Risk Mitigation Strategies in Residential Interior Selection: A Literature Review for Healthy and Safe Housing

Candra Christianti Purnomo[1], Prestasi Aswinda Zebua[2], Stepanus Andi Saputra[3]

[1,2] *Civil Engineering Department, Faculty of Engineering, Christian University of Indonesia*
[3] *Architecture Department, Faculty of Engineering, Christian University of Indonesia*

ABSTRACT : *This study highlights the importance of residential interior selection that goes beyond aesthetics and incorporates considerations of occupant health, comfort, and safety. Elements such as lighting quality, material selection, furniture layout, and spatial conditions significantly influence both physical and psychological risks within a home environment. Appropriate lighting enhances visual comfort and emotional well-being, while well-planned spatial layouts help reduce the likelihood of domestic accidents. Moreover, interior design that integrates ergonomic and safety principles contributes to creating a more adaptive, user-friendly, and sustainable living environment. Through a literature study approach based on various research findings, this study formulates holistic risk mitigation strategies that serve as guidelines for achieving healthy and safe residential interiors. The results emphasize that interior design should be understood as a crucial component in improving quality of life, rather than merely a decorative element.*
Keywords: risk mitigation; interior design; healthy housing; ergonomics; residential safety; occupant comfort.

KEYWORDS : *Risk Mitigation; Interior Design; Healthy Housing; Ergonomics; Residential Safety; Occupant*

I. INTRODUCTION

Interior design in residential environments serves not only as a means of enhancing visual appeal but also as a critical determinant of occupant health, safety, comfort, and psychological well-being. A growing body of research has demonstrated that elements such as lighting quality, material selection, indoor air conditions, spatial configuration, and furniture layout significantly influence both physical and psychological risks within a home. Poor lighting, inappropriate material choices, and inefficient spatial planning may lead to domestic accidents, reduced comfort, health disturbances, and increased psychological stress. Despite these findings, many homeowners still prioritize aesthetics without fully considering the potential hazards associated with improper interior design decisions.

Previous studies have explored the relationship between interior conditions and occupant safety, including issues such as slipping and falling hazards, exposure to toxic materials, inadequate ventilation, insufficient illumination, and poor spatial circulation that disrupts accessibility and mobility. Research has also highlighted the psychological impacts of interior environments such as how color schemes, lighting intensity, thermal comfort, and room atmosphere affect emotion, stress levels, and overall mental well-being. However, comprehensive frameworks that integrate physical, health-related, psychological, and sustainability risks into a unified mitigation strategy remain limited in the existing literature. In response to this

gap, this study develops holistic risk mitigation strategies for residential interior environments through a comprehensive literature review. The objective is to identify key interior-related risk factors and propose integrated guidelines that address physical safety, occupant health, psychological comfort, and sustainable design principles. This paper contributes by offering a unified risk mitigation framework that can serve as a practical reference for interior designers, architects, construction professionals, and homeowners. Through the synthesis of various research findings, the study reinforces the view that interior design is not merely decorative but a strategic component for enhancing quality of life, minimizing hazards, and supporting long-term well-being in residential spaces.

II. LITERATUR REVIEW

2.1 Physical Risks in Residential Interiors

Physical risks in residential interiors are closely associated with unsafe circulation paths, inadequate lighting, and poorly arranged furniture[1]. Epidemiological studies indicate that unstructured pathways and uneven floor surfaces significantly increase the likelihood of slips, trips, and falls in domestic settings [2]. Additional evidence shows that improper surface materials and cluttered layouts contribute to higher injury rates within households [3]. These findings underscore the need for interior planning that ensures safety, clear movement flow, and hazard-free spatial configurations.

2.2 Health-Related Risks from Interior Materials

Material selection plays a critical role in determining indoor environmental quality and occupant health[4]. Research shows that certain furniture finishes and synthetic materials may release harmful chemical emissions, contributing to long-term respiratory and physiological discomfor[5]. High-VOC materials, resin-based finishes, and non-standard flame retardants pose particular risks due to their potential to degrade indoor air quality[6]. These studies highlight the importance of using safe, low-emission materials to reduce health hazards in residential interiors.[7]

2.3 Psychological Impacts of Interior Environments

Psychological responses to interior environments are influenced by lighting quality, color schemes, and sensory condition[1]s. Studies report that inappropriate lighting temperature or visually overstimulating color combinations may trigger stress, discomfort, or emotional instability [8]. Meanwhile, balanced lighting design and calming color choices have been associated with improved mood, mental clarity, and overall emotional well-being [9][10]. These findings reinforce the importance of psychological considerations in designing interior spaces that support comfort and mental health.[11]

III. RESEARCH METHODOLOGY

This study employs a literature review method to identify and analyze risk factors associated with residential interior environments. The research process consisted of collecting, selecting, and reviewing scientific articles, books, and related publications that discuss physical risks, health-related impacts, psychological effects, and sustainable design considerations in interior settings. Sources were obtained from reputable digital databases and screened based on relevance, publication quality, and alignment with the study's objectives. Each selected study was examined to extract key findings, methodological approaches, and recommendations related to risk mitigation in interior design.

The collected literature was then categorized into four thematic groups: physical risks, health risks, psychological impacts, and sustainability considerations. These categories guided the synthesis process, enabling the identification of patterns, challenges, and gaps within the existing research. The synthesis results were used to formulate an integrated risk mitigation framework that addresses safety, health, comfort, and environmental aspects in residential interiors. This methodological approach ensures that the findings are grounded in established research and reflect a comprehensive understanding of risk-related interior design issues.

IV. RESULT AND DISCUSSION

4.1 Identification of Key Interior-Related Risk

The literature review identifies four primary categories of risks present in residential interior environments: physical, health-related, psychological, and sustainability risks. Physical risks commonly stem from inadequate spatial organization, insufficient lighting, slippery flooring, and obstructed circulation pathways. Health-related risks are closely associated with the use of high-VOC materials, synthetic surface finishes, and poor indoor air ventilation. Psychological risks arise from improper lighting temperatures, overstimulating color schemes, and overly cluttered room conditions. Collectively, these findings illustrate that interior design decisions carry significant implications for occupant safety, comfort, and emotional well-being.

4.2 Factors Contributing to Interior Hazards

Multiple contributing factors were identified across the reviewed studies. Unsuitable material selections may release chemical pollutants that degrade indoor air quality. Inadequate lighting—whether excessively dim or overly harsh—reduces visibility and may disrupt emotional stability. Poorly arranged furniture layouts can restrict movement, increasing the likelihood of slips and falls, particularly among children, older adults, and individuals with limited mobility. Furthermore, interiors that do not apply ergonomic principles may lead to prolonged discomfort and musculoskeletal strain. Overall, these contributing factors highlight the critical importance of comprehensive and integrated interior planning in residential settings.

4.3 Impacts on Occupant Health and Well-Being

Findings indicate that interior-related risks have measurable impacts on physical health, such as respiratory irritation, headaches, and increased accident rates. Psychological impacts include heightened stress, reduced concentration, and emotional discomfort caused by inadequate environmental conditions. Poor spatial quality also contributes to fatigue and decreased productivity within the home environment. These effects demonstrate that interior design should be approached as a holistic discipline that influences both the body and mind, rather than merely visual aesthetics.

4.4 Recommended Risk Mitigation Strategies

The synthesis of literature suggests several strategies to mitigate interior-related risks. For physical safety, improving lighting distribution, ensuring clear circulation paths, and using non-slip materials are essential. For health-related risks, adopting low-VOC materials, increasing natural ventilation, and selecting certified safe finishes are recommended. Psychological comfort can be enhanced through balanced lighting, calming color schemes, and decluttered spatial arrangements. Incorporating ergonomic furniture, sustainable materials, and energy-efficient lighting further supports long-term well-being and environmental responsibility. These strategies collectively form a holistic framework for safer and healthier residential interiors

V. Conclusion

This study offers a comprehensive understanding of risk factors in residential interior environments by integrating physical, health-related, psychological, and sustainability considerations into a unified mitigation framework. The findings highlight the strategic role of interior design in enhancing occupant safety, comfort, and well-being, beyond its decorative function. However, the study is limited by its reliance on secondary data, as it does not include field observations or empirical testing. Future research could strengthen the applicability of these strategies through case studies or on-site evaluations. Despite these limitations, the proposed recommendations provide practical guidance for designers, architects, and homeowners in creating safer and more sustainable living environments, while also opening pathways for further exploration into adaptive and environmentally responsible interior design solutions.

REFERENCES

[1] A. Wierzbicka *et al.*, "Healthy indoor environments: The need for a holistic approach," *Int. J. Environ. Res. Public Health*, vol. 15, no. 9, 2018, doi: 10.3390/ijerph15091874.

[2] Woalder and M. Mary K. Tripp, PhD, "乳鼠心肌提取 HHS Public Access," *Physiol. Behav.*, vol. 176, no. 1, pp. 139–148, 2017, doi: 10.1080/02763893.2012.673382.Assessing.

[3] A. Davis, P. B. Ryan, J. A. Cohen, D. Harris, and M. Black, "Chemical exposures from upholstered furniture with various flame retardant technologies," *Indoor Air*, vol. 31, no. 5, pp. 1473–1483, 2021, doi: 10.1111/ina.12805.

[4] M. T. Baeza_Romero *et al.*, "A review of critical residential buildings parameters and activities when investigating indoor air quality and pollutants," *Indoor Air*, vol. 32, no. 11, pp. 1–16, 2022, doi: 10.1111/ina.13144.

[5] S. Lee, "Falls associated with indoor and outdoor environmental hazards among community-dwelling older adults between men and women," *BMC Geriatr.*, vol. 21, no. 1, pp. 1–12, 2021, doi: 10.1186/s12877-021-02499-x.

[6] I. Senitkova, "Impact of indoor surface material on perceived air quality," *Mater. Sci. Eng. C*, vol. 36, no. 1, pp. 1–6, 2014, doi: 10.1016/j.msec.2013.11.032.

[7] N. S. Hayatthien and S. S. M. Wardhana, "Pengaruh Psikologis Pencahayaan Buatan pada Interior Kamar Tidur Anak," *Indo-MathEdu Intellectuals J.*, vol. 4, no. 3, pp. 1717–1723, 2023, doi: 10.54373/imeij.v4i3.413.

[8] J. Zhao, Y. Nagai, W. Gao, T. Shen, and Y. Fan, "The Effects of Interior Materials on the Restorativeness of Home Environments," *Int. J. Environ. Res. Public Health*, vol. 20, no. 14, 2023, doi: 10.3390/ijerph20146364.

[9] M. S. Mohsen and R. Matarneh, "Exploring the Interior Designers' Attitudes toward Sustainable Interior Design Practices: The Case of Jordan," *Sustain.*, vol. 15, no. 19, 2023, doi: 10.3390/su151914491.

[10] T. Alapieti, R. Mikkola, P. Pasanen, and H. Salonen, "The influence of wooden interior materials on indoor environment: a review," *Eur. J. Wood Wood Prod.*, vol. 78, no. 4, pp. 617–634, 2020, doi: 10.1007/s00107-020-01532-x.

[11] M. M. Reham and M. Eldin, "Sustainable Interior Design for Homes," *Indian J. Sci. Technol.*, vol. 10, no. 15, pp. 1–9, 2017, doi: 10.17485/ijst/2017/v10i15/113828.