

# Landscape Architecture and Framing to Psychological Well-Being in Schizophrenics

**Mei-Chung Chang**

Calo Psychiatric Center

**Pey Lung**

Metrics architecture studio founding partner

**For-Wey Lung** (✉ [forwey@seed.net.tw](mailto:forwey@seed.net.tw))

Calo Psychiatric Center <https://orcid.org/0000-0002-4505-7583>

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## Research article

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# Abstract

**Background:** This study is to assess how the presence of landscape features influences the visit intention of users in different roles in a hospital setting.

**Method:** Total of 94 patients with mental illness, including 71 schizophrenics and 23 borderline disorder who lived in a psychiatric hospital in southern Taiwan were recruited. Firstly, all participants were selected three pictures of hospital inside architecture design and another three outside landscape. Second, all of them need to choice each three favorite pictures from 12 of inside architecture design and 12 of outside landscape.

**Results:** By structural equation modeling, patient who select card 8 in outside landscape, tend to better psychological well-being. Patients with higher level of emotional distress like to select card 10 in inside architecture design, then further reducing whose psychological well-being. In addition, who with higher level education like to select card 2 in inside architecture design, and then further increasing contributed to psychological well-being.

**Conclusions:** There are several different outcomes to sex, education, diagnosis, mental illness, social adaption status, and psychological well-being in the effects of landscape architecture for patients with schizophrenia and borderline. Different individuals with different diagnosis mental symptoms, and psychological well-being have different preferences in landscape, but it just be a state of "here and now". Hence, the longitudinal follow-up study should be consider in further studies. Moreover, the effects of landscape architecture how to play the role in the treatment of mental diseases and its clinical implication also need to consider in the future comprehensive studies.

## Highlights

- Different mental symptoms prefer different kinds of landscape architecture.
- Emotional distress will positively contributing to the social adaption status.
- Emotional distress affected psychological well-being by mediating of landscape.

## Background

In fact, fear of stigma associated with a facility appears, despite most mental health facilities have been improved. Architecture of psychiatric hospitals is referred to as the architecture of madness, it is not only fails to guarantee appropriate conditions for stay, but is also inadequate for its function. Architecture of mental health facilities should be neither architecture of madness nor stigma, but architecture of humanity, therapy and safety.

In the nineteenth century, Goethe's approach claimed the human mind is an "organ of perception" [1], that is, the perception itself is a thing and the thinking as a perception [2]. Goethe claim, human being can be the most sensitive instrument, they can appreciate and intuit the wholeness inherent in nature through

robust training [3]. Goethe believed that tension and its reconciliation are prime forces in nature and these can also be discovered in countless ways. Such as, light and darkness, colors and their complements, colored objects seen and the resulting after-images, setting and thing seen, person and world - all point toward an instantaneous, living dialectic that joins the parts in dynamic, interpenetrating whole [4]. Hence, Goethe tried to reunite science and art to illuminate the living principles with both [2]. Like Goethe, Thoreau felt that the process of getting to know the nature consisted of intellectual, emotional, moral, spiritual, and physical [5, 6]. Goethe's method, originated in the past, and it is also belong to the future.

In the philosophical foundations of Goethe's approach, it seeks to draw together the intuitive awareness of art with the rigorous observation and thinking of science, and also it applies the method to the real world of nature, including studies of plants, animals, and the movement of water [4]. Although phenomenology seeks to be scientific, it does not attempt to study consciousness from the perspective of clinical psychology or neurology [7–9]. Instead, it seeks through systematic reflection to determine the essential properties and structures of experience. They believe that analyzing daily human behavior can provide one with a greater understanding of nature [10–12]. Also, person can be understood through the unique ways they reflect the society they live in.

In fact, the “modern” disease frequently related to the western and developed countries, such as depression and mental diseases, diabetes, obesity, substance abuse, heart disease and so on [13]. Particularly, mental diseases are the third leading cause of global disease in the world, also play a critical role in pathogenesis of cardiovascular and other chronic non-communicable diseases [14, 15]. Several previous studies indicted neighborhood environment with green vegetation has play a role in coping with psychological stress and mental illness [14, 16–19]. Another European epidemiological studies also supported, greenness parks are associated with lower levels of perceived stress, anxiety, depression and mental distress [20–25].

People who have mental illness need to spend long time to stay in hospital for treatment. Recently, landscape features and gardens in hospitals have increasingly considered as an integral part of healthcare environment [26]. However, it is lack of evidenced-based research to understand the intersection of mental diseases and architecture in a psychiatric hospital. Hence, this study tried to make sure the effects of architecture designs and landscape features in the visit intent of users in different roles in a hospital setting. In the present study, firstly, identify the effective landscape features that engage visits; and then, secondly, rank the choices of landscape features specific to different user groups based on the effect on the engagement of visits. This study implicates the relevant inclusion and priorities of landscape features for the diverse user groups on a hospital property.

## Methods

## Participants

Total of 94 patients with mental illness, including 71 schizophrenics and 23 borderline, who lived in a psychiatric hospital in southern Taiwan were recruited. Firstly, all participants were selected six cards of paired pictures of hospital inside architecture design, and another six ones of outside landscape. Second, all of them need to choice each three favorite pictures from 12 of inside architecture design and 12 of outside landscape, respectively. After then, they have completed the five-item Brief-Symptom Rating Scale and Happiness Questionnaire.

## First part

Total of six cards with paired pictures in inside architecture design and another six ones in outside landscape were presented. All participants need to choice one picture from each card. The first card of inside architecture design included one picture with small and soft lamp, and another one with giant and very bright lamp. The second card comprised of picture with big conference hall, and another one with small discussion room. The third card contained picture with table with hidden light, and another one with table with bright light. The fourth card composed of picture with sports room, another one with audio visual room. The fifth card involved picture with rest chair with bush, and another one with small chair without trees. The sixth card consisted of picture with courtyard with bush, and another one with hall. All pictures are shown in Fig. 1. For outside landscape, the first card included one picture with big yellow flower and another one with small red multi-petal. The second card consisted of picture with lamp and another one with bird (Chinese bulbul). The third card involved picture with pavilion without roof and another one with pavilion with roof. The fourth card comprised of picture with space with long fence and another one with space with roof. The fifth card contained picture with square with green meadow and another one with road with trees. The sixth card composed of picture with trees with dense leaves and another one with trees with sparse leaves. The pictures are shown in Fig. 2.

## Second part

Then, all participants need to choice each three favorite pictures from 12 of inside architecture design and 12 of outside landscape, respectively. All pictures of inside architecture design and outside landscape are presented in Figs. 3 and 4.

## Measurement

### Five-item Brief-Symptom Rating Scale (BSRS-5)

The BSRS-5 is a five item valid screening tool, which is derived from the 50-item Brief Symptom Rating Scale [27], for the prediction of suicidal ideation in different settings. This self-report survey requires respondents to answer whether they have felt tense, blue, irritated, inferior, had trouble falling asleep, and had any suicide ideation in the past week [28]. An additional question, "Do you have any suicide ideation", was added in the end of the questionnaire. These responses were rated on a five-point Likert-type scale of 0 to 4, with 0 being not at all and 4 being extremely. These responses were rated on a five-point Likert-type scale of 0 to 4, with 0 being not at all and 4 being extremely. The optimal cut-off points of 4/5 for psychiatric patients, of 7/8 for community, and of 12/13 for general medical population, were resulted by

using the receiver operating characteristic curve [28]. The BSRS-5 has demonstrated good reliability and validity [28].

## Happiness Questionnaire

The eight item Oxford Happiness Questionnaire developed by Hills and Argyle was double-translated into Mandarin Chinese [29]. Instead of the original 6-point Likert scale, a 4-point Likert scale of "does not agree at all" to "agree very much" was used. Within the eight items, three were reversed in scoring. Higher scores represented better perceived happiness. The reliability analysis of the eight items resulted in a cronbach's alpha of 0.499. However, item statistics showed that if item number 7 "I feel fully mentally alert" was deleted, the cronbach's alpha would increase to 0.629. Exploratory factor analysis showed the eight items could be separated into two dimensions, as shown in the supplementary table. With items over 0.60 grouping into the same factor, items 1, 3, 4, and 6 could be grouped into the first dimension of social adaptation status; items 2, 5 and 8 in the second dimension of psychological well-being. Item 7 did not fit into either of the two dimensions. Since reliability analysis also suggested deleting item 7 resulted in better cronbach alpha, therefore, item 7 was deleted from the scale. The dimensions of social adaptation status resulted in a cronbach's alpha of 0.76, and psychological well-being resulted in cronbach's alpha of 0.57. The dimensions of social adaptation status and psychological well-being resulted in an adequate correlation of 0.17 ( $p < .001$ ) [30].

## Statistical analysis

We used SPSS for Windows version 22.0 software (SPSS Inc., Chicago, IL, USA) for statistical analysis and organization of the data. Regression was performed using SPSS, and structural equation analysis was performed using AMOS for Windows version 22.0 (SPSS Inc.). The chi-square fit test was used in the structural equation modeling to investigate the overall fit of the model. A non-significant chi-square value ( $p > .05$  and goodness-of-fit  $> .9$ ) and, a root mean square error of approximation (RMSEA) of  $\leq .08$  indicated that a model described the observed data adequately.

## Results

Total of 94 patients with mean age of 50.19 (SD = 10.88), consisted of 60 males and 34 females, that included 71 patients with schizophrenia and 23 with borderline, were enrolled in this study.

## Logistic Regression Analysis

By using of logistic regression analysis, cards in paired inside architectural design and outside landscape were expressed as a dummy variable in the model, either with item 1 or 2. The resulted showed that diagnosis (schizophrenia or borderline) ( $p = 0.05$ ; odds ratio = 2.84), and total scores of BSRS ( $p = 0.02$ ; odds ratio = 0.86) were statistically significant covariates in card 1 of paired inside architectural design in patients group. In card 2, the results presented that sex ( $p = 0.03$ ; odds ratio = 0.31), age (more or less than 55 years old) ( $p = 0.04$ ; odds ratio = 0.35), total score of BSRS ( $p = 0.02$ ; odds ratio = 0.84), and social adaptation status ( $p = 0.05$ ; odds ratio = 0.79) were statistically significant covariates. The results are

shown in Table 1. For paired outside landscape in patients group, the variable of education (university or less) ( $p = 0.04$ ; odds ratio = 0.18), and sex ( $p = 0.01$ ; odds ratio = 0.29) were statistically significant covariates in card 1. The variable of diagnosis ( $p = 0.05$ ; odds ratio = 0.35), total scores of BSRS ( $p = 0.01$ ; odds ratio = 0.82), and psychological well-being ( $p = 0.048$ ; odds ratio = 1.27) were statistically significant covariates in card 2. The variable of education ( $p = 0.01$ ; odds ratio = 0.20) was only statistically significant covariate in card 3. The variable of diagnosis ( $p = 0.01$ ; odds ratio = 0.24), and social adaptation status ( $p = 0.03$ ; odds ratio = 1.31) were statistically significant covariates in card 4. The variable of psychological well-being ( $p = 0.02$ ; odds ratio = 0.75) was only statistically significant covariate in card 5. The variable of social adaptation status ( $p = 0.049$ ; odds ratio = 0.80) was only statistically significant covariate in card 6. The results are shown in Table 2.

For 12 of inside architecture design and 12 of outside landscape, the results showed only the variable of psychological well-being ( $p = 0.03$ ; odds ratio = 1.32) in card 2, and the variables of social adaptation status ( $p = 0.01$ ; odds ratio = 0.69) and psychological well-being ( $p = 0.04$ ; odds ratio = 0.68) in card 10 presented statistically in patients group. There was no statistical significance in hospital workers. The results are shown in Table 3.

## Structural Equation Modeling

The structural equation modeling showed  $P$  values of more than 0.05 ( $p = 0.896, 0.560, \text{ and } 0.883$ , respectively), and adjusted goodness-of-fit models of greater than 0.09 (AGFI = 0.951, 0.969, and 0.982, respectively). Hence, the null model corresponded to the conceptual construct. Figure represented the effects of contributing factors in architectural design and landscape for patients (Fig. 5).

For patients group, the final parsimonious structural equation model revealed that BSRS scores had positive direct effects on the social adaptation status ( $\beta = 0.42$ ), and the selection of card 10 in inside architectural design ( $\beta = 0.24$ ), then further negatively contributed to psychological well-being ( $\beta = -0.19$ ). The variable of education (university or less) had positive direct effect on the selection of card 2 in inside architectural design ( $\beta = 0.21$ ), and then further positively contributed to psychological well-being ( $\beta = 0.21$ ). People who selected card 8 in outside landscape would contribute to psychological well-being ( $\beta = 0.19$ ). The results are shown in Fig. 5.

## Discussion

To assess how the presence of landscape features influences the visit intent of users in different roles in a hospital setting. People stay or work in a hospital are usually accompanied with lots of emotional and work-related stress. We developed a discrete choice experiment to provide quantitative evidence that indicates the effect and effect size of the landscape features. The objectives of this study are to, firstly, identify the effective landscape features that engage visits; and, secondly, select the choices of landscape features specific to different user groups based on the effect on the engagement of visits. This study implicates the relevant inclusion and priorities of landscape features for the diverse user groups on a hospital property.

In inside architectural design (Fig. 1), there were only card 1 and card 2 have statistical significances in patients group (Table 1). The results showed, schizophrenia patients tend to more like the picture of lamp with giant and bright light, on the other hand, patients with higher score of BSRS tend to prefer the picture of lamp with small and soft light (card 1). In this study, the diagnosis divided into schizophrenia and other minor emotional illness, such as minor depression, bipolar and so on. In fact, BSRS is a measurement related to emotional distress. Thus, it may be concluded individual with emotional distress tend to more like the environment with small and soft light lamp. For card 2, females tend to prefer the picture of small discussion room, however, patients with older age, with higher score of BSRS, higher social adaption status tend to prefer the picture of big conference hall. Cognitively, a big conference hall is like a professional, serious and power center, on the contrary, a discussion room is like a warm, happy and relax room. In traditional Chinese culture, males and older age person are the main authority figures in the family and workplace, although, there is a social change in the modern society. In this study, the mean age of patients were 50.19 years old. They might still retain the traditional concept in the mind. Hence, male patients with older age tend to like a professional, serious and power conference hall. In fact, the place with green plants will be appear more happy and relax [14, 25]. That is, females like to stay in the place around the green plants, that may be causing more happiness and relax.

In the outside landscape (Fig. 2), male and person who have higher educational level tend to prefer the picture with large yellow flower in patients group (card 1). Patients with schizophrenia and person with higher scores of BSRS tend to prefer the picture of unmoved lamp, on the contrary, person with higher psychological well-being tend to prefer the picture of moved bird (card 2). That is, schizophrenia and who with higher level of emotional distress will be like to lamp that cannot be moved. In card 3, person with higher educational level tend to prefer the picture of pavilion without roof. In card 4, person with schizophrenia tend to prefer the picture of space with long fence, however, person with higher social adaption status tend to prefer the picture of space with roof. It seems schizophrenics may like places with more security. In card 5, person with higher level of psychological well-being tend to prefer the picture of square with green meadow. Similar to the previous studies, greenness is related to larger reductions in symptoms of anxiety and depression [20–25]. In card 6, person with higher level of social adaption status tend to prefer the picture of trees with dense leaves.

Multiple logistic regression analysis showed that there were several significant associations between contributing factors and architecture and landscape. However, owing to the limitations of regression analysis, mediating and moderating factors may have been neglected in the analysis. Hence, the further path analysis, using of structural equation modeling, were analyzed the mediating and moderating roles of the contributing factors and architecture and landscape in patients group. For patients group, the model resulted that emotional distress will positively contributing to the social adaption status (Fig. 5). Patients with higher level of emotional distress like to select card 10 in inside architectural design, then further reducing whose psychological well-being. Card 10 in inside architectural design act as the mediating factor between emotional distress and psychological well-being. In addition, who with higher level education like to select card 2 in inside architectural design, and then further increasing contributed to psychological well-being.

Comparing the patients and hospital workers, patients tended to higher social adaptation status, but had lower level in psychological well-being. The results are not shown in this study. On the other hand, hospital workers tended to higher educational level, and had likely select card 8 in outside landscape. People who selected card 10 in inside architectural design, tend to lower level in social adaptation status and psychological well-being. In fact, the big different age between patients and hospital workers seems as a limitation in the present study. The mean age in patients was 50.19 years old, and the mean age of hospital workers was 39.05 years old. Different generation may cause different cognitive thinking and value. It may also contributed the results between two groups. Hence, the age- and sex-match in two groups need to consider in the future study.

## **Conclusion**

This pilot study provided a preliminary feature of effect of architecture and landscape on mental health. It detected the mediation and moderation of the link between architecture design, landscape and mental health to adjust for confounding from age, sex, education and diagnosis. There are several different contributors to sex, education, diagnosis, mental illness, social adaptation status, and psychological well-being in effects of architecture and landscape for patients with schizophrenia and other diagnosis. Different kinds of architecture and landscape will making the spaces with different special meaning and effects to each individuals [13, 31]. Although, social adaptation status is related to depressive emotion and mental illness, and psychological well-being is linked to past experiences, the present study only describe the state of "here and now". Hence, the longitudinal follow-up study should be consider in further studies, the test may have to process from patients has hospitalized to leave hospital. In addition, some patients still cannot getting well by pharmacological treatment, hence, we hope to understand the effects of architecture and landscape how to play the role in the treatment of mental diseases, and its clinical implication. Therefore, these can be considered in the future comprehensive studies.

## **Abbreviations**

BSRS-5

Five-item Brief-Symptom Rating Scale.

## **Declarations**

### **Ethics approval and consent to participate**

The Institutional Review Board of the Kaohsiung Armed Forces General Hospital in Taiwan approved the study. After a detailed explanation of the purpose of this study, all participants signed informed consent forms.

### **Availability of data and materials**



The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

### **Competing of Interest**

All authors have no conflict of interest to declare.

### **Funding**

There was no funding in this study.

### **Authors' contributions**

All authors had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. MC and P contributed to the study design, data collection and analyses, writing and revising of the manuscript. FW supervised the execution and collection of data, participated in the development of the protocol, performed the final data analyses, and edited the manuscript. All authors have read and approved the manuscript.

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## Tables

Due to technical limitations, table 1,2 & 3 is only available as a download in the Supplemental Files section.

## Figures

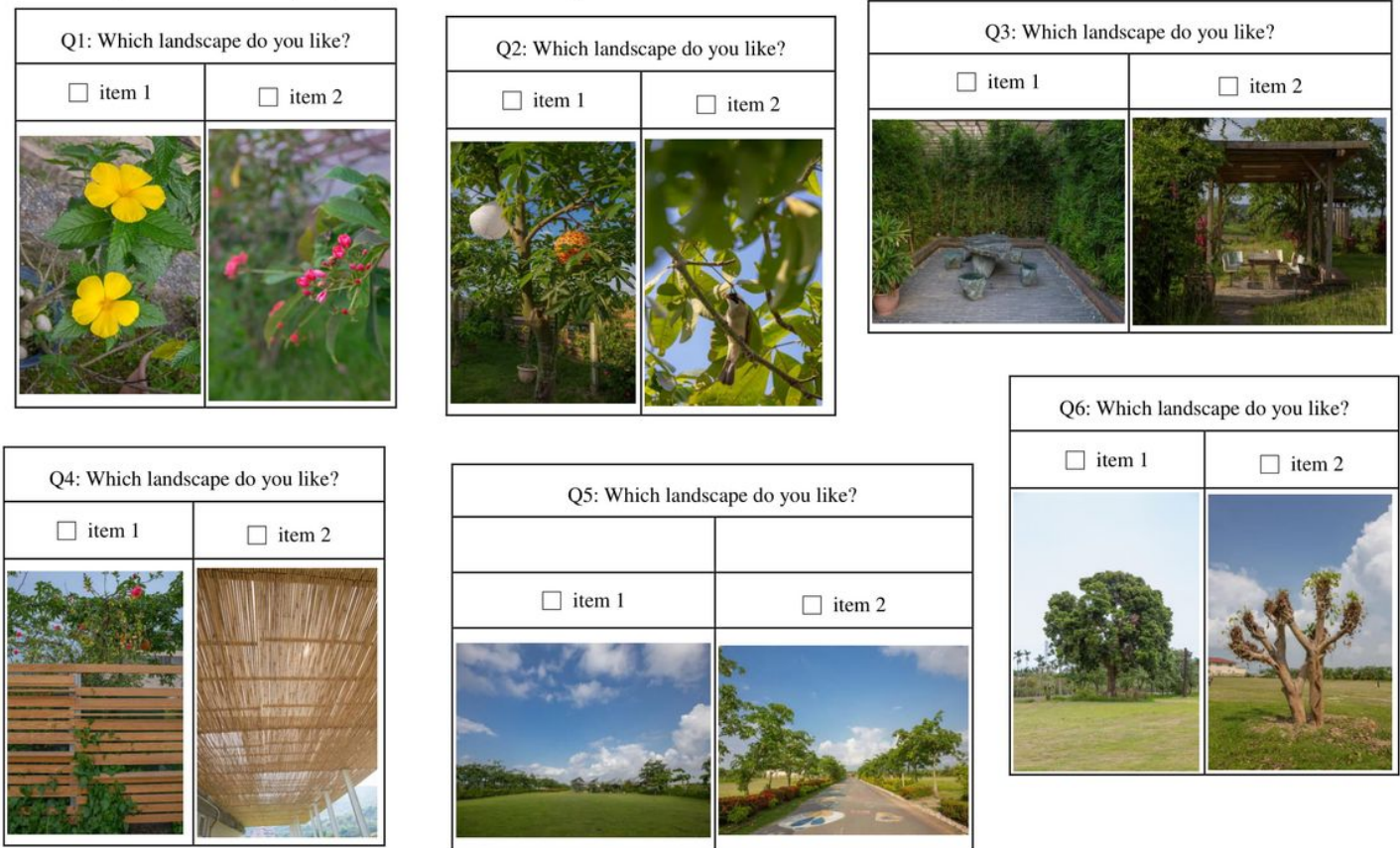
Figure 1. Six cards of pair pictures with inside architectural design



Figure 1

Six cards of pair pictures with inside architectural design

**Figure 2.** Six cards of pair pictures with outside landscape



**Figure 2**

Six cards of pair pictures with outside landscape

Figure 3. All pictures of inside architectural design

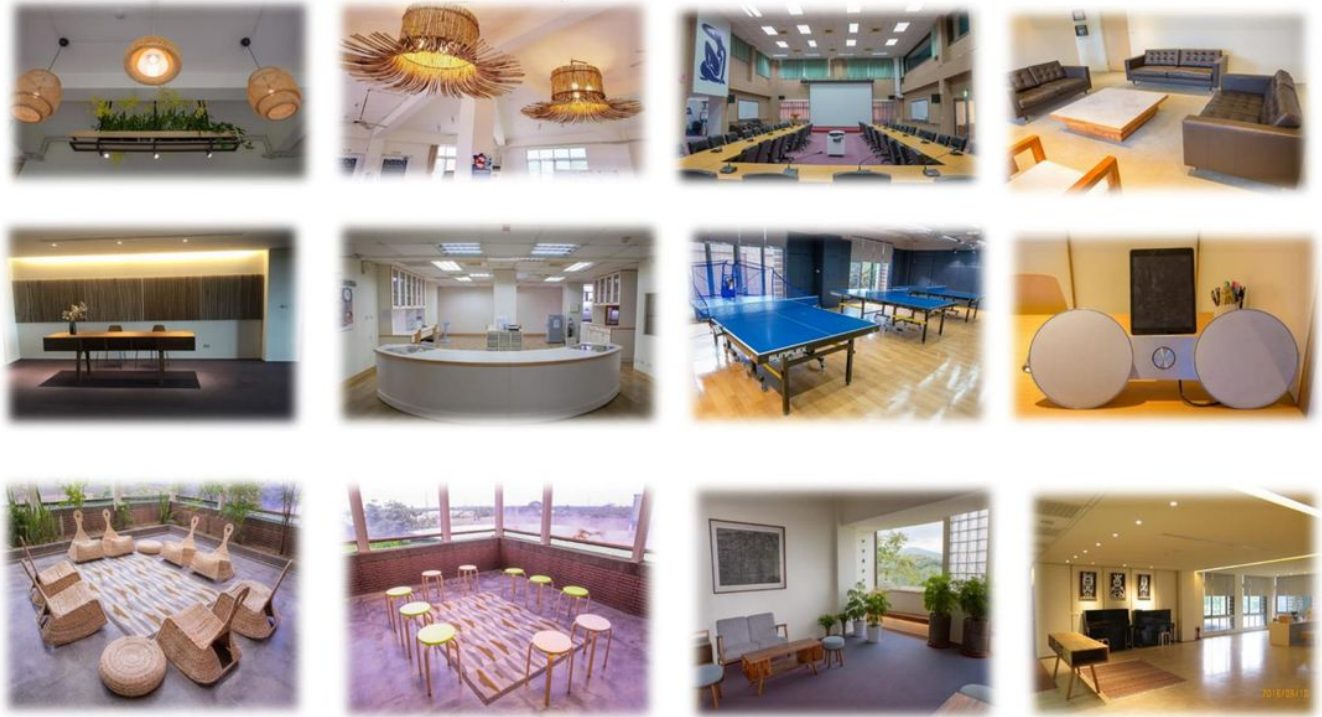


Figure 3

All pictures of inside architectural design



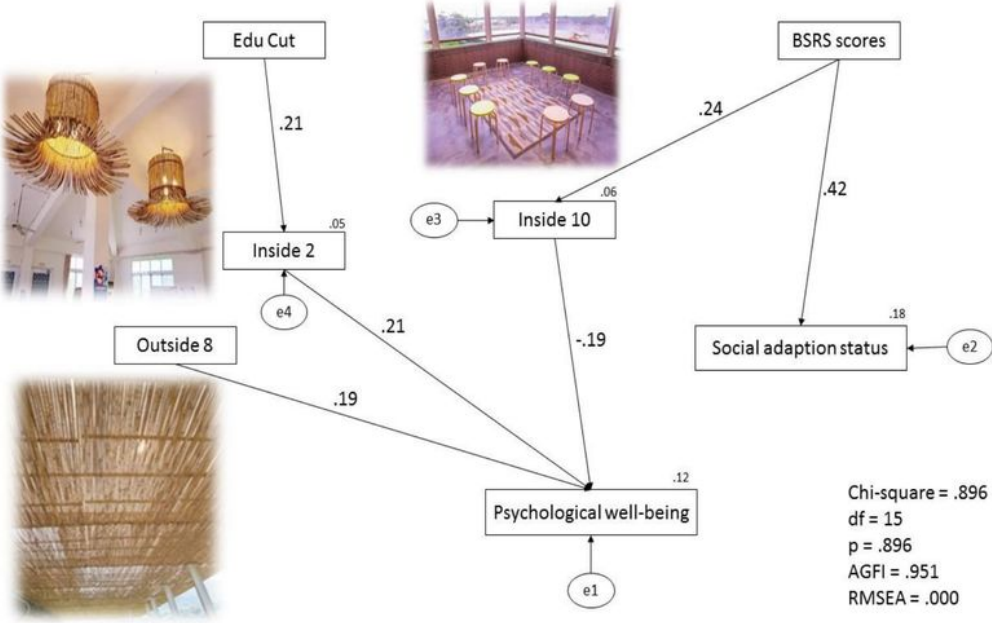
Figure 4. All pictures of outside landscape



Figure 4

All pictures of outside landscape

**Figure 5.** The parsimonious model of effects of contributing factors in architectural design and landscape for patients.



Dummy variables of eduCut: 1 refers to above university, including university, 0 refers to below to university.  
 Total BSRs: total scores of BSRs  
 Social adaption status: dimension of social adaptation status in Happiness Questionnaire  
 Psychological well-being: dimension of psychological well-being in Happiness Questionnaire

**Figure 5**

The parsimonious model of effects of contributing factors in architectural design and landscape for patients.

**Supplementary Files**



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- [Tables.docx](#)