Individuals Appreciation Vs Thermal And Visual Comfort In An Intermediate Space And How Its Design Impacts Health

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Introduction

Research shows a clear link between the built environment – including aspects like temperature and lighting in buildings – and our overall health and well-being. Local climate can also play a significant role in human health and productivity. This underscores the importance of designing spaces that prioritize occupant comfort.

Architects have a term for zones that blur the line between a building's interior and exterior: intermediate spaces**.** These include areas like entry canopies, foyers, hallways, and stairwells. Unlike fully enclosed areas, these zones are partially open to the outdoors, creating a connection to the external environment.

However, this partial openness presents a challenge. While intermediate spaces offer a connection to nature, they are also more vulnerable to fluctuating weather conditions. This variability in temperature and light can negatively impact occupant health, potentially leading to discomfort.

In this study, we will explore how the design of these intermediate spaces affects the health and well-being of the people who use them.

Methodology

This study examines user experiences with thermal and visual comfort in two residential stairwells located in Arris, Batna City, Algeria. We employ a subjective approach, utilizing a questionnaire-based survey delivered to residents during both winter and summer seasons,

Figure 1: Building 1

Figure 2: Building 2

The stairwells differ in design: Building 1 features vertical bays with openwork, while Building 2 uses clear glass for vertical bays.

The questionnaire explores occupant perception through three sections:

Physical sensation**:** This section gathers data on physical sensations experienced by residents in the stairwell.

Visual and thermal sensation**:** This section investigates how residents perceive temperature and lighting conditions within the stairwell.

Design impact: This section explores how the design elements of each stairwell influence user experience.

Data from each questionnaire section will be processed and visualized using graphs and charts within Microsoft Excel, enabling a comprehensive analysis and comparison of resident experiences in the two stairwell designs

Results

The survey achieved a response with 130 participants: 46% male and 54% female.

Part 1: physical sensation

Thermal comfort

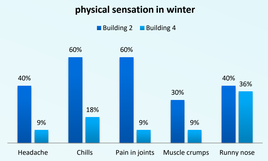

Figure 3: physical sensation in Winter

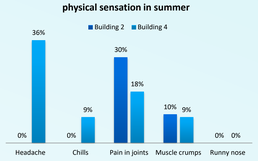

Figure 4: physical sensation in summer

The survey results suggest that residents experienced more discomfort in Building 1, which features an openwork design in the stairwell. This finding aligns with the idea that openwork allows for greater penetration of cold air in winter, potentially impacting thermal adaptation and leading to feelings of discomfort.

The survey results suggest a trend where residents in Building 2 (with clear glass bays) reported higher discomfort levels in summer compared to Building 1 (with openwork bays). This initial finding indicates that openwork designs might be more favorable for thermal comfort during summer.

Visual comfort

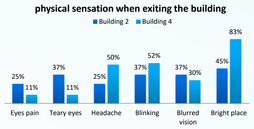

Figure 5: physical sensation when exiting the building

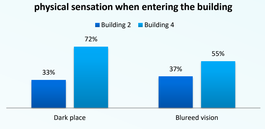

Figure 6: physical sensation when entering the building

The survey results show that residents in both buildings experienced similar levels of physiological symptoms related to visual discomfort when entering or exiting the stairwell. This suggests that neither stairwell design may be effectively providing the necessary conditions for visual adaptation between the building interior and exterior.

Residents in Building 1 reported the visual discomfort upon entering the stairwell, suggesting a potential issue with visual adaptation.

Part 2: Thermal and visual sensation

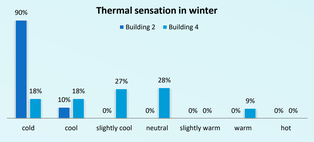

Figure 7: Thermal sensation in winter

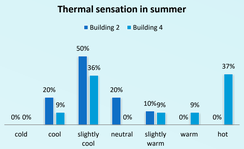

Figure 8: Thermal sensation in summer

The survey results for winter suggest a trend in occupant thermal sensation. Building 1 (featuring openwork vertical bays) had the highest percentage of occupants reporting a cold sensation. Conversely, Building 2 (with clear glass bays) had the highest percentage reporting a neutral sensation.

This initial finding indicates that clear glass bays might offer a more comfortable thermal environment in winter compared to openwork bays. While unexpected, it's possible that clear glass allows for some passive solar heat gain, potentially mitigating the cold exterior temperature.

The survey results for summer comfort reveal an interesting trend. Building 1 (with openwork vertical bays) had the highest percentage of occupants reporting a slightly cool sensation in the stairwell. In contrast, Building 2 (with clear glass bays) had the highest percentage reporting feeling hot.

This initial finding suggests that openwork designs might provide a more favorable thermal environment during summer. Openwork bays allow for greater air circulation and potentially reduce heat gain from the sun compared to clear glass.

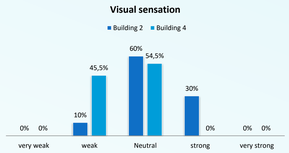

Figure 9: Visual sensation

The survey results on lighting conditions in the stairwells revealed a neutral majority across both buildings.

Part 3: Design impact

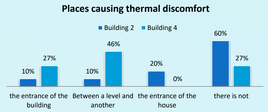

Figure 10: Places causing thermal discomfort

Figure 11: Places causing visual discomfort

Building 1 (openwork bays): The highest percentage of residents reported no specific location within the stairwell causing them thermal discomfort. This suggests that most residents find the overall thermal environment in Building 1's stairwell acceptable.

Building 2 (clear glass bays): While some residents in Building 2 also reported no discomfort, the highest percentage identified experiencing thermal discomfort when moving between levels. This could indicate potential issues with temperature variations at these transition points.

Building 1 (openwork bays): most residents identified the building entrance as the most problematic area. This suggests a potential issue with the transition from outdoor light levels to the stairwell environment in Building 1.

· Building 2 (clear glass bays): In contrast, a higher percentage of residents in Building 2 reported no visual discomfort overall. However, for those who did experience discomfort, the entrance was also the second most frequent location mentioned.

The survey results revealed an interesting discrepancy. While some residents reported experiencing thermal and visual discomfort in the stairwells, a significant percentage indicated no specific area causing discomfort. This finding suggests that some residents might be adapting to the stairwell conditions over time, leading to reduced discomfort.

Conclusion

While both designs have merits, the findings suggest that openwork bays might be more favorable for summer comfort due to ventilation, while clear glass might offer a slight advantage in retaining heat during winter.

Recommendations

- Consider a combination of design elements. For example, openwork bays could be used in combination with strategic use of clear glass panels to maximize both ventilation and heat gain.
- Addressing the light level transition at the entrance seems crucial for improving visual comfort in both buildings. This could involve adding vestibules or implementing shading elements.
- Further research is recommended to explore the long-term impact of these design elements on energy consumption and occupant comfort throughout the year.

References

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