FARU FACULTY OF ARCHITECTURE RESEARCH UNIT
UNIVERSITY OF MORATUWA, SRI LANKA

FARU 2022 – 15TH INTERNATIONAL RESEARCH CONFERENCE
www.faru.uom.lk

Independence and Interdependence of
Sustainable Spaces

APARTMENT DESIGN FOR SENSE OF WELLBEING
A Case Study of Apartment dwellers during the Pandemic in Sri Lanka

SENEVIRATNE, T.T.A.[1*] & COOREY, S.B.A[2]
[1, 2] University of Moratuwa, Moratuwa, Sri Lanka
[1]thanoshi2@gmail.com, [2]scoorey@uom.lk

Abstract: The impact of Apartment Design on the well-being of occupants has become even more critical during the time of the Covid-19 Pandemic. This health crisis is emphasizing the need for resilient built form, especially in the field of housing. Unlike standalone housing, communal housing in the form of high-rise apartments pose many challenges to the lifestyle and the sense of well-being of residents during a pandemic. Lockdowns, social isolation, and quarantine have an adverse impact on the physical, social, and mental well-being of apartment dwellers. This study aims to explore the sense of well-being, their adaptations, and resilience to living in apartments during the Covid-19 pandemic, through a case study of an upper-middle-income apartment complex in Sri Lanka. Primary data on respondents' perceptions, lifestyle during the pandemic, and the challenges to their well-being are explored via online surveys among 38 respondents. Secondary data on the apartment design features are explored via observations and document analysis. Both descriptive statistics and content analysis is conducted to explore the quantitative and qualitative data respectively. Findings reveal apartment design considerations for more resilient and adaptable dwellings in the face of a pandemic, to address the sense of well-being of its dwellers.

Keywords: *Resilience; Adaptable; Apartment Dwellers; Sense of Wellbeing; Covid 19 Pandemic*

1. Introduction

"Home" is the most important architectural space for any individual to instinctively relate physically and psychologically. It is the haven of ultimate freedom to feel at rest, a space for privacy, intimacy, imagination, the place a person belongs and be accepted. (Bachelard, 1994; Rapoport, 1969) The relationship between "house and its dwellers" is given much significance in numerous architectural literature over the years. The terms "health" and "happiness" has often been regarded as factors that can be largely impactful in the relationship between the home and its occupants. (Botton, 2006; Channon, 2018; Seligman, 2012) In the recent decade, this is being collectively identified as "sense of well-being" which implies the physical, psychological, and social impact on occupants living in their residential spaces. (Diener, 2009; Seligman, 2012)

The impact of Apartment Design on the well-being of occupants has become even more critical during the time of the Covid-19 Pandemic. This health crisis is raising awareness, emphasizing the need for resilient built form, especially in the field of housing. Unlike standalone housing, communal housing in the form of mid-rise or high-rise apartments pose many challenges to the lifestyle, activity, and hence the sense of well-being of residents during a pandemic. Lockdowns, social isolation, work from home, and quarantine has adverse impact on the physical, social and mental well-being of apartment dwellers. The use of common spaces, circulation spaces, and social interactions are also adversely affected due to the fear of the spread of disease and high levels of health risks in communal living during the pandemic. (D'alessandro et al., 2020; Peters & Halleran, 2021; Zarrabi et al., 2021)

The purpose of this study is to explore the sense of well-being, the adaptations, and resilience to living in apartments during the covid 19 pandemic, through a case study of an upper-middle-income apartment complex in Colombo, Sri Lanka.

2. Well-Being, Mass Housing, and the Pandemic

2.1. SENSE OF WELL-BEING

The term well-being has been interpreted in numerous ways throughout history since the era of Ancient Greece. It is

*Corresponding author: Tel: +94 776959968 Email Address: thanoshi2@gmail.com
DOI: https://doi.org/10.31705/FARU.2022.17

the origins of philosophy that mark the beginning of research on "the good life" and ways to define it. In terms of **defining** and **measuring** well-being remains to be questioned, criticized, and researched repeatedly since the works of Aristotle to the present day. This is because of the "multifaceted nature of well-being" and the possibility to be interpreted differently in many fields of study.

"Well-being is intangible, difficult to define, and even harder to measure" (Thomas, 2009, p.11).

"well-being; a complex, multifaceted construct that has continued to elude research attempts to define and measure" (Pollard & Lee, 2003)

However, the term "well-being" is commonly used to describe the state of people's lives. The World Health Organization (WHO) has described well-being as "a state of complete Physical, Mental and Social Well-being and not merely the absence of disease or infirmity." (Nakane et al., 1999) Most of the time, well-being refers to positive emotions like feeling good, happiness, contentment, functioning well, having positive relationships, and having control in life with a sense of purpose. This indicates that well-being is measured in comparison to ill-being.

The importance of well-being is highlighted due to its association with the success in professional, personal, and interpersonal lives of people, higher productivity, creativity, active learning, and being socially active and fostering positive relationships. Moreover, research suggests that well-being in childhood affects well-being in adulthood (Diener, 2009). And of course, higher levels of happiness and well-being instinctively connect for positive outcomes, like improved physical health and lifespan, improved individual work performance, and higher levels of life satisfaction.

Well-being is often seen in two perspectives, one is from a subjective point that addresses well-being from a moral-psychological aspect, and the other is from an objective point that elaborates on a socio-economic aspect. This study is focused on **Subjective Well-being**, assessing the perception and satisfaction of apartment dwellers. Subjective well-being refers to cognitive judgments, self-reports, and affective experiences. Throughout this literature study, it was noticed that the terms Pleasure, Happiness, Quality of life, and Life satisfaction have often been used interchangeably; and most studies tend to group these terms and refer to them as "Subjective Well-being". Subjective well-being is known to be the scientific term for happiness in the field of research. The term Subjective Well-being (SWB) was first coined by Ed Diener, (1984)who is also the founder of the Tripartite model of Subjective Well-being, which defines three components of SWB; Life satisfaction, Positive affect, and Negative affect. This means a person with higher levels of life satisfaction along with high positive effects and low negative effects has high levels of SWB.

2.2. SENSE OF WELL-BEING IN MULTISTOREY HOUSING DURING A HEALTH CRISIS

There are both advantages and disadvantages of Vertical living, which outlines a significant lifestyle: a form of communal living. Supportive amenities like swimming pools, gardens, jogging track, gym, recreational spaces, rooftops, etc. available along with housing units are plus points, but such facilities may vary across different apartments based on the income group, location, and other constraints. Further features like accessibility, maintenance, storage, parking facility and security ease the experience of apartment living. (Prathapasinghe et al., 2018) However, there are many challenges in living in apartments as well, especially in a country like Sri Lanka, as traditionally Sri Lankans are used to living in detached houses with their own garden and boundary. In the case of most middle-income and low-income apartments, facilities are lacking, with minimal recreational spaces, gardens, open spaces, light, ventilation, and views. Living in a compact limited space is also challenging due to limited direct contact to the ground level, less ability for personalization, freedom, and free will which is compromised, and bound by the rules and guidelines of the management, lack of privacy, and noise. Well-being could be easily threatened in this type of housing and factors like lighting, ventilation, thermal comfort, acoustics and privacy are much important and need to be planned favorably for the residents. (Foster et al., 2019)

Subjective well-being can play a major role when living in mass housing, as above mentioned all factors and features contribute to the sense of well-being directly or indirectly. (Lee et al., 2011). When amidst a crisis like a pandemic and in a locked-down situation it can be challenging for residents to have a positive sense of well-being. The very recent event of the Covid-19 global pandemic challenged the residents, especially in high-rise apartments where residents were merely "trapped in houses and buildings" irrespective of the place people live. The prolonged periods of staying indoors had adverse effects on day-to-day activities as well as on the sense of well-being irrespective of the housing type detached houses, semi-detached houses, housing schemes, or apartments (Peters & Halleran, 2021). But it was most critical for residents in apartments and multi-story living. Stress could be often experienced in such situations and severe cases may influence adversely on physical health. Having been completely cut off from social interactions with people brings up feelings of loneliness, especially when living alone. A great reduction of physical social interactions occurred worldwide during the Covid-19 pandemic, and people were made to value the need for social contact and social well-being, through simple gestures such as smiling, talking across a balcony, rooftop, window, etc. (*Health and Well-Being during COVID-19 – India Research Center*, n.d.)

2.3. THE ROLE OF ARCHITECTURE IN THE SENSE OF WELL-BEING

The impact of architectural features on the sense of well-being has been countlessly studied and analyzed through much research over the years. Given the scenario of this research three types of themes were considered: Health and Well-being, the Covid-19 pandemic, and living in mass housing.

Table 1, Selection of attributes (Compiled by author)

INDICATOR/ CATEGORY	PARAMETERS/ FACTORS/ ATTRIBUTES	(D'alessandro et al., 2020)	(Western & Tomaszewski, 2016)	(Lee et al., 2011)	(Cuerdo-Vilches et al., 2020)	(Zarrabi et al., 2021)	(Kang et al., 2013)	(Peters & Halleran, 2021)
PHYSICAL	Spatial Arrangement (Organization, Density, Layout)			✓	✓		✓	✓
	Size & Number			✓	✓	✓	✓	✓
	Balcony/ Terrace				✓	✓		✓
	Openings/ Windows				✓			✓
	Housing Quality: Structure, Clutter, Cleanliness			✓	✓		✓	
	Lighting			✓	✓	✓	✓	
	Indoor Thermo-Humidity	✓		✓	✓	✓	✓	✓
	Indoor Ventilation (Indoor Air Quality)	✓		✓	✓	✓	✓	✓
	Acoustics				✓	✓	✓	
	Flexibility, Adaptibility, Sharing & Crowding	✓		✓	✓	✓	✓	✓
	Open spaces, Use of Public Spaces			✓	✓	✓	✓	✓
	Material Finishes				✓	✓	✓	
PHYCHOLOGICAL	Daylight			✓	✓	✓	✓	✓
	Natural Ventilation				✓	✓	✓	✓
	Views			✓	✓	✓	✓	✓
	Noise			✓	✓	✓	✓	
	Greenery, Green Elements And Space	✓		✓			✓	✓
	Privacy & Privatisation, Control	✓		✓	✓		✓	✓
	Pride						✓	
	Density			✓				
	Safety &Security		✓				✓	
SOCIAL	Interactions, Friendliness: Home And Community		✓	✓	✓		✓	✓
	Attractiveness						✓	
	Accessibility & Connectivity		✓	✓	✓	✓		
	Leisure		✓		✓			
	Community Facilities		✓				✓	
	Social Support						✓	
OBJECTIVE WELLBEING	Income		✓					
	Access To Material & Resource		✓					
	Health		✓					
MATERIALS & RESOURCES	Finishes	✓						
	Remodling & Recycling			✓				
	Use & Disposal			✓				
	Water Consumption	✓						
	Waste Management	✓						
ENERGY EFFICIENCY	Existence Of Equipment For Energy Efficiency			✓	✓	✓		
	New & Renewable Energy			✓	✓	✓		
	Automation & Smart Technologies	✓						
	Food Production					✓		
CONVENIENCE & MANAGEMENT	Performance Control & Spatial Use			✓			✓	
	Closet Space			✓				
	It System			✓				
	Management Plan Of Building			✓			✓	
	Maintenance			✓			✓	

7 research were selected as key literature for deriving architectural attributes that are significantly impactful on the sense of well-being of residents during a health crisis.

The review identified factors that are impactful on the sense of well-being of apartment dwellers in a health crisis such as the pandemic. As observed from Table 1, physical, psychological, and social indicators are repeated in several studies. This study focused on factors concerning architecture and human perception.

Table 2 shows the 14 selected Architectural attributes concerning multi-story housing.

Table 2, Summary of Literature Review

	FACTORS	HEALTH & WELLBEING RESEARCH	PANDEMIC RELATED RESEARCH	MASS HOUSING RESEARCH
PHYSICAL	Spatial Arrangement / Layout/ Density/ Circulation/ Balconies	✓	✓	✓
	Size & Number/ Amount of Space	✓	✓	✓
	Openings/ Windows	✓	✓	✓
	Views	✓	✓	✓
	Flexibility/ Adaptability/ Sharing	✓	✓	
	Accessibility & Connectivity		✓	✓
PHYCHOLOGICAL	Daylight / Lighting	✓	✓	✓
	Indoor Ventilation/ Humidity/ Natural Ventilation	✓	✓	✓
	Green elements and connection to Nature (Seeing/ Interacting)	✓	✓	✓
	Sharing & Crowding		✓	✓
	Noise	✓	✓	✓
	Privacy	✓	✓	✓
SOCIAL	Open common spaces & Public spaces	✓	✓	✓
	Social Interactions	✓	✓	✓

3. Methodology

A single case study method was identified as a suitable research strategy due to limitations in accessing most multi-story dwellings during the pandemic. An upper-middle income, multi-story (midrise) housing complex having three types of apartments was selected as the case study. The data collection tools were online questionnaire survey, interviews, and observations. A purposive sampling technique was adopted and respondents living in the different apartment types were approached for the data collection. Collecting data from three types of apartments facilitated a comparison of residents' views on the sense of well-being – physical, social, psychological, and architectural attributes.

Primary data on respondent's perceptions, behavior patterns, lifestyle during the pandemic, and the challenges to their well-being were explored via online surveys among 38 respondents. Interviews were conducted among 8 respondents for an in-depth understanding of the responses given to the online survey. Secondary data on the apartment design features and elements are explored via observations and document analysis. Both descriptive statistics and content analysis is conducted to explore the quantitative and qualitative data respectively.

4. Case Study: Results and Findings

4.1. INTRODUCTION TO CASE STUDY: PRIME RESIDENCIES, MAHABAGE

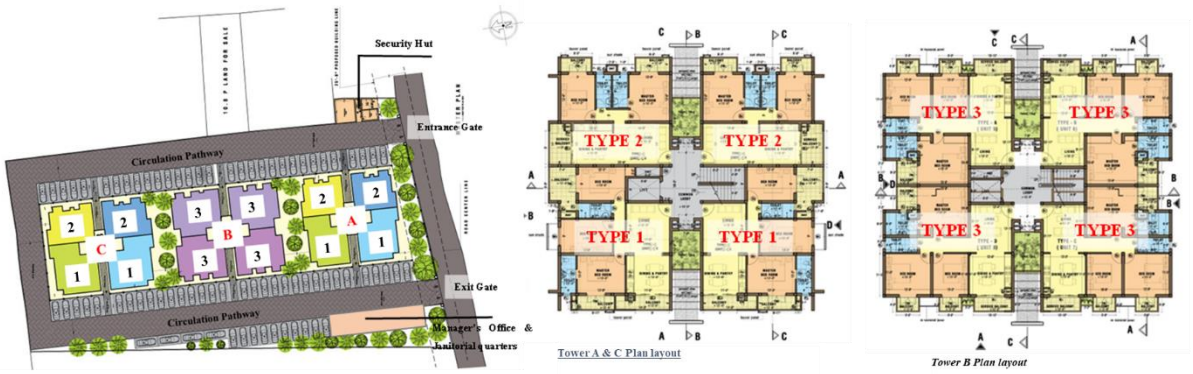

Figure 1, Layout Plan & Tower Plans (Source: https://www.primeresidencies.lk & Author)

The case study is located in the rapidly developing suburbs of Colombo, with easy access to the nearby commercial town center, main road, and highway. The complex includes 84, 2-bedroom and 3-bedroom apartments along with a spacious roof terrace, swimming pool, gym, ample garden area, 24 hours security, and parking.

Apartment Estate includes three towers of apartments placed at a distance, keeping a courtyard/ garden space in between. Towers are referred to as Tower A, B & C. Each tower of the apartment complex includes 4 apartments at each level. Tower A & C includes two different types of apartments which are identified as Apartment type 1 (1082 sqft) and Apartment type 2 (879 sqft) for this study. Type 1 apartments face the suburban scape, and type 2 apartments face the Negombo – Colombo Main Road. All Apartments in Tower B are the same which is identified as Apartment type 3 (1134 sqft). Type 3 is the largest with 3 bedrooms and Type 2 is the smallest in size with 2 bedrooms. Survey respondents are evenly distributed among the 3 types of apartments as 12 respondents from type 1 and 13 from type 2 and 3 hence the statistics can be compared accurately.

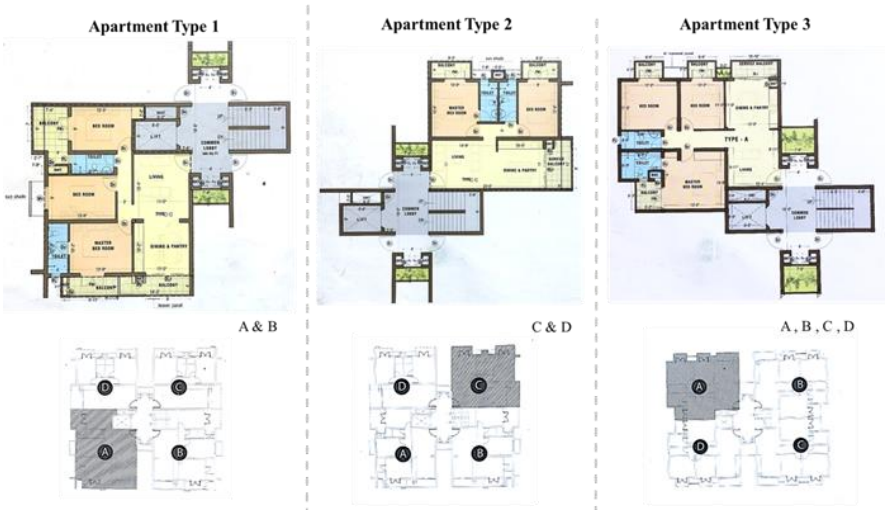

Figure 2, Apartment Layouts (Source: Building Management)

From the ground floor to the 6th Floor each tower includes 4 apartments at each level. Negombo -Colombo Main Road is directly accessible. Ample parking is provided at the ground level, and the access pathway circulates the towers with two gate points of entrance and exit. The circulation pathway acts as one of the important common open places, as it is used as a jogging pathway, a place for informal meetings with the community, and a cycling path for the children. Additionally, there is a vast terrace space, a swimming pool, a gym, and a common room that is generally used for committee meetings at the Rooftop level.

Site orientation is East-West, and this has been unavoidable when orientating the towers. Apartments facing east experience hot temperatures during the day rather than the apartments facing west. This can be due to the sea breezes coming from the west. However, no such specific treatment was observed for the east & west elevation architectural-wise to cut down or control the sun. Towers are of square plan form with three types of Apartment layouts, varying as 2-bedroom and 3-bedroom apartments. Tower A & C is similar in design while apartments in tower B are slightly bigger than the apartments of the other 2 towers. Towers include one central core for circulation with the lift well and an enclosed staircase.

4.1.1 General Details on the Sample

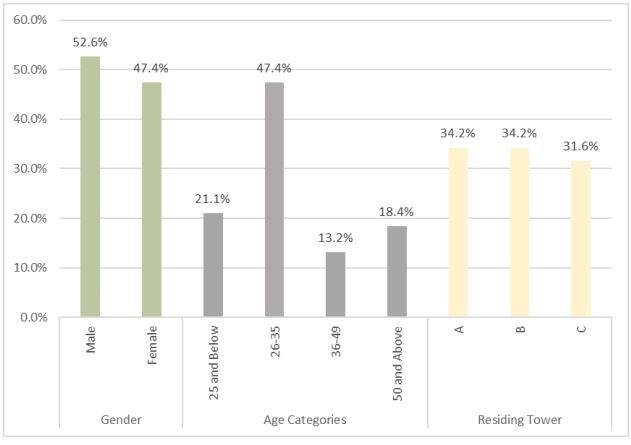

Figure 3, Profile of the respondents (Compiled by author)

There are 50 occupied apartments in the complex and out of that 38 households, responded to the online survey giving a 76% successful response rate. An even number of respondents are recorded from each tower. (A-13, B-13, C-12) As per the figure below the sample consists of 18 females and 20 males, Ages ranging from 22 years to 65 years.

4.2. ANALYSIS

4.2.1 Overall residents' response on well-being across the three apartment types

Overall personal well-being was assessed using the WHO – 5 well-being index (World Health Organization, 1998) which is to rate the score from 0 to 5 for five statements on how they have been feeling over the last two weeks.

Five statements are: I have felt cheerful and in good spirits, I have felt calm and relaxed, I have felt active and vigorous, I woke up feeling fresh and rested, My daily life has been filled with things that interest. 5-item World Health Organization Well-Being Index (WHO-5) is among the most widely used questionnaires assessing subjective well-being. As per its guidelines, the raw score of each statement is calculated and a respondent's score can vary from 0-25 marks, 0 indicating worst possible and 25 indicating the best possible quality of life. A person with a mark below 13 is identified as experiencing poor well-being.

As per the results of the WHO-5 well-being index, Apartment type 1 residents had an average score of 16.7, apartment type 2 - 10.08, and apartment type 3 - 16.3. Accordingly, apartment type 1 has the highest score, therefore its residents with a higher level of well-being, while apartment type 2 has the lowest score which is also less than the score of 13 implying that residents are experiencing poor well-being. Whereas the score of apartment type 3, also indicates the residents experiencing a better level of well-being.

The next stage of analysis observes the Apartment Design and its significant Physical, Psychological, and Social factors, which were studied and analyzed comprehensively to understand its extent of effectiveness on the sense of well-being of occupants during the pandemic of the Covid-19 virus.

5.2.1 Residents' response on Physical aspects of Apartments - Comparison across the three apartment types
According to the derived Framework from the Literature review (Table 2), there are 7 physical factors identified as impactful on the residents' well-being.

Using the collected data, a Spider chart was developed to analyze the results with the possibility of comparing the 3 apartment typologies. Significant observations were made through the spider chart and were analyzed along with the layout plans and other collected data related to the apartment design / physical features etc.

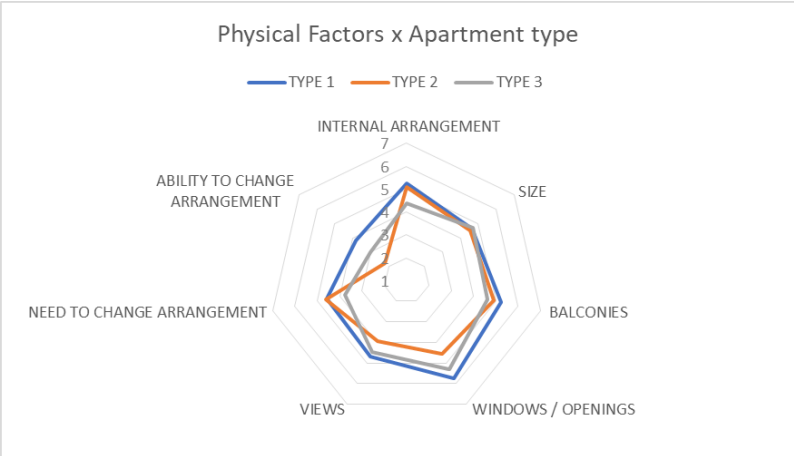

Figure 4, Physical Factors x Apartment type (Compiled by author)

According to the above chart, in apartment type 1 almost all factors are given the highest scores, and type 2 is given comparatively lower scores. This was similarly observed in the overall well-being results where apartment type 1 residents showed a higher level of well-being and apartment type 2 residents with poor well-being. In terms of Spatial arrangement and integration both in Type 1 & 2, common spaces are directly connected to bedrooms. However, in type 3, bedroom and common area connections are indirectly allowing rooms more privacy. The variance of arrangement in type 1 is perceived as highly satisfactory by the residents as the placing of rooms allows for more privacy than in the other 2 types.

As per the Orientation of Apartment type 1, most windows and balconies face West which brings ample daylight, natural breezes, and views towards the suburban scape. Climate-wise this type has advantageous features; hence the residents are much more satisfied with the apartment. Whereas for apartment type 2 most windows and balconies face East with views to the main road and these windows bring hot sun raising the internal temperature and dusty winds from the main road. Hence residents tend to keep these windows closed and avoid using these balconies. The suburban scape is the most satisfying view available to the apartment complex as it is calmer and greener while views to the main road can only be enjoyed during morning and evening hours. For type 3 apartments half of the units face east and the other half faces west. Hence this type has both the pros and cons of types 1 and 2. Type 1 residents had the privilege of using both balconies and windows during the pandemic period without any obstructions, hence balconies were utilized as a crucial space during the crisis time to enjoy the outside, feel the sun and winds, have evening tea with the family, growing plants and to interact and talk with the neighbors. In the case of type 2

apartments, residents were compromised to use balconies as many felt unsafe being exposed to the public, dust accumulating in the balconies facing the main road, and winds from this side were hot.

Size wise apartment Type 3 has the highest area, next Type 1, and the lowest area for Type 2. Even though Type 2 is smaller in size, these apartments had small households of couples or individuals, hence the available size was adequate concerning the number of occupants. Therefore, the size of the apartment was not much influential on the well-being of residents in this case study. But for a case of low-income housing, this could be crucial where large households living in smaller spaces.

With pandemic, the need for change in the arrangement was high especially with work-from-home and online learning situations. When staying indoors for a prolonged period, residents felt the need to make changes to the apartment to break the monotony during lockdowns. Many had done changes to the furniture arrangement and most times that was the extent of changes they were able to do. Having plants was the easiest change made for the apartments during the pandemic. In type 1 middle room has been mostly re-arranged as the workspace, home office, workout space, or gym, whereas in type 2 the layout & amount of space available have not been favorable to make any changes in the arrangement. Here residents preferred having the ability for personalization of arrangement. In type 3, requirements of a home office, workspace, or gym were set in one of the rooms when needed. However, all residents prefer having the ability to personalize arrangement which is not possible because apartment layouts are decided by the developer.

4.2.2 Residents' response on Psychological & Social aspects of Apartments - Comparison across the three apartment types
There are 8 psychological and social factors identified from the study as influential on the residents' well-being during a health crisis.

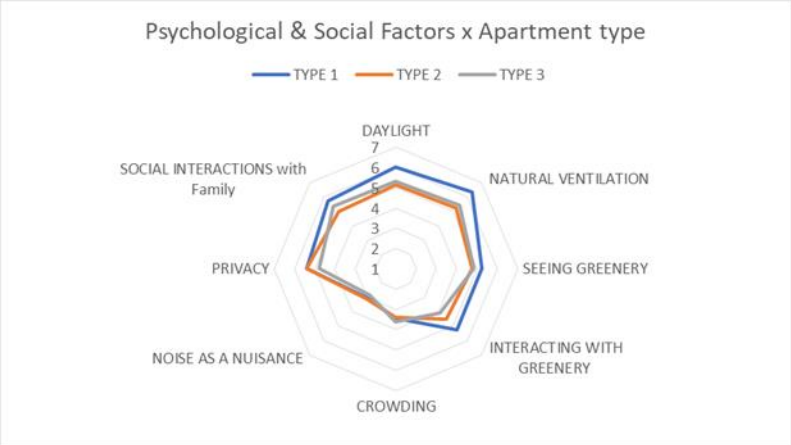

Figure 5, Psychological & Social Factors x Apartment type (Compiled by author)

For most of the psychological and social factors, apartment type 1 shows the highest scores, and apartment type 2 with lower scores, which is similarly observed for physical factors as well as with the overall well-being of residents. Significantly for factors Daylight, Natural ventilation seeing, and interacting with Greenery have much higher scores for apartment type 1 than for the other two types. This is mostly due to the favorable orientation of windows and balconies of the apartment bringing ample daylight and especially natural winds. It was also noticed that indoor plants were much thriving more in the balconies of apartment type 1 than in apartment type 2. Hence most residents of type 1 tend to grow plants, especially herbs and potted vegetable plants on the common balcony near the kitchen. This was an activity that especially occurred with the pandemic. All residents preferred seeing greenery around the complex and much appreciate the maintenance of greens at ground level by the management.

Figure 6, Balcony Utilization for growing plants (Source: Author)

Privacy is a factor that turned out to be very important during the pandemic, especially during working from home and online learning scenarios. Type 1 residents especially regard the layout as favorable for privacy, allowing good privacy levels in between bedrooms. Even though privacy inside apartment type 2 has been scored similar to Type 1, during interviews it was understood that balconies facing the main road were not satisfactory in terms of privacy as residents felt easily exposed to the public. Noise and Crowding can be expected to be high during the pandemic time, having all residents present at the complex most of the time. But it has not been a severe issue at any of the apartment types as both factors have scores below the average. Apartments that had more than 4 people residing had experienced crowding to some level. However, with the pandemic having everyone at home has given a sense of security than feeling burdened by crowding.

Social interactions with family and people living together were experienced to be much increased and this social support is regarded as important by many residents, for peace of mind and comfort during the crisis time. Family members or relatives who are not able to physically meet and talk were frequently contacted over the phone. And spending more time together inside the home has increased social bonds among the family members. Mostly in type 1 and 3 apartments, families of 3-5 members were residing while in type 2, it was mostly occupied by a single resident or two people and this could be a reason for the variation of scores shown in the spider chart.

5. Discussion and Conclusion

The data collection was done during the period of lockdown and when covid-19 regulations were at its peak due to the high number of covid -19 cases in Sri Lanka. This situation influenced the sense of well-being of the residents as people were experiencing a prolonged period of staying indoors away from friends and extended family.

At a time of restricted movement when residents were merely “trapped” in their homes, the sense of well-being was challenging and was mostly dependent on the quality of the house, apartment, or environment they lived in. as much as the engagements with family, inter-personal relationships were important to minimize stress and negative feelings, the environment is considered as an important element for inducing positive emotions and a sense of well-being. The following were identified as key recommendations for apartment design that becomes critical in the face of a pandemic, and help residents cope, be resilient, and adapt in response to such a crisis.

- The spatial arrangement of the apartment needs to be flexible allowing for personalization, adaptability, and maximum usage of space for crisis situations, especially concerning privacy demands.

- Ample balcony spaces are to be provided to facilitate activities like indoor gardening and family gatherings and opportunity for friendly chats and contacts with neighbors – a space for experiencing the sun, light, wind, and nature. Such spaces would also allow views of the road, street and help residents extend themselves beyond their closed doors. Sounds of people, nature can be experienced through balcony, terrace, and rooftop spaces.

- Having daylight natural winds and greenery in the vicinity are highly favorable for psychological well-being. For that orientation of windows and balconies needs to be favorable to climatic conditions and immediate context. (e.g., Busy roads, town centers)

- Create spaces that give a sense of gathering. Visually interconnected spaces can be ideal.

In terms of the entire apartment estate: -

- Avoid repetition of the same floor plan throughout the entire building which gives a monotonous quality; instead have common usage space at intermediate levels.

- Provide alternative circulation modes which allow good accessibility and less crowding and opportunity for people to take a brisk walk, outside their apartments and with minimal contact with others.

- Provide several common areas that can be used at different times of the day for different purposes. Open common areas are much more suitable during a health crisis with the ability to connect with nature. More options and different levels will distribute the users and avoid overuse and contact points which need to be avoided during a health crisis. Such spaces can form meeting places for bio bubbles of groups of residents in clustered housing or different floors.

- Greenery is to be incorporated as much as possible, especially in common areas, and the opportunity for greening within interior spaces- adequate light, and ventilation can be conducive.

- Balconies, terraces, and common spaces are to be designed allowing for visual social interactions. But this needs to be favorable with privacy concerns.

As these findings and recommendations are based on a single case study of a midrise, middle-income apartment type, it should be highlighted that are applicable and limited to similar cases. The severity of the problem will be diverse in different apartment types such as low income to high income, low rise to high rise. The apartment designs will have an impact on the sense of well-being and adaptive responses and resilience of its residents.

Hence future studies are recommended in critical apartment types such as low-income low-cost high-rise housing, where the quality is often compromised and large households reside in restricted, tight apartments. Further to the internal space the common spaces, circulation, amenities, and recreational opportunities in such apartments are limited. Hence such a case would be most needed and valuable and needed for the future. Finally, to conclude the derived framework from this study is one of the important outcomes that can be used in future research.

6. References

Bachelard, G. (1994). The Poetics of Space: Beacon Press. https://doi.org/10.2307/j.ctt1tfj9q4.6

Botton, A. de. (2006). *The Architecture of Happiness*. Hamish Hamilton,.

Channon, B. E. N. (2018). *Happy by Design: A Guide to Architecture and Mental Wellbeing*. RIBA Publishing.

Cuerdo-Vilches, T., Navas-Martín, M. Á., & Oteiza, I. (2020). A mixed approach on resilience of spanish dwellings and households during covid-19 lockdown. Sustainability (Switzerland), 12(23), 1–24. https://doi.org/10.3390/su122310198

D'alessandro, D., Gola, M., Appolloni, L., Dettori, M., Fara, G. M., Rebecchi, A., Settimo, G., & Capolongo, S. (2020). COVID-19 and living space challenge. Well-being and public health recommendations for a healthy, safe, and sustainable housing. *Acta Biomedica*, *91*(1), 61–75. https://doi.org/10.23750/abm.v91i9-S.10115

Diener, E. (2009). *Introduction—The Science of Well-Being: Reviews and Theoretical Articles by Ed Diener*. 1–10. https://doi.org/10.1007/978-90-481-2350-6_1

Foster, S., Maitland, C., Hooper, P., Bolleter, J., Duckworth-Smith, A., Giles-Corti, B., & Arundel, J. (2019). High Life Study protocol: A cross-sectional investigation of the influence of apartment building design policy on resident health and well-being. *BMJ Open*, *9*(8). https://doi.org/10.1136/bmjopen-2019-029220

Health and Well-being during COVID-19 – India Research Center. (n.d.). Retrieved November 6, 2021, from https://www.hsph.harvard.edu/india-center/health-and-well-being-during-covid-19/

Lee, J., Je, H., & Byun, J. (2011). Well-Being index of super tall residential buildings in Korea. *Building and Environment*, *46*(5), 1184–1194. https://doi.org/10.1016/j.buildenv.2010.12.010

Nakane, Y., Tazaki, M., & Miyaoka, E. (1999). Whoqol. *Iryo To Shakai*, *9*(1), 123–131. https://doi.org/10.4091/iken1991.9.1_123

Peters, T., & Halleran, A. (2021). How our homes impact our health: using a COVID-19 informed approach to examine urban apartment housing. *Archnet-IJAR*, *15*(1), 10–27. https://doi.org/10.1108/ARCH-08-2020-0159

Pollard, E. L., & Lee, P. D. (2003). Child well-being: A systematic review of the literature. Social Indicators Research, 61(1), 59–78. https://doi.org/10.1023/A:1021284215801

Prathapasinghe, D., Perera, M., & Ariyawansa, R. G. (2018). Evolution of condominium market in Sri Lanka: a review and predict. *SMART Real Estate: Towards Unmet Socio-Economic Needs*, *October*, 92.

Rapoport, A. (1969). *House form and society*.

Seligman, M. E. P. (2012). *Flourish (A Visionary New Understanding of Happiness and Well-Being)* (1st ed.). Atria Books. https://doi.org/10.1093/nq/s1-II.43.199-h

Stoneham, B., & Smith, D. (2015). The house and the home: The balance of architecture and psychology within the residential home. *Researchgate.Net*, *October*, 0–28. https://www.researchgate.net/publication/282854099_The_house_and_the_home_The_balance_of_architecture_and_psychology_within_the_residential_home

Western, M., & Tomaszewski, W. (2016). Subjective Wellbeing, Objective Wellbeing and Inequality in Australia. https://doi.org/10.1371/journal.pone.0163345

Zarrabi, M., Yazdanfar, S. A., & Hosseini, S. B. (2021). COVID-19 and healthy home preferences: The case of apartment residents in Tehran. *Journal of Building Engineering*, *35*(November 2020). https://doi.org/10.1016/j.jobe.2020.102021