JOURNAL OF ARCHITECTURAL RESEARCH AND DESIGN STUDIES
DOI: 10.20885/jars.vol7.iss2.art1

Millennial's Residential Design Principle & Basic Model To Improve Work-from-Home Performance Through Mindfulness Practices

Kartiansmara L. Purnaumbara[1]

[1] Departement of Architecture, UIN Sunan Kalijaga Yogyakarta

Article History
Received : 28 February 2023
Accepted : 12 October 2023
Published : 21 November 2023

Abstract

Since the pandemic COVID-19 outbreak in 2020, it appears that the entire world has been forced to become acquainted with working from home as a new working concept. One of the dominant challenge in implementing work-from-home comes from decline of work performance caused by incapability to cognitively focus on several task at once. Millennial as a dominant productive age range in Indonesia are facing this continuously emerging problems, considering work-from-home working culture and flexible working are believed to be a future of work culture. When implementing work-from-home, millennials face the challenge to improve work performance, one of which is through mindfulness practices to help boost work performance. Through a literature review and design by research, this study seeks to identify a home and workspace design application model that accommodates mindfulness practices. Mindfulness practices are accommodated through flexible spatial planning, building materials with various texture, window openings in the workspace are strategically adjacent to green garden, green spaces with wide variety of colour, shape, and textures, and then the principle are applied in a residential models that fit the preferences for the millennial generation.

Keywords: *Millennial house design; mindfulness; workspace; work performance*

Introduction

Since the outbreak of the pandemic COVID-19, in 2020, it is as if the whole world has been forced to become familiar with an unusual working concept, namely working from home. In fact, the concept of working from home is not a new concept for the professional landscape. In 1970 the concept was considered as a solution to minimize traffic caused by vehicle mobility by eliminating worker mobility, namely by working from home (Siddhartha & Malika, 2016) . The pandemic actually only encourages the implementation of working from home as a massive work culture, as a solution to minimize contact with other humans which ultimately aims to minimize the transmission of the COVID-19 virus.

There are several factors that determine the success or failure of a work from home initiative. One of them is corporate policy, both from private sector and government. At the private level, large companies such as Google, Microsoft, Amazon, Twitter after the pandemic have encouraged their staff to work from home. In Indonesia, even government institutions are also starting to plan the implementation of working from home for certain positions. The Ministry of National Development Planning/ Bappenas has carried out a work from home trial under the name Flexi Work after the COVID 19 pandemic (Mungkasa, 2020).

However, the implementation of working from home require us to overcome some challenges. One of the contributors to distraction in working

Correspondence: Kartiansmara L. Purnaumbara
Department of Architecture, UIN Sunan Kalijaga Yogyakarta
E-mail: kartiansmara.purnaumbara@uin-suka.ac.id

from home is the absence of restrictions on access to distractions from cyberspace, one of which is social media. (Ashfar, 2020). The issue of equal distribution of internet network technology has also become one of the obstacles at the start of the adaptation process of working from home in Indonesia. However, over time, it turned out that technological constraints could be overcome properly, then it was collectively realized that work culture issues were the main obstacle to implementing work from home in the Asian region. Distraction from domestic work and a work space that is inseparable from home activities raises its own obstacles in getting used to working from home (Mungkasa, 2020). Changes in work patterns by working at home also affect work performance. As many as 20% of workers feel their work performance has decreased since the implementation of work from home (Dharma, 2021).

Problems regarding work productivity when working from home are of course faced by many millennial generation workers. The millennial generation refers to the age range of 20-39 years (Duffy et al., 2017), whereas based on data from Bappenas 30-36 years of age are included in that age range and considered as the most productive age range in Indonesia. Demographically speaking, millennial generation is a generation that has a large proportion of the productive age range in Indonesia. The millennial age range in the demographic portion reaches 39% of the total productive age population in Indonesia (Bappenas, 2021). When compared to other generations, the millennial generation has distinct characteristics. The millennial generation has a specific income class size that influences their preferred residential location. According to research, the millennial generation's income allows them to purchase housing with a range of 33,659 USD and a property area of 60 m² (Analisa & Okada, 2023). The millennial generation has specific housing preferences that are closely related to flexibility. (Analisa & Okada, 2023; Andrew, 2020; Mulyano et al., 2020; Surat, 2014).

Over the past decade, clinical psychologists and physicians have used many mindfulness training techniques to treat patients with a variety of disorders, from depression and anxiety to chronic pain (Baer, 2003). The definition of mindfulness itself is rooted in Buddhist epistemology, and traditional definitions are closely related to Buddhist meditation (Porter et al., 2017). Traditionally, mindfulness has meant the practice of seeing things as they are based on their current state (Gunaratana, 2003). The practice of mindfulness aims to create a clear, calm, focused mind in order to achieve a disciplined, pure mind that leads to the elimination of suffering from self-denial and delusions (Bodhi, 1994).

The corelation between mindfulness practices and work performance is also highly related. Based on research, mindfulness practices are closely related to vitality, human connection, and a high sense of satisfaction with life (Brown & Ryan, 2003). Another study was conducted and concluded that mindfulness increases energy and boosts the immune system in stressful environments and stressful conditions (Malarkey et al., 2013). It is also proved by a results from MRI scans show that a group with a background of mindfulness training is more resistant to negative emotional stimuli (Davidson et al., 2003). MRI scans were also studied by his Modino (Modinos et al., 2010) , and Farb (Farb et al., 2010) came to similar conclusions.

The link between work performance and mindfulness practice is also strengthened by the data collected by Dane. Based on his research, mindfulness practices are not only related to work performance, but also tend to strengthen work relationships with organizations (Dane & Brummel, 2014). Similar notion has also been concluded by other research that various mindfulness practices also contribute to increasing adaptability in focusing on doing diverse tasks (Hülsheger et al., 2013).

Thus, the ability to improve work performance while working from home is a significant challenge that must be addressed in a collaborative manner. Especially when it comes to the needs of the millennial generation, who constitute the majority of users who implement Work From Home. This paper aim to identify crucial component to develop a house model for millennial generation that hopefully able to improve Work From Home performance through mindfulness practices.

In addition to exploring the benefits of mindfulness techniques, several studies on housing for young families have been

undertaken. Many studies address the considerations for selecting homes for users with low financial resources. Demographics, price, finances, location, environment, and structure are among factors that young families consider when purchasing their first house (Ameera Mentaza Khan et al., 2017). Rahardjo also discusses studies that focus on decision-making variables in choosing homes for young families (Rahardjo et al., 2015). Farraz has also discussed similar criteria related with the specific characteristics of a commuter families (Farraz & Barus, 2019) and Farasa (Farasa & Kusuma, 2018). Other studies on the house as a work environment has also been carried out. Sullivan studied potential challenges as well as the link between spatial planning and behavior (Sullivan, 2000), Rowe also examines the impact of adjusting the house as a work space, one of which is the impact on the layout of the house.

With the rising prominence of researching the inclusion of residential designs as workspaces and the variety of difficulties associated with them, as previously discussed, this research is expected to be able to develop residential designs to address these issues. This research approach focuses on residential designs that are not only in line with millennial preferences as residential users with unique characteristics as work-from-home workers, but also meet the requirements of work space in the residential according to the guidelines discussed in previous studies.

Literature Review

1. Distinct characteristics of house for millennials

a) Spatial Flexibility

The principle of spatial planning relates to how the space and activity connects in a residential plan. Spatial planning plays a very important role in mindfulness practice. It is recommended to have a separate room from regular activities, or it could be accomplished through a specific room whose arrangement is designed to be flexible enough when used as a private room, whether for a group or an individual (Porter et al., 2017)

The house is divided into private and semi-private areas. According to the findings of previous research, spatial flexibility is an important principle in designing for the millennial generation. Planning a house with an open floor plan is thought to be a beneficial way to increase the efficiency and effectiveness of space (Nuraeny et al., 2020). Analisa and Okada also came to the same conclusion. Minimizing semi-private room partition, such as the living room, dining room, and kitchen, can increase function flexibility in residential areas for the millennial generation. The house for the millennial generation is also commonly regarded as the initial house, which is assumed to be built in stages over time. This development phase are also being aided with this spatial flexibility (Analisa & Okada, 2023).

Andrew (Andrew, 2020) is also sharing the simillar notions. In the context of millennial housing, flexibility can categorized into 4 kind of flexibility: spatial flexibility (both in fixed surface areas and in evolutionary spatial flexibility), flexibility in construction, and flexibility in building technology application. The flexibility of space is closely related to mindfulness practice among the various flexibility that can be applied above in the context of mindfulness.

Spatial flexibility is also a design principle emphasized by Surat. This is related to the need for a space that can be used to collaborate and socialize. The millennial generation has the characteristics of high social relations, so that semi-private spaces inside the compact and flexible housing are an important requirement to be accommodated (Surat, 2014). Analisa and Okada share the same viewpoint. According to Analisa and Okada, everyone who enters the house can almost be assumed to be a person with close social relations with the house's owner. (Analisa & Okada, 2023)

b) User characteristics, preffered size & model

The majority of Millennials are employed, have a stable income, are married, and have one or two children. This has a repercussions on the millennial generation's need for space in the home. Furthermore, the fact that the economy is still in its initial stages of stable income indicates that the millennial home will develop over time. In Indonesia, millennials prefer houses priced under $33,659 USD. This is closely related to millennials' income levels, which are still in the initial phases of their economic development. The need for space in the home is also influenced by the economic level. Houses in this price range on the Indonesian property market typically have two private rooms and a land area of 60-80 m² (Analisa & Okada, 2023). While in Indonesia property market, those land area are usually highly correlated with 36-48 m² building area constructed within its limited land area. Surat previously expressed space requirements, also emphasize that the millennial generation requires two rooms and other semi-private spaces for socializing and interacting, both among residents and guests (Surat, 2014).

Some research also share the same notions about the importance of space efficiency in designing house for millennials. Simillar room with same characteristics could be merged into a single space with multi-purpose utilization (Analisa & Okada, 2023; Mulyano et al., 2020; Surat, 2014) to minimize floor area.

Millennials' preferences for residential types have distinct characteristics. According to Surat's research, preferences in the context of western countries tend to choose housing that is not only compact, but also has many public amenities that can be shared among building user, which is typically found in an apartment (Surat, 2014). This means that millennials in developed countries prefer to live in vertical housing/apartments. Although it does not refer to quantitative proportions, Clark and Onaka's research concludes that proximity to natural elements such as garden is one of the key factors considered by people when choosing a property. (Clark & Onaka, 1983). Meanwhile, in Indonesia, millennial users have distinct characteristics, with 95% preferring landed housing. (Analisa & Okada, 2023).

2. Design principle to accomodate mindfulness practice

According to previous research, in order to design a mindfulness-based environment, a built environment should include specific requirements that assist its users in practicing mindfulness, such as spatial arrangement, texture, material, light, shadow, natural element, and other architectural components. These design elements are then classified into the following key principles: a) Indoor and outdoor spaces arrangement; and b) Architectural details, materials, and textures.

a) Integration of Natural Element from outside and inside of the building

The integration of natural element such as vegetation in dwellings serves many important philosophical and practical functions in order to accommodate dwellers in practicing mindfulness, according to a traditional approach close to Buddhist roots. *Utsuroi*, which translates as "periodic change," is a concept widely known in Japanese architecture. Natural elements considered to always grow, develop, and change from time to time are philosophically interpreted that the true reality is temporary and will disappear/change from time to time. Natural vegetation elements will always create different shadows, affect a person's perception of the space he is in, strengthen the focus on the present, and eventually the change is thought to make it easier for individuals to practice mindfulness (Kawai, 2018).

Incorporating vegetation as a design element, both for indoor and outdoor spaces in the living environment has a positive impact on human psychological health. Biophilia, as an approach to integrate natural elements with human living spaces, increases the restorative ability of human psychology in dealing with anxiety disorders and lowering blood pressure in an indoor space. Meanwhile, gardens and other natural elements in open spaces can help people recover from anxiety disorders, as long as they have enough visual access (Yin et al., 2020). Direct visual connection of the outdoor natural environment in human living spaces have been shown to improve user work quality and stress recovery. It even reduces the harmful effects of stressors on users (Li & Sullivan, 2016). Aligned with the previous notion, continuous exposure of natural sound such as trees, birds, water, and various other sounds aids in stress recovery (Alvarsson et al., 2010).

According to the findings discussed above, environmental design that incorporates vegetation and other natural elements, using both conventional and empirical approaches, is thought to benefit users and aid in the practice of mindfulness. When viewed from the perspective of traditional mindfulness, for example, the vegetation element is seen as an element that supports the user in practicing mindfulness as a natural marker of present time and space, encouraging users to focus on the present time. Meanwhile, from a more secular standpoint, vegetation serves as a soothing visual element. Vegetation, as a positive sound stimuli, has a positive impact on stress recovery and can be used to aid in mindfulness practice (Zinn, 1995) The vegetation used in the design is suggested to serve an evocative function as a stimulus for the user's senses, with a variety of textures, aromas, colors, and even a distinct sound when blown by the wind (Oyetola et al., 2013).

According to Porter, Bramham, and Thomas (Porter et al., 2017) and Salingaros (Salingaros, 2015), the use of biophilia design can aid in the practice of mindfulness. Biophilia requires eight key spatial qualities to create a space that promotes recovery: (a) light, (b) color, (c) gravity, and (d) the formation of fractal patterns. (e) Curved pattern (f) Extensive detail (g) Has a Water Element (h) Plant/natural element integration. These eight keys serve as multisensory stimuli for users nearby and are thought to have a positive impact on human psychology.

b) Architectural details, materials, and textures.

Architectural details are also crucial in establishing the dark-light sensation created by dark areas. In Japanese architecture, the term Yúgen refers to the sensation of darkness and mystery. Yúgen is an essential component that can also be employed to create a sense of mystery from a seamless circulation flow and to exemplify a transcendental atmosphere (Lazarin, 2014). The use of shadow/dark-light elements is thought to increase emphasis on the surrounding conditions rather than an evenly lit room.

This traditional approach is also aligned with the secular approach to mindfulness, which asserts that in order to engage in mindfulness, humans must be able to pay great attention to everything, both external and internal occurrences (Brown & Ryan, 2003; Dane, 2011). What must be taken into account when developing detailed design features is the role of these detailed features as a medium to aid the user in practicing mindfulness.
It is suggested that the detailed design features include stimuli that cause various sensory information, encouraging residents to focus on current conditions (Zinn, 1995). Natural views from windows, natural light, ambient noise, and even just natural nuanced images have been shown in studies to provide positive diversions for patients, ultimately improving their

psychological health (Ulrich et al., 1991).

The materials used in house design can also be used to aid mindfulness practices. Textured materials are stimuli with psychological impact. Textures can have a psychological impact by incorporating visual and tactile effects. Textures generate shadows that change over time, as well as Yúgen and Utsuroi sensations that aid in mindfulness practices (Kawai, 2018). Visual stimuli from building materials have a favorable psychological effects on house dwellers to reduce negative impact of stress (Brown & Ryan, 2003; Dane, 2011) caused by Work from Home, prevents decreasing work performance among workers. Textures, on the other hand, induce tactile sensations as positive stimuli for users. Tactile stimulation from natural materials is also soothing and has been proven to alleviate stress. (Salingaros, 2015).

3. House as a future of workspace

A house used as a workplace must meet certain requirements. This is because a working person will seated and use a living space as if it were an office for an extended period of time. Meanwhile, the house is not necessarily ready to function as a workplace, both architecturally, in terms of work ergonomics, and in terms of other technical supporting requirements.

JLL Research put together a report on predictions of the future workspace. The results of this study concluded that the future workspace must apply the principle of flexibility as a key principle in its design. This is because the number of remote working people will continue to increase in the future, and the office will one day function as a communal space to support collaboration (JLL, 2020). Foo also appears to agree on the importance of flexibility in the future workspace, stating that the center of the future workspace design rests on the importance of flexibility in design. (Foo, 2021).

However, even though a collaborative work culture will continue to develop over time, other studies have also emphasized the importance of private workspaces. Other important features that need to be considered in using a house as a work space are (a) the size that fits your needs; and (b) has good internal space quality (Cuerdo-Vilches et al., 2021). Another study conducted by Susanto concluded in more detail regarding the area requirements. The area of work space at home that is private is recommended to be carried out in a private room with an area of 3-6 m2. From the same research, the position of work at home is still dominated by 45% of respondents, the largest proportion of all survey respondents. This private workspace does not mean that you have to have a special room like an office workspace. The workspace can be merged inside a room that is also used for resting and sleeping, because the workspace in the house has behavioral trait that tend to be similar to the activities carried out in the bedroom. (Susanto et al., 2022)

Other researchers have also proposed merging room and workspace functions. According to other research, the trend of integrating room functions with workspaces has increased in 2019-2020. In 2019, it was discovered that 2.07% of the house's area was used as a work space. Whereas in 2020, it was documented that the average area of the house used as a work space reached 5.23%.(Uherek-Bradecka, 2021). The integration of spatial functions and flexibility is actually consistent with the recommendations discussed previously by Porter on the subject of the aspects of millennial generation houses (Porter et al., 2017), Nuraeny (Nuraeny et al., 2020), and Analisa (Analisa & Okada, 2023). As a result, it is possible to conclude that there is a similar connection point between the characteristics of the millennial generation house and the function of the house as a future work space. This is an indication of the importance of spatial flexibility in developing residential models as work spaces for the millennial generation.

At a more technical level, technical features must also be considered, bearing in mind that not all private houses are ready to be

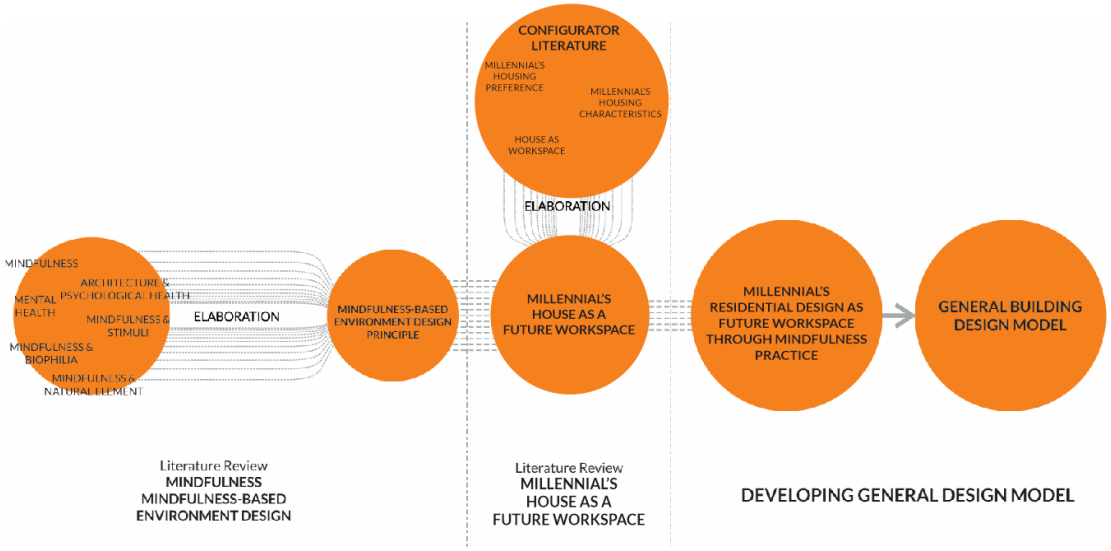
used as a work space. For example, it is advisable to keep the lighting up to standard (Dubey et al., 2022), have equipment to minimize acoustic interference (Bonenberg & Lucchini, 2022; Dubey et al., 2022), clean air (Susanto et al., 2022), furniture that meets the requirement of working pose ergonomics are also obligatory (Bonenberg & Lucchini, 2022; Cuerdo-Vilches et al., 2021; Dubey et al., 2022).

Methodology

The authors first conduct a literature review to develop set of criteria that will be utilized as a basis for developing building design models through design by research. The literature that being elaborated as a literature were books and indexed journal articles, ranging from qualitative and research and practically validated design criteria. The literature review covers topics such as mindfulness, psychology, well-being, work performance, and architecture.

Authors elaborate on developing mindfulness-based environmental design criteria from both modern and secular mindfulness approaches, work performance improvement, well-being and health in both architectural and non-architectural contexts in the first elaboration stage. The majority of the literature on traditional mindfulness approaches is qualitative, though some of the traditional mindfulness principles have been later supported by empirical studies by other researchers before they can be verified as secular mindfulness approaches. Architecture cannot always intervene in environmental influences on traditional mindfulness practices. This is due to the fact that traditional mindfulness not only discusses the environment, but also the mental state and mindset of humans. During the first stage of elaboration, author extracts general principles of mindfulness based on the possibility of intervening architectural elements in general, regardless of the requirement of the architectural function of the surrounding environment. The second stage of elaboration aims to eliminate the previously concluded general criteria and relate them to the requirements of the intended architectural function: millennial generation house as a workspace. To fit the framework of house for millennial generations, authors expanded on a literature review to conclude specific characteristics for a house for millennials The researchers then extracted the architectural design principle that were deemed critical in the process of developing the house design for millennials. House characteristics for millennials serve as configurators to eliminate irrelevant criteria in the context of designing house for millennials that accomodate mindfulness practices. The configured criteria are then used as fundamental principles to be applied in house design model for millennials to improve work from home performance through mindfulness practices.

Figure 1. Elaboration Stages Diagram
Source: Author



Result and Discussion

To improve residential design principles for the millennial generation A literature review was carried out to develop work-from-home performance through mindfulness practices. The elaboration process aims at identifying elaborative design principles from prior research. These collaborative design principles are then implemented during the creation of models based on the previously outlined residential models that meet the needs of the millennial generation. Based on a review of the literature, the findings of previous studies on residences for the millennial generation and homes as work spaces can be elaborated and grouped into several main principles.

The elaboration process includes analyzing the correlation between general principle and an analytical framework. Elimination are also being carried out during elaboration process, as shown in **Table 1** by using Millennial's house preference as an analytical framework that serves as a configurator. Authors evaluate the correlation between the general principles of mindfulness-based design and the house as a future workspace with previously formulated Millennial's house preference principle from the first phase of elaboration.

The principles that have been analyzed and correlated with the configurator theory are then categorized into general categories and formulated into design principles that could be easily replicated in different design scenarios based on their respective context. Based on the matrix above, four prominent categories were identified: (1) Spatial Layout; (2) Material & Details; (3) Wall Opening; (4) Natural vegetation.

1. Spatial Layout Principle

The importance of spatial layout principles cannot be overlooked because they relate to flexibility, effectiveness, and efficiency. Spatial principles also address the placement of workspaces in the home, which has a significant impact on the work performance of work from home workers. Spatial principles influence not only work performance, but also the implementation of mindfulness practices, because spatial planning must be organized in such a way that users have convenient physical and visual access to outdoor environments, which is one of the strengthening aspects of mindfulness practice.

Table 1. Elaboration Matrix & Categorization

		Millennials's Housing Preference						
		Flexibility (Analisa & Okada, 2023; Andrew, 2020; Nuraeny et al., 2020; Surat, 2014)		*User characteristics* (Analisa & Okada, 2023; Clark & Onaka, 1983; Mulyano et al., 2020; Surat, 2014)		*Preferred size & Model* (Analisa & Okada, 2023; Clark & Onaka, 1983; Mulyano et al., 2020; Surat, 2014)		
		Spatial Flexibility	**Open plan arrangement**	**Multi-purpose space to accomodate several activity**	**Relatively Simplistic room function**	**Landed house**	**Natural element**	**Limited building/land area**
Design Principle to accomodate mindfulness practice (Alvarsson et al., 2010; Brown & Ryan, 2003; Dane, 2011; Kawai, 2018; Lazarin, 2014; Li & Sullivan, 2016; Oyetola et al., 2013; Porter et al., 2017; Salingaros, 2015; Ulrich et al., 1991; Yin et al., 2020; Zinn, 1995)	***Integration of Natural Element from outside and inside of building***	-	Open Plan arrangement should use a strategically placed window openings located adjacent nearby natural element such as garden/tree.	-	-	Remaining land, even if small in size, are utilized as a green and natural open space	• Remaining land are utilized as a green open space • Utilizing indoor plant as a tool in enhancing natural element inside workspace • Utilizing natural vegetation with various color, scent, and texture	Applying vertical garden/green wall to enhance a stimuli created by natural element in limited green space
	Architectural details, material, and texture	-	-	-	Applying architectural detail, unique material and texture only in an area with high chance of direct/indirect contact to enhance visual, scent, and tactile stimuli from the workspace	-	Window design should be operable and should gave the dweller option on how the window being used, despite the limited space	Applying architectural detail, unique material and texture only in an area with high chance of direct/indirect contact to enhance visual, scent, and tactile stimuli from the workspace
House as future workspace (Bonenberg & Lucchini, 2022; Cuerdo-Vilches et al., 2021; Dubey et al., 2022; Foo, 2021; JLL, 2020; Susanto et al., 2022; Uherek-Bradecka, 2021)	***Workspace can be accomodated through semi-private and private workspace***	Applying spatial flexibility by using a modest and affordable tools/technology to create private workspace	• Semi-private workspace are accomodated through merging workspace with public area of the house by utilizing open plan arrangement in public area of the house, such as living room and dining room	• Semi-private workspace are accomodated through merging workspace with public area of the house • Private workspace are accomodated through merging workspace with private area of the house, such as bedrooms.	• Semi-private workspace are accomodated through merging workspace with public area of the house • Private workspace are accomodated through merging workspace with private area of the house, such as bedrooms.	-	-	-
	Minimum area of 3-6 m2 are needed for ideal workspace	-	-	Merging workspace with pre-existing space, such as living room/dining room (for a semi-private workspace), and bedroom (for a private workspace)	Merging workspace with pre-existing space, such as living room/dining room (for a semi-private workspace), and bedroom (for a private workspace)	Workspace are being positioned strategically close to the source of natural element such as garden, green wall, pond, indoor plant,etc.	Workspace are being positioned strategically close to the source of natural element such as garden, green wall, pond, indoor plant,etc.	Merging workspace with pre-existing space, such as living room/dining room (for a semi-private workspace), and bedroom (for a private workspace)

CATEGORIES
Spatial Layout | Material & Details | Wall Opening | Natural vegetation

Source: Author

If it is not possible to provide a dedicated space for work, it is possible combine the function of the work space into the room because the room has privacy characteristics that are similar to the work space (Uherek-Bradecka, 2021). The size of the room actually meets the standard as a private workspace. Millennials have a medium size preference with the availability of 2 rooms (Analisa & Okada, 2023; Surat, 2014) for under 33,659 USD. When associated with the Indonesian context, a house with these specifications usually has a bedroom area of 8-9 m². Meanwhile, according to Susanto, the area of private workspaces is suggested to be around 3-6 m². (Susanto et al., 2022). Another research has also conclude a simillar notion, that work space area only require 1.195x1.195 mm , equal with ± 3.6 m² in the form of working pod (Dubey et al., 2022).

Residential for millennials has limited land area according to the economic level and needs of its users (Analisa & Okada, 2023; Nuraeny et al., 2020). Space flexibility is the vital element in creating a work space that is close to ideal amidst existing limitations for millennial residences with limited space. The workspace can make use of the remaining spaces with temporary boundaries so that it can be converted into a private workspace when necessary.

Collaboration, is a culture that will develop in the work culture of modern society (JLL, 2020). To respond to possibilities for periodic collaboration, a combination of semi-private/public spaces can also be carried out (Analisa & Okada, 2023; Nuraeny et al., 2020; Surat, 2014), such as The semi-private/public dining room, living room, and guest area. Thus a semi-private room can accommodate small groups to work together and collaborate regularly.

2. Wall Opening Principles

Another key principles that must be established is the placement of green open spaces and openings. This is due to the fact that the principle of opening the house affects lighting, ventilation, and visual access to the surrounding open spaces. Window openings are important not only for increasing the comfort of the home office, working from home performance, and implementing mindfulness practices.

From all of the various workspace possibilities discussed in the previous discussion (whether in the form of a special workspace, room, or working pod) it is suggested to have a visual connection to a green open area that consist of natural vegetation. The presence of natural vegetation has many impacts in mindfulness practice. Vegetation functions as a component in the formation of visual stimuli. Visual stimuli can also be generated by utilizing various levels of light and darkness via natural light. Shadows from natural vegetation create a Yúgen sensation and encourage the user to be more aware of their position against time, encouraging the user to focus on the present moment. It is considered to assist the user in practicing mindfulness (Lazarin, 2014) and, as a result, can reduce the negative effects of stress (Brown & Ryan, 2003; Dane, 2011; Davidson et al., 2003; Ulrich et al., 1991; Yin et al., 2020)

Window openings in workspace should be able to be opened and closed as needed. This is due to the need for good air exchange into the work space (Susanto et al., 2022), and good window openings make it easier for scent stimuli from green open spaces to enter the workspace. Scent stimuli also serve as beneficial stimuli for mindfulness practice because they aid users become aware of their own existence. Aromatic landscaping aids in post-stress care and healing (26). Herbal plants can also be used to create scent stimuli.(Oyetola et al., 2013). This stimuli is beneficial in order to helps user in practicing mindfulness practice to optimize their cognitive ability to improve their work performance.

3. Material Application Principles

The material application principle is important in formulating the use of textures to create tactile sensations and shadow effects caused by certain textures. Texture influences multisensory sensations, allowing users to concentrate on their surroundings. With an emphasis on building materials, it can assist users in focusing on mindfulness practices and improving

performance by reducing stress caused by work pressure.

The materials used in design can also being utilized to aid mindfulness practices. Textured materials are stimuli and highly correlated with psychological impact. Textures may result in a psychological impact by combining visual and tactile effects. Specific building material in a specific area helps user to identify their location and will helps user to understand their position, and in the end helps user in practicing mindfulness Tactile stimulation from natural materials is also relaxing and has been proven to reduce stress (Kawai, 2018; Salingaros, 2015)

Textures create shadows that shift as time passes, as well as Yúgen and Utsuroi sensory experiences that aid in mindfulness practices (Kawai, 2018). Visual stimuli from building materials have a positive psychological impact on workspace as well (Brown & Ryan, 2003; Dane, 2011) to improve work performance at home.

Textured building materials should be placed in an easily visible location and should be exposed to direct sunlight to increase the number of shadows. Building materials that produce various shadow effects must be placed in an exposed area. Area with textured materials must be placed in areas with high visibility from home workspace, so that they can be easily seen and touched by users without any restrictions.

4. Natural vegetation utilization principle

The final principle that must be concluded is the principle of natural vegetation utilization. The use of natural vegetation as sound, smell, visual, and tactile stimuli is beneficial. As with the stimuli from building materials discussed earlier, multisensory sensations caused by plants can also help users accommodate mindfulness practices by providing positive stimuli.

Landscape components are essential as a third restorative place and as a component to facilitate in practicing mindfulness. Natural elements are considered to be recovery elements for both mental and somatic symptoms (Salingaros, 2015). Furthermore, natural elements have the possibility to serve as a generator of positive stimuli, which is a crucial component of mindfulness practice. Visual stimuli, tactile stimuli, and sound stimuli can all be obtained through landscape.

Users should have easy access to the garden and open spaces. It is also possible to utilize indoor greenery not only as a decoration purposes, but also as a source of multi-sensory stimuli. Users are able to encounter tactile sensations because of easily accessible greenery. The sensation of direct contact is one of the positive stimuli that can aid mindfulness practice (Yin et al., 2020). It is suggested that the greenery used in the area has an adult human waist height (+75 cm from the ground floor) to facilitate the ability of users to reach it. It is recommended that the greenery used has a variety of branch toughness and leaf textures.

Green outdoor space and indoor plants should give careful consideration to the variety of vegetation shades utilized. Colorful vegetation reinforces the perception formed in the human psyche and has a favorable psychological effect (Oyetola et al., 2013; Yin et al., 2020). Colored leaf and flower trees may be utilized as well. Flowering trees ought to be placed in the sunlight's path to enhance the impression made by the utsuroi (Kawai, 2018). Trees also function as visual stimuli for practicing mindfulness by providing the sensations of darkness and light (Lazarin, 2014). It is best to focus to the season of each selected greenery when selecting plants to help insure that there will remain sprouting plants in an home during the annual seasons. This intends to provide the user with visual stimuli all year round.

Flowers may offer aroma scent stimuli to improve one's perception of space through greenery. Aromatic landscaping aids in post-stress care and healing (Oyetola et al., 2013). Scent stimuli can also be generated by herbs and plants such as rosemary (*Rosmarinus officinalis*), basil (*Ocimum basilicum*), and numerous different herbs. Plants with flowers might even emit the scent needed to generate scent stimuli.

Plants with fragrant flowers that enable the individual to become more aware of his surroundings, which is an essential element of mindfulness practice.

5. Design Applications

The key principles developed from the literature review serve as a guide in constructing a design model. The house model being used as a precedent is a house that applying the previous conclusions regarding millennial generation housing, namely a) the price is not more than 33,659 USD; b) the land area is not more than 60-80 m²; and c) accommodates the number of occupants ± 4 people with 2 bedrooms. Based on market preferences in Indonesia, the building area used with a land area of 60 m² is less than 40 m². If correlated with a value of 33,659 USD, the housing preference of the millennial generation can be concluded to fall into the 40/60 variety type. Using this reference, the author generate a simple floor plan based on design references from the Indonesian property market, as shown in the illustration in Figure 2.

Figure 2. Basic House Plan Design
Source: Author

Based on previous research, it was determined that there are two possible workspace models that can be developed as design models, namely the private workspace model and the semi-private workspace model. The workspace model will then be applied to the house plan precedent above to provide an overview of how the elaborated design principles will be applied.

a) Private Workspace Arrangement

By combining workspace functions with rooms, Private Workspace is developed. The use of foldable work furniture allows for greater flexibility in the use of space. Indoor plants can be used as visual and scent stimuli and can be arranged so that they are close to the user. Indoor plants in the home workspace are priven to be beneficial with post stress recovery during work (Yin et al., 2020). The utilization of foldable furniture and indoor plants can be seen in precedent Figure 3.

Figure 3. Example of foldable furniture to be utilized in room as a private workspace.
Source: www.etsy.com

The private workspace is positioned in a spot with direct visual and ventilation access to the outdoor area (Figure 4). This aims to bring the workspace closer to positive stimuli in order to encourage mindfulness practices and, as a result, improve work performance. Based on the illustration below, a textured wall can be used as a form of visual stimuli in the form of light and dark elements in the area of the highlighted red wall (Figure 5). Meanwhile, open spaces could use various vegetation types to create a visual barrier from the service area, as well as components for creating visual, scent, and texture stimuli.

Figure 4. Top & Bottom: Workspace layout are arranged in both room to have an unobstructed view toward stimuli sources.
Source: Author

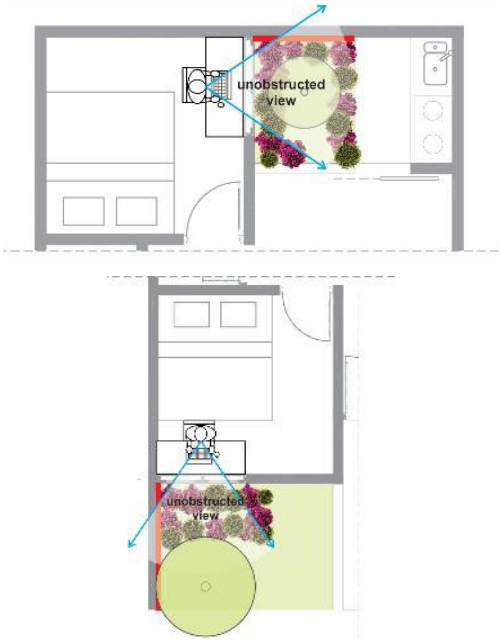
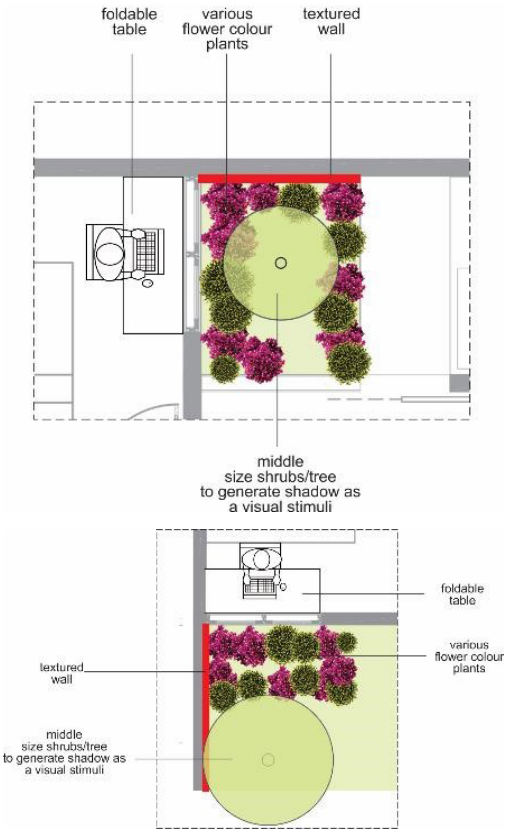
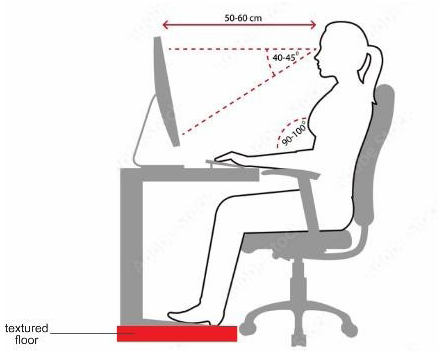


Figure 5. Top & Bottom: Workspace and open space arrangement model based on design principle applied on both room.
Source: Author



Material texture may be utilized to provide positive stimuli in the form of a tactile sensation in the workplace, such as the floor of the workspace area. If the workspace user feels the need to increase their focus and cognitive awareness through regular mindfulness practices, the workspace area can have a coarser texture than the room area to provide a tactile sensations (Figure 6).

Figure 6 An Example of applying texture in the workspace's floor
Source: Reneshia (www.stock.adobe.com) & Author



b) Semi-private Workspace arrangement

Semi-private workspace is incorporated by making use of existing semi-private spaces in the home. The semi-private function in millennial housing is found in the space in the house that usually functionally merged with other space. As an example, the dining room, living room, and guest area. Semi-private workspaces generally require flexibility if certain work-related activities require privacy, such as during meetings, brainstorming, or activities with other limited scopes.

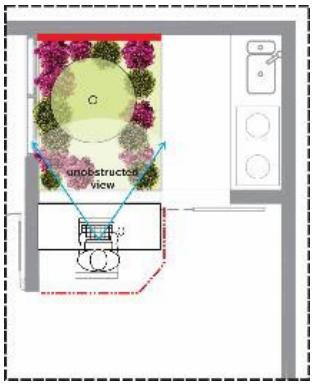
Utilization of working pod (Dubey et al., 2022) Non-permanent can be used in the design of semi-private workspaces. Enclosing materials can be used in a variety of ways depending on the needs, architectural styles, and functions. Figure 7 shows a precedent of Kiri House using a fabric as a temporary room divider to protect the privacy of workspace users when needed. Semi-private workspaces, like private workspaces, should have an unobstructed visual connection to green areas as a source of stimuli. Visual

connection could be established through an operable window openings, to helps not only visual stimuli, but also audio and scent stimuli through window openings.

The majority of visual stimuli (such as color, light and dark, natural plant movements), scent stimuli (smells from soil, plants, and air), and audio stimuli (derived from natural plant sounds, water sounds, and wild birds) emerge from the greenery area, and should be connected directly to the workspace (Figure 8)

Figure 7 Study of Precedent Kiri House: Utilization of Fabric to Cover workspace when needed.
Source: Atelier Riri, www.archdaily.com

Figure 8 Workspace and open space arrangement model based on design principle applied on semi-private workspace, merged with common room (living room/dining room)
Source: Author



c) Open Space Arrangement

It has been discussed earlier that the majority of visual, scent stimuli, and audio stimuli emerge from the greenery area, and should be connected directly to the workspace. Green open space serve as a source of stimuli, it is because green open space became an ideal place to arrange various positive stimuli, directly connected to workspace. Textured material in outdoor space (highlighted in red in Figure 4 and Figure 5) could also be applied in a wall with unobstructed view from workspace. Textured wall provide visual stimuli that helps user practicing mindfulness practice to improve their work from home performance. Visual stimuli from textured wall are generated from naturally lit wall, creating a dynamic light and dark sensation depends on the time and weather, evoking awareness about time and position (Kawai, 2018). Even during night, textured wall can be created by using artificial lighting to highlight material and create dark-light sensation. (Figure 10)

The use of texture walls can be combined with the use of water features in buildings, such as artificial waterfalls. The use of water components creates positive stimuli in the form of water natural sound that aid user in the post -stress therapeutic process (Ulrich et al., 1991). The use of vertical walls as a feature of artificial waterfalls is more recommended than the use of ponds, because the area of millennial residence has problems related to the area of buildings and limited land area.

Figure 9 Water feature applied on a textured wall, combined with a artificial lighting
Source: www.google.com

Utilization of natural vegetation must maximize its potential as a visual stimuli through a wide range of hues and textures, scent stimuli through the aroma released by plants/flowers, and its ecological and architectural function. The strength of plant branches must also be considered in order to increase the possibility of plants moving with the wind, since the natural sound that occurs can have a beneficial affect as a stimuli in mindfulness practice.

Figure 10 Naturally lit textured wall (left) and Artificially lit textured wall (right)
Source: www.google.com

Figure 11 Semi-private workspace arrangement and it connections with green space as a source of stimuli
Source: Author

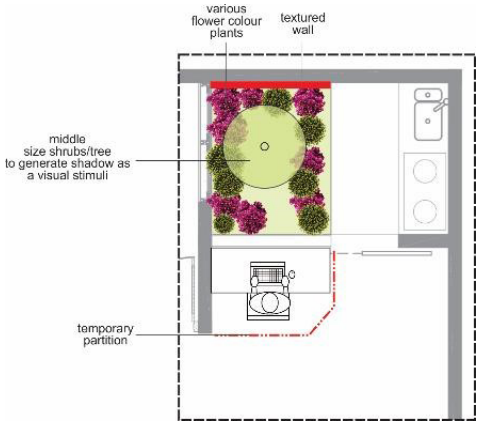
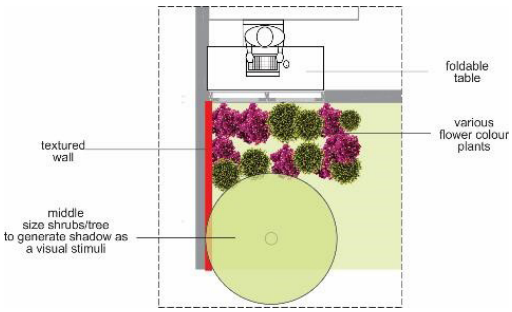


Figure 12 Private workspace arrangement and it connections with green space as a source of stimuli
Source: Author



Conclusion

Based on the results of the elaboration of the literature review, development of design principles, and application in the design model, several crucial remarks were concluded regarding accommodating mindfulness practices in millennial's dwellings to improve work-from-home performance as follows:

1. Spatial planning, building materials, window openings, and the green space of a dwelling are key components in accommodating mindfulness practices in a house that also serves as a work space.
2. A mindfulness workspace in the home can be implemented in millennial dwellings in two different ways: a) as a private workspace by incorporating it into the function of the bedroom; and b) as a semi-private workspace by integrating it into semi-private functions by emphasizing flexibility and adaptability.
3. The accommodation of mindfulness practices to be applied at home for millennials has strict constraints that must be considered, such as the size of the house, which tends to be limited, the number of occupants, and the availability of existing space. Design model generated from the principle in this research are generated by considering specific characteristic based on millennial's preference in residential design
4. The principle concluded in this research are also can be implemented not only in small building associated to millennial's residential design, but also in various scale of residential case and may generate various approach in implementation according to the different scale of the house.

By adhering to the findings above, it is desired that the residence will develop into an even more ideal workspace, both for the user and for the employer where the company where the occupants of the house work. However, take into account that, as previous researchers have concluded, the practice of mindfulness requires habituation and practice before it's capable of having a significant impact. Because the house, as an architectural vessel, can only be accommodating in accordance with the needs and activities of the people who live in it, the key to the success or failure of accommodating mindfulness practices in relation to work performance is the occupants as a mindfulness practitioners themselves.

References

Alvarsson, J. J., Wiens, S., & Nilsson, M. E. (2010). Stress recovery during exposure to nature sound and environmental noise. I*nternational Journal of Environmental Research and Public Health*, 7(3), 1036–1046. https://doi.org/10.3390/ijerph7031036

Ameera Mentaza Khan, P., Azmi, A., Hafizah Juhari, N., Khair, N., Zaleha Daud, S., & Tunku Abdul Rahman, U. (2017). Housing Preference for First Time Home Buyer in Malaysia. *International Journal of Real Estate Studies*, 11(2), 1–6.

Analisa, F. C. K., & Okada, S. (2023). Tiny house characteristics in Indonesia based on millennial's user preference. *Urban, Planning and Transport Research*, 11(1). https://doi.org/10.1080/21650020.2023.2166095

Ashfar, V. (2020). *Life and work in the next normal: WFH redefined*. https://www.zdnet.com/article/life-and-work-in-the-next-normal-wfh-redefined/

Baer, R. A. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science and Practice*, 10(2), 125–143. https://doi.org/10.1093/clipsy/bpg015

Bappenas. (2021). *Peta Jalan Sustainable Development Goals (SDGs) di Indonesia.* Kementerian PPN/Bappenas, 35.

Bodhi, B. (1994). *The noble eightfold path : way to the end of suffering*. 128.

Bonenberg, A., & Lucchini, M. (2022). Home Office: Working and Studying Spaces in Residential Interiors during and after Forced Social Isolation. *Środowisko Mieszkaniowe*, 39, 98–109. https://doi.org/10.4467/25438700sm.22.016.16594

Brown, K. W., & Ryan, R. M. (2003). The Benefits of Being Present: Mindfulness and Its Role in Psychological Well-Being. *Journal of Personality and Social Psychology*, 84(4), 822–848. https://doi.org/10.1037/0022-3514.84.4.822

Clark, W. A. V., & Onaka, J. L. (1983). Life Cycle and Housing Adjustment as Explanations of Residential Mobility. *Urban Studies*, 20(1), 47–57. https://doi.org/10.1080/713703176

Cuerdo-Vilches, T., Navas-Martín, M. Á., & Oteiza, I. (2021). Working from home: Is our housing ready?. *International Journal of Environmental Research and Public Health*, 18(14). https://doi.org/10.3390/ijerph18147329

Dane, E. (2011). Paying attention to mindfulness and its effects on task performance in the workplace. *Journal of Management*, 37(4), 997–1018. https://doi.org/10.1177/0149206310367948

Dane, E., & Brummel, B. J. (2014). Examining workplace mindfulness and its relations to job performance and turnover intention. *Human Relations*, 67(1), 105–128. https://doi.org/10.1177/0018726713487753

Davidson, R. J., Kabat-Zinn, J., Schumacher, J., Rosenkranz, M., Muller, D., Santorelli, S. F., Urbanowski, F., Harrington, A., Bonus, K., & Sheridan, J. F. (2003). Alterations in brain and immune function produced by mindfulness meditation. *Psychosomatic Medicine*, 65(4), 564–570. https://doi.org/10.1097/01.PSY.0000077505.67574.E3

Dharma, P. (2021). Exploration Study Of The Impact Of Working From Home (Wfh) On Employee Performance During The Covid-19 Pandemic. *Airlangga Development Journal*, 5(2), 101. https://doi.org/10.20473/adj.v5i2.32050

Dubey, A., Jain, V., & Chhabra, M. (2022). Rethinking Interior Spaces for Work from Amidst the Pandemic. International *Journal for Research in Applied Science and Engineering Technology*, 10(3), 2176–2189. https://doi.org/10.22214/ijraset.2022.40279

Duffy, B., Shrimpton, H., & Clemence, M. (2017). Millennial: Myths and Realities. In Ipsos Mori. *Ipsos MORI*. https://doi.org/10.1080/14672715.1973.10406351

Farasa, N., & Kusuma, H. E. (2018). Housing preferences of young adults in Indonesia: Housing attributes and consequences. *IOP Conference Series: Earth and Environmental Science*, 126(1). https://doi.org/10.1088/1755-1315/126/1/012184

Farb, N. A. S., Anderson, A. K., Mayberg, H., Bean, J., McKeon, D., & Segal, Z. V. (2010). Minding One's Emotions: Mindfulness Training Alters the Neural Expression of Sadness. *Emotion*, 10(1), 25–33. https://doi.org/10.1037/a0017151

Farraz, M. A., & Barus, L. S. (2019). Housing Preferences and Choice Young Families Commuters in Depok City, Indonesia. *IOP Conference Series: Earth and Environmental Science*, 264(1). https://doi.org/10.1088/1755-1315/264/1/012010

Foo, S. T. (2021, June). *Reimagining the Workspace of Tomorrow.* Centre for Liveable Cities, 25–29.

Gunaratana, B. (2003). Mindfulness in Plain English. *Opera News*, 68(4), 37. https://doi.org/10.1007/bf02025316

Hülsheger, U. R., Alberts, H. J. E. M., Feinholdt, A., & Lang, J. W. B. (2013). Benefits of mindfulness at work: The role of mindfulness in emotion regulation, emotional exhaustion, and job satisfaction. *Journal of Applied Psychology*, 98(2), 310–325. https://doi.org/10.1037/a0031313

JLL. (2020). *The impact of COVID-19 on flexible space*. July, 9.

Kawai, Y. (2018). *Designing Mindfulness: Spatial Concepts in Traditional Japanese Architecture*. J.S. Talk.

Lazarin, M. (2014). Phenomenology of Japanese architecture: En (edge, connection, destiny). *Studia Phaenomenologica*, 14, 133–159. https://doi.org/10.5840/studphaen2014148

Li, D., & Sullivan, W. C. (2016). Impact of views to school landscapes on recovery from stress and mental fatigue. *Landscape and Urban Planning*, 148, 149–158. https://doi.org/10.1016/j.landurbplan.2015.12.015

Malarkey, W. B., Jarjoura, D., & Klatt, M. (2013). Workplace based mindfulness practice and inflammation: A randomized trial. *Brain, Behavior, and Immunity,* 27(1), 145–154. https://doi.org/10.1016/j.bbi.2012.10.009

Modinos, G., Ormel, J., & Aleman, A. (2010). Individual differences in dispositional mindfulness and brain activity involved in reappraisal of emotion. *Social Cognitive and Affective Neuroscience*, 5(4), 369–377. https://doi.org/10.1093/scan/nsq006

Mulyano, Y., Rahadi, R. A., & Amaliah, U. (2020). Millennials Housing Preferences Model in Jakarta. *European Journal of Business and Management Research,* 5(1), 1–9. https://doi.org/10.24018/ejbmr.2020.5.1.240

Mungkasa, O. (2020). Bekerja dari Rumah (Working From Home/WFH): Menuju Tatanan Baru Era Pandemi COVID 19. *Jurnal Perencanaan Pembangunan: The Indonesian Journal of Development Planning*, 4(2), 126–150. https://doi.org/10.36574/jpp.v4i2.119

Nuraeny, E., Paramitha, A., & Herlily, H. (2020). Tiny House: Reflection on Participatory Action Research As a Tool of Inquiry in the Kampung Community. *Journal of Environmental Science and Sustainable Development*, 3(2), 302–328. https://doi.org/10.7454/jessd.v3i2.1045

Oyetola, S. A., Adebisi, G., Onuwe, J., & Salihu S. (2013). Reducing Stress Levels through Landscape; A Study of Senior Staff of the. *IOSR Journal Of Environmental Science Toxicology And Food Technology*, 4(4), 2319–2399.

Porter, N., Bramham, J., & Thomas, M. (2017). Mindfulness and design: Creating spaces for well being. Creative Practices for Improving Health and Social Inclusion. *5th International Health Humanities Conference,* Sevilla 2016, 199–209.

Rahardjo, H. A., Dinariana, D., & Permana, V. (2015). The Determinant Factors for Residential Selection of the Relocated Low-Income Communities in Jakarta, Indonesia. *International Journal of Social Science and Humanity*, 5(8), 667–671. https://doi.org/10.7763/ijssh.2015.v5.537

Salingaros, N. A. (2015). *Biophilia & Healing Environments HEALTHY PRINCIPLES FOR DESIGNING THE BUILT WORLD*. Terrapin Bright Green,LLC, 1–44.

Siddhartha, V., & Malika, C. (2016). Telecommuting and Its Effects in Urban Planning. *International Journal of Engineering Research And*, V5(10), 448–453. https://doi.org/10.17577/ijertv5is100350

Sullivan, C. (2000). Space and the intersection of work and family in homeworking households. *Community, Work & Family,* 3(2), 185–204. https://doi.org/10.1080/713658903

Surat, J. (2014). *Millennial Housing. Department of Architecture and Landscape Architecture of North Dakota*, 1–135.

Susanto, D., Ningsih, T. A., Felly, R., Sari, A. P., & Primalaila, D. (2022). The Minimum Space Standard: Proposing New House Floorplan on Dwelling Activities in Greater Jakarta Region, Indonesia. *Urban, Planning and Transport Research,* 10(1), 372–395. https://doi.org/10.1080/21650020.2022.2093790

Uherek-Bradecka, B. (2021). Architectural and aesthetic aspects of workspace at home – a new design challenge in the age of pandemic. *IOP Conference Series: Materials Science and Engineering,* 1203(2), 022005. https://doi.org/10.1088/1757-899x/1203/2/022005

Ulrich, R. S., Simons, R. F., Losito, B. D.,

Fiorito, E., Miles, M. A., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology*, 11(3), 201–230. https://doi.org/10.1016/S0272-4944(05)80184-7

Yin, J., Yuan, J., Arfaei, N., Catalano, P. J., Allen, J. G., & Spengler, J. D. (2020). Effects of biophilic indoor environment on stress and anxiety recovery: A between-subjects experiment in virtual reality. *Environment International*, 136(September 2019), 105427. https://doi.org/10.1016/j.envint.2019.105427

Zinn, J. K. (1995). Wherever you go, there you are: Mindfulness meditation in everyday life. *Behaviour Research and Therapy,* 33(8), 996. https://doi.org/10.1016/0005-7967(95)90133-7