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Article

Defining *Domestic Environmental Experience* for Occupants' Mental Health and Wellbeing

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Abstract: This study was stipulated by today's limited living conditions of middle income households in Bangladesh who have economic constraints that contribute to hindering improvement of their existing domestic settings that may affect occupants' mental health and wellbeing. The design of domestic living environments tend to influence occupants' emotions, feelings and moods. Thus, domestic environmental experiences need to be examined and incorporated into architectural design decisions. To understand the notion of such experiences, this study reviewed literatures concerning the related domains extensively. This study found the significant impact of domestic environments on human perceptions. Each design of domestic settings affects occupants' emotional responses positively or negatively. Through this study, the term *domestic environmental experience* was defined as users' experiences of cognitive perceptions and physical responses to their domestic built environment. In addition, it led to proposing the composition of domestic environmental experiences that need to be correlated with architectural design solutions. Nonetheless, this study did not examine the correlation where the emerging notion of Environmental Experience Design (EXD) may serve as the mediator. Accordingly, this new horizon of EXD research needs to be explored further with the aim to improve domestic built environments in Bangladesh which were the original driver of this research.

Keywords: domestic built environment; human responses; environmental experience design; mental health and wellbeing

1. Introduction

Bangladesh is a fast-urbanizing developing country [1]. It is the 7th position in the global population which is estimated at nearly 164 million residents. By 2030, Bangladesh will be the 24th largest economy in the world [1,2]. Approximately 47.6 million or 29% of the total population is classified into young generations aged between 10 and 24. The role of young people is significant and they are contributing to the growth of economics in Bangladesh. Therefore, the government is adopting various policies for the overall development of this young generation [3–5]. Nonetheless, according to the World Health Organization (WHO), a large portion of young people in Bangladesh are suffering from various types of mental health and wellbeing problems such as mental disorder, depression and anxiety. These problems are crucial particularly in middle income families who live in urban areas in Bangladesh where the high level of air pollution, occupant density and economic constraints including housing affordability [1,6]. In Bangladesh, middle income families fall into three categories in terms of their income level—i.e., lower-, middle- and upper-middle income groups [1,7].

In particular, the lower-middle income families who have minor ability to change their existing households' conditions due to their socioeconomic limitations are prone to such mental difficulties [1]. Most of the lower-middle income families are living in small domestic dwelling spaces of urban buildings where only physical elements such as room sizes and configurations tend to be brought into the architectural design considerations [1,8]. Such limited design considerations alone may be insufficient in addressing occupants' mental health and wellbeing in the local context as domestic environment has impacts on the occupants' quality of living that in turn affects their mental health and wellbeing [1,9,10].

Occupants' mental health and wellbeing may be improved by changing their way of living conditions that are to some extent related to their household experiences, as well as the building's existing physical conditions. Nonetheless, modification of the existing design components may be difficult due to the middle income earners' economic constraints in Bangladesh. On the other hand, their way of living conditions may be modified through the adjustment of occupants' subjective perception, social engagement, visual stimuli, cultural presence and attachment to places within their domestic built environment given—i.e., "human experience" [11–15]. Although domestic indoor qualities have been studied extensively in Bangladesh, the research on the occupants' household environmental experiences is still marginal to date. Therefore, there is a need for pragmatic studies of domestic environmental experiences that affect occupants' mental health and wellbeing. Nonetheless, the notion of domestic environmental experiences for the middle income families in Bangladesh is not clearly understood or well defined. The complexities seem to be debatable even in global contexts. Then, a question arises: what is the notion of domestic environmental experiences that may have impacts on occupants' mental health and wellbeing? To explore this research question, extensive literature reviews concerning environmental design and psychology, human perception and phenomenology, mental health and wellbeing and product user experience in the global context were conducted in this paper. Although this initial study is aimed solely at clarifying the notion (or conceptual framework), the research outcomes are expected for the future application to designing or upgrading domestic living environments of middle income groups for enhancement of their mental health and wellbeing in Bangladesh.

2. Synthesis of Literature Review

In this study, the literature reviews concerning theories related to this paper's thematic study areas such as environmental design and psychology, human perception and phenomenology, mental health and wellbeing and product user experience were conducted mainly to clarify the notion of 'domestic environmental experiences' as described above (Figure 1). PubMed, Scopus, Science-Direct and Google Scholar databases were explored to identify the relevant literatures based on the titles, abstracts and keywords falling into the thematic study areas. Overall, 187 literatures were initially selected. After reviewing these contents, in total, 89 references were used for this study.

The thematic study was carried out in view of the following domains with associate keywords: (A) environmental design and psychology (i.e., housing, dwelling, apartment, house, home, place, residence, domestic, indoor environmental quality and design, environmental psychology for design and environmental experience design); (B) human perception and phenomenology (i.e., phenomenon, perception, consciousness, soul, imagination, spiritual, human experience and perception); (C) mental health and wellbeing (i.e., mental health and wellbeing, wellbeing and environmental design, emotions, feelings and moods); and (D) product user experience (i.e., user experience design and consumer behavior) (Table 1).

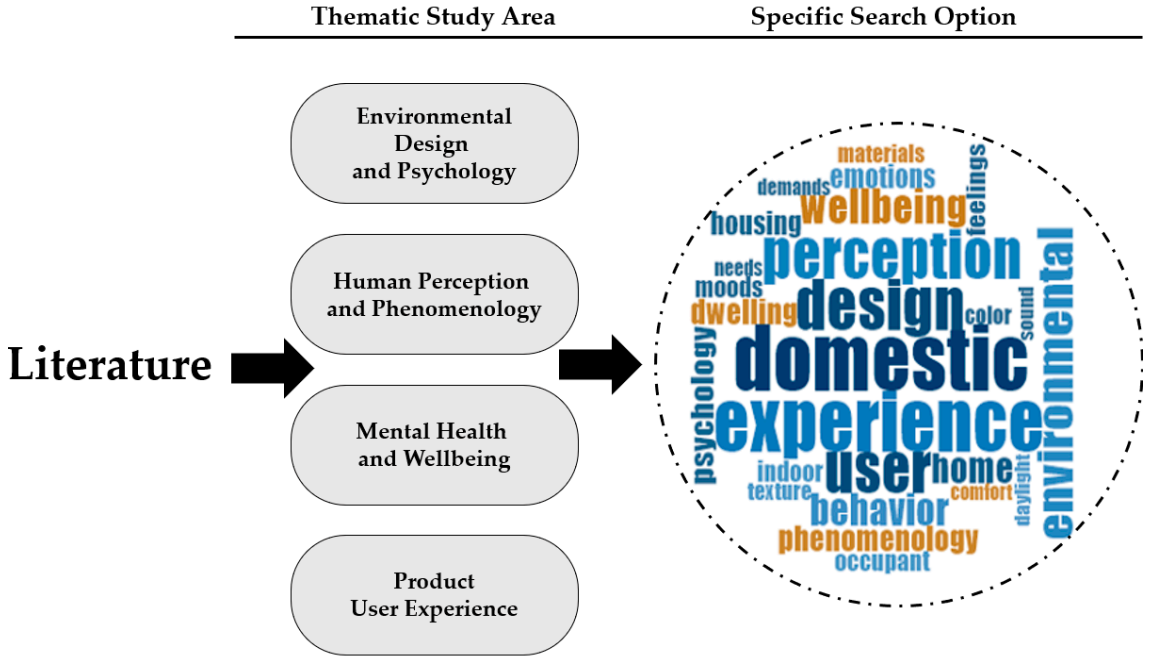

Figure 1. Thematic study domains identified.

Table 1. A synthesis of literatures reviewed as per thematic study domains.

Thematic Study Domains	Keywords Searched	References Used
Environmental Design and Psychology	Domestic Environment	[11], [12], [14], [16–43]
	Indoor Environmental Quality and Design	[12–14], [28], [44–54]
	Environmental Psychology for Design	[12], [15], [22], [44–46], [49–51], [53],
	Environmental Experience Design	[12], [15], [22], [44–46], [49], [50], [53–63]
Human Perception and Phenomenology	Phenomenon and Perception	[11], [12], [19], [22], [41], [44–51], [53–55], [62], [63–76]
	Consciousness, Imagination, Spiritual	[14], [15], [22], [57], [61], [64], [73], [76], [77]
	Human Experience and Perception	[11], [15], [17], [19], [26], [37], [53], [60], [65–71], [78–83]
Mental Health and Wellbeing	Mental Health and Wellbeing	[12], [21], [22], [52–56], [61–63], [72–75]
	Wellbeing and Environmental Design	[47], [54–60], [65–78]
	Emotions, Feelings and Moods	[15], [51], [57], [61], [62], [76], [79–86]
Product User Experience	User Experience Design	[17–20], [23], [54], [55], [87–89]
	Consumer Behavior	[52]

3. Conceptual Meaningfulness of Domestic Environment

The definition of "built environment" has different terms and ideologies. According to McClure and Bartuska (2007), "built environment is a relatively new term, but it is as old as the beginning of time because it is an inclusive concept that embodies all human creation–past, present and future plans" [16]. Therefore, most spatial design settings created by humans are elements of built environments. The built environment has four interrelated characteristics or mandates and the settings are: (a) to be "humanly made, arranged or maintained"; (b) to be designed "to fulfill human purposes (needs, wants and values)"; (c) to be coordinated in a way "to mediate the overall environment"; and (d) to respond

with "results that affect the environmental context" [16,17]. There is close connectivity between people and their surrounding built environment [17–19]. People adjust or adapt to the environments to fulfill their requirements, desires and expectations within various settings. The built environment connects human thoughts and integrity to their social, physical and cultural contexts. Moreover, spaces created provide opportunities for the users' everyday life activities serving as a medium of human experiences [13,17–19]. Bartuska (2011) noted that built environments are rooted in seven design, planning and management domains such as "products, interiors, structures, landscapes, cities, regions, and Earth" (Figure 2) [16]. These domains have their own roles, tasks and responsibilities, yet they correlate to each other. The design of domestic settings in which people live may reflect those of the interior and structure domains within the built environments.

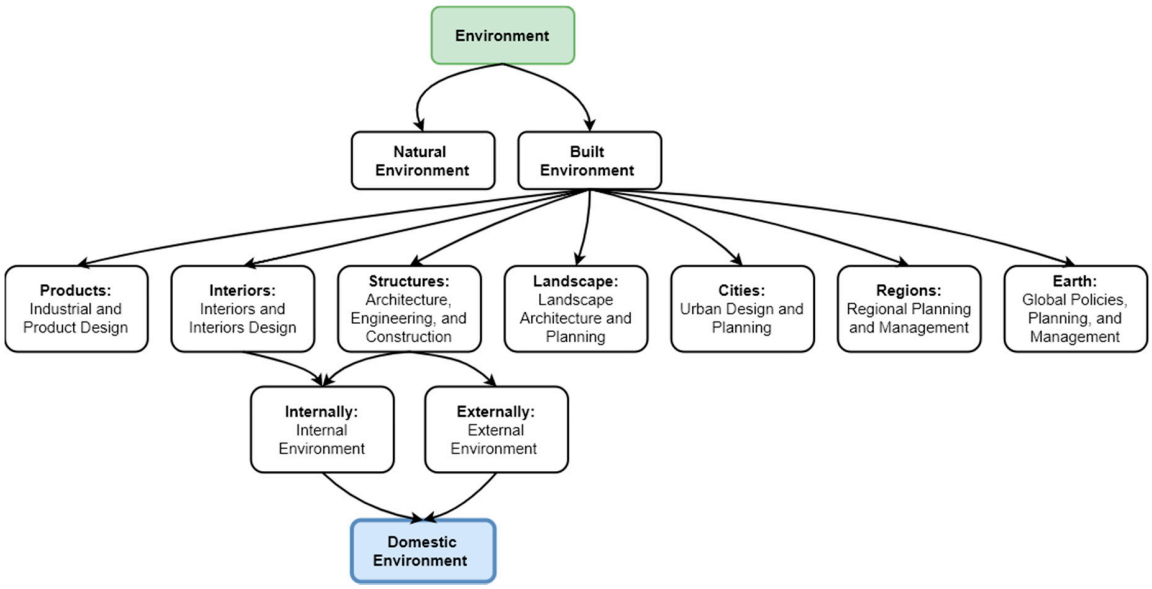

Figure 2. Multidisciplinary domains within built environment [13,16,20,21].

The domestic settings have dual characteristics within both indoor and outdoor environments that may require to reflect human spatial wants and needs. Several literatures reviewed in this study also indicated that this domestic enclosure protects occupants from undesirable circumstances (i.e., bad weather) of outdoor environments while users' physical and mental comfort needs to be well maintained for their health and wellbeing [16,20,21]. Generally, the term "domestic environment" refers to places in which people live and it embraces social, economic and cultural dimensions that affect human health and wellbeing [12,17]. Such environment tends to be designed and built based mainly on existing local building regulations and conventions. Therefore, the architectural design tends not to encompass the occupants' individual needs and demands [15,17]. Perhaps, it may hardly provide users with the individuals' desirable living experiences. These settings are often occupied by people for a great deal of time daily [15,21–23]. The design influences human emotions, feelings, moods and behaviors within such environment as the physical settings have impacts on human health and wellbeing [13]. Designing these settings may need to be developed with due consideration of occupants' social and psychological wellbeing [24,25]. A question then arises: how do people perceive such domestic environment as a home? From literature viewpoints, the following section explores the notion of *home* and the relation to the domestic environment.

3.1. Home as A Domestic Environment for Experiences

The history of domestic architecture suggests that the various styles, materials, arrangements and textures engage with human social, physical and psychological qualities in living environments [13,26–28]. "Home is where the heart is, or there is no place like home" and this

notion is the subject of scholarly debates across various disciplines [27,29–31]. Cooper (1974) indicated that home as the mother of the whole environment that takes on the role as a place of security and love [32].

An article entitled "Understanding Home: a Critical Review of the Literature" written by Mallett (2004) addressed the notion of home considering numerous literatures [33]. It indicated that "Clearly the term home functions as a repository for complex, interrelated and at times contradictory socio-cultural ideas about people's relationship with one another, especially family and with places, spaces and things. It can be a dwelling place or a lived space of interaction between people, places, things; or perhaps both. The boundaries of home can be permeable and/or impermeable. It can be associated with feelings of comfort, ease intimacy, relaxation and security and/or oppression, tyranny and persecution" [33]. An article entitled "Home: Territory and identity" written by Wise (2000) described that "Home, likewise, is a collection of milieus, and as such is the organization of markers (objects) and the formation of space. However, home, more than this, is a territory, an expression. Home can be a collection of objects, furniture, etc. that one carries with one from move-to-move" [1]. According to Stokols (1972), home is a place where people can meet all their psychological, physical and social needs and it is an essential place for humans where individuals can keep themselves connected [34]. Hayward (1977) suggested the psychological concept of home in view of the significance of "family, social networks, self-identity, privacy, continuity, personalization, behavior, the dwelling, and the childhood home" [35]. Pennartz (1986) illustrated five atmospheric opportunities that one may be able to experience at home such as: "(I) communicating with each other; (II) being accessible to one another; (III) being relaxed after having finished work; (IV) being able to do what one wants to; (V) being occupied, absence of boredom" [36]. According to the literature, a home is closely related to its identity through the personalization of the environment. Nonetheless, home represents a crucial point of the social life and the relationships of its residents. All these features contribute to making a home comfortable and friendly, promoting a feeling of comfort and satisfaction [22,37,38].

Smith (1994 and 2012) described that the "essential qualities of a home environment from a general contextual level . . . The experience of dwelling, and therefore the significance of the home, is widely accepted as a universal human experience by Western philosophers and writers [37,38]. However, a home is more than a dwelling, it is a way of weaving up a life in particular geographic spaces and the most important center, and as such is a complex multidimensional concept" [37,38]. Dovey (1985) emphasizes in his article entitled "Home and Homelessness" that "Home is a schema of relationships that brings order, integrity, and meaning to experience in place—a series of connections between person and, world. Home then is an integrative schema that is at once per bonding of person and place and, a set of connections between the experience of dwelling and the wider spatial, temporal, and sociocultural context within which it emerges. Home orients us and connects us with the past, the future, the physical environment, and our social world" [39].

In short, home is a domestic environment having diverse aims, purposes and meaningfulness such as attachment, identity, social rules, affordance, happiness, belongings, security, privacy, relationship, emotion, self-identity, ownership, aspirations, values, preferences, control, activities and experiences [28,40–42]. An internal domestic setting has three types of spatial areas such as private spaces (e.g., bedroom, study, toilet and bathroom) used individually by family members; semi-private spaces (e.g., family room, kitchen, dining room, prayer room and service room) used commonly by only family members; and public spaces (e.g., foyer, drawing room, guest room and powder room) used by guests beyond family members (Figure 3) [13,20,28]. These internal spatial areas may be connected with some external additions (e.g., garden, porch and balcony) which fall into private, semi-private or public spaces.

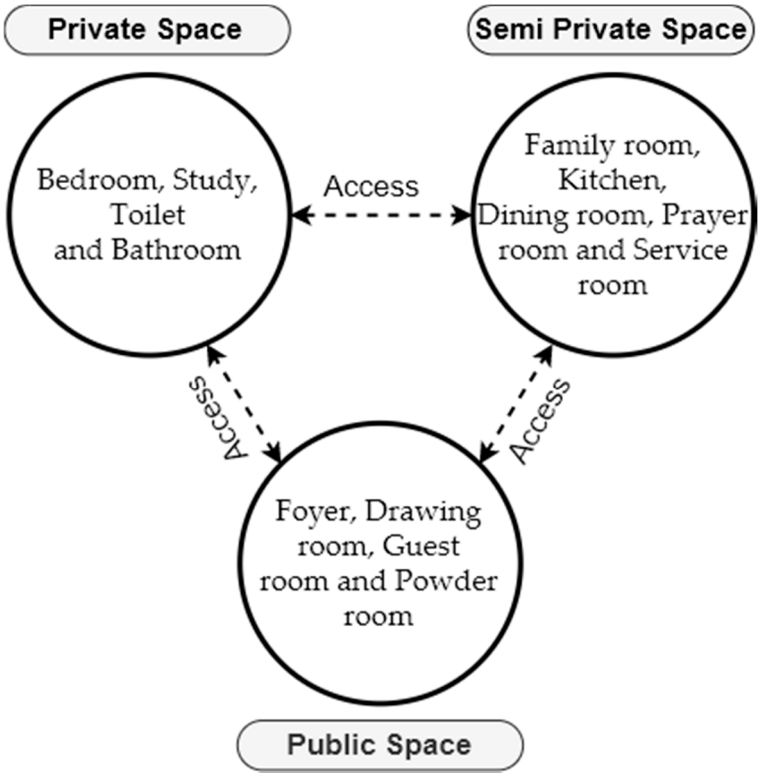

Figure 3. Spatial functions of domestic environment [13,14,20,43].

3.2. Human Responses within Built Environments

Domestic environments influence human lives and experiences. Historically, various disciplines in psychology examine human responses to social and physical experiences in built environments [33,40,44]. There are different theories of environmental perceptions (e.g., the Brunswik model of probabilistic lens, Gibson model of affordance and Berlyne model of esthetics) [17,29,45–48]. Moreover, social learning theory, integration theory, control theory, behavior setting theory, simulation theory and attention restoration theory fall into the field of built environments. All these theories develop the ideas and fundamental frameworks on the process of human–environment perceptions and interactions relating to the domain of built environments [17,46,49,50]. "Environmental Psychology" is the area that investigates the relationship between human perceptions and behaviors within built environments [17,51]. Today, environmental psychology tends to focus mainly on investigating individual experiences in both human cognitive and emotional levels that interact with specific environments such as schools, hospitals and offices [52–55]. The psychologists have developed the relationship between human brain and cognitive interactions within built environments that stimulate humans' physical, biologic and psychological factors (Figures 4 and 5) [56–59]. These human factors serve as primary variables in the domain of environmental psychology that affects individual experiences (e.g., emotions, feelings and moods) in built environments [56–59].

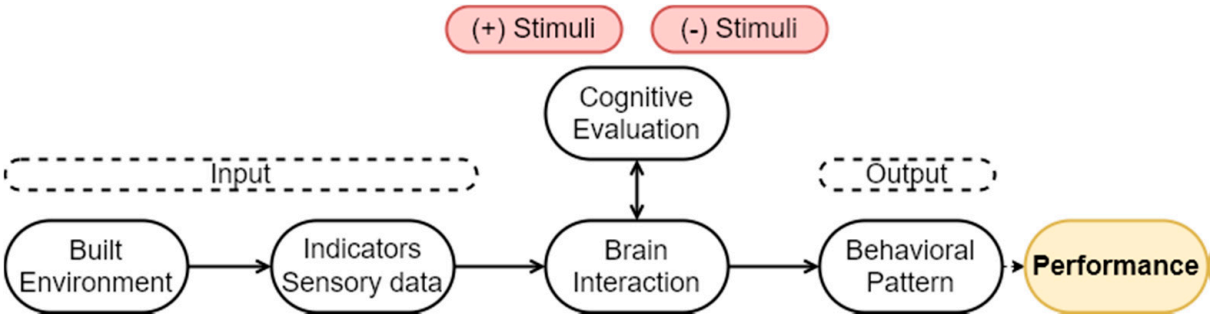

Figure 4. Built environment and human responses [15,17,24,49,60].

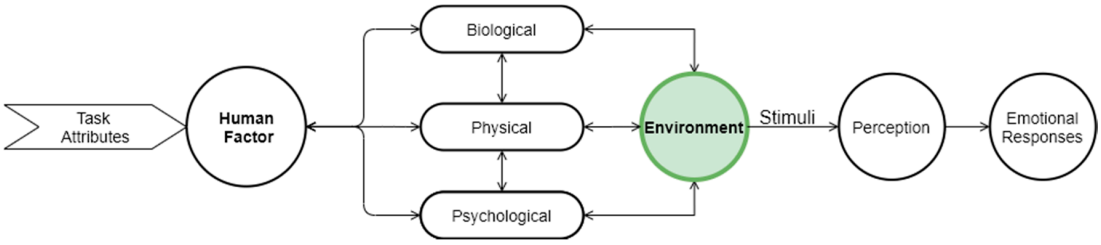

Figure 5. Relationship between human factors and built environment [15,17,49,53,61].

An article entitled "An Approach of Environmental Psychology" written by Mehrabian (1974) described three primary human emotional responses such as pleasure, arousal and activation in any spatial setting and meeting all these emotional responses through experiences results in user satisfaction or performance that impacts on human behavior [61]. Human emotions are complex phenomena to define precisely. Most current emotion theories encompassing physiological arousal and activation aspects describe the core feelings of humans' subjective emotional states [61]. The emotions fluctuate with external events in built environments and arousal changes impact on human biologic factors. The environment influences human moods and feelings even after people leave the space [15,17,61]. Human emotional states affect memory and performance on cognitive responses and individuals do not react to their environment in the same way [15,32,53].

Human sensory organs play a central role in experiencing a place [15]. Humans perceive their surrounding environments through their senses. According to environmental psychology, the relationship between people in a specific spatial setting exists and it involves six sensory dimensions such as vision, hearing, smell, skin-sense of air, haptic and kinesthesia (Figure 6) [15,17,53,61]. Any spatial setting leads to some human sensory responses whether they are visual, auditory or tactile stimuli [53,61,62]. Different environmental design variables affect occupants' sensory perceptions in various ways within their built environments [15,17,61].

Ittelson (1976) described the relationship between human experiences and environmental settings as a systematic connection [51]. Pallasmaa (2005) also revisited human emotional adaptation processes and relationships of user and space interactions within living environments [49]. Recognition of such relationship seems to be important when environmental settings are designed. The following section explores environmental design parameters that affect occupants' emotions, feelings and moods in their domestic settings based on further literature reviews.

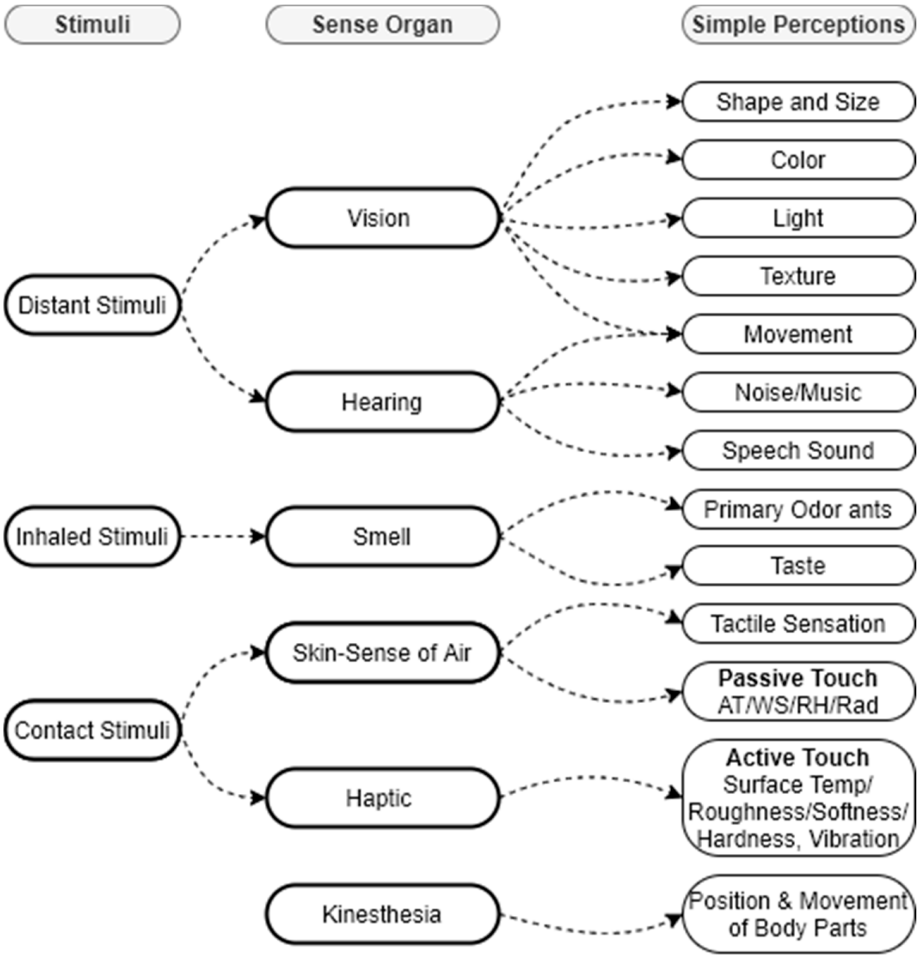

Figure 6. Human sensory perceptions in built environment [15,17,49,54,63].

3.3. Environmental Design Parameters for Human Experiences

Domestic settings are part of built environments that influence human health and wellbeing and the spaces may need to be arranged for accommodating different styles of occupants' daily life activities [13]. Residential satisfaction for occupants' quality of life is important and the arrangement of indoor spaces can change human emotions, feelings and moods [64]. These human factors strengthen the occupants' psychological immune systems that affect their health and wellbeing [12,22,65,66]. Occupants use their living spaces in different ways and their perception to the environment may differ from one another [67,68]. Design criteria of domestic settings may hardly be generalized since individuals' needs, desires and preferences are complex matters to be identified [67]. Lawlor (1997) in his book entitled "The Temple in the House" describes how human emotions interact with architectural internal elements such as ornaments, doors, windows, floors, walls, ceilings and even pillars [14]. He illustrated the interconnection between architectural forms and human bodies in light of five spiritual elements (i.e., earth, water, fire, air and space) through the senses of user experiences [14]. Ulrich (1991), Evans (1996), Somerville (1997) and Kopec (2018) identified that building materials and finishes, spatial flexibilities, adjustabilities and multifunctionalities, natural settings and user comfort tend to contribute to linking occupants' perceptions to their domestic environments [13,30,55,69]. Since the 1st century BC, the importance of indoor environmental quality has been recognized and it was described by Vitruvius in his books collectively entitled "De Architectura" [53,70]. Hawkes (2015) noted that the interactions of light, air and sound with architectural form and materiality have positive health impacts on human physical, biologic and psychological aspects [71]. There are four primary

environmental design parameters concerning temperature, vision, air quality and noise in indoor environments that directly and indirectly influence human perceptions through senses [72].

For instance, it is known that indoor lighting tends to affect human factors [73]. Reduced lighting levels affect occupants' feelings that trigger their mental stress and change circadian rhythms [73]. Insufficient indoor lighting levels decrease the inhabitants' psychological growth [21,74]. Ittelson (1976) identified that noise affects the sense of users' individual privacy within their living environments [51]. Occupants tend to spend their leisure time outside when there is a noise problem in their domestic environment [12,51]. Therefore, the designers need to consider occupants' preferences for acoustic comfort [12,51]. Hall (1989) suggested that human memory is related to the smell of place [75]. Cooper (2014) also regarded smell as a robust human sensor that has substantial impacts on human memory [21]. According to him, human memory for places associated with smell is stronger than that with vision or sound [21]. Kaplan (1995), Evans (1996) and Miller (1985) expanded their views on psychological benefits of gardening that can be experienced in domestic environments [69,76,77]. Green space tends to refresh atmospheric air quality and temperature, as well as to provide visual comfort. They also identified that window creates environmental stimuli that assist human psychological escape from mental stress [69,76,77]. If no window permits, plants can be hung from the ceiling helping to develop positive indoor atmospheres [12,69,76]. Weisner (1981) opinioned that signs and posters can display a pro-environmental atmosphere that positively affect human perceptions in domestic settings [78].

Spatial ergonomics related to dimensions, sizes, shapes and heights affect human usability and perception (e.g., agitation, calmness, simulation and/or depressions) within living environments [44,72,79]. Studies of the built environment and mental health identified that high density living and short depth of spaces create distress among inhabitants [12,69]. Evan (1996) indicates that a high-rise living environment has a negative psychological impact for both females and children [69]. Crowding is a prominent reason in domestic settings, and it reduces the level of perceived privacy resulting in the occupants' psychological distress [12,69,80]. The studies also illustrated that floor area and height of ceiling have a significant impact on human feelings in their living environments [81]. Enclosed spaces increase occupants' mental stress and spatial flexibility contributes to reducing their mental stress [73]. Gosling, Gifford and McCunn (2013) identified that features of spaces (e.g., kitchen, bedroom, living room and bathroom) influence daily activities and social interactions and they also affect the occupants' cognitive and emotional states in their domestic settings [68,82]. The literatures suggest that kitchen is an important part of family activities; bedroom is a personal space; living room serves as a reading space; and bathroom requires safety for occupants [20,61,83]. Plumbing, heating, cooling equipment and other service facilities affect occupants' satisfaction levels in domestic settings [20,69,83].

In light of literatures reviewed, environmental design components or approaches in domestic settings correlate with occupants' perceptions (Figure 7). Studies also stressed that people have capacities for adaption or adjustment of their living environments in different ways [13,15,17]. Occupants may need to adapt to unpleasant circumstances if there is no alternation for improvement [15,17,61]. However, people may attempt to change their existing living environments according to their physical, biological and psychological needs and demands [18,23]. Therefore, domestic environment design requires to address these occupants' diversities through consideration of individuals' experiences for the purpose of enhancing their health and wellbeing.

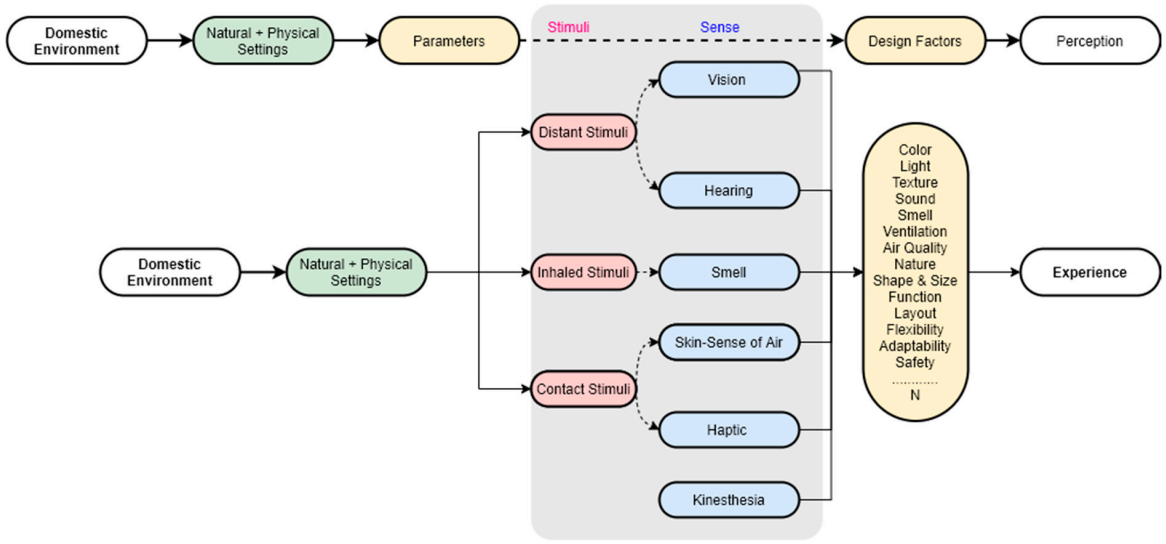

Figure 7. Domestic environmental design parameters [12–15,17,61,82].

4. Domestic Environmental Experiences

Since the 20th century, new design dimensions have raised voices in architecture [17]. Recent studies identified that humans spend most of their time in indoor environments and such domestic settings need to be design for retaining or improving the users' safety and security [12,15,17]. Therefore, it is imperative to understand the occupants' diversities and their required and desired living experiences in domestic environments with the aim to enhance their health and wellbeing. Domestic environment is a core space that accommodates human lives. The designers need to understand occupants' socioeconomic and cultural background and engage the knowledge of their required and desired living experiences in the design decision making process [15,17,84]. Moore (2000) also illustrated that the design of domestic environments reflects diversities of human personalities and choices due to their living experiences [42]. Caan (2011) pointed out that human physical and psychological experiences are essential in indoor spaces to mediate tangible and intangible design aspects [20]. Graham (2015) addresses issues on how domestic environments can be linked to human perceptions [2]. Lawlor (1997) observed the design gaps of spiritual experiences between body, mind and places in domestic settings that enhance to serve the core feelings of a human being [14]. According to his criticism, conventional dwelling designs do not encompass enough human experiences [14]. The linkage between human experiences and spatial designs becomes prominent in the modern architectural context [11,15,18]. Sussman (2015) emphasizes the need for understanding of human cognitive experiences in creation of living environments [53,85].

Human experiences are persons' cognitive perceptions and physical responses to a given event or their environmental setting [15,17,18]. There are different types of human experiences in built environments (Figure 8) [15,17]. Different types of spaces have various states and opportunities of human experiences [15,17]. For example, standing by the edge of a room and looking through the window have different effects on human thoughts and emotions rather than sitting on the sofa with a view of artifacts hung on the walls [3]. These theoretical articulations raise an important perspective of how human experiences need to be applied in the spatial design decision making of living environments [15,17].

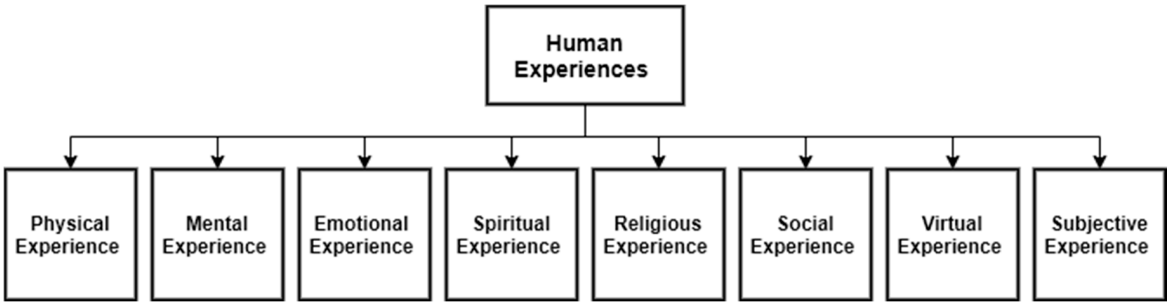

Figure 8. Human experiences in built environment [15,17,46,85–87].

Peoples' living experiences are unique and different in every step of their daily life activities [15,20,77]. In living environments, there are nine common human psychological needs such as control, privacy, identity, security, order, variety, esthetics, choice and sociability [13,20,88]. They are related to environmental design and perceived through occupants' experiences (Figure 9). However, the assessment of these human psychological needs is critical in designing living environments. Architectural design decisions tend to be made based on untested theories and personal hypotheses where human perceptions to space are less of a consideration [15,17,23]. Design of living environments can be enriched by integrating rationalized concepts and analytical data that are related to occupants' experiences into the decision making process [15,17,18,53].

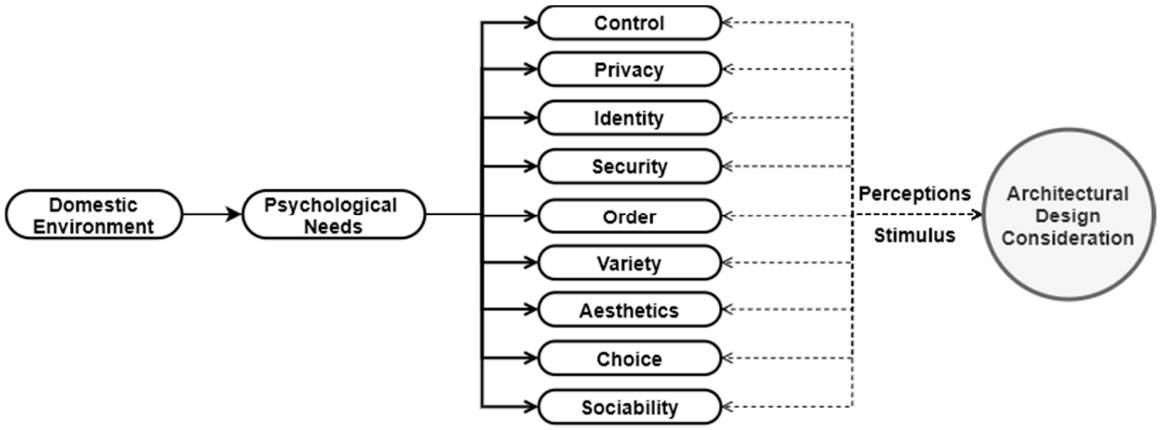

Figure 9. Human psychological needs for architectural design consideration [13,15,17,49,85].

Consideration of occupants' experiences in domestic settings is important in the environmental design decisions to enhance their health and wellbeing [15,17,49,53]. Assessment of occupants' psychological needs and demands through their existing household experiences may help to understand how architectural design parameters can be prioritized. In short, domestic environmental experience seems to serve as a medium that connects occupants' needs and demands to human physical, phycological and biologic responses within their living environments. Understanding of such experiences helps to contribute to shaping and determining architectural design parameters for user health and wellbeing (Figure 10). Grasping the notion and stance of domestic environmental experience is important for the future application to environmental experience design research and implementation.

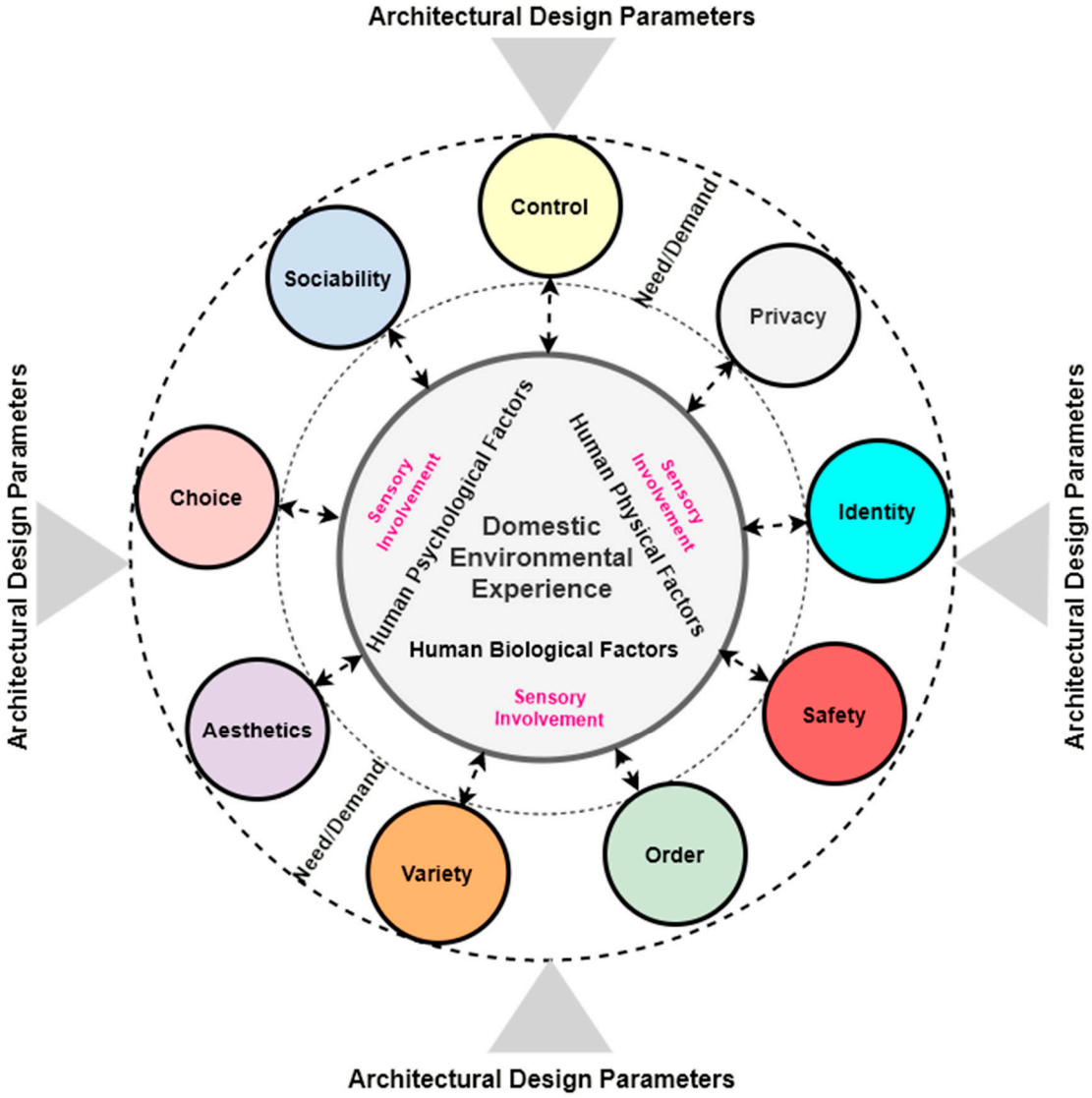

Figure 10. Thematic correlation diagram of domestic environmental experience.

Toward Environmental Experience Design

Studies of environmental psychology concerning domestic environments tend to cover mainly indoor environments related to occupants' health risks and behaviors and they are conducted by means of direct-observation methods (e.g., interview, video recording, surveying, monitoring and mapping) [15,17,53,82]. Today's studies of domestic environment design tend not to include data analyses related to user experiences. The term "Experience Design" was developed in the industrial design domain and it was derived from the concept of "User Experience (UX)" design that focuses on improving user-product interfaces for usability [18,19,87]. Pable (2011) described "person-centric" design philosophy for low income housing [89]. The book entitled "The Handbook of Interior Design" also emphasizes that consideration of user experiences is imperative in the design of indoor living environments [3]. Papers written by the second author of this study (2017 and 2018) proposed the concept of "Environmental Experience Design" (EXD) for the aged care facilities [18,23]. This study was initiated with the aim to provide a conceptual base for application of the outcomes to the future EXD research for design improvement of domestic environments that affect occupants' mental health and wellbeing (Figure 11).

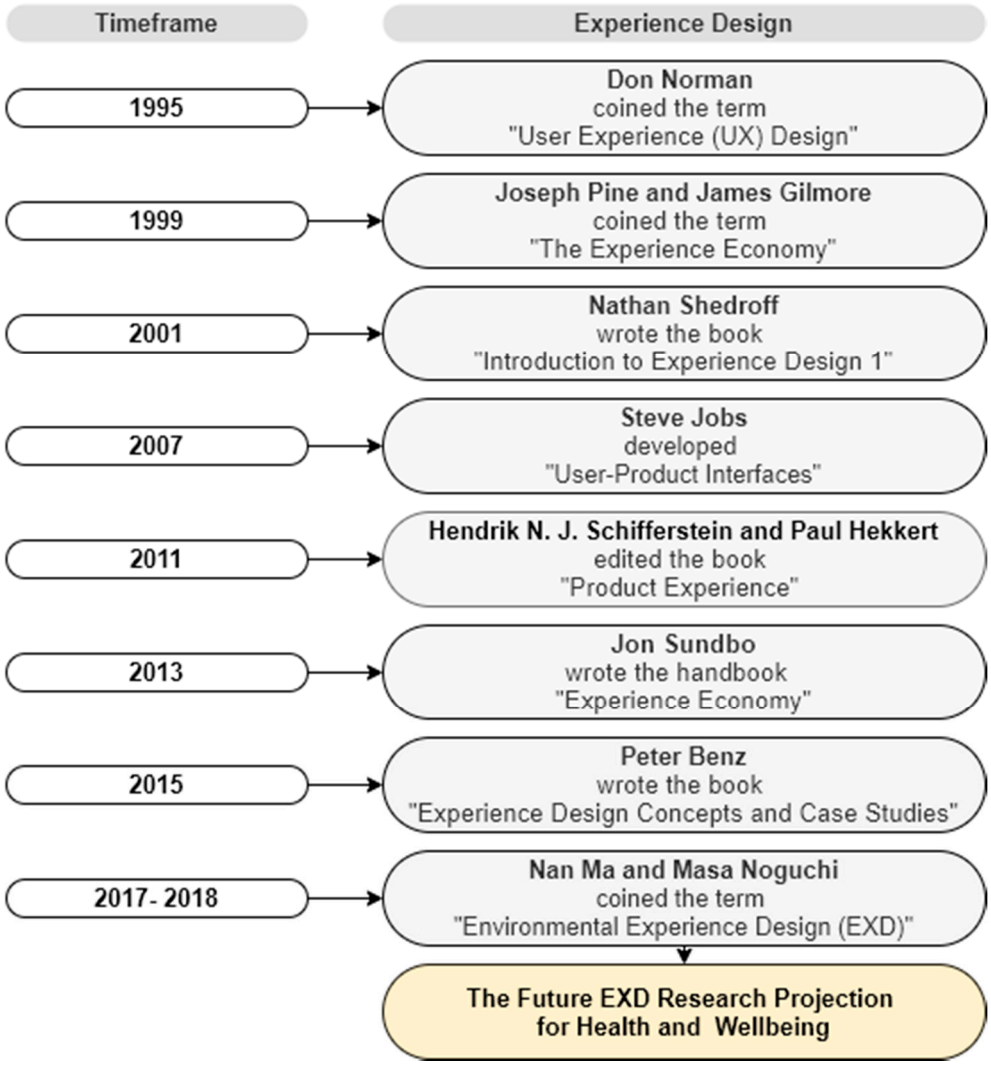

Figure 11. Historical milestones of user experience design initiatives and the future direction.

5. Conclusions

This study explored a concept of domestic environmental experiences following a research question: what is the notion of domestic environmental experience that may have impacts on occupants' mental health and wellbeing? This question was originally stipulated by today's limited living conditions of middle income households in Bangladesh where design research on user experiences in domestic environments has not yet been well developed to date. This study found the significant impacts of domestic environments on human perceptions that to some extent influence occupants' mental health and wellbeing. Each design of the domestic settings yields meditative capacities that affect occupants' physical, biological and psychological responses. Moreover, it also contributes to stimulating occupants' emotions, feelings and moods positively or negatively. In consideration of this study's outcomes, the term *domestic environmental experience* can be defined as users' experiences of cognitive perceptions and physical responses to their domestic built environment. Domestic environmental experiences are diverse according to occupants' daily household activities. Without rigorous understanding of occupants' domestic living experiences, the environmental design solutions to enhance their mental health and wellbeing may hardly be identified or implemented. Therefore, this research also led to proposing the composition of domestic environmental experiences that need to be correlated with architectural design solutions. Nonetheless, this study did not extend the research scope to exploring the correlation where the emerging notion of Environmental Experience Design (EXD) may be able to

serve as the mediator. Accordingly, this new horizon of EXD research that helps to enhance domestic environmental experiences defined through this study needs to be explored further. Particularly, this study will revisit architectural design approaches to domestic built environments being occupied by middle income households in Bangladesh whose limited living conditions were the original driver of this research.

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References

1. Markony, G.A.U.Z.; Zahan, I.; Zillur, K.; Hoque, M.U.; Hasan, M.; Hossain, S.; Islam, M.S.; Ahamed, R.; Talukder, S.K.; Aziz, S.S.; et al. *The State of Cities 2017: Housing in Dhaka*; BIGD Report; Brac Institute of Governance and Development, Ed.; BRAC University: Dhaka, Bangladesh, 2017.
2. Marien, M.J.C. *Global Trends 2030: Alternative Worlds*; A Publication of the National Intelligence Council: Washington, DC, USA, 2013; Volume 1, p. 160.
3. Khatun, F.; Saadat, S.Y. *Youth Employment in Bangladesh*; Springer: Berlin/Heidelberg, Germany, 2020.
4. OFFICE, I.L. *Global Employment Trends for Youth 2020: Technology and the Future of Jobs*; International Labour Office: Geneve, Switzerland, 2020.
5. United Nations, Department of Economic and Social Affairs, Population Division. *World Population Ageing 2019: Highlights (ST/ESA/SER. A/430)*; United Nations: New York, NY, USA, 2019.
6. Islam, A.; Biswas, T. Mental health and the health system in Bangladesh: Situation analysis of a neglected domain. *Am. J. Psychiatry Neurosci.* **2015**, *3*, 57–62. [CrossRef]
7. Shams, S.; Mahruf, M.; Shohel, C.; Ahsan, A. Housing problems for middle and low income people in Bangladesh: Challenges of Dhaka Megacity. *Environ. Urban. ASIA* **2014**, *5*, 175–184. [CrossRef]
8. Kamruzzaman, M.; Ogura, N. *Apartment Housing in Dhaka City: Past, Present and Characteristic Outlook*; Building Stock Activation: Tokyo, Japan, 2007.
9. Choguill, C.L. Problems in providing low-income urban housing in Bangladesh. *Habitat Int.* **1988**, *12*, 29–39. [CrossRef]
10. Khare, H.S. *Barriers Constraining the Low and Middle Income Housing Finance Market in Bangladesh*; World Bank: Washington, DC, USA, 2016.
11. Dovey, K. The aesthetics of place. In *Aesthetics, Well-being and Health*; Cold, B., Ed.; Ashgate Publishing: Aldershot, UK, 2001; pp. 93–101.
12. Evans, G.W. The built environment and mental health. *J. Urban Health* **2003**, *80*, 536–555. [CrossRef]
13. Kopec, D.A. *Environmental Psychology for Design*, 3rd ed.; Bloomsbury Publishing Inc.: London, UK, 2018.
14. Lawlor, A. *A Home for the Soul: A Guide for Dwelling with Spirit and Imagination*; Clarkson Potter Publishers: New York, NY, USA, 1997.
15. Mallgrave, H.F. *From Object to Experience: The New Culture of Architectural Design*; Bloomsbury Publishing: London, UK, 2018.
16. McClure, W.R.; Bartuska, T.J.; Young, G.L. *The Built Environment: A Collaborative Inquiry into Design and Planning*; John Wiley & Sons Inc.: Hoboken, NJ, USA, 2011.
17. Goldhagen, S.W. *Welcome to Your World: How the Built Environment Shapes Our Lives*; Harper Collins: New York, NY, USA, 2017.
18. Noguchi, M.; Ma, N.; Woo, C.M.M.; Chau, H.; Zhou, J. The Usability Study of a Proposed Environmental Experience Design Framework for Active Ageing. *Buildings* **2018**, *8*, 167. [CrossRef]
19. Norman, D.A. *The Psychology of Everyday Things*; Basic books: New York, NY, USA, 1988.

20. Caan, S. *Rethinking Design and Interiors: Human beings in the Built Environment*; Laurence King: London, UK, 2011.
21. Cooper, R.; Burton, E.; Cooper, C. *Wellbeing: A Complete Reference Guide, Wellbeing and the Environment*; John Wiley & Sons: Hoboken, NJ, USA, 2014; Volume 2.
22. Colombo, B.; Laddaga, S.; Antonietti, A. Psychology and Design. The Influence of the Environment's Representation Over Emotion and Cognition. An ET Study on Ikea Design. *Procedia Manuf.* **2015**, *3*, 2259–2266. [CrossRef]
23. Ma, N.; Chau, H.W.; Zhou, J.; Noguchi, M. Structuring the Environmental Experience Design Research Framework through Selected Aged Care Facility Data Analyses in Victoria. *Sustainability* **2017**, *9*, 2172. [CrossRef]
24. Fisher, S. *Body Consciousness; You are What You Feel*; Prentice-Hall: Englewood Cliffs, NJ, USA, 1973.
25. Perkins, H.; Thorns, D. Making a home: Housing, lifestyle and social interaction. In Proceedings of the ENHR Conference, Gavle, Sweden, 25–30 June 2000.
26. Friedman, A. *The Adaptable Home: Designing and Building for Choice and Change*; McGraw-Hill: New York, NY, USA, 2002.
27. Hollander, J. The Idea of Home: A Kind of Space. *Social Res.* **1991**, *58*, 31–49.
28. Rybczynski, W. *Home: A Short History of an Idea*; Penguin Books: London, UK, 1987.
29. Heidegger, M. *Building Dwelling Thinking. Poetry, Language, Thought*; Trans. Albert Hofstadter, Harper Colophon: New York, NY, USA, 1971.
30. Somerville, P. The social construction of home. *J. Arch. Plan. Res.* **1997**, *14*, 226–245.
31. Wise, J.M. Home: Territory and identity. *Cult. Stud.* **2000**, *14*, 295–310. [CrossRef]
32. Cooper, C. *Designing for Human Behavior*; Dowden-Hutchingson &.(nd): London, UK, 1974.
33. Mallett, S. Understanding home: A critical review of the literature. *Socio. Rev.* **2004**, *52*, 62–89. [CrossRef]
34. Stokols, D. On the distinction between density and crowding: Some implications for future research. *Psych. Rev.* **1972**, *79*, 275. [CrossRef] [PubMed]
35. Hayward, D.G. Psychological concepts of 'home'. *HUD Chall.* **1977**, *8*, 10–13.
36. Pennartz, P.J. Atmosphere at home: A qualitative approach. *J. Environ. Psychol.* **1986**, *6*, 135–153. [CrossRef]
37. Smith, S.G. The essential qualities of a home. *J. Environ. Psychol.* **1994**, *14*, 31–46. [CrossRef]
38. Smith, S.J. *International Encyclopedia of Housing and Home*; Elsevier: Amsterdam, The Netherlands, 2012; Volume 5.
39. Dovey, K.; Altman, I.; Werner, C. *Home Environments. Human Behavior and Environment: Advances in Theory and Research*; Altman, I., Werner, C.M., Eds.; Plenum Press: New York, NY, USA, 1985.
40. Bryson, B. *At Home: A Short History of Private Life*; Doubleday Canada: Toronto, ON, Canada, 2010.
41. Després, C. The meaning of home: Literature review and directions for future research and theoretical development. *J. Arch. Plan. Res.* **1991**, *8*, 96–115.
42. Moore, J. Placing home in context. *J. Environ. Psychol.* **2000**, *20*, 207–217. [CrossRef]
43. Schoenauer, N. *6000 Years of Housing. (Revised & Expanded Edition)*; W.W. Norton: New York, NY, USA, 2000.
44. Graham, L.T.; Gosling, S.D.; Travis, C.K. The Psychology of Home Environments: A Call for Research on Residential Space. *Perspect. Psychol. Sci.* **2015**, *10*, 346–356. [CrossRef]
45. Gibson, J.J. *The Senses Considered as Perceptual Systems*; Houghton-Mifflin: Boston, MA, USA, 1966.
46. Lawson, B. Design and the Evidence. *Procedia-Soc. Behav. Sci.* **2013**, *105*, 30–37. [CrossRef]
47. Merleau-Ponty, M.; Smith, C. *Phenomenology of Perception*; Humanities Press: New York, NY, USA, 1969.
48. Proshansky, H.M. The field of environmental psychology: Securing its future. *Handb. Environ. Psychol.* **1987**, *2*, 1467–1488.
49. Pallasmaa, J. *The Eyes of the Skin: Architecture and the Senses*; Wiley: Hoboken, NJ, USA, 2005.
50. Seamon, D.; Mugerauer, R. *Dwelling, Place, and Environment: Towards A Phenomenology of Person and World*; M. Nijhoff: Leiden, The Netherlands, 1985.
51. Ittelson, W.H.; Franck, K.A.; O'Hanlon, T.J. *The Nature of Environmental Experience, in Experiencing the Environment*; Wapner, S., Cohen, S.B., Kaplan, B., Eds.; Springer: Boston, MA, USA, 1976; pp. 187–206.
52. Manganari, E.; Siomkos, G.J.; Rigopoulou, I.; Vrechopoulos, A.P. Virtual store layout effects on consumer behaviour. *Internet Res.* 2011. [CrossRef]
53. Sussman, A.; Hollander, J.B. *Cognitive Architecture: Designing for How We Respond to the Built Environment*; Routledge: Abingdon, UK, 2015.

54. Ulrich, R.S.; Berry, L.; Quan, X.; Parish, J.T. A Conceptual Framework for the Domain of Evidence-Based Design. *HERD Health Environ. Res. Des. J.* **2010**, *4*, 95–114. [CrossRef]
55. Ulrich, R.S.; Simons, R.F.; Losito, B.D.; Fiorto, E.; Miles, M.; Zelson, M. Stress recovery during exposure to natural and urban environments. *J. Environ. Psychol.* **1991**, *11*, 201–230. [CrossRef]
56. Ellis, E.V.; McEachron, D.L. Health and Wellness in Today's Technological Society. In *Health and Well-Being for Interior Architecture*; Routledge: Abingdon, UK, 2017; pp. 94–107.
57. Hull, R.B., IV; Michael, S.E. Nature-based recreation, mood change, and stress restoration. *Leisure Sci.* **1995**, *17*, 1–14. [CrossRef]
58. Kaplan, B.; Wapner, S. *Perspectives in Psychological Theory: Essays in Honor of Heinz Werner*; International Universities Press: New York, NY, USA, 1960.
59. Maslow, A.H. *The Farther Reaches of Human Nature*; Viking Press: New York, NY, USA, 1971; Volume 19711.
60. Robinson, S. *Mind in Architecture: Neuroscience, Embodiment, and the Future of Design*; Robinson, S., Pallasmaa, J., Eds.; Mit Press: Cambridge, MA, USA, 2015.
61. Mehrabian, A.; Russell, J.A. *An Approach to Environmental Psychology*; MIT Press: Cambridge, MA, USA, 1974.
62. Russell, J.A.; Pratt, G. A description of the affective quality attributed to environments. *J. Person. Soc. Psychol.* **1980**, *38*, 311. [CrossRef]
63. Huta, V. Meaning as a Subjective Experience. *J. Const. Psychol.* **2017**, *30*, 20–25. [CrossRef]
64. Amérigo, M.A.; Aragones, J.I. A theoretical and methodological approach to the study of residential satisfaction. *J. Environ. Psychol.* **1997**, *17*, 47–57. [CrossRef]
65. Devlin, A.S. *Environmental Psychology and Human Well-Being: Effects of Built and Natural Settings*; Academic Press: Cambridge, MA, USA, 2018.
66. Overtoom, M.E.; Elsinga, M.G. Oostra, M.; Bluyssen, P.M. Making a home out of a temporary dwelling: A literature review and building transformation case studies. *Intell. Build. Int.* **2019**, *11*, 46–62. [CrossRef]
67. Clark, W.A. Residential preferences and residential choices in a multiethnic context. *Demography* **1992**, *29*, 451–466. [CrossRef]
68. Gosling, S.D.; Gifford, R.; McCunn, L. Chapter 20: The selection, creation, and perception of interior spaces: An environmental psychology approach. In *Handbook of Interior Architecture and Design*; Broker, G., Ed.; Bloomsbury: London, UK, 2013; pp. 278–290.
69. Evans, G.W.; Lepore, S.J.; Schroeder, A. The role of interior design elements in human responses to crowding. *J. Person. Soc. Psychol.* **1996**, *70*, 41–46. [CrossRef]
70. Ana, G.R.; Morakinyo, O.M.; Fakunle, G.A. Indoor air quality and risk factors associated with respiratory conditions in Nigeria. In *Current Air Quality Issues*; IntechOpen: London, UK, 2015.
71. Hawkes, D. *The Circadian House: Hawkes House-Designing for Ageing*; Housing Learning & Improvement Network: London, UK, 2015.
72. Iavicoli, I.; Leso, V.; Bergamaschi, A. Occupational exposure to urban airborne particulate matter: A review on environmental monitoring and health effects. In *Urban Airborne Particulate Matter*; Springer: Berlin/Heidelberg, Germany, 2010; pp. 501–525.
73. Ergan, S.; Shi, Z.; Yu, X.J. Towards quantifying human experience in the built environment: A crowdsourcing based experiment to identify influential architectural design features. *J. Build. Eng.* **2018**, *20*, 51–59. [CrossRef]
74. Lawrence R., J. Research, Transition spaces and dwelling design. *J. Arch. Plan. Res.* **1984**, *1*, 261–271.
75. Hall, E.T. *Beyond Culture*; Anchor Books/Doubleday: Garden City, NY, USA, 1989.
76. Kaplan, S. The restorative benefits of nature: Toward an integrative framework. *J. Environ. Psychol.* **1995**, *15*, 169–182. [CrossRef]
77. Miller, S.; Schlitt, J.K. *Interior Space: Design Concepts for Personal Needs*; Praeger Publishers: Westport, CT, USA, 1985.
78. Weisner, T.S.; Weibel, J.C. Home environments and family lifestyles in California. *Environ. Behav.* **1981**, *13*, 417–460. [CrossRef]
79. Kent, J.; Thompson, S. Health and the built environment: Exploring foundations for a new interdisciplinary profession. *J. Environ. Pub. Health.* **2012**, *1*, 261–267. [CrossRef]
80. Fuller, T.D.; Edwards, J.N.; Sermsri, S.; Vorakitphokatorn, S. Housing, stress, and physical well-being: Evidence from Thailand. *Soc. Sci. Med.* **1993**, *36*, 1417–1428. [CrossRef]

81. Vartanian, O.; Navarreteb, G.; Chatterjeec, A.; Fichd, L.B.; Gonzalez-Morae, J.L.; Lederf, H.; Modro, C.; Nadalf, M.; Rostrupg, N.; Skovh, M. Architectural design and the brain: Effects of ceiling height and perceived enclosure on beauty judgments and approach-avoidance decisions. *J. Environ. Psychol.* **2015**, *41*, 10–18. [CrossRef]
82. Gifford, R.; Nilsson, A. Personal and social factors that influence pro-environmental concern and behaviour: A review. *Int. J. Psychol.* **2014**, *49*, 141–157.
83. Inman, M.; Sinn, M. Family stress in the interior living environment related to the number of bathrooms. *Hom. Econ. Res. J.* **1987**, *16*, 103–108. [CrossRef]
84. Altman, I.; Werner, C.M. Human Behavior and Environment: Advances in Theory and Research. *Hom. Environ.* **1985**, *8*.
85. Hollander, J. *A Sussman, Cognitive Architecture*; Routledge: New York, NY, USA, 2015.
86. Oishi, S. The psychology of residential mobility: Implications for the self, social relationships, and well-being. *Persp. Psychol. Sci.* **2010**, *5*, 5–21. [CrossRef] [PubMed]
87. Norman, D.A. *Emotional Design: Why We Love (or Hate) Everyday Things*; Basic Civitas Books: New York, NY, USA, 2004.
88. Thompson, J.A.A.; Blossom, N.H. *The Handbook of Interior Design*; John Wiley and Sons: New York, NY, USA, 2015.
89. Pable, J.; Waxman, L.; McBain, M. Low-Income Housing and the Practical Potential of Livability Standards. In Proceedings of the 2011 ART & DESIGN for Social Justice Symposium, Tallahassee, FL, USA, 17 January 2011.