

The Dynamics of Comfort and Awareness in Terrace House Renovations

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ABSTRACT

House renovation is a common practice in Malaysia as homeowners modify their houses to meet changing family needs, lifestyle preferences, and aspirations for more attractive and luxurious living spaces. Despite their spatial limitations, terrace houses remain the most common housing type in mass residential developments. However, comfort-related factors are often overlooked during renovation works, affecting the physical, psychological, and environmental well-being of occupants. This study investigates the relationship between occupants' awareness of comfort and the factors influencing comfort in post-renovation terrace houses. The objectives are to evaluate occupants' awareness of comfort, to identify the key aspects that contribute to comfort in post-renovation environments, and to examine the relationship between comfort awareness and perceived comfort factors. Primary data were collected through questionnaire surveys conducted at Rancangan Perumahan Rakyat (RPR) Fasa 2, Jalan Astana, Kuching. SPSS and Microsoft Excel were utilised to facilitate data processing and statistical computations. The findings show that "Adequate Natural Lighting" recorded the highest Relative Importance Index (RII) value of 0.838, indicating a high level of occupant awareness regarding its contribution to comfort. This was followed by "Ventilation" with an RII value of 0.832. Among the comfort aspects assessed, "Movement" ranked highest, while "Functionality" and "Thermal Comfort" shared the second-highest RII value of 0.820. Chi-square analysis revealed a strong and statistically significant relationship between occupants' awareness levels and the factors influencing comfort in post-renovation environments. The findings provide valuable insights for housing developers, designers, and policymakers in addressing future spatial and comfort requirements in terrace housing developments. The study also supports affordable housing agencies in incorporating personalisation features into future housing designs, in line with the first objective of Malaysia's National Housing Policy to provide quality and affordable homes for all.

Keywords: *Comfort, Terrace Houses, Renovation, Personalisation*

INTRODUCTION

Renovation in this research means modifying or adding spatial arrangements, such as the building's front, back, or side. It is common in Malaysia for renovation to be carried out for personalisation, in order to cater to growing families and social needs; where improper renovation may lead to health and technical issues, especially for terrace houses. According to (Omar *et al.*, 2016), the spatial arrangement for terrace homes in Malaysia has mostly stayed the same; the cross ventilation is blocked by the additional partition constructed within the narrow, deep space of the terrace, which can cause severe respiratory diseases. The standardised renovations may not be feasible as the perceived comfort consists of multifaceted aspects, which are dynamic and vary from one to another. Poor and improper renovation strategies may lead to discomfort or even worsen problems such as stress and disease. People spend 65% of their time at home, thus it is crucial to ensure that the building performs well to maintain the occupant's health and wellbeing (Andargie *et al.*, 2019). Occupants uncomfortable with their overall environment reported much lower self-estimated performance than those who felt comfortable with their overall environment (Wargocki *et al.*, 2012).

In recent times, the concept of comfort has become increasingly significant in the renovation of these buildings. Spatial comfort, in the context of residential architecture, encompasses not only the physical dimensions and layout of living spaces but also the psychological and emotional well-being of the inhabitants (Altman & Chemers, 1980). Despite its importance, the incorporation of spatial comfort into the renovation of terrace houses remains under-explored and under-theorised in architectural and urban planning literature. One of the critical factors influencing spatial comfort is architectural design; including elements such as natural lighting, ventilation, and the functional use of space. Studies have shown that natural lighting and ventilation significantly impact the occupants' comfort and well-being (Raji *et al.*, 2019). Moreover, the functional use of space, which involves efficient and practical layout of interior spaces, plays a crucial role in the perception of comfort and ease of living (Hassanain & Mahroos, 2023). Material usage in renovations also affects spatial comfort whereby the choice of materials can influence thermal comfort, acoustics, and the overall aesthetic appeal of the living space. Research indicates that materials that enhance thermal insulation and reduce noise pollution contribute positively to the inhabitants' comfort levels (Zeng *et al.*, 2022).

Another aspect worth exploring is the residents' awareness and perception of spatial comfort. This involves understanding how residents perceive changes made during renovations and whether these changes align with their expectations and need for comfort. It is essential to investigate the gap between the architects' or renovators' intentions and the residents' actual experience of the renovated space (Loiseau *et al.*, 2022). Furthermore, cultural and social factors play a significant role in the perception of comfort. Different cultures and societies have varied norms and expectations regarding living spaces, which can influence residents' satisfaction with their living environments (Rapoport, 1982). It is crucial to consider these cultural nuances when renovating terrace houses, especially in diverse urban settings. The anticipated outcome of this study is to offer valuable insights for architects, urban planners, and policymakers. These insights will contribute to developing guidelines and best practices for future renovations of terrace houses, ensuring that they not only meet the functional requirements, but also enhance the comfort of the inhabitants. The renovation of terrace houses presents an opportunity to significantly improve the quality of living spaces in urban environments. By focusing on comfort and taking into account the various influencing factors and the inhabitants' awareness, this study will be beneficial to bridge the gap between

renovation practices and the actual needs and preferences of the residents. It is crucial for the industry to evaluate awareness levels and the important aspects in comfort perception for inhabitants, in order to foreplan and educate inhabitants prior to renovation work.

MATERIALS AND METHODS

The selection of an appropriate research approach is pivotal in ensuring the successful attainment of research objectives. For this study, a quantitative research approach was deemed most fitting. Quantitative research involves the systematic empirical investigation of observable phenomena through statistical, mathematical, or computational techniques. It aims to quantify and analyse data to uncover patterns, relationships, and trends. In the context of quantitative research, various statistical methods and measurement tools are utilised to ensure reliability and validity of the findings. Cronbach's Alpha is a widely used measure of internal consistency reliability in quantitative research. It assesses the extent to which items in a scale or questionnaire are interrelated. Studies such as those by Fallahzadeh *et al.* (2019); Hu *et al.* (2020) and Wyk (2019) have utilised Cronbach's alpha to evaluate the internal consistency of measurement instruments, demonstrating its significance in ensuring the reliability of research instruments.

Likert scales are frequently employed in quantitative research to measure attitudes, perceptions, and opinions. They allow respondents to indicate their level of agreement or disagreement with a series of statements. Studies such as those by Ramírez-Carvajal *et al.* (2022); Lexis *et al.* (2023) and Mulyaningrum and Kusumanungrum (2022) have utilised Likert scales to gather quantitative data, highlighting their widespread use in various research domains. The Relative Importance Index (RII) is another quantitative method used to assess the significance of factors rated on Likert scales. It allows for the prioritisation of indicators based on respondents' ratings. Studies such as those by Hoy (2010) have employed the RII method, demonstrating its utility in determining the relative importance of factors or criteria in quantitative research. In identifying the correlation between the inhabitant's awareness level and the essential aspects of perceived comfort in a post-renovation environment, the Chi-Square test was deployed. The Chi-Square test is a statistical method used to determine if there is a significant association between categorical variables. It is a non-parametric test, meaning it does not make any assumptions about the distribution of the data (McHugh, 2013). It is particularly useful for analysing nominal and ordinal data in the form of frequencies (Buckalew & Pearson, 1982).

RESULTS AND DISCUSSION

In this research, Cronbach's Alpha reliability test was carried out in SPSS and the result is 0.832 (TABLE 1) which falls within the range of Very Reliable as shown in TABLE 2.

TABLE 1. Reliability Statistic (SPSS)

Cronbach's Alpha	N of Items
832	30

TABLE 2. Cronbach's Alpha Level of Reliability

<i>Cronbach's Alpha Score</i>	<i>Level of Reliability</i>
0.0 – 0.20	Less Reliable
> 0.20 – 0.40	Rather Reliable
> 0.40 – 0.60	Quite Reliable
> 0.60 – 0.80	Reliable
> 0.80 – 1.00	Very Reliable

The demographic survey findings shed light on a population residing in the surveyed area and highlight a significant number of retired or non-working individuals within this demographic group. Furthermore, it showcases the prevalence of long-term residents who have chosen to undergo moderate scale renovations in their homes. In assessing the awareness level of inhabitants towards comfort as tabulated in TABLE 3, "Adequate Natural Lighting" leads other variables with an RII value of 0.838 indicating that the inhabitants are aware of the important aspect of natural lighting in house renovation.

Closely following is the factor of "Ventilation" with an RII value of 0.832, which reflects the importance of proper ventilation. "Thermal Comfort" ranks third, with an RII value of 0.820 indicating that individuals are highly aware of the importance of maintaining temperature in their living space. The factors "Movement", "Space Dimension", and "Functionality" hold lower positions with RII values of 0.813, 0.807, and 0.804 respectively. These factors also significantly contribute to inhabitant's awareness of comfort highlighting the importance of maintaining movement within the space, spaciousness, and space functionality.

Based on RII values in TABLE 4, the top ranked essential aspect that factors towards perceived comfort in post-renovation environments is "Movement" with an RII value of 0.83. This indicates that the ease of movement within the environment is important in shaping how comfortable inhabitants feel in post-renovations. The factor of "Functionality" and "Thermal Comfort" shared the same RII value of 0.82 which signifies its impact on comfort.

TABLE 3. Table of Relative Important Index (RII) on Level of Awareness Toward Comfort

	Not Important	Very Important	Not Important	Neutral	Important	Very Important	Total	AN	RII	Rank
Natural Lighting	0	0	0	57	212	200	469	560	0.838	1
Proper Ventilati	0	0	2	72	172	220	466	560	0.832	2
Thermal Comfort	0	0	0	78	196	185	459	560	0.820	3
Movement	0	0	0	90	180	185	455	560	0.813	4
Space Dimensio	0	0	0	75	232	145	452	560	0.807	5
Functionality	0	0	2	84	204	160	450	560	0.804	6

“Ventilation” holds positions with an RII value of 0.81 emphasising the importance of ventilation in creating an environment. Both "Natural Lighting" and "Space Dimension" have a respective value of 0.80. These dimensions underscore how crucial lighting and spatial considerations are in influencing comfort levels.

TABLE 4. Table of Relative Important Index (RII) on the Essential Aspect of Comfort in the Post-Renovation

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total	AN	RII	Rank
Movement	0	0	66	216	180	462	560	0.83	1
Functionality	0	0	72	208	180	460	560	0.82	2
Thermal Comfort	1	4	54	220	180	459	560	0.82	2
Ventilation	0	4	81	192	175	452	560	0.81	3
Natural Lighting	0	4	81	204	160	449	560	0.80	4
Space Dimension	0	0	96	192	160	448	560	0.80	4

In probing the correlations, the P-values of “<.001” obtained from square statistics as represented in TABLE 5 is extremely low and highly significant indicating that this association is not simply due to chance. When we consider the concepts of "The Awareness Level of Inhabitants Towards Comfort” and “The Essential Aspects That Perceived Comfort of The Inhabitants in Post-Renovation Environment” these findings suggest that the awareness level of inhabitants toward comfort has an impact on how comfortable occupants feel in their post-renovation surroundings. The obtained P-values from the Chi Square tests, provide evidence

of a relationship which reflects that the more residents are aware of comfort-related factors, the more it influences their assessment of comfort in the home.

These findings have implications for both homeowners and professionals involved in house renovations. For homeowners, it highlights the importance of considering comfort factors when planning and carrying out renovation projects. Being mindful of these factors can lead to levels of renovation comfort. For professionals in the renovation industry, these results emphasise the need to incorporate considerations for comfort into their projects. Figure 1 provides evidence that having an approach which is aware of comfort factors can greatly enhance the inhabitant's overall satisfaction with their post-renovation living environment. It helps to bridge the divide between how aware people are of the actual elements of comfort, illuminating the way these factors are interconnected when it comes to renovating houses. These discoveries contribute to an understanding of the factors that affect post-renovation comfort, which ultimately benefits homeowners and professionals involved in renovations as they strive to create cozy living spaces.

TABLE 5. Chi-Square Test Result

	Value	df	Asymptotic Significance (2sided)
Chi-Square	26.205 ^a	4	<.001
Likelihood Ratio	24.626	4	<.001
Linear-by-Linear Association	21.150	1	<.001
N of Valid Cases	112		

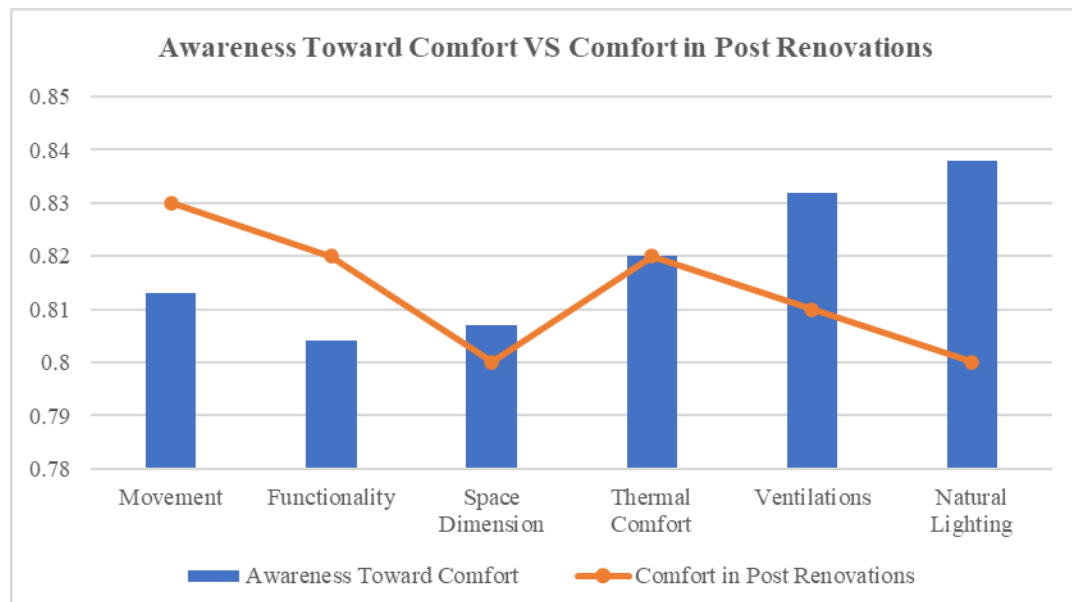


FIGURE 1. Awareness vs Comfort (Ranked in RII)

CONCLUSION

The homeowners should integrate, prioritise, and enhance natural lighting and ventilation in renovation projects to create a sense of comfort and well-being in their living spaces. Ease of movement and functionality of space are pivotal in post-renovation to ensure occupants' comfort and accessibility for individuals of all abilities. Homeowners should ensure that renovations do not impede movement and maintain functionality of spaces. It is also recommended for house owners to incorporate efficient cooling systems which can significantly impact the thermal comfort of the living space, further improving energy usage and reducing utility costs. Professionals in the renovation industry should emphasise comfort factors in design, with a keen focus on the key factors identified that are natural lighting, ventilation, and thermal comfort. This is to ensure a comfortable and enjoyable living experience for the occupants. Effective communication about the importance of these comfort factors can enhance homeowner satisfaction. Professionals should educate homeowners about the impact of each factor on overall comfort. The integration of holistic comfort also needs to be considered beyond the physical aspects, such as the psychological comfort that arises from a well-planned space, ensuring the renovation caters to the inhabitants' overall wellbeing.

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