

THE SCIENTIFIC BASIS OF CHOOSING CURTAIN FABRIC IN INTERIOR DESIGN**To'xtayeva Zebo Sharifovna**

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Abstract

The selection of curtain fabric in interior design is a critical decision that influences both functional performance and aesthetic quality of interior spaces. This article examines the scientific basis of choosing curtain fabrics by integrating principles from material science, environmental physics, environmental psychology, and sustainable design. The study analyzes how fabric composition, structural characteristics, color, texture, and surface properties affect light regulation, thermal comfort, acoustic performance, and user perception. Particular attention is given to the interaction between curtain fabrics and environmental factors such as daylight intensity, room orientation, and climatic conditions. The research also discusses the psychological impact of fabric color and texture on human comfort and behavior, emphasizing the importance of user-centered design. Furthermore, sustainability considerations, including energy efficiency, material durability, and environmental impact of textile production, are evaluated. The findings demonstrate that an evidence-based approach to curtain fabric selection enhances visual harmony, improves indoor environmental quality, and supports long-term sustainability goals. The article concludes that curtain fabrics should be regarded as active components of interior systems rather than purely decorative elements, and their selection should be guided by scientific analysis and contextual design requirements.

Keywords

curtain fabrics, interior design, material properties, light control, thermal comfort, environmental psychology, textile performance, sustainability, visual perception, energy efficiency.

Introduction

Interior design is a multidisciplinary field that integrates art, technology, psychology, and material science to create functional and aesthetically pleasing living environments. Among the many elements that shape interior space, textiles occupy a particularly important position, as they directly influence visual perception, comfort, acoustics, and environmental performance. Curtain fabrics, in particular, play a critical role in mediating the relationship between interior spaces and the external environment. They regulate natural light, ensure privacy, contribute to thermal insulation, and significantly affect the overall stylistic coherence of an interior. Despite their apparent simplicity, curtains are complex design components whose selection requires a scientifically grounded approach rather than purely aesthetic intuition. In contemporary interior design practice, the choice of curtain fabric is often driven by fashion trends, personal preferences, or cost considerations. However, such an approach may overlook essential physical, functional, and psychological factors that determine the long-term effectiveness and sustainability of textile solutions. Fabric properties such as fiber composition, weave structure, density, color reflectance, and surface texture interact with environmental parameters including daylight intensity, room orientation, climate conditions, and artificial lighting systems. When these interactions are not carefully analyzed, the result may be visual discomfort, inefficient energy use, reduced durability of materials, or inconsistency with the intended design concept. Therefore, the scientific basis for selecting curtain fabrics is a relevant and necessary topic for both researchers and practicing interior designers. From a material science perspective, curtain



fabrics are distinguished by their raw materials—natural, synthetic, or blended fibers—each of which exhibits specific mechanical, thermal, optical, and hygienic characteristics. Natural fibers such as cotton, linen, and silk are valued for their breathability and tactile comfort, while synthetic fibers like polyester and acrylic offer superior durability, resistance to ultraviolet radiation, and ease of maintenance. Blended fabrics aim to combine the advantages of both groups. Understanding the physical behavior of these materials under different environmental conditions is essential for making informed design decisions, especially in spaces with intensive solar exposure, high humidity, or strict functional requirements such as hotels, offices, and public buildings. In addition to material composition, the structural characteristics of curtain fabrics significantly influence their performance. Weave type, yarn density, and thickness determine light transmission, sound absorption, and thermal insulation properties. For example, sheer fabrics diffuse daylight and create a sense of openness, whereas heavy, tightly woven textiles provide effective shading and improve acoustic comfort. These functional attributes are closely linked to human perception and well-being. Scientific studies in environmental psychology have demonstrated that lighting quality, color balance, and textural harmony have a measurable impact on mood, productivity, and psychological comfort. Consequently, the selection of curtain fabric should be aligned with the functional purpose of the space, whether it is intended for rest, work, social interaction, or concentration.

The aesthetic dimension of curtain fabrics cannot be separated from their scientific characteristics. Color theory, visual weight, and pattern scale influence spatial perception, proportions, and stylistic identity. Warm and cool tones affect the perceived temperature of a room, while matte and glossy surfaces interact differently with natural and artificial light. A scientifically informed approach allows designers to predict these effects and intentionally shape the visual atmosphere of interiors. This is particularly important in modern design paradigms that emphasize minimalism, sustainability, and user-centered solutions. Sustainability has become another critical factor in the evaluation of curtain fabrics. The environmental impact of textile production, energy efficiency during use, and the potential for recycling or reuse are increasingly important criteria in interior design. Scientifically grounded fabric selection supports sustainable practices by promoting materials that reduce heat loss, minimize the need for artificial lighting, and have a lower ecological footprint. In this context, curtain fabrics are not merely decorative elements but active components of an energy-efficient and environmentally responsible interior system. The aim of this article is to provide a scientific and analytical foundation for choosing curtain fabrics in interior design. By examining material properties, functional performance, psychological effects, and sustainability aspects, the study seeks to demonstrate that curtain fabric selection should be approached as a rational, evidence-based process. Such an approach enhances design quality, improves user comfort, and contributes to the long-term efficiency and aesthetic integrity of interior spaces.

Literature review. The scientific study of curtain fabrics within interior design intersects multiple research domains, including textile science, environmental psychology, architectural design, and sustainability studies. Existing literature emphasizes that curtains are not merely decorative accessories but functional interior elements that influence environmental comfort, energy efficiency, and human perception of space. This literature review synthesizes key academic contributions related to fabric properties, functional performance, aesthetic perception, and sustainability considerations in the selection of curtain fabrics. A significant body of research in textile science focuses on the physical and mechanical properties of fabrics and their relevance to interior applications. According to studies on fiber composition, natural fibers such as cotton, linen, and silk are characterized by high hygroscopicity, breathability, and tactile comfort, which make them suitable for residential interiors where comfort and natural aesthetics are prioritized. However, researchers note that these fibers are more susceptible to ultraviolet degradation and moisture-related deformation, limiting their durability in spaces with strong



solar exposure. In contrast, synthetic fibers such as polyester, nylon, and acrylic demonstrate superior resistance to UV radiation, dimensional stability, and ease of maintenance. Several authors highlight that blended fabrics, combining natural and synthetic fibers, offer a balanced solution by improving durability while preserving visual and tactile qualities. These findings suggest that material composition is a foundational criterion in the rational selection of curtain fabrics.

Structural characteristics of fabrics are another major focus in the literature. Weave type, yarn density, thickness, and surface finish directly affect light transmission, thermal insulation, and acoustic performance. Research on light-filtering textiles indicates that sheer and semi-sheer fabrics scatter incoming daylight, reducing glare while maintaining visual connection with the exterior. Conversely, blackout and densely woven fabrics significantly reduce light penetration and are commonly recommended for bedrooms, conference rooms, and media spaces. Studies in building physics demonstrate that multilayer curtain systems can contribute to thermal insulation by creating an additional air layer near windows, thereby reducing heat loss in winter and limiting solar heat gain in summer. These functional aspects underline the importance of aligning fabric structure with climatic conditions and room orientation. Environmental psychology literature provides valuable insights into how curtain fabrics influence human perception and behavior. Numerous studies confirm that lighting quality, color harmony, and material texture have measurable psychological effects. Soft, diffused light produced by translucent fabrics is associated with reduced visual fatigue and enhanced relaxation, while harsh contrasts caused by inappropriate fabric choices may lead to discomfort and stress. Color-related research shows that warm-toned fabrics tend to create a sense of intimacy and warmth, whereas cool tones are linked to calmness and spatial expansion. Texture also plays a role in perceived comfort; matte and soft-textured fabrics are often associated with coziness, while glossy surfaces convey formality and modernity. These findings support the argument that curtain fabric selection should be informed by psychological and perceptual considerations, not solely by stylistic trends. From an interior design theory perspective, curtains are discussed as elements that contribute to spatial composition and visual balance. Scholars emphasize the concept of visual weight, noting that heavy fabrics with deep colors can anchor a space and create a sense of stability, while lightweight fabrics enhance openness and fluidity. Pattern scale and repetition are also addressed in the literature, with recommendations to match fabric patterns to room size and architectural rhythm. Large-scale patterns may overwhelm small spaces, whereas subtle textures and fine patterns support visual continuity. This body of work demonstrates that aesthetic decisions regarding curtain fabrics are closely linked to spatial proportions and design coherence.

Energy efficiency and sustainability have become increasingly prominent themes in recent studies. Research on sustainable interior design highlights the role of window treatments in reducing energy consumption. Thermally efficient curtain fabrics, particularly those with reflective coatings or insulating linings, have been shown to lower heating and cooling demands. Life-cycle assessments of textile products reveal that fiber production, dyeing processes, and transportation significantly contribute to environmental impact. As a result, scholars advocate for the use of eco-friendly materials such as organic cotton, recycled polyester, and low-impact dyes. Additionally, durability and longevity are identified as key sustainability indicators, as longer-lasting fabrics reduce replacement frequency and material waste. This literature positions curtain fabrics as active components in sustainable interior systems rather than passive decorative elements. Another important strand of research addresses the performance of curtain fabrics in different functional contexts. Studies on hospitality and commercial interiors emphasize fire resistance, acoustic control, and maintenance requirements. In healthcare and educational environments, hygienic properties and ease of cleaning are prioritized, leading to a preference for synthetic or treated fabrics with antimicrobial characteristics. These findings reinforce the idea that fabric selection criteria vary significantly depending on building type and usage patterns,



necessitating a context-sensitive, evidence-based approach. Despite the breadth of existing research, several authors point out a gap between scientific knowledge and practical design application. While textile engineers and environmental researchers provide detailed analyses of fabric performance, interior designers often rely on experiential knowledge and visual judgment. This disconnect can result in suboptimal choices that fail to maximize functional and environmental benefits. Recent interdisciplinary studies call for integrative frameworks that translate scientific data into practical guidelines for designers. Such frameworks aim to bridge the gap between theory and practice by combining material science, human factors, and design principles. The reviewed literature demonstrates that the selection of curtain fabrics is a complex process influenced by material properties, structural performance, psychological effects, aesthetic considerations, and sustainability goals. Academic research consistently supports the need for a scientific basis in fabric selection, emphasizing that informed decisions enhance user comfort, energy efficiency, and design quality. However, the literature also reveals the necessity for further analytical studies that synthesize these diverse factors into coherent selection models. This review provides a theoretical foundation for the present study, which seeks to contribute to the development of an evidence-based approach to choosing curtain fabrics in interior design.

Research discussion. The discussion of the research findings on the scientific basis of choosing curtain fabric in interior design requires an integrated interpretation of material science, environmental performance, human perception, and design practice. This section critically analyzes how the theoretical concepts identified in the literature translate into practical design decisions and how curtain fabrics function as active components within interior environments rather than passive decorative elements. The discussion is structured around key thematic dimensions: functional performance, material behavior, psychological and aesthetic impact, sustainability, and implications for professional interior design practice.

One of the central outcomes of this research is the reaffirmation that curtain fabrics must be understood primarily as functional systems. Unlike purely decorative accessories, curtains directly interact with light, heat, sound, and privacy requirements. The findings support the idea that fabric selection significantly influences indoor environmental quality. For instance, the degree of light transmission controlled by curtain fabric affects not only visual comfort but also circadian rhythms and energy consumption. Sheer and semi-sheer fabrics enable daylight harvesting, reducing reliance on artificial lighting, whereas dense blackout fabrics provide precise light control essential for rest and specialized activities. The research discussion highlights that the effectiveness of curtain fabrics depends on their compatibility with spatial orientation and climatic context. In regions with intense solar radiation, fabrics with higher UV resistance and reflective properties demonstrate superior performance by limiting material degradation and reducing heat gain. Conversely, in colder climates, multilayer curtain systems with insulating linings contribute to thermal comfort by minimizing heat loss. These findings confirm that curtain fabrics operate as microclimatic regulators, supporting the argument that their selection should be grounded in building physics rather than aesthetic preference alone.

Material composition emerged as a decisive factor influencing the long-term performance of curtain fabrics. Natural fibers, while aesthetically appealing and environmentally perceived as “warm” and “authentic,” exhibit limitations related to durability, maintenance, and resistance to environmental stressors. The discussion emphasizes that cotton and linen, despite their breathability, may suffer from fading, shrinkage, and sensitivity to moisture if used without protective treatments. Silk, although visually luxurious, presents even greater challenges in terms of UV stability and cost-efficiency. Synthetic fibers, particularly polyester-based fabrics, demonstrate consistent mechanical strength, color fastness, and ease of maintenance. The research discussion suggests that these properties make synthetics particularly suitable for commercial and public interiors where performance reliability outweighs tactile preference. However, the perception of synthetic materials as less “natural” introduces psychological and



aesthetic challenges that must be addressed through advanced textile engineering and surface finishing techniques. Blended fabrics represent a strategic compromise between natural and synthetic materials. The discussion confirms that blends can enhance durability and functional stability while preserving the visual softness and texture associated with natural fibers. This balance is particularly relevant in contemporary interior design, where clients demand both comfort and longevity. The findings underline the importance of understanding fiber behavior at a microscopic level to predict macroscopic performance outcomes in real interior conditions.

Beyond fiber composition, the research highlights the decisive role of fabric structure. Weave type, density, and thickness directly determine how curtain fabrics interact with environmental forces. The discussion reveals that loosely woven fabrics promote light diffusion and visual permeability, contributing to spatial openness and psychological comfort. In contrast, tightly woven and multilayered fabrics enhance acoustic absorption and thermal insulation, making them suitable for noise-sensitive and climate-controlled environments. The discussion also emphasizes the dynamic nature of curtain fabric performance. Unlike static building materials, curtains are adjustable and responsive, allowing users to modify environmental conditions throughout the day. This adaptability positions curtain fabrics as flexible design tools that empower occupants to actively manage comfort. From a scientific perspective, this dynamic behavior increases the functional value of curtains and justifies the need for performance-based selection criteria.

A significant portion of the discussion focuses on the psychological impact of curtain fabrics. The research confirms that fabrics influence emotional responses through color, texture, and light modulation. Soft, translucent materials are associated with calmness and relaxation, while heavy, dark fabrics evoke a sense of security and enclosure. These associations are not merely subjective but are supported by empirical studies in environmental psychology. Color plays a particularly influential role. The discussion notes that warm-toned fabrics enhance perceived warmth and intimacy, which is beneficial in residential and hospitality interiors. Cool-toned fabrics, on the other hand, contribute to a sense of calm and spatial expansion, making them suitable for workspaces and healthcare environments. Importantly, the research highlights that color perception is inseparable from lighting conditions, reinforcing the need for an integrated approach to fabric and lighting design. Texture further contributes to multisensory perception. Matte and soft-textured fabrics are linked to comfort and informality, while glossy or rigid surfaces communicate formality and modernity. The discussion suggests that these perceptual cues influence user behavior and satisfaction, reinforcing the argument that curtain fabric selection should consider human-centered design principles.

From a design theory perspective, the discussion underscores the role of curtain fabrics in shaping spatial identity. Curtains contribute to visual rhythm, balance, and proportion, acting as vertical elements that frame windows and define boundaries. The research findings indicate that fabric weight and pattern scale must correspond to room dimensions and architectural style to achieve visual harmony. Heavy fabrics with pronounced textures can ground large spaces and enhance formality, while lightweight fabrics support minimalist and contemporary interiors. The discussion emphasizes that inappropriate fabric choices can disrupt spatial coherence, either by overpowering the interior or by appearing visually insignificant. Thus, aesthetic decisions should be informed by both scientific understanding and compositional logic.

Sustainability emerges as a critical dimension in the research discussion. Curtain fabrics influence energy efficiency by regulating heat transfer and light usage, positioning them as contributors to sustainable interior design. The discussion highlights that fabrics with thermal linings or reflective coatings can reduce heating and cooling loads, leading to measurable energy savings over time. From a life-cycle perspective, material selection affects environmental impact through resource consumption, manufacturing processes, and end-of-life disposal. The research discussion supports the use of recycled and low-impact materials, emphasizing durability as a



key sustainability criterion. Longer-lasting fabrics reduce replacement frequency, minimizing waste and resource depletion. The discussion also acknowledges the complexity of sustainability evaluation. While natural fibers are often perceived as environmentally friendly, their cultivation and processing may involve significant water and chemical use. Synthetic fibers, although derived from non-renewable resources, may offer superior longevity and recyclability. This nuanced understanding reinforces the need for evidence-based sustainability assessments rather than assumptions based on material origin alone.

The research discussion demonstrates that curtain fabric selection criteria vary across functional contexts. In residential interiors, comfort, aesthetics, and personalization are prioritized. In commercial and public spaces, performance requirements such as fire resistance, acoustic control, and maintenance efficiency become dominant. The discussion confirms that a universal fabric solution is impractical; instead, designers must adopt context-sensitive strategies informed by scientific data. Healthcare and educational environments present unique challenges where hygiene and psychological well-being are critical. The discussion highlights the growing relevance of antimicrobial treatments and easy-to-clean surfaces, aligning fabric selection with health and safety standards. These findings expand the scope of curtain fabric research beyond traditional residential design.

A key contribution of this research lies in addressing the gap between scientific knowledge and design practice. The discussion reveals that while extensive data exists on fabric performance, this information is often inaccessible or underutilized by designers. The research advocates for the development of practical frameworks and guidelines that translate technical data into design-oriented criteria. By integrating material science, environmental psychology, and aesthetic principles, designers can make informed decisions that enhance both performance and visual quality. The discussion emphasizes that such integration requires interdisciplinary collaboration and continuous education within the design profession.

The discussion acknowledges limitations related to the scope of available empirical data and the variability of user preferences. While scientific principles provide a robust foundation, individual perception and cultural context also influence fabric selection. Future research should incorporate experimental studies and user-centered evaluations to validate theoretical models. Additionally, advancements in smart textiles and adaptive materials present new opportunities for curtain fabric innovation. The discussion suggests that future studies explore responsive fabrics capable of dynamically adjusting light transmission and thermal properties, further enhancing interior environmental control.

In synthesis, the research discussion confirms that the selection of curtain fabric in interior design is a multidimensional process that demands scientific rigor and design sensitivity. Curtain fabrics function as environmental moderators, psychological influencers, and aesthetic contributors. A scientifically grounded approach enables designers to predict performance outcomes, enhance user comfort, and support sustainability goals. This discussion reinforces the central argument of the study: curtain fabric selection should be treated as an evidence-based design decision. By integrating functional performance, material behavior, perceptual impact, and environmental responsibility, interior designers can elevate curtains from decorative elements to integral components of high-quality interior environments.

Conclusion. This study has demonstrated that the selection of curtain fabric in interior design is a complex and multidimensional process that extends far beyond decorative considerations. By integrating principles from material science, environmental physics, environmental psychology, and sustainable design, the research confirms that curtain fabrics function as active elements influencing light regulation, thermal comfort, acoustic performance, and human well-being. The findings emphasize that fabric composition, structural characteristics, color, texture, and environmental performance must be evaluated in relation to the functional purpose of a space and its climatic context. Moreover, the study highlights the importance of an



evidence-based approach in bridging the gap between scientific research and design practice. Scientifically informed fabric selection enhances visual harmony, improves user comfort, and contributes to energy efficiency and environmental responsibility. Ultimately, adopting a scientific basis for choosing curtain fabrics enables interior designers to make rational, sustainable, and user-centered decisions, ensuring long-term performance and aesthetic integrity of interior spaces.

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