THE SUBJECTIVITY OF LIGHT EXPERIENCE IN ARCHITECTURAL SPACES

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ABSTRACT

Light experience in architectural spaces extends beyond measurable metrics and is deeply personal. This paper explores the various factors that influence individual light perception, including physiological, psychological, cultural, and emotional elements. While daylighting standards provide guidelines for safety and comfort, they fail to fully address the subjective nature of light experience. This study investigates how different demographic groups, cultural backgrounds, and psychological states shape light perception and proposes adaptable lighting strategies for more inclusive and responsive architectural design. The findings highlight the necessity of human-centered lighting approaches that balance technical precision with individual needs.

KEYWORDS

Light perception, daylighting, architecture, cultural influences, physiological factors, psychological well-being.

RESEARCH QUESTION

How do physiological, psychological, and cultural factors influence individual experiences of light in architectural spaces, and how can architectural design address these subjective differences?

FACTORS INFLUENCING LIGHT PERCEPTION

Light experience in architectural spaces goes beyond measurable metrics—it is deeply personal and shaped by various factors that influence how individuals perceive and respond to their environment. While daylighting standards provide essential guidelines for achieving safety and visual and thermal comfort, they cannot fully account for the realistic subjectivity of light perception (Tregenza and Wilson, 2011). Each person interacts with light differently, influenced by physiological, psychological, cultural, and emotional factors that make their experience unique (Knoop et al., 2020; Reinhart, 2014).

These subjective differences come from a complex connection of factors. For instance, human health is pivotal in shaping how light is perceived. For individuals with sensory sensitivities, such as those with visual impairments or prone to migraines, lighting conditions that others may find pleasant could prove overwhelming or even painful (Boyce et al., 2003). For example, bright lights or harsh contrasts may trigger discomfort or enhance symptoms, making it essential for spaces to offer adaptable lighting solutions to accommodate these sensitivities (Jain, 2017). Conditions like autism, which frequently involve heightened sensory sensitivities, present another layer of complexity. People with autism might find specific light-shadow patterns or intense glare uncomfortable and distressing. This sensitivity necessitates carefully considering how light is distributed within a space, avoiding overly bright or dynamic lighting schemes that could cause discomfort or anxiety (The benefits of Daylight through windows;).

The natural aging process also significantly influences how people see and experience light. As people age, several physiological changes

affect vision, including a decrease in the eye's ability to adapt to varying brightness. Older adults often require higher brightness levels to achieve the same visual clarity as younger individuals, particularly for tasks requiring detailed vision. Additionally, the aging eye becomes less efficient at distinguishing colors due to changes in the lens and retina, which may cause colors to appear less vibrant or more muted levels(Tregenza and Wilson, 2011). This diminished ability to perceive a broad range of colors can make lighting conditions with diverse spectral qualities less effective, necessitating lighting designs that prioritize brightness and contrast to enhance visibility and comfort for older adults (Edwards and Torcellini, 2002; Jain, 2017).

Cultural influences add another layer of complexity to how light is experienced and valued in architectural spaces. These influences are deeply rooted in the historical and environmental contexts in which different societies have developed. Over centuries, communities have adapted to their unique geographical and climatic conditions, shaping their architectural practices and lighting preferences. These culturally ingrained attitudes towards light influence how spaces are designed and how individuals within those cultures perceive and interact with light (Elkadi and Al-Maiyah, 2020).

For instance, architectural designs often focus on controlling the light in societies that have historically lived in regions with intense sunlight, such as Middle Eastern cultures, where intense heat and sunlight are standard. Features such as wooden screens, courtyards with water features, and thick walls are used to create shaded, cool interiors that provide relief from the harsh external environment(Saber, 2019). These design strategies not only enhance comfort but also reflect a cultural understanding of light as a powerful force that must be carefully managed to maintain balance and harmony within living spaces (Baker and Steemers, 2013; Boubekri, 2014).

In contrast, Scandinavian countries, where long, dark winters are a significant part of the climate, strongly emphasize maximizing natural light during the short daylight hours (Morales-Bravo and Navarrete-Hernandez, 2022). Scandinavian design often incorporates large windows, light-colored interiors, and minimalistic spaces to enhance available natural light, creating warm and inviting environments despite the external darkness (Edwards and Torcellini, 2002).

Japanese culture has historically developed architectural practices that prioritize controlled and subdued lighting. Traditional Japanese interiors often feature shoji screens and carefully positioned openings that filter and diffuse light, creating a serene and contemplative atmosphere. Using natural materials like wood and paper further softens the light, fostering a sense of tranquility and harmony with nature. In these contexts, subdued lighting is not merely a functional choice but a cultural expression of aesthetics and values, reflecting a preference for subtlety, introspection, and a close relationship with the natural world (Salve, 2019; Tanizaki, 1977).

These culturally specific approaches to light shape the physical design of spaces and influence how individuals within those cultures experience and interpret light on an emotional and psychological level. The preferences and expectations formed by cultural background can affect how comfortable or satisfied people feel in different lighting conditions.

In addition to the physiological aspects, psychological factors also play a crucial role in how light is experienced. Light has a profound impact on mood, cognition, and overall well-being (Morales-Bravo and Navarrete-Hernandez, 2022). For individuals with mental health conditions such as depression or anxiety, exposure to natural light or light with certain qualities can have therapeutic effects, improving mood and reducing stress. Conversely, insufficient or poor-quality lighting can exacerbate feelings of lethargy or discomfort (Boubekri, 2014; Edwards and Torcellini, 2002). This underscores the importance of designing spaces that meet the functional needs of occupants and consider the psychological effects of light, promoting environments that

foster well-being and positive emotional responses. Bright, warm light can evoke feelings of joy and vitality for some, while others may find it overstimulating (Knoop et al., 2020). How people interpret light is deeply tied to their emotional states, past experiences, and daily routines, making it nearly impossible to design spaces that meet everyone's needs uniformly.

DESIGN STRATEGIES FOR INCLUSIVE LIGHTING

To create spaces that genuinely resonate with their occupants, architects must move beyond quantitative metrics and consider light's qualitative, human-centered dimensions. This means not just focusing on measurable values like illuminance and daylight factor but also understanding how light shapes mood, comfort, and spatial perception. Instead of treating light as a static element, it should be viewed as a dynamic component that adapts to the diverse needs and habits of the people within a space (Barrett, 2009; Knoop et al., 2020).

A practical approach to maximizing space comfort and usability is to create adjustable natural lighting conditions. By incorporating elements such as operable skylights, dynamic louvers, and adjustable shading devices, occupants can modify the amount and direction of daylight entering a space. These solutions are particularly beneficial in multi-use environments where natural light needs vary throughout the day or across activities. For instance, an office could feature adjustable louvers that reduce glare during peak sunlight hours or open fully to maximize daylight during overcast conditions, ensuring comfort and functionality while relying on natural light as the primary source (Lim and Heng, 2016; Lyons and Hamber, 2013).

Another solution lies in designing spaces with multiple lighting zones or options. By incorporating various lighting conditions within a single environment—such as bright, sunlit areas for focus and darker, more subdued corners for relaxation—architects can offer users the flexibility to choose spaces that best suit their moods, activities, or specific tasks (Lam William, 1986). This zoning approach enables spaces to cater to diverse needs within a shared environment, enhancing functionality and the overall user experience. It also allows occupants to personalize their interactions with the space, fostering a greater sense of agency, comfort, and well-being (Cheirchanteri, 2017).

Moreover, this strategy can create dynamic environments that adapt to changing circumstances, such as varying light conditions throughout the day or different activities that occur within the same space. For instance, a library might feature areas with abundant natural light for reading and studying alongside quieter, dimly lit nooks for contemplation or relaxation. Similar zoning can support productivity in offices by offering bright, energized spaces for teamwork and calmer areas for individual focus (Saber, 2019).

However, this approach is not universally feasible, as it can be constrained by factors such as the building's size, location, or budget. Smaller spaces might lack the physical room to accommodate multiple zones. At the same time, specific locations—such as dense urban areas with limited daylight access—may not provide the natural lighting necessary to create these conditions. Budgetary limitations can also restrict the use of advanced lighting systems or design features.

Understanding building users' habits, routines, preferences, and other patterns is also an option. In residential settings, this might mean designing spaces that reflect the individual lighting needs of different family members. For larger public buildings, where individual customization is less feasible, architects should focus on creating inclusive environments that consider shared characteristics among occupants. This might involve accounting for factors such as the average age of users, which can affect visual acuity and lighting needs, or cultural context, which influences how light is perceived and valued (Elkadi and Al-Maiyah, 2020; Lam William, 1986).

While transitional areas like hallways or staircases require less consideration for individual preferences, the quality of light in

environments where people work, learn, or relax directly impacts their comfort, health, and productivity. The importance of tailoring daylighting design to specific functions and user habits becomes even more evident when considering spaces where comfort is key, such as homes, schools, and healthcare facilities. In such environments, providing flexible lighting options not only enhances physical comfort but also supports psychological well-being by allowing occupants to control their surroundings (Boyce et al., 2003). By creating adaptable lighting conditions in these spaces, architects can ensure that natural light not only serves functional purposes but also enhances the overall human experience (Reinhart, 2014).

CONCLUSION

At the core of daylighting design lies an essential understanding: there is no single, universally “perfect” human for whom lighting standards can be uniformly applied. While measurable metrics and guidelines serve as valuable tools, they cannot fully account for the deeply personal and subjective ways in which individuals experience light. Factors such as age, cultural background, personal habits, and even health conditions all influence how light is perceived, making flexibility a crucial element in successful lighting design.

Rather than relying solely on rigid standards, architects have the opportunity to craft spaces that enhance well-being by prioritizing adaptability, observing user behavior, and offering environments that cater to a range of lighting needs. In an era where people spend an increasing amount of time indoors, the role of natural light in shaping both comfort and functionality becomes more significant than ever.

To address these subjective differences, architects can explore various strategies, such as adaptive lighting solutions that allow individuals to modify light conditions, implementing multi-lighting zoning to balance brightness and subdued areas, and adopting a user-centered design approach to ensure inclusivity. These approaches offer potential solutions to accommodate diverse populations and improve well-being in architectural spaces, but their implementation will depend on specific project needs and constraints. Ultimately, by considering these options, architects can contribute to the creation of more responsive and inclusive lighting environments that enhance both functionality and human experience.

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