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Original Research

Green Environment, Mental Health, and Loyalty among Male and Female Patients

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Abstract

Background: Existing studies revealed that exposure to green spaces within healthcare establishments has multiple physical and mental health benefits to patients. In this context, the concept of biophilic design has received growing attention among environmental psychology researchers. Several studies indicated that the positive effect of green environment may be different for males and females. Therefore, the present study sought to investigate the influence of biophilic design elements (i.e., green items and natural light) on patients'self-rated mental health value, satisfaction with medical care, and loyalty toward the healthcare establishment. The study also investigated the possible influence of gender differences in the relationships between the variables. **Methods**: A structural equation modeling was employed as a data analysis technique. **Results**: Our empirical result indicated that biophilic design elements significantly improved the patients' self-rated mental health value, and this dimension had a positive effect on their satisfaction with medical care and loyalty toward the health care facility. Our findings indicated that the relationships among biophilic design elements, self-rated mental health value, satisfaction with medical care, and loyalty toward the healthcare establishment were substantially different across male and female groups. Moreover, self-rated mental health value and satisfaction with medical care acted as significant mediators between biophilic design elements and loyalty. **Conclusions**: Results of this study offer healthcare practitioners and researchers valuable strategies to effectively incorporate biophilic design elements into the interior spaces of a healthcare establishment.

Keywords: biophilic design; healthcare facility; gender; self-rated mental health value; satisfaction; loyalty

1. Introduction

There is growing recognition that the physical evidence of healthcare settings has a critical influence on health outcomes for patients [1–7]. Recently, some studies have reported that exposure to green/natural environments within healthcare facilities has multiple physical and mental health benefits to patients [8–10]. For example, Gascon *et al*. [8] found a positive relationship between exposure to natural environment and mental health/physical activity. Swan *et al*. [9] investigated the impact of hospital rooms on patients' satisfaction and observed a positive correlation between appealing rooms and patient evaluations of hospital services. Additionally, Weerasuriya *et al*. [10] explored experiences of patients who have had access to green environments within a healthcare establishment and showed that such spaces had significant psychophysiological, social and spiritual benefits to patients.

In this context, the concept of biophilic design (i.e., the inherent affinity people have for the green/natural spaces) has received growing attention among environmental psychology researchers. Several studies reported that the implementation of biophilic design principles into the interior spaces of healthcare settings reduced mental/psychological stress, increased pain tolerance, improved mental fatigue, shortened hospital stays, enhanced immune function, relieved mental anxiety and/or facilitated faster and more complete physical and psychological healing among patients [11–13].These biophilic environments have been additionally recognized as contributing to enhanced perceptions of medical care among patients, increased levels of satisfaction with the care received and, eventually, a higher loyalty toward the healthcare provider [14]. Other research also showed that patients who are satisfied with medical care during their hospitalization tend to follow medical regimens, recover faster from illness and are more likely to return to that healthcare provider for other medical investigations [15–19].

Several studies indicated that the beneficial influence of green/natural environment may be different for males and females [20–26]. Some of these studies revealed that the effect of exposure to green environment was higher for males than for females [24,26], while other studies showed no gender differences [23,27] or a higher effect in the female group [21,28,29]. In the healthcare context, Tucker and Kelley [30] have investigated the difference in satisfaction between males and females and reported a positive and significant association between male patients and higher levels of satisfaction. Carlson *et al*. [31], however, reported that women have higher levels of satisfaction with physicians and medical care received than men. In addi-

tion, Dolinsky and Caputo [32] found that women are more likely to become loyal to healthcare providers than men.

However, differences between men and women in their response to green/natural environment within a healthcare facility remain largely uninvestigated. The existing literature that considered differences between men and women in their perceptions of natural/green surroundings recorded mixed findings. Exploring the associations among green/natural environment, mental health value, satisfaction, and loyalty for males and females is critical because it provides information about who might benefit most from exposure to green spaces into interior spaces of a healthcare facility. To the authors' knowledge, no studies have yet attempted to include biophilic design elements (i.e., green items and natural light) and mental health value into the conceptual framework that explicate the patients' satisfaction and loyalty toward the green interventions of a healthcare establishment. Moreover, the precise understanding about the gender differences in explaining the influence of biophilic design on mental health value, satisfaction and loyalty in the context of a healthcare facility is lacking. Accordingly, the purpose of the present research was threefold: (1) to test the possible relationships among biophilic design elements (i.e., green items and natural light), self-rated mental health value, satisfaction with the medical care, and loyalty toward the healthcare facility, (2) to examine the mediating effects of self-rated mental health value and satisfaction, and (3) to investigate the possible influence of gender differences in the relationships between the study constructs. In order to evaluate the proposed relationships, a conceptual framework was developed. Subsequently, a measurement model and a structural equation modeling that included the research constructs were conducted to assess the proposed theoretical model. In addition, the proposed relationships among dimensions were evaluated for both males and females.

2. Theoretical Background

2.1 Biophilic Design and its Influence on Self-Rated Mental Health Value, Satisfaction and Loyalty

Biophilic design is a design approach that involves the incorporation of green features in the modern built environment [33,34]. The biophilia philosophy is based on the idea that humans have an innate affinity for the green environment [33]. Exposure to green elements has been shown to improve human mental and physical health and well-being [35]. In a healthcare context, the critical instances of biophilic design are green features (e.g., trees, flowers, and potted plants), natural surroundings, and access to daylight, which can generate positive responses and behaviors among patients [36]. The increased emphasis on including green/natural items in healthcare establishments has been shown to decrease stress and anxiety, enhance psychological and physical well-being, increase pain tolerance, improve illness recovery, and facilitate faster and more complete healing [37–39]. For example, Totaforti [39] found that patient rooms with plants, natural light and views of nature can intensify the activity of the parasympathetic nervous system, thus lowering their stress levels. Park and Mattson [38] also showed that patients who were exposed to green features during their hospitalization took less analgesic medication, had significantly lower pains and reported significantly lower levels of anxiety.

Furthermore, the importance of the green/natural environment within healthcare facilities has been shown to increase patients' perception of care, satisfaction with medical care and loyalty toward the healthcare provider [14,38,40,41]. For instance, Park and Mattson [38] showed that patients who were exposed to plants during hospitalization had higher levels of satisfaction with the healthcare establishment compared with the patients who were not exposed to such green items. Harris *et al*. [40] carried out a research among discharged inpatients and found that interior design, window views of nature and adequate lighting had a significant influence on patients' satisfaction with the medical care. In addition, Swan *et al*. [9] observed that appealing patient rooms resulted in positive perceptions about the medical services, higher intentions to revisit the healthcare facility and higher intentions to recommend it to others.

2.2 Self-Rated Mental Health Value and its Impact on Satisfaction and Loyalty

There is a well-established evidence that exposure to green environments has a critical role in supporting self-rated mental health value among occupants in a built environment [36,42,43]. Self-rated mental health value was defined as the cognitive self-evaluation of an individual about his/her present mental health state [44]. Existing research has found that self-rated mental health value is significantly associated with the amount of green surroundings in the urban environment [45,46]. For example, Coppel and Wüstemann [45] observed that individuals who live in neighborhoods with green/natural surroundings will have less mental health in comparison with those living farther away. In the healthcare context, Beukeboom *et al*. [47] showed that patients' connection with nature can decrease their physiological and psychological stress. Smith [48] also reported that access to green spaces in a healthcare establishment can reduce stress, increase health outcomes, and stimulate a general sense of emotional wellbeing and mental health among patients.

Empirical research indicated that individuals' self-rated mental health value has a significant effect on satisfaction and loyalty [49,50]. For instance, Ghubach *et al*. [51] showed that people's life satisfaction decreases when their perception about mental health value is lower. In the hospitality sector, Kim *et al*. [52] examined airline customers' behavioral intentions. Results revealed a significant relationship between customers' mental health value and satisfaction, which, in turn, generated positive behavioral inten-

tions. These works demonstrated the significant influence of self-rated mental health value on customers' satisfaction and loyalty.

2.3 Satisfaction

Patient satisfaction with the quality of healthcare has been extensively researched in the healthcare literature. Patient satisfaction was defined as the judgment about how much his/her needs and expectations are satisfied by the healthcare provider [53]. Some studies have investigated the difference in satisfaction between men and women in the healthcare context [54,55]. Some of these studies have concluded that women tend to be more satisfied with physicians and/or medical care received compared to the men group [31]. Other studies found that gender did not significantly influence satisfaction [27,56]. For instance, Otani *et al*. [56] observed that women tended to evaluate their experience with nurses as having a greater importance in the overall satisfaction, while men evaluated their experience with physicians as more important. However, some other studies reported that male patients had higher levels of satisfaction with the medical care than the female patients [30,57,58]. For example, Brown *et al*. [57] showed that older and less educated male patients are more satisfied with the medical care provided by the hospital compared to younger and more educated female patients. In addition, Lyon and Powers [25] indicated that men are more consistent in satisfaction responses over time compared to the female group.

2.4 Hypotheses Development

Previous studies indicated that women and men respond differently to green/natural surroundings. Some of these studies reported that women have a stronger preference for natural/green environment than men [26,59–62]. For example, Caula *et al*. [60] found that gender significantly influences preferences for the green features and that women generally prefer the more natural/green designs. In addition, Sang *et al*. [61] observed that women associate urban green environment with a higher sense of well-being compared with men. However, other studies found that men visit green environments more frequently than women [63–67]. For instance, Manning [67] investigated how connected students were to green surroundings and found that male students had a higher preference for such green spaces than female students. Similarly, other studies [65,66] found that male students have significantly lower levels of stress and higher perceived restoration after exposure to green spaces than female students. Dadvand *et al*. [64] also demonstrated that only males benefit from green/natural environment with higher self-reported health value. Based on these theoretical arguments, the following hypotheses were proposed:

H1: The association between green items and self-rated mental health value is significantly different by gender.

H2: The association between natural light and self-rated mental health value is significantly different by gender.

H3: The association between green items and satisfaction with the medical is significantly different by gender.

H4: The association between natural light and satisfaction with the medical care is significantly different by gender.

H5: The association between green items and loyalty toward the healthcare facility is significantly different by gender.

H6: The association between natural light and loyalty toward the healthcare facility is significantly different by gender.

Existing studies indicated that physiological and psychological responses to green/natural stimuli may be different for men and women [26,68,69]. Some of these studies [68] found that women display higher emotional affinity toward green environment than men. Other empirical research [70] demonstrated that men's preference for green environment was significantly higher than that of women, but their subjective health and well-being were lower. In addition, Richardson and Mitchell [26] found that more green/natural surroundings were linked to lower rates of cardiovascular and respiratory disease for men than for women. Morris *et al*. [69] revealed that women pay more attention to the green surroundings in the urban environment than men. Therefore, the following hypotheses were proposed:

H7: The association between self-rated mental health value and satisfaction with the medical care is significantly different by gender.

H8: The association between self-rated mental health value and loyalty toward the healthcare facility is significantly different by gender.

Furthermore, patients who are more satisfied with the medical care received tend to become loyal (i.e., who express his/her desire to revisit the healthcare facility, to recommend it to others and/or spread positive word-of-mouth) to the healthcare establishment. Previous studies [32] showed that women patients tend to be more loyal toward the healthcare facility than men. For example, Qin *et al*. [71] demonstrated that patients' satisfaction with the medical care has a greater influence on loyalty for women than for men. In addition, Meesala and Paul [72] showed that women patients' satisfaction with medical care has a stronger effect on their loyalty toward the hospital compared to the male patients. Based on these theoretical arguments, the following hypothesis was proposed:

H9: The association between satisfaction with the medical care and loyalty toward the healthcare facility is significantly different by gender.

2.5 Proposed Theoretical Framework

Based on the above theoretical background, the present study proposed the theoretical framework displayed in Fig. 1. This framework consists of five dimensions, which include green items, natural light, self-rated mental health, satisfaction and loyalty toward the healthcare establishment. In addition, nine research hypotheses were developed for the proposed theoretical framework.

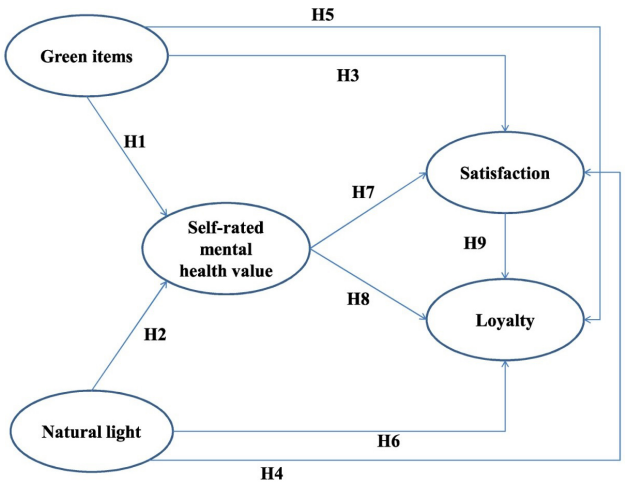

Fig. 1. The research conceptual framework.

3. Methodology

3.1 Measurement Scales and Questionnaire Design

The survey questionnaire included four sections that covered (1) perceptions of green items and natural light utilized within healthcare establishments, (2) self-rated mental health value, (3) satisfaction with the medical care provided by the healthcare settings and loyalty toward the healthcare setting, and (4) demographic characteristics of respondents. The measures of study dimensions were borrowed from existing studies [36,42,73] and slightly modified for the present research. Multiple items using 5-point Likert scales (from Extremely agree (1) to Extremely disagree (5)) were utilized. More specifically, two items were used for the assessment of green items (e.g., "Green items (plants/flowers/trees) are easily accessible throughout this healthcare setting"). To assess natural light, two items were utilized (e.g., "Natural light through glass windows/walls is easily observable throughout this healthcare setting"). For the evaluation of self-rated mental health value, two items were used (e.g., "Green environment in this healthcare setting plays an important role in relieving my mental anxiety/stress"). In addition, four items were utilized for the assessment of satisfaction with medical services provided by the healthcare setting (e.g., "Overall, I am satisfied with my experience at this healthcare setting"). Lastly, to evaluate loyalty toward the healthcare establishment three items were utilized (e.g., "I will recommend this healthcare setting to my family/colleagues/friends").

The survey questionnaire was pre-tested with experts in the healthcare filed and medical practitioners in order to verify whether the items are explicit and to avoid ambiguities. Minor amendments were made based on the comments received.

3.2 Data Collection Process and Sample Characteristics

In order to collect the data, an online survey methodology was employed. The survey was carried out for approximately four weeks, which was from June 1 to June 30, 2020. In addition, a snowballing sampling approach was developed in order to efficiently reach Romanian patients. More specifically, participants included in the present research were asked to identify and invite other colleagues/friends to fill out the questionnaire. Through this sampling technique, the survey questionnaires were sent by email to approximately 2000 subjects. However, despite its ease of use, the snowballing sampling technique does not permit the researcher to extrapolate data to the target population. As a screening question, only those respondents who had visited a Romanian healthcare establishment (i.e., hospital and/or health clinic) with green items/ spaces at least once within the last six months were eligible to fill out the questionnaire. A description of the study was offered to respondents in the beginning of the survey. A total of 386 usable questionnaires were received through this procedure and then utilized for analysis. Demographic characteristics of the sample are shown in Table 1.

Table 1. Demographic characteristics of the sample.

	Males		Females	
	Frequency	Percent	Frequency	Percent
Gender	159	41.2	227	58.8
Age				
18–24	40	10.4	98	25.4
25–33	60	15.5	90	23.3
34–66	59	15.3	39	10.1
Education				
high school degree	38	9.9	26	6.7
bachelor's degree	121	31.3	201	52.1
Income[a]				
500$-under 500$	42	10.9	62	16.0
501$-over 501$	117	30.3	165	42.8

[a] indicates monthly income per family member.

3.3 Reliability and Validity Assessment

A measurement model that included the research dimensions was conducted by utilizing AMOS 20. A confirmatory factor analysis (CFA) using the maximum likelihood estimation method was employed in order to verify the reliability and validity of the scale. Our findings showed that the model had a very good fit to the data (Goodness-

Table 2. Measurement model assessment (for male respondents).

	GI	NL	MH	SAT	LOY	CR	AVE	Mean (SD[c])
Green items (GI)	1.000					0.886	0.794	3.140 (1.397)[c]
Natural light (NL)	0.607[a] (0.368)[b]	1.000				0.870	0.771	2.420 (1.255)
Self-rated mental health (MH)	0.679 (0.461)	0.609 (0.370)	1.000			0.866	0.764	3.125 (1.357)
Satisfaction (SAT)	0.590 (0.348)	0.643 (0.413)	0.564 (0.318)	1.000		0.980	0.926	2.085 (1.283)
Loyalty (LOY)	0.707 (0.499)	0.571 (0.326)	0.576 (0.331)	0.628 (0.394)	1.000	0.965	0.903	3.333 (1.394)

Note. Goodness-of-Fit Statistics: χ^2 = 412.760, df = 162, χ^2/df = 2.548, $p < 0.001$, RMSEA = 0.045, CFI = 0.971, IFI = 0.972, TLI = 0.959).

[a] Correlations.

[b] Squared correlations.

[c] Standard Deviation.

Table 3. The hypotheses testing for the structural model.

Hypothesized paths	Standardized coefficients				*p*-values	Results of hypotheses testing
	Males	t-values	Females	t-values	males vs females	
H1: GI → MH	0.489	5.168**	0.738	4.042**	0.864	H1: Not supported
H2: NL → MH	0.312	3.353**	–0.091	–0.760	0.002	H2: Supported
H3: GI → SAT	0.240	2.405*	–0.072	–0.435	0.076	H3: Supported
H4: NL → SAT	0.402	4.236**	0.440	4.310**	0.454	H4: Not supported
H5: GI → LOY	0.452	4.684**	0.159	1.015	0.064	H5: Supported
H6: NL → LOY	0.082	0.942	0.199	1.953	0.623	H6: Not supported
H7: MH → SAT	0.156	1.554	0.144	1.036	0.909	H7: Not supported
H8: MH → LOY	0.065	0.710	–0.021	–0.165	0.632	H8: Not supported
H9: SAT → LOY	0.272	3.462**	0.329	4.185**	0.593	H9: Supported

Note: GI, Green Items; NL, Natural light; MH, Self-Rated Mental Health; SAT, Satisfaction; LOY, Loyalty.

* $p < 0.05$, ** $p < 0.01$.

of-Fit Statistics: χ^2 = 412.760, df = 162, χ^2/df = 2.548, $p < 0.001$, RMSEA = 0.045, CFI = 0.971, IFI = 0.972, TLI = 0.959). All standardized loadings were found to be significant ($p < 0.01$). As reported in Table 2, the composite reliability values were between 0.866 and 0.980, which exceeded the minimum threshold of 0.700 [74]. The internal consistency of the multiple-item measures was thus demonstrated. For the evaluation of construct validity, average variance extracted values (AVE) were measured. These values all exceeded the minimum threshold of 0.500 [74]. Additionally, these AVE values were all higher than the squared correlations between the dimensions (see Table 2), which showed that discriminant validity was evident.

Subsequently, structural equation modeling (SEM) was employed in order to assess the proposed theoretical model. As showed in Table 3 and Fig. 2, the goodness-of-fit statistics of the structural model were found to be good (Goodness-of-Fit Statistics: χ^2 = 412.760, df = 162, χ^2/df = 2.548, $p < 0.001$, RMSEA = 0.045, CFI = 0.971, IFI = 0.972, TLI = 0.959). Our findings revealed that the proposed conceptual model satisfactorily accounted for the total variance in the loyalty toward the healthcare facility (R^2_{male} = 0.575), satisfaction with the medical services (R^2_{male} = 0.488), and self-rated mental health value (R^2_{male} = 0.522). Moreover, these total variances were all greater for men than for women.

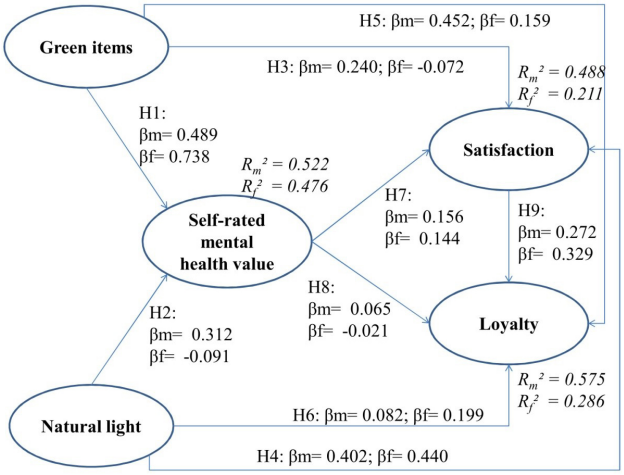

Fig. 2. The results of the structural model.

4. Results

4.1 Hypothesis Testing

Next, the proposed relationships among dimensions were evaluated for both males and females. As shown in Table 3, green items significantly and positively affected self-rated mental health value ($\beta_{male(GI\text{-}MH)}$ = 0.489, $p < 0.01$; $\beta_{female(GI\text{-}MH)}$ = 0.738, $p < 0.01$). However, this relationship was stronger for females than for males. Therefore, hypoth-

Table 4. The mediating effects of the structural model.

Indirect effect on satisfaction		Total effect on satisfaction	
Male	Female	Male	Female
$\beta_{\text{GI-MH-SAT}} = 0.076^{**}$	$\beta_{\text{GI-MH-SAT}} = 0.106^{**}$	$\beta_{\text{GI}} = 0.316^{**}$	$\beta_{\text{GI}} = 0.034$
$\beta_{\text{NL-MH-SAT}} = 0.397^{**}$	$\beta_{\text{NL-MH-SAT}} = 0.163^{**}$	$\beta_{\text{NL}} = 0.451^{**}$	$\beta_{\text{NL}} = 0.427^{**}$
		$\beta_{\text{MH}} = 0.156$	$\beta_{\text{MH}} = 0.144$
Indirect effect on loyalty		Total effect on loyalty	
$\beta_{\text{GI-MH-SAT-LOY}} = 0.274^{**}$	$\beta_{\text{GI-MH-SAT-LOY}} = 0.094^{**}$	$\beta_{\text{GI}} = 0.570^{**}$	$\beta_{\text{GI}} = 0.154$
$\beta_{\text{GI-MH-LOY}} = 0.465^{**}$	$\beta_{\text{GI-MH-LOY}} = 0.232^{**}$	$\beta_{\text{NL}} = 0.225$	$\beta_{\text{NL}} = 0.342^{**}$
$\beta_{\text{GI-SAT-LOY}} = 0.372^{**}$	$\beta_{\text{GI-SAT-LOY}} = 0.132^{**}$	$\beta_{\text{MH}} = 0.108$	$\beta_{\text{MH}} = 0.026$
$\beta_{\text{NL-MH-SAT-LOY}} = 0.255^{**}$	$\beta_{\text{NL-MH-SAT-LOY}} = 0.079^{**}$		
$\beta_{\text{NL-MH-LOY}} = 0.373^{**}$	$\beta_{\text{NL-MH-LOY}} = 0.164^{**}$	$\beta_{\text{SAT}} = 0.272^{*}$	$\beta_{\text{SAT}} = 0.329^{**}$
$\beta_{\text{NL-SAT-LOY}} = 0.418^{**}$	$\beta_{\text{NL-SAT-LOY}} = 0.214^{**}$		
$\beta_{\text{MH-SAT-LOY}} = 0.359^{**}$	$\beta_{\text{MH-SAT-LOY}} = 0.124^{**}$		

Note: GI, Green Items; NL, Natural light; MH, Self-Rated Mental Health; SAT, Satisfaction; LOY, Loyalty.

* $p < 0.05$, ** $p < 0.01$.

esis 1 was not supported. In addition, the influence of natural light on self-rated mental health value was significant for males ($\beta_{\text{male(NL-MH)}} = 0.312$, $p < 0.01$), but not significant for females ($\beta_{\text{female(NL-MH)}} = -0.091$, $p > 0.01$). This association was stronger for males than for females, thus supporting hypothesis 2. The relationship between green items and satisfaction with medical services was also tested. Results indicated that this link was stronger and significant for men than for women ($\beta_{\text{male(GI-SAT)}} = 0.240$, $p < 0.01$; $\beta_{\text{female(GI-SAT)}} = -0.072$, $p > 0.01$), thus supporting hypothesis 3. In addition, the linkage from natural light to satisfaction with medical services was significant and positive both for males and females ($\beta_{\text{male(NL-SAT)}} = 0.402$, $p < 0.01$; $\beta_{\text{female(NL-SAT)}} = 0.440$, $p < 0.01$). However, this relationship was stronger for women group. Thus, hypothesis 4 was not confirmed. The influence of green items on loyalty toward healthcare establishment was significant only in the male group ($\beta_{\text{male(GI-LOY)}} = 0.452$, $p < 0.01$; $\beta_{\text{female(GI-LOY)}} = 0.159$, $p > 0.01$), thus supporting hypothesis 5. The association between natural light and loyalty toward healthcare facility was not significant ($\beta_{\text{male(NL-LOY)}} = 0.082$, $p > 0.01$; $\beta_{\text{female(NL-LOY)}} = 0.199$, $p > 0.01$). However, this linkage was greater for females compared to males. Consequently, hypothesis 6 was not supported. The relationships between self-rated mental health value and satisfaction with medical services ($\beta_{\text{male(MH-SAT)}} = 0.156$, $p > 0.01$; $\beta_{\text{female(MH-SAT)}} = 0.144$, $p > 0.01$) and between self-rated mental health value and loyalty toward healthcare facility ($\beta_{\text{male(MH-LOY)}} = 0.065$, $p > 0.01$; $\beta_{\text{female(MH-LOY)}} = -0.021$, $p > 0.01$) were not significant. However, these relationships were stronger in the female group. Therefore, hypotheses 7 and 8 were not supported. Lastly, the relationship between satisfaction and loyalty was significant and positive both for men and women ($\beta_{\text{male(SAT-LOY)}} = 0.272$, $p < 0.01$; $\beta_{\text{female(SAT-LOY)}} = 0.329$, $p < 0.01$). This relationship was however greater for females, thus supporting hypothesis 9.

4.2 The Mediating Effects of the Structural Model

In order to evaluate the potential mediating effect of self-rated mental health value and satisfaction with medical services in the relationship between green environment (i.e., green items and natural light) and loyalty toward healthcare setting, a bootstrapping procedure recommended by Jose [75] was conducted. The number of bootstrapping samples was set at 2000 with a confidence level of 95%. As indicated in Table 4, green items had a significant effect on satisfaction indirectly through self-rated mental health value both for males and females ($\beta_{\text{male(GI-MH-SAT)}} = 0.076$, $p < 0.01$; $\beta_{\text{female(GI-MH-SAT)}} = 0.106$, $p < 0.01$). However, this mediating effect was stronger for females. In addition, natural light had a significant and positive indirect influence on satisfaction through self-rated mental health value ($\beta_{\text{male(NL-MH-SAT)}} = 0.397$, $p < 0.01$; $\beta_{\text{female(NL-MH-SAT)}} = 0.163$, $p < 0.01$). This linkage is however stronger for males than for females. Green items had a significant indirect effect on loyalty through self-rated mental health value and satisfaction both in the male and the female group ($\beta_{\text{male(GI-MH-SAT-LOY)}} = 0.274$, $p < 0.01$; $\beta_{\text{female(GI-MH-SAT-LOY)}} = 0.094$, $p < 0.01$; $\beta_{\text{male(GI-MH-LOY)}} = 0.465$, $p < 0.01$; $\beta_{\text{female(GI-MH-LOY)}} = 0.232$, $p < 0.01$; $\beta_{\text{male(GI-SAT-LOY)}} = 0.372$, $p < 0.05$; $\beta_{\text{female(GI-SAT-LOY)}} = 0.132$, $p < 0.01$). However, these indirect relationships were all greater for male group than for female group. Similarly, natural light had a significant indirect effect on loyalty through self-rated mental health value and satisfaction ($\beta_{\text{male(NL-MH-SAT-LOY)}} = 0.255$, $p < 0.01$; $\beta_{\text{female(NL-MH-SAT-LOY)}} = 0.079$, $p < 0.01$; $\beta_{\text{male(NL-MH-LOY)}} = 0.373$, $p < 0.01$; $\beta_{\text{female(NL-MH-LOY)}} = 0.164$, $p < 0.01$; $\beta_{\text{male(NL-SAT-LOY)}} = 0.418$, $p < 0.01$; $\beta_{\text{female(NL-SAT-LOY)}} = 0.214$, $p < 0.01$). These indirect linkages were all stronger for men than for women. Additionally, satisfaction exerted a significant mediating effect in the association between self-rated mental health value and loyalty ($\beta_{\text{male(MH-SAT-LOY)}}$

= 0.359, $p < 0.01$; $\beta_{female(MH\text{-}SAT\text{-}LOY)} = 0.124$, $p < 0.01$). This mediation effect was greater for males than for females. Moreover, as indicated in Table 4, green items, natural light and self-rated mental health value had a greater total effect on satisfaction in the male group than in the female group ($\beta_{male(GI)} = 0.316$, $p < 0.01$; $\beta_{female(GI)} = 0.034$, $p > 0.01$; $\beta_{male(NL)} = 0.451$, $p < 0.01$; $\beta_{female(NL)} = 0.427$, $p < 0.01$; $\beta_{male(MH)} = 0.156$, $p > 0.01$; $\beta_{female(MH)} = 0.144$, $p > 0.01$). Green items and mental health had a greater total effect on loyalty in the male group comparing with the female group ($\beta_{male(GI)} = 0.570$, $p < 0.01$; $\beta_{female(GI)} = 0.154$, $p > 0.01$; $\beta_{male(MH)} = 0.108$, $p > 0.01$; $\beta_{female(MH)} = 0.026$, $p > 0.01$). However, natural light and satisfaction had a stronger total effect on loyalty for women than for men($\beta_{male(NL)} = 0.225$, $p > 0.01$; $\beta_{female(NL)} = 0.342$, $p < 0.01$; $\beta_{male(SAT)} = 0.272$, $p < 0.05$; $\beta_{female(SAT)} = 0.329$, $p < 0.01$).

5. Discussion

The present study aimed to evaluate patients' loyalty toward a healthcare facility by incorporating four critical constructs (i.e., green items, natural light, self-rated mental health value, and satisfaction) into the proposed conceptual model, as well as the potential effect of gender differences in the relationships between the study constructs. Our findings revealed that the green items and natural lighting in the interior spaces of healthcare facilities significantly influenced patients' self-rated mental health value, which, in turn, enhanced their satisfaction with medical care and loyalty toward the healthcare provider. Moreover, the dimensions used in the present research (i.e., green items, natural light, self-rated mental health value, and satisfaction) and their significant relationships were shown to be critical drivers of patients' loyalty that has not been previously investigated. Our findings are consistent with studies that highlight that green spaces within a healthcare setting are important drivers of patient satisfaction (e.g., [39,41,76]) or loyalty (e.g., [33,77]). From a practical point of view, our findings can be utilized by healthcare managers to implement efficient biophilic design strategies within healthcare establishments that contribute to increasing patients' self-rated mental health value, which in turn determine an increase of their satisfaction with medical care and loyalty toward the healthcare provider.

Our empirical results revealed that the associations between constructs were substantially different for men and women. More specifically, our results revealed that the proposed theoretical model had a stronger predictive power for self-rated mental health value, satisfaction, and loyalty among male patients. Thus, our results emphasized the critical importance of understanding the influence of incorporating of biophilic design elements by the healthcare establishments on the self-rated mental health value, satisfaction with medical care and loyalty toward the healthcare provider among male patients, which filled a gap in the extant body of the healthcare literature. Our results are in line with previous studies emphasizing that green environment has a stronger effect in males (e.g., [21,26]).

Our results also indicate that the links from natural light to self-rated mental health value as well as from self-rated mental health value to satisfaction and loyalty were significant and higher for men than for women. In addition, the relationships between green items and satisfaction and between green items and loyalty were significant and higher among the male patients. These findings signify that at similar levels of natural lighting, male patients have a higher level of self-rated mental health value than female patients, and that at a similar level of self-rated mental health value, male patients are more satisfied with the medical care received and a stronger loyalty toward the healthcare provider than the female patients. Moreover, results indicate that at similar levels of green items in the interior spaces of healthcare facilities, male patients are more satisfied with the medical care received and a higher probability to become loyal to the healthcare provider than the female patients. These results are consistent with findings from previous studies showing that the presence of more green/natural environments are correlated with improved physical and mental health among males (e.g., [26,70,78]). Meanwhile, the links from green items to self-rated mental health value, and from natural light to satisfaction and loyalty were significant and higher among the female patients. This finding implies that at similar levels of green items, female patients have a higher level of self-rated mental health value than male patients, and that at a similar level of natural lighting, female patients are more satisfied with the medical care received and a stronger loyalty toward the healthcare provider than the male patients. These outcomes are in line with some previous studies indicating that exposure to green spaces has a stronger influence on women [21], and that women reported higher satisfaction with medical care received and greater loyalty toward healthcare settings (e.g., [31,32]).

Theoretically, these results provide critical information that the incorporation of biophilic design elements within the healthcare facility had different levels of significance for men and women when relating to self-rated mental health value, satisfaction and loyalty toward the healthcare provider. Overall, this study contributes to the limited research that address the influence of biophilic design on self-rated mental health value, satisfaction and loyalty within healthcare establishments among males and females. From a managerial perspective, these results suggest that healthcare practitioners should enhance the natural lighting within a healthcare establishment by increasing the number of glass windows/walls, which, in turn, can significantly improve self-rated mental health value and satisfaction among male patients, whereas these biophilic improvements have a greater and direct impact on satisfaction and loyalty to the healthcare facility among female patients. Additionally, our results suggest that greening the

interior spaces of the healthcare facility (e.g., adding a variety of potted plants, trees, and flowers) can be efficient biophilic design strategies increasing the self-rated mental health value and satisfaction of female patients, and have a greater direct impact on satisfaction and loyalty to the healthcare establishment among the male patients. Moreover, healthcare practitioners need to make various endeavors to increase male patients' self-rated mental health value, which, ultimately, boost their satisfaction with medical care and loyalty to the healthcare provider. As our findings revealed, the incorporation of biophilic design elements into the interior spaces of a healthcare facility can be an important strategy to male patients' self-rated mental health value.

6. Limitations and Directions for Future Research

The present research has some limitations that need to be addressed in future studies. First, the proposed theoretical framework included biophilic design elements (i.e., green items and natural light), self-rated mental health value, and satisfaction with medical care as important drivers of loyalty toward the healthcare establishment. Accordingly, future studies could further strengthen our theoretical framework by including additional variables for its completeness (e.g., natural material furnishings, water features, healing gardens, fish tanks, and/or vertical green walls in the reception area).In addition, future studies on the effect of gender on the relationships among biophilic design and self-rated mental health value, satisfaction and loyalty should be conducted in order to validate these results and offer more insights. Second, the study was carried out only in Romanian healthcare establishments, which leads us to strongly caution against the generalization of our results. Accordingly, future studies should replicate this work in other countries for further comparison. Third, the sampling technique utilized for the selection of respondents is a non-probability method and relies on the judgement of the researcher. Consequently, the study results could not be extrapolated to the target population, and any conclusions drawn must be considered with caution. In addition, due to the non-probability sampling method that was utilized in the present study, the structure of the sample was somewhat imbalanced, and included a higher number of younger respondents. Thus, future studies should consider other age groups to validate our results.

7. Conclusions

The purpose of the present study was to evaluate the possible influence of gender differences in the associations among biophilic design elements, self-rated mental health value, satisfaction with the medical care, and loyalty toward the healthcare facility. Our empirical findings revealed that biophilic design elements and self-rated mental health value had a significant impact on satisfaction and loyalty toward the healthcare establishment. In addition, the relationships between the study variables were significantly different across gender. Our results indicated that the incorporation of various biophilic design elements into the interior spaces of a healthcare establishment can have different effects across gender, which should be considered by healthcare operators. Investigating the relationships among biophilic design elements, self-rated mental health value, satisfaction, and loyalty for men and women is critical because it offers information about who might benefit most from exposure to biophilic design elements into interior spaces of a healthcare establishment. Healthcare operators should develop different biophilic design strategies across gender in order to enhance their self-rated mental health value, which, in turn, will increase their satisfaction with medical care and loyalty toward the healthcare establishment. More specifically, in order to increase self-rated mental health value among males, healthcare operators should focus on increasing the number of glass windows/walls, which ultimately will increase their satisfaction and loyalty. On the other hand, for females, healthcare managers should increase the interior green spaces in order to improve their self-rated mental health value, which in turn will boost their satisfaction and loyalty. Thus, the present study fills a gap in the healthcare literature as it highlights the different roles that biophilic design has on improving self-rated mental health value, satisfaction and loyalty among male and female patients within healthcare establishments.

Author Contributions

Writing - original draft preparation—ENU and HH; writing - review and editing—HK and AAM; supervision—HH and AAM; Funding acquisition—HK and AAM. All authors have read and agreed to the published version of the manuscript.

Ethics Approval and Consent to Participate

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Conflict of Interest

The authors declare no conflict of interest. AAM and HH are serving as one of the Guest editors of this journal. We declare that AAM and HH had no involvement in the peer review of this article and has no access to information regarding its peer review. Full responsibility for the editorial process for this article was delegated to Chin Hai Teo.

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