjusted or removed at any time, so they influence behaviour indirectly rather than forcing it. The Flexibility is that is, different activities have different emotional requirements. A person needs to be open in collaborative work, concentrated on focus work, and soft during recovery and rest. Fiber materials can offer many indoor environments for the display of these various states in a temporary, sensory and symbolic manner. In this way, textiles function as a type of soft spatial governance. They adjust the distance, closeness and movement by changing perception. Therefore, the behaviour-altering effects of these materials are not limited to their material texture; placement, density, transparency, colour and relationships with other buildings also affect them [1, 2, 5, 9].

5. Conclusion

The scale of the noise problem in contemporary buildings is also relatively large. A major trend in the world now is to build very sparse, open-plan buildings with raw concrete ceilings and wide windows; as a result, there is an extreme lack of sound insulation in homes and offices. Due to the high volatility of the sound environment, people have to use their auditory processing centers to an extreme extent just to understand simple words. This continuous low-level noise is constantly disturbing our thoughts unconsciously; as a result, we are less able to learn and remember information, and we also feel sad. When highly engineered acoustic textiles are introduced suddenly in these rundown areas, the changes in behaviour will be relatively pronounced and measurable. A reduction in the loud noise of an urban street will help the people in that area feel less isolated.

Based on the above analysis, the comprehensive study has shown that fibre materials need to bridge the gap between the relatively rigid physical structure of enclosed spaces and the highly varied emotions and behaviours of the people living there. Modern architectural enclosures, lacking tactile and acoustic-dampening components, are often very harsh and stressful to

people's minds. Fiber Materials Address the Problem of Extreme Architectural Disparity. Through various kinds of tactile sensations, textiles have provided a basic sense of safety and warmth for people's bodies in an era when highly industrialised materials have caused a lack of such sensory experience.

Thick, noisy fibre-woven materials are also good sound-absorbing materials that can help reduce the stress caused by noise pollution at home for many people. Through the absorption of chaotic reverberation, textiles can create a more tranquil and concentrated social atmosphere for people. Fabric Structure can provide different senses for the senses and, in doing so, create many smaller environments within a large space, making life more personal and reducing people's stress through subtle changes in touch.

Finally, the integration of fibre materials is promoting a new era for current interior architecture. Designers and engineers should no longer believe that textiles are merely for visual enhancement at the end of a project. Therefore, fiber materials need to be actively recognised and promoted as basic psychological supports in the initial stages of architectural planning. By integrating a comprehensive and deeply humane multi-sensory approach to the use of materials, the world's design community can create restorative, emotionally intelligent spaces for people that are both nourishing to the body and mind.

References

- [1] Pallasmaa, J. (2012). *The eyes of the skin: Architecture and the senses* (3rd ed.). John Wiley & Sons.
- [2] Desmet, P. M. A., & Hekkert, P. (2007). Framework of product experience. *International Journal of Design*, 1(1), 57–66.
- [3] Gallace, A., & Spence, C. (2014). *In touch with the future: The sense of touch from cognitive neuroscience to virtual reality*. Oxford University Press.
- [4] Ulrich, R. S. (1984). View through a window may influence recovery from surgery. *Science*, 224(4647), 420–421.
- [5] Vavik, T. (2010). *Exploring and teaching tactility in design* [Working paper]. Oslo School of Architecture and Design.
- [6] Nakanishi, E. Y., Poulin, P., Denis, M., Blanchet, P., & Beauregard, V. (2024). A systematic review of the implications of construction materials on occupants' physical and psychological health. *Building and Environment*, 257, 111527.
- [7] Kang, J., & Schulte-Fortkamp, B. (2016). *Soundscape and the built environment*. CRC Press.
- [8] International Organization for Standardization. (2009). *ISO 3382-1:2009, Acoustics-Measurement of room acoustic parameters-Part 1: Performance spaces*. ISO.
- [9] Kellert, S., Heerwagen, J., & Mador, M. (2008). *Biophilic design: The theory, science and practice of bringing buildings to life*. John Wiley & Sons.
- [10] Leather, P., Beale, M., & Sullivan, L. (2003). Noise, psychosocial stress and their interaction in the workplace. *Journal of Environmental Psychology*, 23(2), 213–222.