Distress, anxiety, boredom, and their relation to the interior spaces under COVID-19 lockdowns

Berk Diker and Halime Demirkan
Department of Interior Architecture and Environmental Design, Faculty of Art, Design, and Architecture, I. D. Bilkent University, Ankara, Turkey

Received 29 March 2022
Revised 1 July 2022
Accepted 22 July 2022

Abstract

Purpose – This research is based on the idea that interior elements leave a wide variety of impressions on their occupants and that some interiors are likely to have more positive impressions than others. These impressions are especially prevalent when an individual cannot leave their homes for extended periods. The architectural elements of an interior where people are isolated can mitigate the adverse psychological effects.

Design/methodology/approach – The study was conducted by surveying individuals under lockdown because of the COVID-19 pandemic. A total of 140 participants completed three different scales (GAD-7, K10, FTB Scale) to measure mental health problems often experienced in isolated and confined environments. Their responses were then associated with the interior environments of the participants.

Findings – Statistically significant relationships were identified between the reported interiors and the results of the psychological evaluations. The level of psychological distress was associated with Volume and Visual Variety factors. Susceptibility to generalized anxiety disorder was associated with Visual Variety and Airiness factors. Finally, free time boredom was associated with Volume, Visual Variety, and Airiness factors. The Furniture and Clutter factor did not significantly contribute to any of the psychological evaluations.

Originality/value – The study was performed in response to the severe lockdown measures taken in response to the COVID-19 pandemic. It successfully highlighted the need for a rethinking of interior design approaches regarding the design for isolated and confined environments.

Keywords Psychological distress, Anxiety, Boredom, Confined environments, COVID-19, Lockdown, Interior design, Isolated environments

Paper type Research paper

1. Introduction

Coronavirus disease, also known as COVID-19, is an infectious disease caused by the SARS-COV-2 virus (World Health Organization, 2021). Based on the way the virus spread among the world population, the earliest implemented methods for slowing down infection rates and the spread of the disease were to implement social distancing measures and lockdowns. Because of the unusual circumstances caused by the response to the COVID-19 pandemic, many individuals were unable to leave their houses for extended periods. This response manifested as lockdown measures causing thousands of people to be isolated in their private residences for prolonged durations. In addition to this long period of isolation, environments beyond these boundaries were deemed dangerous, extreme, and possibly lethal to human life (Person *et al.*, 2004; Shultz *et al.*, 2016). Many characteristics of the social and physical isolation that emerged as part of the pandemic response are very similar to those often associated with isolated and confined environments. Such similarities were drawn in previous studies (Tachibana *et al.*, 2012, 2017). Over the length of the pandemic and following lockdowns, a number of researchers examined the behavioral, psychological, and environmental impacts of the various measures. These examinations varied from the

This study was conducted as a part of Ph.D. thesis of the first author in I. D. Bilkent University, in the Department of Interior Architecture and Environmental Design. The authors received no specific funding for this work.

Archnet-IJAR: International Journal of Architectural Research

2631-6862
DOI 10.1108/ARCH-03-2022-0088

urban scale to individuals. For many researchers, the prevalence of boredom experienced under lockdowns and the challenges of designing new environments became the focal research topic (Abusaada and Elshater, 2022a, 2022b).

Aljunaidy and Adi (2021) examined the contributions of architecture and interior design research toward the relationship between the physical environment and its' effects on mental disorders. They noted that a significant portion of research has focused on dementia and autism, while very little research was done on anxiety, stress-related disorders, depressive disorders, and schizophrenia. No studies were identified regarding other mental disorders. Their final remarks highlight the lack of architectural studies focusing on relieving or preventing the symptoms of all forms of mental disorders through the design of physical environments. This research partly aims to fill the gap of knowledge on the impact of the immediate physical environment of individuals and their subjective experiences and psychological well-being in lockdown.

The primary hypothesis of this research relies on the idea that interior elements leave a wide variety of impressions on their occupants and that some environments are likely to have more positive impressions than others. Based on these, the researchers hypothesize that the architectural elements of interiors in which people quarantine can mitigate the adverse psychological effects on the individuals observed under isolation and confinement. The researchers test this hypothesis by measuring the psychological distress (H1), general anxiety (H2), and boredom (H3) using a number of self-reported assessment tools when quarantined, and compare these ratings to the respondents' evaluation of their interiors, quantified through a number of self-assessed statements. The interior evaluations of the respondents were analyzed through exploratory factor analysis, which yielded four factors; Airiness, Furniture and Clutter, Visual Variety, and Volume. Afterward, the relationship between these four factors and the assessments for psychological distress, anxiety, and boredom were explored in detail. The findings highlight the existence of a minor but significant relationship between the properties of a number of factors and the psychological distress, anxiety, and boredom experienced by the occupants. Hence, this study provides a new approach to the evaluations of interiors in which the occupants remain under isolation and confinement, and highlight the important architectural components that require additional attention during the design stage.

2. Theory and literature

A large body of research explores the psychological effects of isolation and confinement within extreme environments and situations (Gunderson, 1963; Natani and Shurley, 1974; Evans *et al.*, 1988; Suedfeld and Steel, 2000; Connors *et al.*, 2005). Common characteristics of such environments include the isolation of an individual from the typical social environment, like family or friends for a prolonged duration, the physical constraints of the environment that an individual is living in, and the heavy restrictions on mobility (Carrère, 1990; Nicolas *et al.*, 2019). Life in such environments often causes psychological drawbacks, especially if the individual is not trained and prepared beforehand. The most common observations in such cases are; a lack of motivation, a decline in alertness and mental functioning, aggressive or depressed moods, social withdrawal, conflict, and biological disturbances such as sleeplessness (Evans *et al.*, 1988; Suedfeld and Steel, 2000; Connors *et al.*, 2005). Additionally, being subjected to quarantine introduces new stressors for the individual caused by its duration, lack of information and supplies, fear of infection, frustration, and boredom (Brooks *et al.*, 2020). Studies conducted on individuals during the pandemic identified several negative psychological occurrences regardless of their nationality or geographical location (Alkhamees *et al.*, 2020; Tee *et al.*, 2020; Fiorillo *et al.*, 2020; Hazarika *et al.*, 2021). The most significant ones are; depression, anxiety, stress, boredom, low mood,

irritability, and insomnia (Hawryluck *et al.*, 2004; Reynolds *et al.*, 2008; Salari *et al.*, 2020; Orgilés *et al.*, 2021). Generalized Anxiety Disorder (GAD) is one of the most commonly observed anxiety disorders in the general population (Spitzer *et al.*, 2006). It can be summarized as excessive and ongoing worries about various concerns, such as current events. It is often accompanied by impaired concentration, irritability, restlessness, fatigue, muscle tension, and disturbed sleep (Kessler *et al.*, 2001). On the other hand, psychological distress is a unique and uneasy emotional state that a person experiences in reaction to a particular stressor or demand that may pose a danger to them, either temporarily or permanently (Ridner, 2004). In some cases, it is characterized by symptoms of severe anxiety and depressive disorders (Mirowsky and Ross, 2002). Finally, boredom can be explored under a few different definitions. The two prominent explanations of boredom are; the non-optimal state of arousal that results from a mismatch between a person's required arousal and the accessibility of environmental stimuli; and the sensation of being helpless, feeling empty, being unable to act, and meaninglessness (Eastwood *et al.*, 2012).

The discussion of interiors and their effects on well-being have been ongoing since the 90s. In its broadest term, well-being is the existence of positive outcomes and expectations from an individual's life. It is an indication that their lives are meaningful and are going well, described as the presence of positive impressions and absence of negative emotions such as depression, stress, and anxiety (Diener, 2000). Moreover, in previous literature, Diener and Seligman (2004) explained well-being as an individual's judgment of life satisfaction. Several significant theories discuss various environmental properties of interiors and their influence on the well-being of the occupants. Ulrich's (1991) theory of supportive design as a pioneer emphasizes that an environment's design must satisfy its' occupant's psychological needs. Although the theory focuses on healthcare environments and their impact on patients' ability to cope with stress, it provides several key suggestions that could be adapted to improve the well-being of occupants in various other interiors. Specifically, Ulrich's (1991) theory suggests three key elements for reducing stress in healthcare environment designs: fostering a sense of control, access to social support, and access to positive distractions while avoiding negative distractions. The relationship between the interior elements and well-being has been extensively examined since Ulrich's (1991) theory was first published. A brief review of the literature regarding this topic reveals two primary elements that have an observable effect on the occupants' well-being in interiors. These can be summarized as; having access to views of nature (Ulrich, 1984) and regulation of privacy and crowding (Evans *et al.*, 1996).

In addition to the theories of well-being, the physical environment plays a prominent role in occupants' behavior, perception, and psychology (Gifford, 2014). The spaciousness of an environment, both within natural and built settings, is one factor that determines its livability. In many cases, an environment with a higher perceived spaciousness is more likely to be perceived positively (Bharucha-Reid and Kiyak, 1982; Herzog, 1985). This case has been demonstrated in several studies comparing housing satisfaction and room/house dimension, among other factors such as income and age, where an increase in house size corresponded with an increase in housing satisfaction (Aigbavboa and Thwala, 2016; Zhang *et al.*, 2018). Similarly, different architectural design elements have a wide range of documented effects on the perception of spaciousness and preference. Several interior elements have been demonstrated to affect the size impressions and perceived livability. These elements include the furniture density and organization (Imamoglu, 1973; Kaye and Murray, 1982; von Castell *et al.*, 2014; Bokharaei and Nasar, 2016), lighting amount, and direction (Kirschbaum and Tonello, 1997; Inui and Miyata, 1973; Martyniuk *et al.*, 1973), use of color and texture (Oyama and Nanri, 1960; Sundstrom and Sundstrom, 1986; Oberfeld *et al.*, 2010; Hidayetoglu *et al.*, 2012), and permeability (Franz *et al.*, 2005; Stamps, 2010; Bokharaei and Nasar, 2016). For example, in interiors, warmer colors are perceived to be more attractive than colder colors and are better remembered by the occupants (Hidayetoglu *et al.*, 2012).

While a considerable amount of research has been performed regarding interior architecture and occupants' physical and mental well-being, very little information is present regarding those living in isolation and confinement. This may be of no surprise since such environments concern very few occupants compared to others. However, with the pandemic, the idea of living in isolation and confinement became the very reality experienced by the world. There has been a lack of research and analysis within the context of these interiors that can quickly be converted into implementable design methods and ideas. Hence, the unique requirements of individuals living under lockdown require an in-depth analysis of their environments to satisfy their needs adequately.

3. Methodology

3.1 Participants

The study was conducted by surveying individuals under either government or self-mandated lockdowns for at least one week caused by the COVID-19 pandemic. The approval of the ethics committee at I. D. Bilkent University was obtained before starting the experiment (No: 2020_05_24_02). An *a priori* power analysis was performed using G*Power version 3.1.9.7 (Faul *et al.*, 2007) to determine the final sample size. The results indicated the required sample size to achieve 80% power for detecting a small effect ($d = 0.2$ based on Cohen (1988)), at a significance criterion of $\alpha = 0.05$, was $n = 98$ for each hypothesis. Convenience sampling method was used to recruit the required number of participants for the study.

Participation in this study was entirely voluntary, and 142 participants completed the first part survey; 2 participants did not complete the evaluations of psychological distress, anxiety, and boredom; hence their responses were not included in the results of the relevant sections. The responses were initially assessed for lockdown duration by asking how long they have been under lockdown and how often, if at all, they went out for necessities.

3.2 Measures and procedure

The main aim is to identify the association between the interiors and the self-reported change in the most common psychological outcomes related to the COVID-19 lockdown as anxiety, distress, and boredom. The surveys were conducted over the Internet through Google Forms and consisted of three parts. The respondents were allowed to fill it out at their leisure. Their responses were automatically collected and filtered based on the criteria set by the researchers. The first part consisted of brief general demographic questions and a 21-item questionnaire that aimed to get a picture of the respondent's environment and how they perceived the architectural and spatial properties of the rooms they spent the most time in during the lockdown. The questions in this part aimed to understand the properties of the interiors, such as their geometry, lighting, surface properties, furnishings, clutter, openings, and outside connections. In addition to defining the characteristics of the space, such as its area, ceiling height, colors, lighting, etc., they were asked if their rooms felt spacious enough, whether they were satisfied with their environment, and whether they found it monotonous. The answers are scored on a 5-point Likert scale ranging from strong disagreement (1) to strong agreement (5).

The second part of the survey consisted of questions that aimed to understand how the increase in free time because of a lack of mobility and changes in daily activities (i.e. not being able to go to their regular workplaces) under lockdown affected the individual's susception to boredom. Since there is strong evidence that in isolated and confined environments, a lack of environmental stimulus could cause severe levels of boredom, which could cause further detriments to the individuals if it is not treated. To measure this, the shortened version of the

Free time Boredom Scale (FBT) (Ragheb and Merydith, 2001) was provided to the participants. The scale begins with the statement "During my free time" followed by 20 items and measured boredom through four subscales: lack of meaningful involvement, lack of mental involvement, slowness of time, and lack of physical involvement. A higher score on the FTB scale indicates that the respondent is less likely to experience boredom during their free time. These subscales are closely associated with mental health and led to the third part of the survey.

The third part of the survey further aimed to identify the presence of psychological issues such as anxiety and distress, which are found to be common manifestations of prolonged isolation and confinement. Two tests were used to get an accurate picture of the respondents' psychological functioning. These tests were the Kessler Psychological Distress (K10) test (Kessler *et al.*, 2002) and General Anxiety Disorder (GAD-7) test (Spitzer *et al.*, 2006). K10 Scale consists of 10 items and attempts to measure distress through questions about anxiety and depression. Responses reflect how much the participants had experienced symptoms over the lockdown period, such as "feeling tired out for no good reason" and "nervous or hopeless." The answers are scored on a 5-point scale with a minimum score of 10, indicating no distress, and 50, indicating severe distress. The questions are designed to highlight the most recent happenings around the individual rather than focusing on their long-term psychological well-being. GAD-7 scale focuses on screening individuals for signs of general anxiety disorder through a 7-item scale. The items are about the degree to which the participant has been bothered by "feeling nervous, anxious or on edge", "not being able to stop or control worrying", "worrying too much about different things", "having trouble relaxing", "being so restless that it is hard to sit still", "becoming easily annoyed or irritable "and "feeling afraid as if something might happen" (Spitzer *et al.*, 2006).The answers are scored on a 4-point scale with a minimum score of 0, indicating minimal anxiety, and 21, indicating severe anxiety. Additional to the tests, participants were directly asked how stressed they were in the context of the pandemic and the ongoing lockdown.

3.3 Statistical analysis

Exploratory factor analysis was performed in the first section of the questionnaire to highlight the main factors of interior evaluations. During this process, seven questions out of 21 were left out based on redundancy, namely; room having light colored walls, mirrors, lamps, adequate artificial light, presence of livable outdoor space, and the participant's enjoyment of spending time in the room. The remaining questions were examined using principal component analysis with Oblimin and Varimax rotations; however, an Oblimin rotation, which allows the factors not to be orthogonal, provided the ideally defined factor structure. The analysis yielded four factors explaining 55.69% of common variance. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO = 0.713) provided evidence of a statistical relationship between the factors and indicated that the dataset was suitable for analysis, which is above the recommended value of 0.6, and Bartlett's test of sphericity was significant (χ^2 (91) = 412.59, $p < 0.01$). The 14 items were grouped into four factors; Airiness, Furniture and Clutter, Visual Variety, and Volume. Table 1 displays the components of each factor and their loadings. Each factor highlights a different aspect of the interiors.

Cronbach's Alpha was calculated for each factor to check for their internal consistency. The alphas were moderate and acceptable at 0.708 for Airiness (3 items), 0.626 for Furniture and Clutter (4 items), 0.622 for Visual Variety (4 items), and 0.578 for Volume (3 items). No substantial increases in alpha values for any of the scales could have been achieved by eliminating more items.

The scoring of the evaluation was done based on the mean of the items which had their primary loadings on each factor. A higher score in the Airiness factor indicated that the

Item	Item name	Factor 1	Factor 2	Factor 3	Factor 4	Communalities
1	My room receives plenty of natural light	0.834				0.699
2	My room has large windows	0.794				0.670
3	I'm satisfied with the scenery outside my room	0.524				0.490
4	I have large/heavy pieces of furniture in my room		0.760			0.613
5	I have a hard time keeping my room clean		0.721			0.623
6	My room is cluttered most of the time		0.668			0.460
7	There is a lot of furniture in my room		0.549			0.513
8	There are patterned surfaces in my room			−0.738		0.551
9	There are surfaces with natural materials in my room			−0.721		0.571
10	I find my room to be monotonous			0.668		0.638
11	There are plenty of natural objects in my room			−0.445		0.410
12	My room's ceiling is . . .				0.705	0.545
13	How big is the room you are currently staying in?				0.608	0.587
14	My room feels spacious				0.478	0.427
	Eigenvalue	3.489	1.880	1.266	1.162	
	% of Common Variance	24.921	13.431	9.041	8.298	
	Cumulative %	24.921	38.352	47.392	55.690	

Note(s): Factor 1: Airiness, Factor 2: Furniture and Clutter, Factor 3: Visual Variety, Factor 4: Volume

Table 1.
Factor loadings and communalities based on a principal components analysis with Oblimin rotation for 14 items of interior spaciousness assessment (n = 142)

respondents' room is more likely to feel spacious by having more daylight, having pleasing connections with the outside, and the overall permeability of their lockdown environment. In comparison, a lower score indicates that the participant is not satisfied with the permeability of their environment. A higher score in Furniture and Clutter indicates that the respondent is more likely to have a busy, cluttered and overwhelming environment. A higher Visual Variety score corresponds with a larger variety of visual stimulation available within the environment through different textures, colors, and natural materials, while a lower score indicates a monotonous and boring environment. Also, the negative loading of some items in the Visual Variety factor indicates that the item is related in the opposite direction from this factor. Finally, a higher Volume score indicates that the respondent has a larger environment in which they are quarantined.

Upon completing the exploratory factor analysis, Pearson's correlation coefficients among each factor and responses to psychological evaluations were examined to highlight any significant correlation present within the data set. Stepwise multiple regression analysis was conducted to evaluate further the relationship between each factor and the psychological occurrences. This method was selected to determine which factors were significant predictors, and a good fit within a model, regarding psychological distress, anxiety, and boredom.

4. Results

4.1 Sample characteristics

A total of 140 participants consisting of 32 men (22.9%), 103 women (73.6%), and 5 with no answer (3.5%) completed the self-assessments for psychological distress, anxiety, and

boredom. The mean age of the participants was 38.83 years (SD = 16.27), with a minimum of 15 and a maximum of 72. Sixteen participants received secondary education degrees (11.4%), 46 participants received undergraduate degrees (32.9%), and 78 participants received post-graduate degrees (55.7%). In addition to this, 58.6% ($n = 82$) of the participants worked from home while 40.0% ($n = 56$) did not (1.4% [$n = 2$] no answer). Household populations of the participants had a mean of 2.91 (SD = 1.207), and participants spent a mean time of 8.55 h (SD = 6.07) in a single room in a day. The lockdown duration of the participants varied from 10 days to 93 days, with a mean of 34.41 days (SD = 13.39).

4.2 Influence on psychological distress

The K10 evaluation was completed by 140 participants in total. The overall results showed that 25.0% ($n = 35$) of the participants showed very high levels of psychological distress, 27.9% ($n = 39$) showed high levels, another 27.9% ($n = 39$) with medium levels, and finally 19.2% ($n = 27$) with low levels. As displayed in Table 2, there was a significant negative weak correlation between the K10 responses and Airiness factor [$r(138) = -0.28$, $p < 0.01$], Visual Variety factor [$r(138) = -0.30$, $p < 0.01$], and Volume factor [$r(138) = -0.29$, $p < 0$ 0.01]. A stepwise multiple regression analysis was performed to examine how many of these factors were a good predictor of psychological distress within an acceptable model. The results indicated that Volume ($\beta = -2.88$, SE = 1.14, $p = 0.012$) and Visual Variety ($\beta = -1.78$, SE = 0.88, $p = 0.045$) factors were statistically significant predictors of psychological distress. The fitted regression model was K10 Score = 34.32–2.88*(Volume) −1.78*(Visual Variety). The overall regression was statistically significant [$F(2, 138) = 9.95$, $p < 0.0005$, $R^2 = 0.127$]. Meanwhile, Airiness or Furniture and Clutter factors had no significant contribution.

4.3 Influence on anxiety

The GAD-7 evaluation was completed by 140 participants. The overall results showed that 13.6% ($n = 19$) of the participants showed severe signs of generalized anxiety disorder, while 15.7% ($n = 22$) showed moderate signs, 29.3% ($n = 41$) showed mild signs, and 41.4% ($n = 58$) showed minimal signs. As displayed in Table 3 significant but weak negative correlation was identified between the GAD7 scores and Airiness factor [$r(138) = -0.27$, $p < 0.01$], Visual Variety factor [$r(138) = -0.28$, $p < 0.01$] and Volume factor [$r(138) = -0.24$, $p < 0.01$]. In addition, a significant positive correlation was identified between the Furniture and Clutter factor [$r(138) = 0.18$, $p < 0.05$]. According to the stepwise multiple regression analysis, Airiness ($\beta = -1.39$, SE = 0.646, $p = 0.032$) and Visual Variety ($\beta = -1.25$, SE = 0.59, $p = 0.037$) factors were good predictors of the severity of anxiety disorders under lockdown. The fitted regression model was GAD7 Score = 14.41–1.39*(Airiness) −1.25*(Visual Variety). The overall regression was statistically significant [$F(2, 137) = 8.44$,

		1	2	3	4	5
1	K10 - Total Score	–				
2	Airiness	−0.276**	–			
3	Furniture and Clutter	0.122	−0.142	–		
4	Visual Variety	−0.302**	0.380**	−0.135	–	
5	Volume	−0.294**	0.431**	−0.188*	0.398**	–

Note(s): ** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

Table 2. Pearson's correlation among interior spaciousness factors and K10 evaluations ($n = 140$)

$p < 0.0005$, $R^2 = 0.11$]. The analysis indicated that participants who are likely to have more Airiness and Visual Variety in their environments are likely to have less severe anxiety symptoms.

4.4 Influence on boredom

Because of the construction of the Free Time Boredom (FTB) scale, each subscale present within the evaluation was compared with the four factors independently; Table 4 presents the preliminary analysis of correlations among the four subscales of FTB and four factors of interior spaciousness. In addition, a fifth comparison was drawn between the overall FTB scores and interior spaciousness. The significant correlations were marked with an asterisk and considered for further analysis.

Based on Table 4, significant correlations were noted between most subscales of boredom measured through the FTB scale and the factors of the interior assessment. Each subscale was analyzed independently using stepwise linear regression to explore these correlations further and understand which interior spaciousness factors impact free time boredom. Only the Volume factor ($\beta = 1.20$, SE = 0.40, $p = 0.003$) was identified as a significant predictor of the degree of physical involvement [$F(1, 140) = 8.70$, $p = 0.004$, $R^2 = 0.059$]. Physical involvement, engagement, and activity increase as more volume are available. The results seem reasonable, as individuals under lockdown are heavily confined. Those who have more room for activities within their environments are more likely to be active and involved physically. However, although a significant relationship is observed, its predictive value is meager, almost negligible.

In the case of mental involvement, the Visual Variety factor ($\beta = 0.21$, SE = 0.069, $p = 0.002$) was identified to be a significant contributor [$F(1, 140) = 10.60$, $p = 0.001$, $R^2 = 0.071$]. This indicates that an increase in visual variety corresponds to a better degree of mental engagement, emotional commitment, and an increased feeling of relatedness. Similar to the previous aspect of boredom, it is reasonable to assume that visual variety within the interior provides a larger variety in surroundings, increased visual stimulation, and an increased sense of belonging to that environment.

Table 3.
Pearson's correlation among interior spaciousness factors and GAD-7 evaluations ($n = 140$)

		1	2	3	4	5
1	GAD7 Scores	–				
2	Airiness	−0.271**	–			
3	Furniture and Clutter	0.179*	−0.142	–		
4	Visual Variety	−0.279**	0.380**	−0.135	–	
5	Volume	−0.241**	0.431**	−0.188*	0.398**	–

Note(s): ** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

Table 4.
Pearson's correlation among FTB subscales and factors of interior spaciousness ($n = 140$)

	Airiness	Furniture and clutter	Visual variety	Volume
Physical Involvement	0.198*	−0.142	0.139	0.243**
Mental Involvement	0.165	−0.064	0.266**	0.169*
Meaningfulness	0.284**	−0.188*	0.374**	0.347**
Speed of Time	0.239**	0.048	0.060	0.132

Note(s): **Correlation is significant at the 0.01 level (2-tailed)
*Correlation is significant at the 0.05 level (2-tailed)

Both Volume ($\beta = 0.35$, SE = 0.12, $p = 0.004$) and Visual Variety ($\beta = 0.29$, SE = 0.09, $p = 0.002$) factors were significant predictors of lack of meaningful involvement [$F(2, 140) = 15.83$, $p < 0.0005$, $R^2 = 0.187$]. These results show that similar to the previous two evaluations, individuals with access to larger living spaces and more variety within these spaces report an increased sense of meaning, be more focused, less prone to irritation, and less likely to feel like they are "dragging their feet" while under lockdown.

Finally, the Airiness factor ($\beta = 0.206$, SE = 0.07, $p = 0.004$) was identified to be a significant contributor to the speed of time [$F(2, 140) = 8.39$, $p = 0.004$, $R^2 = 0.057$]; however, the relationship appears to be very weak. This correspondence indicates respondents who were more satisfied with the connections their environment has with the outside and had more opportunities for observation were more likely to experience the feeling that their free time was passing faster.

5. Discussion

This study aimed to explore the relationship between the mental health of individuals under lockdown in response to the COVID-19 pandemic and the built environment, namely the indoor environments in which people lived. The analysis of the indoor environments through the web-based questionnaire highlighted four factors that would be important for further investigation and comparisons. These were; Airiness, Furniture and Clutter, Visual Variety, and Volume factors. These factors were a good categorization for representing how individuals perceived their interiors during a lockdown and what element within contributed to a higher level of psychological well-being. Based on the results of the study, high ratings in Airiness, Visual Variety, and Volume factors played a significant role in improving the psychological well-being of individuals during a lockdown. Overall, participants who perceived their room as more attractive had more space available for living and activities, and were satisfied with their outdoor connections showed fewer symptoms of psychological distress and anxiety, and were less likely to be bored during a lockdown.

The relationship between housing satisfaction, house dimensions, crowding, and mental health was demonstrated in two separate studies conducted during the COVID-19 lockdowns in Italy (Amerio *et al.*, 2020; Fornara *et al.*, 2022). The first study was conducted through web-based forms. It used five different assessment tools that are used to recognize signs of depression (Patient Health Questionnaire, PHQ-9), anxiety (Generalized Anxiety Disorder scale, GAD-7), impulsivity (Barratt Impulsiveness Scale–11, BIS-11), quality of life (The Short Form 12-Item Health Survey, SF–12), and sleep-related symptoms (Insomnia Severity Index, ISI). According to their findings, individuals who rated their indoor quality (lighting, acoustics, temperature, etc.) and outside views (absence of a balcony, etc.) poorly, and were living in apartments smaller than 60 square meters, were significantly more likely to show moderate-severe and severe symptoms of depression (Amerio *et al.*, 2020). The second study explored the effects of "objective" and "subjective" dimensions of the physical environment, such as home crowding and residential satisfaction, and their impact on the perceived stress (using the Perceived Stress Scale, PSS) of individuals under lockdown. The researchers did not identify any relationship between home crowding and perceived stress. However, a strong effect was observed when home crowding and perceived stress were mediated through residential satisfaction. In addition, individuals who were satisfied with the spatial dimensions of their homes showed lower levels of perceived stress (Fornara *et al.*, 2022).

The discussion regarding lived experiences in urban and architectural spaces has gained a new significance with the lived experiences of individuals under lockdown. Salama *et al.* (2021) highlighted the different roles of architects and planners versus social sciences researchers regarding life within the built environment. He emphasized the importance of the built environment that is perceived and lived in, and how overlooked these subjective

experiences are compared to what is conceived and implemented. Telltale signs of this conclusion were also present in their previous studies in which they examined the behavioral impact of urban spaces and their functions on the spatial experiences of the users (Salama *et al.*, 2017). With the pandemic and subsequent lockdown measures, the built environment, especially the interiors, was forced to adapt and change according to its occupants' functional and behavioral needs. Throughout the pandemic, demand for flexible spaces and designs and secured and private outdoor spaces surged (Abd Elrahman, 2021). However, AlWaer *et al.* (2021) have emphasized the difficulty of pinpointing the effects of the built environment, especially within the urban scale, on the occupants' physical health and mental well-being and that too much significance may be attributed to the design and planning. Hence, a more interdisciplinary approach to the design of living spaces is required. Abusaada and Elshater (2022a) put front the need for a new design paradigm that can adapt to the needs of the post-pandemic world. Furthermore, they recommended three guidelines to overcome post-pandemic boredom in urban studies: "*Confronting heterogeneity for metamorphosis in urban form", "tracing the pattern of change in public life", and "digital adaptation in times of uncertainty on how to confront the (un)seen boredom"* (Abusaada and Elshater, 2022b, p. 179). On the other end of the spectrum, Amerio *et al.* (2020) and Fornara *et al.* (2022) examined the relationship between the objective and subjective qualities of housing and their relationship to occupants' psychological well-being. However, to the best knowledge of authors, no studies have been conducted that specifically focus on an individual's immediate interior and architectural characteristics and their influences on one's experiences of anxiety, psychological distress, and boredom. As such, while the interior can assist in creating meaningful experiences, it may not be the primary contributor.

In the case of psychological distress, having more space to live in, and having a larger variety of items/features within the interior corresponded with reduced severity of psychological distress experienced by individuals during a lockdown. This explanation is in line with the findings of Fornara *et al.* (2022), in which residential satisfaction and room size appeared to reduce the severity of perceived stress. Similarly, Fornara *et al.* (2022) did not identify a significant relationship between home crowding and perceived stress, which is mirrored in this study, as no significant relationship was established between Furniture and Clutter factor and psychological distress.

In the case of anxiety, the findings indicated that Visual Variety and Airiness factors showed a significant influence on signs of generalized anxiety disorder. Participants who had a larger variety of items and features within their environment, and had pleasant connections with the outdoors were less likely to show signs of severe anxiety disorder. These findings appear to align with the study conducted by Amerio *et al.* (2020), where having pleasant outdoor connections corresponded to fewer signs of severe depression. One important differentiation is worth mentioning regarding the pleasantness of outdoor connections; while Amerio *et al.* (2020) focused on the availability of access to outdoors, topography, and subjective quality of views, this study focused on how well the permeability of the interior is, through windows and availability of light, and how satisfied the respondents are with their views, regardless of their content. However, having less space available, or having too many objects within the interior did not significantly contribute to the severity of anxiety.

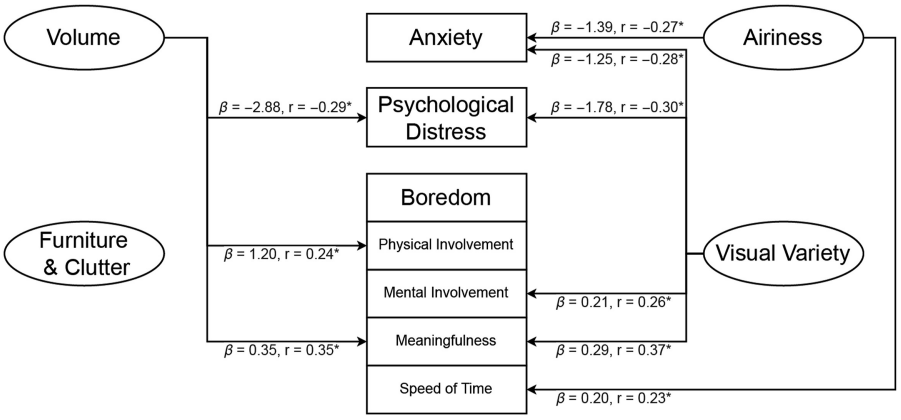
In the case of free time boredom, available volume was identified as a predictor of physical involvement. Although the relationship was weak, it is reasonable to assume that those with larger living spaces also have more room for physical activities, which in turn would reduce their level of free time boredom during a lockdown. Similarly, mental involvement scores had a significant relationship with the level of visual variety within interiors. Those who had a larger variety within their environments had a higher degree of mental stimulation. This relationship is closely relevant to the previous studies regarding the level of environmental stimulation and boredom levels (Mikulas and Vodanovich, 1993). Following the previous two

subscales of the FTB scale, meaningfulness was affected by the volume and visual variety factors. This may indicate that having more room for activities, being able to interact with the environment, and being able to receive adequate stimulation, can help individuals derive more meaning from the activities they perform while under lockdown. Meaning can be derived from how the individual spends their free time, but it can also be derived from whom the individual spends their free time with. Finally, the speed of time experienced by participants appeared to increase when the interiors were evaluated to have more airiness. Wessels *et al.* (2022) studied the perceived passage of time(PPT) and boredom reported by individuals that were under lockdown during the COVID-19 pandemic. Their findings indicated that participants experienced higher levels of boredom and slower PPT while under lockdowns; however, their reported levels normalized when the lockdowns were lifted and increased again when the second wave of lockdowns began. In addition, participants were able to adapt to the lockdown and manage their expectations, which appeared to reduce the boredom they experienced. This relationship is a good callback to Wessels *et al.*'s (2022) study. Similar to the case identified there, individuals may perceive that the passage of time is faster when they have more pleasant connections with the outdoor. Even if they cannot directly go out, being able to observe the outside may increase the level of arousal and provide a meditative state of mind.

In summary, Figure 1 outlines the relationship between each interior spaciousness factor and the measured psychological effects within the study. The lines highlight which factors have a predictive strength over the psychological effects.

6. Conclusion

The findings of this study indicate that interior spaces may have more influence on the psychology of its occupants than is often considered. This effect is especially prevalent when individuals cannot leave their homes for extended durations because of a lockdown period. Interior architects need to give adequate attention to the impact that their design decisions may have on the occupants' experiences of psychological distress, anxiety, and boredom. When designing and planning interiors in which the occupants are in isolation and confinement because of unforeseen or extreme circumstances, the interior architect should provide a variety of architectural elements within the interior and avoid features that may be perceived as too monotonous by the occupants; in addition, the connections of the



Note(s): *$p < 0.01$ **$p < 0.05$

Figure 1.
Factors and their connection to psychological distress, anxiety, and boredom

environment to the outside must be taken into consideration, finally, the availability of a large volume, or at the very least impression of a large volume, may be helpful for the occupants to feel less stressed. While the study focuses on the effects of the interior on experiences of anxiety, psychological distress, and boredom, it is important to keep in mind that such mental states are influenced by a large number of other uncontrollable internal and external variables. The variances in isolation duration and the frequency of outdoor excursions reduce the reliability of data and the results of the data analysis and illustrate one of the biggest limitations of this study. Hence, while this study successfully highlights the possible influence of the interiors, the observed effects may be less prevalent or non-existent in many other scenarios. Because of the subjective experiences of the occupants, future studies should attempt to measure such mental states with greater sensitivity. Similarly, topics such as place attachment can provide valuable insight in regards to living under similar conditions. Although the lockdowns were a unique citation unlikely to happen again at this scale, the findings may apply to a wider range of scenarios, especially in other isolated and confined environments. Additional studies and research may be needed to achieve more conclusive results regarding this subject.

References

Abd Elrahman, A.S. (2021), "The fifth-place metamorphosis: the impact of the outbreak of COVID-19 on typologies of places in post-pandemic Cairo", *Archnet-IJAR: International Journal of Architectural Research*, Vol. 15 No. 1, pp. 113-130, doi: 10.1108/ARCH-05-2020-0095.

Abusaada, H. and Elshater, A. (2022a), "COVID-19's challenges to urbanism: social distancing and the phenomenon of boredom in urban spaces", *Journal of Urbanism: International Research on Placemaking and Urban Sustainability*, Vol. 15 No. 2, pp. 258-260, doi: 10.1080/17549175.2020.1842484.

Abusaada, H. and Elshater, A. (2022b), "COVID-19 and 'the trinity of boredom' in public spaces: urban form, social distancing and digital transformation", *Archnet-IJAR: International Journal of Architectural Research*, Vol. 16 No. 1, pp. 172-183, doi: 10.1108/ARCH-05-2021-0133.

Aigbavboa, C. and Thwala, W. (2016), "A notional appraisal of the bases of housing satisfaction", *International Journal for Housing Science and its Applications*, Vol. 40 No. 2, pp. 133-145.

Aljunaidy, M.M. and Adi, M.N. (2021), "Architecture and mental disorders: a systematic study of peer-reviewed literature", *HERD: Health Environments Research and Design Journal*, Vol. 14 No. 3, pp. 320-330, doi: 10.1177/1937586720973767.

Alkhamees, A.A., Alrashed, S.A., Alzunaydi, A.A., Almohimeed, A.S. and Aljohani, M.S. (2020), "The psychological impact of COVID-19 pandemic on the general population of Saudi Arabia", *Comprehensive Psychiatry*, Vol. 102, 152192, doi: 10.1016/j.comppsych.2020.152192.

AlWaer, H., Speedie, J. and Cooper, I. (2021), "Unhealthy neighbourhood 'syndrome': a useful label for analysing and providing advice on urban design decision-making?", *Sustainability*, Vol. 13 No. 11, p. 6232, doi: 10.3390/su13116232.

Amerio, A., Brambilla, A., Morganti, A., Aguglia, A., Bianchi, D., Santi, F., Costantini, L., Odone, A., Costanza, A., Signorelli, C., Serafini, G., Amore, M. and Capolongo, S. (2020), "COVID-19 lockdown: housing built environment's effects on mental health", *International Journal of Environmental Research and Public Health*, Vol. 17 No. 16, p. 5973, doi: 10.3390/ijerph17165973.

Bharucha-Reid, R. and Kiyak, H.A. (1982), "Environmental effects on affect: density, noise and personality", *Population and Environment*, Vol. 5 No. 1, pp. 60-72, doi: 10.1007/BF01359052.

Bokharaei, S. and Nasar, J.L. (2016), "Perceived spaciousness and preference in sequential experience", *Human Factors*, Vol. 58 No. 7, pp. 1069-1081, doi: 10.1177/0018720816650068.

Brooks, S.K., Webster, R.K., Smith, L.E., Woodland, L., Wessely, S., Greenberg, N. and Rubin, G.J. (2020), "The psychological impact of quarantine and how to reduce it: rapid review of the evidence", *The Lancet*, Vol. 395 No. 10227, pp. 912-920, doi: 10.1016/S0140-6736(20)30460-8.

Carrère, S. (1990), *Physiological and Psychological Patterns of Acute and Chronic Stress during Winter Isolation in Antarctica*, University Microfilms International, Ann Arbor, MI.

Cohen, J. (1988), *Statistical Power Analysis for the Behavioral Sciences*, 2nd ed., Routledge, New York, NY.

Connors, M.M., Harrison, A.A. and Akins, F. (2005), *Living Aloft: Human Requirements for Extended Spaceflight*, University Press of the Pacific, Washington, DC.

Diener, E. (2000), "Subjective well-being: the science of happiness and a proposal for a national index", *American Psychologist*, Vol. 55 No. 1, pp. 34-43, doi: 10.1037/0003-066X.55.1.34.

Diener, E. and Seligman, M.E.P. (2004), "Beyond money: toward an economy of well-being", *Psychological Science in the Public Interest*, Vol. 5 No. 1, pp. 1-31, doi: 10.1111/j.0963-7214.2004.00501001.x.

Eastwood, J.D., Frischen, A., Fenske, M.J. and Smilek, D. (2012), "The unengaged mind: defining boredom in terms of attention", *Perspectives on Psychological Science*, Vol. 7 No. 5, pp. 482-495, doi: 10.1177/1745691612456044.

Evans, G.W., Stokols, D. and Carrère, S. (1988), "human adaptation to isolated and confined environments: preliminary findings of a seven month antarctic winter-over human factors study", NASA, Contractor Report (177499), available at: https://ntrs.nasa.gov/citations/19890006160.

Evans, G.W., Lepore, S.J. and Schroeder, A. (1996), "The role of interior design elements in human responses to crowding", *Journal of Personality and Social Psychology*, Vol. 70 No. 1, pp. 41-46, doi: 10.1037/0022-3514.70.1.41.

Faul, F., Erdfelder, E., Lang, A.G. and Buchner, A. (2007), "G*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences", *Behavior Research Methods*, Vol. 39 No. 2, pp. 175-191, doi: 10.3758/BF03193146.

Fiorillo, A., Sampogna, G., Giallonardo, V., Del Vecchio, V., Luciano, M., Albert, U., Carmassi, C., Carrà, G., Cirulli, F., Dell'Osso, B., Nanni, M.G., Pompili, M., Sani, G., Tortorella, A. and Volpe, U. (2020), "Effects of the lockdown on the mental health of the general population during the COVID-19 pandemic in Italy: results from the COMET collaborative network", *European Psychiatry: The Journal of the Association of European Psychiatrists*, Vol. 63 No. 1, p. e87, doi: 10.1192/j.eurpsy.2020.89.

Fornara, F., Mosca, O., Bosco, A., Caffò, A.O., Lopez, A., Iachini, T., Ruggiero, G., Ruotolo, F., Sbordone, F.L., Ferrara, A., Cattaneo, Z., Arioli, M., Frassinetti, F., Candini, M., Miola, L. and Pazzaglia, F. (2022), "Space at home and psychological distress during the Covid-19 lockdown in Italy", *Journal of Environmental Psychology*, Vol. 79, pp. 1-10, doi: 10.1016/j.jenvp.2021.101747.

Franz, G., Von Der Heyde, M. and Bülthoff, H.H. (2005), "An empirical approach to the experience of architectural space in virtual reality-exploring relations between features and affective appraisals of rectangular indoor spaces", *Automation in Construction*, Vol. 14 No. 2 SPEC. ISS., pp. 165-172, doi: 10.1016/j.autcon.2004.07.009.

Gifford, R. (2014), "Environmental psychology matters", *Annual Review of Psychology*, Vol. 65, pp. 541-579, doi: 10.1146/annurev-psych-010213-115048.

Gunderson, E. (1963), "Emotional symptoms in extremely isolated groups", *Archives Of General Psychiatry*, Vol. 9 No. 4, pp. 362-368, doi: 10.1001/archpsyc.1963.01720160052006.

Hawryluck, L., Gold, W.L., Robinson, S., Pogorski, S., Galea, S. and Styra, R. (2004), "SARS control and psychological effects of quarantine, Toronto, Canada", *Emerging Infectious Diseases*, Vol. 10 No. 7, pp. 1206-1212, doi: 10.3201/eid1007.030703.

Hazarika, M., Das, S., Bhandari, S.S. and Sharma, P. (2021), "The psychological impact of the COVID-19 pandemic and associated risk factors during the initial stage among the general population in India", *Open Journal of Psychiatry and Allied Sciences*, Vol. 12 No. 1, pp. 31-35, doi: 10.5958/2394-2061.2021.00009.4.

Herzog, T.R. (1985), "A cognitive analysis of preference for waterscapes", *Journal of Environmental Psychology*, Vol. 5 No. 3, pp. 225-241, doi: 10.1016/S0272-4944(85)80024-4.

Hidayetoglu, M.L., Yildirim, K. and Akalin, A. (2012), "The effects of color and light on indoor wayfinding and the evaluation of the perceived environment", *Journal of Environmental Psychology*, Vol. 32 No. 1, pp. 50-58, doi: 10.1016/j.jenvp.2011.09.001.

Imamoglu, V. (1973), "The effect of furniture density on the subjective evaluation of spaciousness and estimation of size of rooms", in Küller, R. and Stroudsburg (Eds), *Architectural Psychology*, Dowden, Huthinson and Ross, PA, pp. 341-352.

Inui, M. and Miyata, T. (1973), "Spaciousness in interiors", *Lighting Research and Technology*, Vol. 5 No. 2, pp. 103-111, doi: 10.1177/096032717300500205.

Kaye, S.M. and Murray, M.A. (1982), "Evaluations of an architectural space as a function of variations in furniture arrangement, furniture density, and windows", *Human Factors*, Vol. 24 No. 5, pp. 609-618, doi: 10.1177/001872088202400511.

Kessler, R.C., Keller, M.B. and Wittchen, H.U. (2001), "The epidemiology of generalized anxiety disorder", *The Psychiatric Clinics of North America*, Vol. 24 No. 1, pp. 19-39, doi: 10.1016/s0193-953x(05)70204-5.

Kessler, R.C., Andrews, G., Colpe, L.J., Hiripi, E., Mroczek, D.K., Normand, S.L., Walters, E.E. and Zaslavsky, A.M. (2002), "Short screening scales to monitor population prevalences and trends in non-specific psychological distress", *Psychological Medicine*, Vol. 32 No. 6, pp. 959-976, doi: 10.1017/s0033291702006074.

Kirschbaum, C. and Tonello, G. (1997), "Visual appearance of office lighting", *Proceedings of Right Light 4th European Conference Energy-Efficient Lighting*, Copenhagen, Denmark: DEF Congress Service, pp. 143-148.

Martyniuk, O., Flynn, J.E., Spencer, T.J. and Hendrick, C. (1973), "Effect of environmental lighting on impression and behavior", in Küller, R. (Ed.), *Architectural Psychology*, Dowden, Hutchinson & Ross, Stroudsburg, PA, pp. 51-63.

Mikulas, W.L. and Vodanovich, S.J. (1993), "The essence of boredom", *The Psychological Record*, Vol. 43 No. 1, pp. 3-12.

Mirowsky, J. and Ross, C.E. (2002), "Measurement for a human science", *Journal of Health and Social Behavior*, Vol. 43 No. 2, pp. 152-170, doi: 10.2307/3090194.

Natani, K. and Shurley, J.T. (1974), "Sociopsychological aspects of a winter vigil at south polar station", in Eke, G. (Ed.), *Human Adaptability to Antarctic Conditions*, American Geophysical Union, Washington, DC, pp. 89-114.

Nicolas, M., Martinent, G., Suedfeld, P. and Gaudino, M. (2019), "Assessing psychological adaptation during polar winter-overs: the isolated and confined environments questionnaire (ICE-Q)", *Journal of Environmental Psychology*, Vol. 65, 101317, doi: 10.1016/J.JENVP.2019.101317.

Oberfeld, D., Hecht, H. and Gamer, M. (2010), "Surface lightness influences perceived room height", *Quarterly Journal of Experimental Psychology*, Vol. 63 No. 10, pp. 1999-2011, doi: 10.1080/17470211003646161.

Orgilés, M., Morales, A., Delvecchio, E., Francisco, R., Mazzeschi, C., Pedro, M. and Espada, J.P. (2021), "Coping behaviors and psychological disturbances in youth affected by the COVID-19 health crisis", *Frontiers in Psychology*, Vol. 12, 565657, doi: 10.3389/fpsyg.2021.565657.

Oyama, T. and Nanri, R. (1960), "The effects of hue and brightness on the size perception", *Japanese Psychological Research*, Vol. 2 No. 1, pp. 13-20, doi: 10.4992/psycholres1954.2.13.

Person, B., Sy, F., Holton, K., Govert, B., Liang, A. and National Center for Infectious Diseases/SARS Community Outreach Team (2004), "Fear and stigma: the epidemic within the SARS outbreak", *Emerging Infectious Diseases*, Vol. 10 No. 2, pp. 358-363, doi: 10.3201/eid1002.030750.

Ragheb, M.G. and Merydith, S.P. (2001), "Development and validation of multidimensional scale measuring free time boredom", *Leisure Studies*, Vol. 20 No. 1, pp. 41-59, doi: 10.1080/02614360122569.

Reynolds, D.L., Garay, J.R., Deamond, S.L., Moran, M.K., Gold, W. and Styra, R. (2008), "Understanding, compliance and psychological impact of the SARS quarantine experience", *Epidemiology and Infection*, Vol. 136 No. 7, pp. 997-1007, doi: 10.1017/S0950268807009156.

Ridner, S.H. (2004), "Psychological distress: concept analysis", *Journal of Advanced Nursing*, Vol. 45 No. 5, pp. 536-545, doi: 10.1046/j.1365-2648.2003.02938.x.

Salama, A., Remali, A.M. and MacLean, L. (2017), "Deciphering urban life: a multi-layered investigation of St. Enoch Square, Glasgow city centre", *Archnet-IJAR: International Journal of Architectural Research*, Vol. 11 No. 2, pp. 137-156.

Salama, A. (2021), "Foreword: rethinking the 'lived' within the 'urban' of the Middle Eastern city", in Azzali, S., Mazzetto, S. and Petruccioli, A. (EDs), *Urban Challenges in the Globalizing Middle-East: Social Value of Public Spaces*, 1st ed., The Urban Book Series, Springer International Publishing AG, pp. v-vii, doi: 10.1007/978-3-030-69795-2.

Salari, N., Hosseinian-Far, A., Jalali, R., Vaisi-Raygani, A., Rasoulpoor, S., Mohammadi, M., Rasoulpoor, S. and Khaledi-Paveh, B. (2020), "Prevalence of stress, anxiety, depression among the general population during the COVID-19 pandemic: a systematic review and meta-analysis", *Globalization and Health*, Vol. 16 No. 1, p. 57, doi: 10.1186/s12992-020-00589-w.

Shultz, J.M., Cooper, J.L., Baingana, F., Oquendo, M.A., Espinel, Z., Althouse, B.M., Marcelin, L.H., Towers, S., Espinola, M., McCoy, C.B., Mazurik, L., Wainberg, M.L., Neria, Y. and Rechkemmer, A. (2016), "The role of fear-related behaviors in the 2013-2016 west Africa ebola virus disease outbreak", *Current Psychiatry Reports*, Vol. 18 No. 11, p. 104, doi: 10.1007/s11920-016-0741-y.

Spitzer, R.L., Kroenke, K., Williams, J.B.W. and Löwe, B. (2006), "A brief measure for assessing generalized anxiety disorder: the GAD-7", *Archives of Internal Medicine*, Vol. 166 No. 10, pp. 1092-1097, doi: 10.1001/archinte.166.10.1092.

Stamps, A.E. (2010), "Effects of permeability on perceived enclosure and spaciousness", *Environment and Behavior*, Vol. 42 No. 6, pp. 864-886, doi: 10.1177/0013916509337287.

Suedfeld, P. and Steel, G.D. (2000), "The environmental psychology of capsule habitats", *Annual Review of Psychology*, Vol. 51, pp. 227-253, doi: 10.1146/annurev.psych.51.1.227.

Sundstrom, E. and Sundstrom, M.G. (1986), *Work Places: the Psychology of the Physical Environment in Offices and Factories*, Cambridge University Press, Cambridge.

Tachibana, S., Sano, S. and Inoue, N. (2012), "Stress factors among flight passengers who have been isolated and confined in quarantine due to the containment operations for Influenza (H1N1) 2009: comparison with similar isolation and confinement environments", *Journal of the National Defense Medical College*, Vol. 37 No. 1, pp. 27-38.

Tachibana, K., Tachibana, S. and Inoue, N. (2017), "From outer space to Earth—the social significance of isolated and confined environment research in human space exploration", *Acta Astronautica*, Vol. 140, pp. 273-283, doi: 10.1016/j.actaastro.2017.08.015.

Tee, M.L., Tee, C.A., Anlacan, J.P., Aligam, K., Reyes, P., Kuruchittham, V. and Ho, R.C. (2020), "Psychological impact of COVID-19 pandemic in the Philippines", *Journal of Affective Disorders*, Vol. 277, pp. 379-391, doi: 10.1016/j.jad.2020.08.043.

Ulrich, R.S. (1984), "View through a window may influence recovery from surgery", *Science*, Vol. 224 No. 4647, pp. 420-421, (New York, N.Y.), doi: 10.1126/science.6143402.

Ulrich, R.S. (1991), "Effects of interior design on wellness: theory and recent scientific research", *Journal of Health Care Interior Design*, Vol. 3, pp. 97-109.

von Castell, C., Oberfeld, D. and Hecht, H. (2014), "The effect of furnishing on perceived spatial dimensions and spaciousness of interior space", *PLoS ONE*, Vol. 9 No. 11, e113267, doi: 10.1371/journal.pone.0113267.

Wessels, M., Utegaliyev, N., Bernhard, C., Welsch, R., Oberfeld, D., Thönes, S. and von Castell, C. (2022), "Adapting to the pandemic: longitudinal effects of social restrictions on time perception and boredom during the Covid-19 pandemic in Germany", *Scientific Reports*, Vol. 12 No. 1, pp. 1-12, doi: 10.1038/s41598-022-05495-2.

Word Health Organization (2021), "Coronavirus disease (COVID-19): how is it transmitted?", available at: https://www.who.int/news-room/questions-and-answers/item/coronavirus-disease-covid-19-how-is-it-transmitted.

Zhang, F., Zhang, C. and Hudson, J. (2018), "Housing conditions and life satisfaction in urban China", *Cities*, Vol. 81, pp. 35-44, doi: 10.1016/j.cities.2018.03.012.

About the authors

Berk Diker is currently a Ph.D. student at Bilkent University and working towards the design and development of ideal living and working environments in isolated, confined and extreme environments. He is a graduate of the Master of Arts in Interior Architecture program at Suffolk University. He has worked and written his Master's thesis on the cognitive and behavioral impact of isolated and confined environments in space and how these issues can be countered by good interior design solutions. Berk Diker is the corresponding author and can be contacted at: berk.diker@bilkent.edu.tr

Halime Demirkan is a Professor of Architecture in the Department of Interior Architecture and Environmental Design at I. D. Bilkent University, Turkey. Her research interests include creativity, architectural design, design education, and human factors in design. She has published more than 40 peer-reviewed articles and many book chapters. She received her MS and BS in Industrial Engineering and PhD in Architecture at Middle East Technical University.