



The Effectiveness of Landscape Architecture Components on Women's Reactions to Reduce Depression Symptoms

Elnaz Abbasian¹, PhD candidate,  Mohsen Faizi^{1*}, PhD;  Asghar Mohammadmoradi¹, PhD; Abbas Erfanian Omidvar², PhD; Reza KhosrowAbadi³, PhD

¹School of Architecture And Environmental Design, Iran University of Science and Technology, Tehran, Iran

²Iran University of Science and Technology (IUST), Iran University of Science and Technology, Tehran, Iran

³Shahid Beheshti University, Tehran, Iran

*Corresponding author: Mohsen Faizi, School of Architecture And Environmental Design, Iran University of Science and Technology, Tehran, Iran.

Tel: +98-21-774500-9; Fax: +98-21-77240468; Email: mfaizi@iust.ac.ir

Received April 10, 2020; Revised May 11, 2020; Accepted June 19, 2020

Abstract

Background: women have been exposed to growing symptoms of depression by urban life as well as endangering their mental health. Researches show that the effect of landscape components can be virtually seen in films and images. However, the main point is to rank the effectiveness of components in providing an appropriate virtual environment for women's health. Tehran has gardens where effective components on mental health are hidden. These gardens are suitable samples for evaluating landscape architecture components from users' views, especially women in virtual environment.

Methods: This research introduced the effective components on mental health based on universal research. By determining these components in the gardens of Tehran, we assessed their effectiveness in six selected qualified spots of public gardens in Tehran with multimedia questionnaires in virtual space from 300 women who went to garden in three completely similar areas from 8 A.M to 12 A.M. The method of this research was set in the category of Structured Analysis research with Generalized Least Squares tested via a software AMOS version 24.

Results: A significant positive association existed between the details of the gardens and their direct impact on the reduction of depression symptoms (CR>0.7, RMSEA: 0.025, P=0.008, P<0.05). Geometry and color by potential effectiveness and sound, material, water and vegetation were considered effective in women's reactions to reduce depression symptoms.

Conclusion: Iranian gardens have the effective components based on health patterns. Pattern of public gardens in Tehran are shown as an appropriate icon to have an effect on mental health of women in virtual environment to reduce depression symptoms.

Keywords: Depression, Symptoms, Women, Health, Landscape architecture, Garden components

How to Cite: Abbasian E, Faizi M, Mohammadmoradi A, Erfanian Omidvar A, KhosrowAbadi R. The Effectiveness of Landscape Architecture Components on Women's Reactions to Reduce Depression Symptoms. Women. Health. Bull. 2020;7(3):42-53.

1. Introduction

Currently, the world is faced with pandemic diseases; therefore, the mental health of citizens can control their spiritual conditions, their functions and reduce the occurrence probability of other problems such as depression. In this case, three chains of technology, called virtual space, health components in the city, depression symptoms and their way of connections with the cities as well as their effectiveness are the best solutions. Depression changes the biological indexes and causes special physical symptoms such as heart and lung diseases, weight loss or weight gain, heart rate change (1), blood pressure and cortisol level that change the brown part of brain as well as its structure and function (2-4); also, by through hereditary features which are transferred by the mother to the child, they will transfer the conclusive changes to other generations as well (5). There is a meaningful relationship among stress, anxiety, and depression,

the stressor stimuli of the environment will increase depression. Before the pandemic, based on the published statistics of WHO, the damages in Iran, depression will be the third universal and pandemic disease. (6, 7) It has been announced as the third mental problem in the country. (8-10)

Currently, depression symptoms are increasing in cities, and biological indexes, as architectural elements can determine the mental and physical health of each space in favour of urban mental health by use of behavioural and cognitive actions (10). Therefore, studying the influential components of the city and their type in utilizing the virtual elements, particularly for the women's health and pregnant ones exposed to the danger of depression symptoms can present an appropriate solution towards the mental health of the society. (11-13)

Having access to a common pattern among

psychologists, architects, and the medical society has defined the environment components as an improving or positive stimulus to reduce the depression symptoms. Studying concentration restorative theory and stress reduction theory, salutogenic, (14) effectiveness place of architectural components reveals the role of landscape architecture in city as a health chain. Field study, regarding the identification scope of influential landscape architecture components in public place, particularly gardens as an adjunctive environment in the main body of the city can reduce the stimuli effects of depression symptoms. On the other hand, it seems that virtual space can reduce the stimuli effects in the environment through its impact on women`s reactions.

To receive the women`s reaction toward depression symptoms and the effectiveness type of environment components in cyber space is temporary and will construct or change the components in the environment in different time intervals. Therefore, research should not only be done distinctively on

genders, but it should also coordinate the biological needs of men and women to find an environment and meet the both requirement. The current research is the second and third part of a PHD dissertation which seeks to determine the effectiveness of landscape architecture components. By collecting information, effective environmental components on women`s depression symptoms were studied and in the cities, it has determined the components and some selected areas in Tehran as a sample. In this case, by a pictorial questionnaire, films and images, women were asked some questions about the component effectiveness. At last, by determining the type of landscape component effectiveness, we determined the features of elements for improving the environment by use of virtual reality to define a healing period in the laboratory (11). This experiment was held between April and July, which the researchers believe that it is a good time to reduce the depressive symptoms. Figure 1 Theoretical model of study Depression is a condition causing sorrow and helplessness for a long time, involving the body, temper,

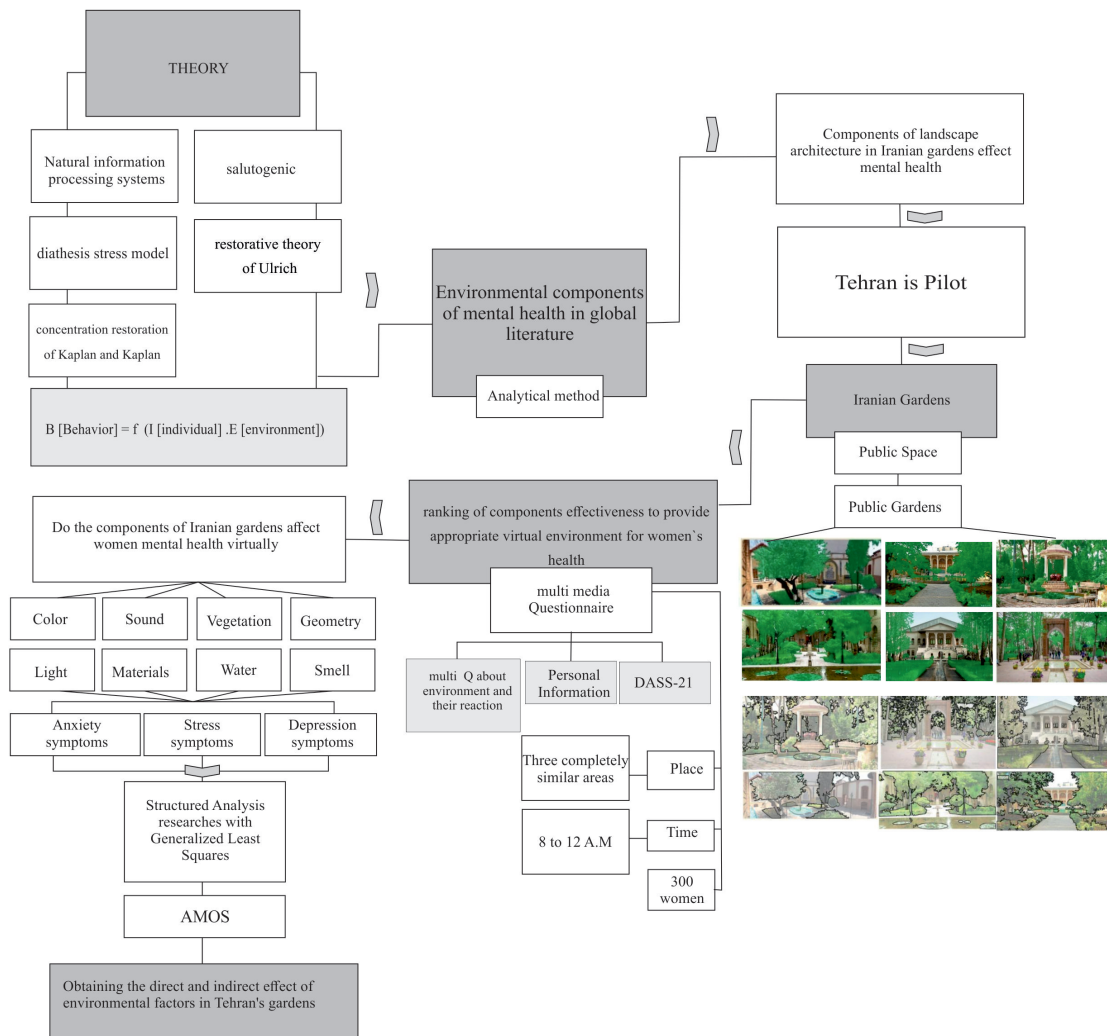


Figure 1: Theoretical model of study

and thought and changing the natural function of the individual (12, 13). One out of three people experience depression at a certain period during their life time. Depression can be mild, moderate, and severe. Some symptoms are sleeping disorder, sorrow, lack of concentration, inactivity, and lack of energy (2, 15-22).

Studies have shown that depression ranges from 13.1 to 75.3% among women and from 7.6 to 67% among men. This indicates that women are more vulnerable than men; in fact, they are exposed to depressive and anxious disorders 50 to 60% percent more than men (13, 15, 16, 23). Depression symptoms in many epidemiological studies are related to stressor events in life, misbehavior in childhood, disease background, and environment because environment perception defines the human behavioral function as environmental elements and individual features (21). In salutogenic theory, inside and outside environment which acts as a mental stimulus, and based on stress reduction theory of Ulrich and restorative theory (22) positive health results by supporting garden emphasizes to reduce stressor factors and the feeling of dominance in the environment as well as improving the depression symptoms. By inspecting the research of Bernosqwick, VanDenBerg, Berlaien, Nackmerd, fuji, Lumen, Hartig, Kendall, Ulrich, Bowler, Buyung-Ali, Knight, Pullin, Berman, Alizadeh, Mansouri, Ashouri, Ibrahim Zadeh, and Ebadi in this filed, it can be perceived that city environments with landscape architecture can take over people's reactions in the environment, provide an environment along with improving depression symptoms considering the effectiveness of mental objects of users. (21)

Landscape based on stress reduction, restorative theory of Ulrich and concentration restoration of Kaplan and Kaplan, diathesis stress model, restorative theory, cognitive potentials, and walking in the urban environment are considered as a promoting spatial framework of physical, spiritual, and social environment (24). The main part of the healing purposes landscape architecture (25), anxiety and depression symptoms do not necessarily have activity in landscape but also it can be possible by observing the landscape (26, 27).

From 2000 to 2018, researchers have indicated that landscape architecture significantly increases mental health and satisfaction, reduces the disease symptoms, changes one's self-confidence, and eventually decreases the effect of stressor stimuli. These findings have been obtained through environmental tests, using short and long term interventions, empirical and non-empirical

studies with physiological and psychological effect on natural environment, exploiting virtual reality, rebuilding daily experiences of people, watching films and images, providing native software for getting reactions, and finally receiving individual report in different studies.

Gardens are spaces which can be applied as the goal of this research. Gardens can increase the physical and mental state of people based on the theory of supportive garden to discover the people's capability toward light physical activities, movement and reduce the depression. (2, 28-39)

Healing environments meet the biological needs of people in healing mental disorders in face of gardens. (40-43). These components can include health features in two categories: natural and man-made. However, gardens are considered restorative with dense trees and the geometry by organizing the elements in gardens in partial and total scope which organize the stimuli as a unique design legible with geometric form with less tension (43). Vegetation cover density between 1.7 to 24% of area reduces the stressor stimuli of the environment and more than 24% removes the stress, improves the concentration effect Horticulture. (39, 44, 45)

Broadleaf vegetation with moderate density reduces depression symptoms up to 90%. Human's brain has shown more sensitivity towards fallible trees. Tall trees and more simple species are more acceptable. (46) Fragrance further produces Endorphin, reduces heartbeat, relaxes the muscles, and increases the concentration. (45) For instance, the smell of wood is a sensory stimulus reducing the stress and according to Iranian psychologists, honeysuckle, wallflower, violets, willow, pine trees and stain, are effective in improving depression symptoms. Along with studying green spaces in public places, supplying maximum area covered with water space will be conducive to mental wellbeing (11, 47-49). To supply maximum one third of water area on complex and the presence of water variety can be a stimulus for women's activity in the environment or even the happy element of women. (Iranian psychologists' interview 2017)

Organic materials, light, sound, and color are architectural and health factors considered as appropriate stimulus in reducing depression symptoms. Using opaque color materials with no gazing and yellow can approach the environment to an improving one. The presence of natural light and also (11, 50) maximum and minimum sound in the environment

Table 1: landscape architecture components

Effective environmental landscape architecture components	Preventing disease symptoms in biological reactions	The features which should exist in the environment	Experiments
Geometric features	Controlling Mental restoration	Round elements and funny curved lines Diagonal and angular arrangements can be a threat Totality in details Geometric forms and design legibility Simple spatial patterns Symmetrical objects Creating Axes, pulling for movement	Kaplans, Mc Gooy Gestalt psychologists, Betchel, Makin
Building materials	neuroscience	no gazing Having suitable organic materials in a proper place (this case was studies in hospitals)	Neuroscience researches
Smell	Muscles relaxation Concentration increase Producing endorphin Heart rate decrease	Borage, Saffron, lavender , silk flower tree, honeysuckle, wallflower, violets, willow, pine trees, restorative environment of forests, the smell of wood	Saki, Iranian smell psychologists
Sound	Changing social behavior Physiological disorders Stress, blood pressure, heart beat, respiration Anxiety, headache, mental function disorders	Iran standard environment 55Db Sound of birds, water sounds perception Reducing negative perception by plants	Mazoch and Stephen, Chapman Boer and Shroten by Alimohammadi Irvaneh
Color	Positive results of warmer colors with longer wavelength compared with cold colors Spatial recognition and familiarity with the environment, yellow, appropriate color for depressive patients		Cook, Eston ,Lingwood, Parsones group,Ulrich
Water	Appropriate stimulus for depression Doubling the effects of green space	Water dynasty presence in complex	Mc Karen and Morton Barton
Natural light	Depressive symptoms ameliorator Stress reduction Melatonin production Daily biological rhythm in human`s body	Sunlight treatment and the effects of anti-depression The effect of at least three weeks` treatment Morning sunlight has double effect on depression	Ulrich, Basinger theory
Vegetation Density	Reduction of the symptoms of depression, anxiety of mental illness Concentration restoration recovery Reduction of people`s anger Treatment of mental illness Increasing activity and mental health recovery Direct restorative features: effects of parks with plant species	Good state in places with over 33% of green space The Positive Role of Looking at natural landscapes Vegetation density of 1.7 to 24%: stress reduction Over 24% complete recovery of stress The effect of medium density of plants on stress reduction Influence of high plant density on concentration Increased susceptibility of the human brain to deciduous trees More acceptance of trees than the shrubs Acceptable height of trees 10 to 30 meters Simpler species of tall trees	Mass Berman, Barton, Hine & Pertty, Mass and Roe and Aspinal, Van den Bosch Hansmann, Hug, &Seeland Nutsford

Ref: (17)

with psychological comfort up to 50 decibel improves the depression symptoms. The components defined in Table 1 affect the depression symptoms well; however, the effectiveness is changeable based on cultural and climate features and folk elements. In different studies,

adding the spring sound reduces comprehended sound of environment (51, 52) and adding the sound of birds causes a tremendous joy in space. Gulburn and Ali (2013) considered the sound of water effectiveness below 3 decibels along with the presence of plants to get

negative noise. In long term, by exposure to green and blue spaces, (11, 51) water sound in motion axis, creates silence in some spots, fountains, ponds and experiences the skin touched water to gain peace.

Iranian gardens, by applying eyesight, hearing, smell, and tactile sense for perceiving the surrounding environment, locate individuals in an environment without any tension or stressful pressure and provide a healthy landscape. Using Qajar garden patterns in Tehran can provide an opportunity for effective components on citizen's health in contemporary urban landscape (11). Precise pattern of Iranian gardens, movement Axes, presence of water as an emotional indicator, gardens bordering in perspectives and purposefulness at the end of each main road, tree arrangements, shrubs and flowers in Tehran gardens (11, 52), all have completely influenced people's receptors (11, 53). They will have a great contribution to reduce depression symptoms as a positive environmental stimulus. The gardens of Tehran have been an appropriate icon for measuring the questions by creating safety feeling among women and visual meaning limits.

2. Methods

The method of this research was set in the category of Structured Analysis research with Generalized Least Squares. We randomly selected six spots with eligible gardens and asked 300 female participants (20 to 45 years of age) in Tehran who had gone to the gardens (women were not menstruated during this project) to talk about their reactions in the determined spots at the moment or during a period of time using a three-part questionnaire. The study lasted from April to July 2018 and was re-examined in a course of adjunctive treatment by virtual reality in 2019.

Three similar places were determined to respond and refer to the digital questionnaire. Based on diathesis, the effect of stress and anxiety stimuli in the environment on depression symptoms was studied by an individual questionnaire (5 questions), DASS-21(21 questions) and component – built questionnaire, including film, image, and sounds (30 questions). The selected spaces were shown by virtual reality films and 360 view pictures. The pictures had markers, easily moving the views. The films were captured in a direction by 0.2 m/s speed and the individuals were able to turn their heads 360 degrees. The questions concerned the senses and were able to reduce the stressors by moving and viewing the perspectives.

The questionnaires were handed in these three parts to examinees on the internet. Some questionnaires were basically designed to promote a good mood, inspired a peaceful environment, and improved the movement and temporal features of depressed people. By confirmatory structured analysis, Generalized Least Squares (GLS) provided a model matched with effectiveness of each component on anxiety, depression, and stress symptoms, tested by a software AMOS version 24 (Analysis of moment structures). Amos is a powerful structural equation modeling software helping support the complicated models with different variables by extending the standard multivariate analysis methods, including regression, factor analysis, correlation, and analysis of variance. The model mainly includes variables and the relationships between them. (Direct and potential effects) (P is less than 0.05) Thus, the effectiveness of components can be studied in two forms, namely direct effect and potential effect. Each effective environmental component of landscape architecture except light was precise based on users' / views. This experimental sample was special for Tehran and its gardens which were accessible for everyone as a public place. Of course, matching features of gardens in Tehran with the features inserted in other studies justifies their generalizability for use in other spaces.

Confirmatory Structured Analysis and Generalized Least Squares

Structured model is able to test theories in the form of between-variable equations. (55) Generalized Least Squares (GLS) is a solution for estimating a linear equation with disruptive sentences that are not well-behaved (Figure 2).

3. Results

Determining the model. Validity and Evaluation

The conceptual model of the current research was determined based on two environmental indexes of landscape and effective indexes on depression symptoms among women (Figure 3) in the model; there is no self-correlation between structures and parameters. The more the variance, the less the error will be, and the evaluation of the model is reported more appropriately. The table indicates three least numbers related to three indexes with acceptable intervals. The flashes coming out of the variable are external variables, and those which enter a variable are called internal. A , Z , Q , are the signs of questions and e is the sign of terms error in the model. The

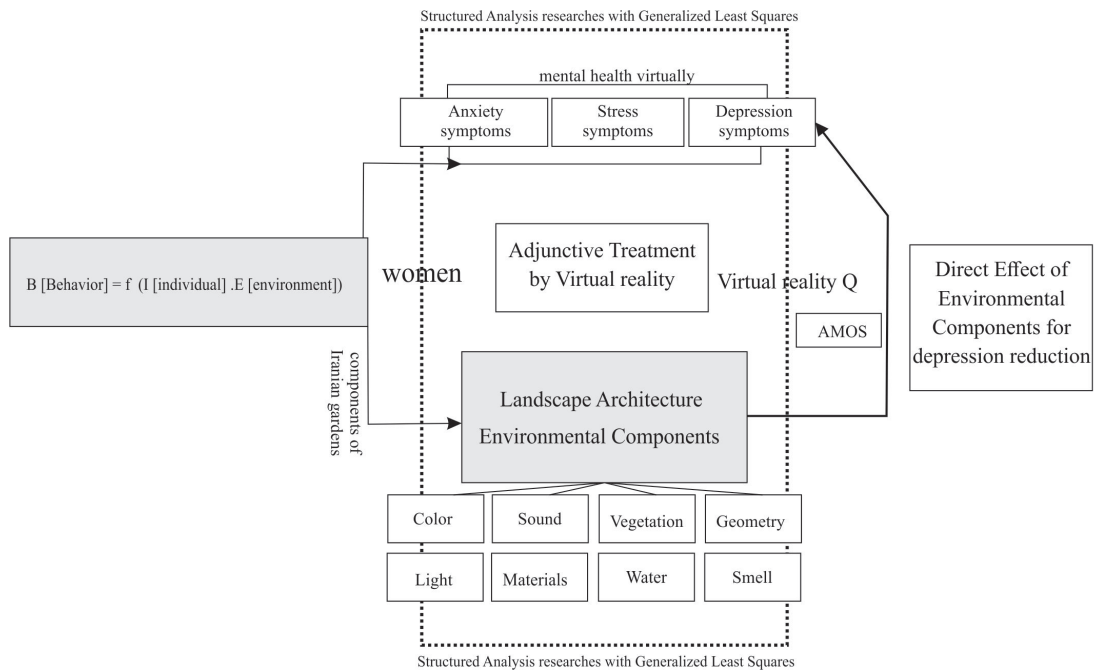


Figure 2: Concept Model of this Research

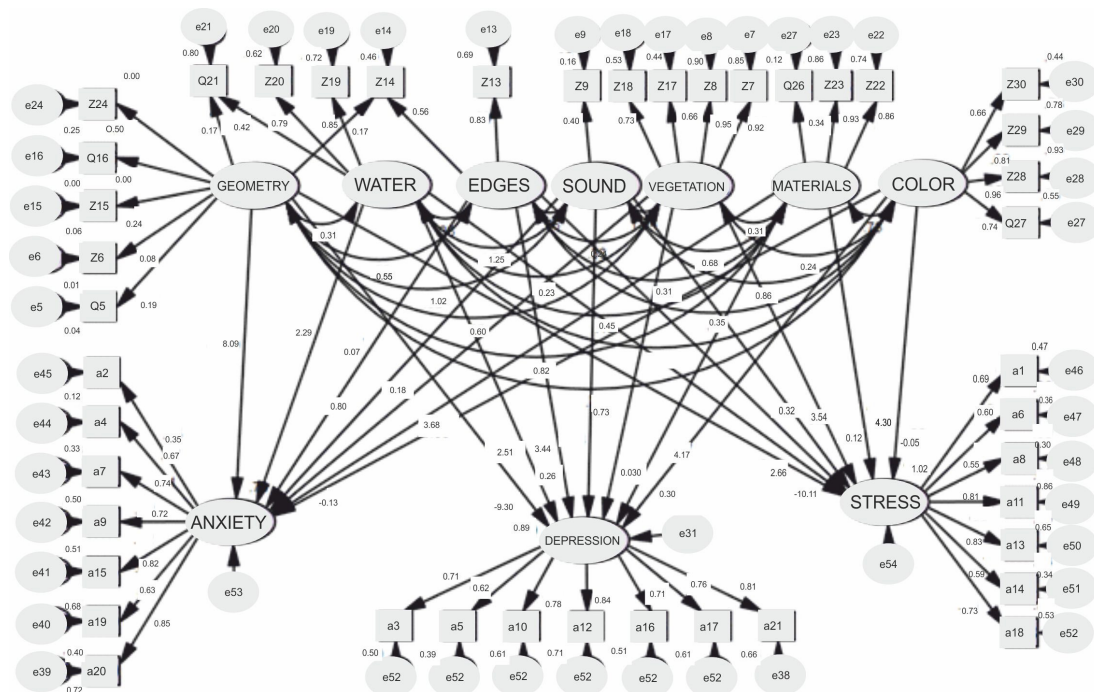


Figure 3: Model with standardized coefficients

numbers on one-way flashes indicate the regression coefficients among variables and the numbers of two-way flashes indicate co-variance amount among internal variables.

In Figure 3 and Table 2, standardized regression coefficient is shown. In this model. The greater the coefficients are; the more effectiveness level will be. Plus, sign signifies direct effect and minus sign signifies potential effect. Confidence interval is 90% for P) because P-value is equal to 0.008, the null hypothesis

is rejected at the significance level of 0.1, 0.05, and 0.01 (and RMASE is 0.025).

-Stability and admissibility of the research tools

After providing the introductory questionnaire, four experts who confirmed the content and formal admissibility modified writing style and videos professionally. After completing the questionnaire, stability of the tools and the model were studied showing that structure stability had been used. Answering maximum time was 20 minutes. Geometry questions

Table 2: Model evaluation

Measurement criterion	Statistical amount	Freedom degree	Comparison criterion	Evaluation status
Chi-Square	916,491	816	-	The freedom degree of the model is appropriate
RMSEA	0.025	-	<0.07	Confirms the model.
PCFI	0.668		>0.5	Confirms the model.
CFI	0.739			It is negligible.
GFI	0.786		0.9<	It is negligible.
AGFI	0.752		>0.8	It is negligible.
CMIN/DF	1.123		3>	Confirms the model.

This table shows on the results of model evaluation for figure 2. At least, values of 3 indicators have an acceptable range.

Table 3: determining admissibility and stability of model structures

	CR	AVE	Expressed variances of the model by variables		
			Estimated value	S.E.	P
Geometry	0.73	0.58	0.14	0.05	0.006
Color	0.79	0.57	0.37	0.08	***
Material	0.72	0.56	0.46	0.07	***
Vegetation	0.78	0.67	0.13	0.03	***
Edge	0.65	0.68	0.55	0.01	0.004
Water	0.80	0.50	0.18	0.03	***
Sound	0.69	0.97	0.04	0.07	0.005

This table shows on the results of logistic reliability for significant variables based on Tables 2 and figure 1. S.E.: Standard Error

Table 4: Direct Effect of Environmental Components

	Sound	Edge	Vegetation	Water	Geometry	Materials	Color
Stress	10.81	0.25	0.19	3.724	-16.06	3.80	-0.05
Anxiety	3.083	0.022	0.11	1.18	-4.73	1.20	-0.04
Depression	8.88	0.18	0.03	3.05	-12.866	3.21	-0.25

were more time-consuming. Because Cronbach’s alpha is a conventional criterion for determining structure reliability, the **Construct** Reliability (CR) of the compound structures should be more than 0.7. Reliability Factor Values should be meaningful Standard Factor loading higher than 0.5 and, if possible, more than 0.7.(CR > AVE, AVE > 0.5). Based on the Table 3, only sound and edges had no stability and admissibility; they may have convergence admissibility by changing the number of relevant questions.

The effect of landscape architecture components in Iranian Gardens on Anxiety Depression and Stress are shown in Table 4.

4. Discussion

The complexity of architectural components is not hidden to anyone. Table 4 shows the impact of environmental components on depression, stress, and anxiety based on standardized regression coefficients.

Components were not only effective on depression symptoms, anxiety, and stress, but also their effects were seen in other components. According to stress diathesis, stress and anxiety stimuli can cause depression symptoms. Components were observed to affect these three items, and at last, were studied after interpreting the effectiveness level on depression symptoms. In the current research, component effectiveness was rated according to direct and potential effectiveness. Some components have direct effects on reactions; meanwhile, some of them have potential effects that can be seen after a long time on the reactions or their effect is seen in other component effects.

Numerical values of geometry gardens in Iran and their effects on depression, stress, anxiety, and its minus sign indicate the potential geometry of Iranian gardens. Iranian gardens, with a simple pattern, make the environment attractive and can be a useful stimulus in women’s movement in space. Self-expression of women about environmental array,

motion axis, and symmetry in the components of gardens, subjective control and innovation, legibility, space organization, better sensory perception and consequently reduce environmental stimuli of stress and increase visual security in vision corridors finally tension move in complexes. Warmer colors with longer wavelength with creating visual signs (path finding), spatial recognition, and the feeling of familiarity have a positive effect on the improving process of depression symptoms specially women. Based on the correlation of color with vegetation, materials and geometry in high amounts, we found the effect of color in other components. Color like geometry has a potential effect which shows its effectiveness in the materials of the facade. The correlation of colors and the geometry in the environment with materials and vegetation can be seen in yellow reflection in the bodies of gardens like the color of brick in façade, colorful glasses, and mirrors in the past architectural bodies of buildings in gardens of Tehran and also in planting the flowers. Higher wavelength colors are promising stimuli of appropriate environment to reduce depression symptoms among women.

Gestalt psychologists consider the responder environment feature clear to lengthen the received responses from the people in the environment. (Archia quoted from Tabatabaeeian and Tamanayee, 1977, Avance 2003, Stecher 2004). The researchers have shown that natural elements increase the effectiveness level of the environment on health. Light and nutrition are critically involved in patients' health. Thus, it is highly important to determine the light in images. The depression level of women versus light therapy in one month declined, their energy level boosted And morning light has double effect on improving women's depression in winter (54).

Researchers such as Schweitzer, Gilpin, and Frampton have stated the anti-depression effects of sunlight during a three-week treatment. In this regard, research imaging was done from the middle of April to July 2018 from 8 to 11 A.M. (to use the advantages of natural light for adjunctive treatment, light in the dome sky of Tehran, 18000 Lux was determined by experts).

The reaction of women to sound in the environment is quicker and high volume of sound shows the change of women's stress. The complex relationship between sound and mental function indicated that its inappropriate amount damaged mental function, appeared stress, anxiety and depression symptoms (11, 55, 56). Based on studies, expert opinions,

interviews and studying the research result show on the spot reactions of people receive direct effect from the environmental sound (27, 11, 52). This research shows that sound dealing with stress, anxiety and depression has shown increasing number in the table with direct and quick effectiveness in the experiment. 93% of the participants paid a great deal of attention to the sound of birds and water (2 to 5 dB) which was really relaxing. The high co-efficiency correlation between sound and geometry indicates the spatial geometry form influences the sound spread. Greater amount in the form of plus shows the direct effect on people's stress, and showing the reaction of people in virtual environment is proposed. This amount will be evident and studied in depression. Thus, loud and unpleasant sound can appear in environmental stimuli in depression. Sunlight exposure increases the tendency of virtual motion alongside the gutters against standing Women tended to move too much toward sunlight glittering in virtual environment (when light goes through the leaves of the trees). Moving alongside the gutters and curved ponds of water was really pleasant for them. It seems that the effective amounts of materials and the water components, women's movement in virtual reality was directly influenced by these two components, has encouraged people to be present and move in the space. By studying the selected areas, supplying one third of total water area and can stimulate women's presence to move in the environment. High co-efficiency correlation among water, geometry and vegetation indicates the direct effect of water on reducing inappropriate elements of environment effectiveness. These three elements have direct effectiveness on depression symptoms. Hierarchy of water presence, gutter appearance along the movement and ponds in pause space makes women more interested in being active in the space and the geometrical frame of selection of women is understandable in ponds, curves and geometrical shapes. To corroborate the effect of materials, high correlation between materials and color was effective on the effectiveness level; moreover, in areas where yellow color was highlighted, women were more excited, and they were deeply attracted to walking along the turquoise ponds. In short and long-term studies, the positive correlation between green space and mental health, green space is an effective way to reduce depression symptom and produce the adjunctive environment to reduce infection risk of mental disease among women. The influential vegetation of gardens in Tehran was up to 60% density on women in an experiment. Women were more interested in moving along mobile corridors in virtual space. In movement corridors, vegetation was reported

30 to 57% respectively. In the main corridors, flowers, fallible trees with a height of 10 to 15 meters, and shrubs in visual cone were effective in women's choice. In this research, regarding women's self-expression, choosing the tree height had a direct relationship with their visual security and stressor stimuli reduction. In all selected gardens, according to people's need, vegetation of fallible trees has been considered in second important level. Correlation between vegetation and edges indicated the less effect of edges in comparison with created freshness in the environment. (45, 46). We can conclude that by interpreting women's self-expression, almost 78% of women believe that the edge of trees, containing a major part of women's visual cone, reduced the visual security; however, the effect of vegetation on reducing stress and anxiety of women implied their lack of attention to the studied edges. Thus, shrubs are less popular. Evergreen trees are categorized in the second degree or next layer of plant selection. Correlation between vegetation and sound showed that the presence of plants was an effective factor for the mental perception of sound effect. Vegetation effect could be seen in the correlation and effectiveness of other components. Concerning the edges and the effect of shapes, it can be said that circular elements with an effect on electrophysiological process, can be a positive stimulus in spatial elements for women. Based on individual reports, reaction toward curved edges were mostly women's interest. Although the reactions to edges can convey stress, anxiety and depression, their effectiveness is seen in spatial geometry. By studying women's choice in the research, the total geometry of space was superior to each particle. Geometry of place in addition to body is seen in perspectives. Illegibility and disorganized signs, symptoms, and routes as mentioned by Bechtel, create a vague space in the mind of audience and necessity of spaces is not perceived by the audience, hence the stress stimulus. In Kaplan and Kaplan research, wide perspective, widening the sight's circle, captivation, coordination and alignment of the environment with the person's demand, the environment reconstruction from MacGooy's view (1998), environmental coherence can reduce stressor. These components parallelism can reduce mental pressures. In the selected spaces, the more eligible and simpler the geometry was, the more the women were attracted to the environment, so those simpler spaces were chosen for virtual movement. Correlations higher than 0.5 in all components of the geometry, the effect of geometry on the effectiveness level on other components will impact depression symptoms (Figure 1).

5. Conclusion

The aim of designing the adjunctive environment of women's health is to increase the process in reducing the depression symptoms among women. Applying landscape architecture components to the public space of the city can reduce the effects of depression symptoms in cities. The impact of environmental components on depression, stress, and anxiety, based on standardized regression coefficients, showed that component effectiveness was rated in two parts of direct and potential effectiveness. Some components have effects on quick reactions while the effect of the other components can be seen for a long time. Research results showed that the virtual effect of public gardens in Tehran, considering the natural light, affected the total and partial geometry. In long term, the effects of landscape environmental components can play an important role in providing the virtual course of adjunctive treatment to improve the depression symptoms.

Living environment in urban and private space can speed recovery process of those who are suffering from depression. Healthcare, appropriate service of individual culture, healthcare experts and at last, an environment mixed with controlled landscape architecture components and considering their effectiveness on biological indexes will change urban open space to somewhere suitable for improving depression symptoms. It seems that the criteria of mental health in the world and its footprint in public gardens of Tehran as small yards in the city are considered as a desired element to reduce depression symptoms among women. Actually, they prepare the urban space pattern for modeling by preserving health and patients in an organized way.

Doing time-consuming experiments, daily renovation of people's experience, daily experience sampling, by the existence of natural light, used materials and water in the form of hierarchical gutters, short fountains and ponds play an important role to make women excited and stimulated. It is worth mentioning that effectiveness geometry has long term effect on user's reactions compared to some designed elements.

Geometry has been considered significant with the help of its direct effect and potentiality and can be seen in other elements as well as resulting in thorough improvement. The geometry of Iranian gardens, 25% vegetation pattern, the area of water procuring gutters

in central part of movement, yellow bodies, 3 decibel sound of birds and water, moving in a direct and curved way, Effectiveness of two long and short term surfaces, accurate direction in the route, applying tall trees along the way and perspective to draw women's attention in sight way, security sense provision should be considered in producing each body either urban or space. Studying the number of women's quick, long and short term reactions, designs effectiveness by virtual reality and applying procured pattern in simulations or virtual reality can improve depression symptoms among women.

Acknowledgement

This research is based on a part of the dissertation titled "Short-Term Effects of Landscape Architectural Components on Depression Symptoms in Women aged 18 to 45 with the benefit of cognitive science" by Elnaz Abbasian. Dr. Faizi (author), Dr. Asghar Mahmoodamadi are Supervisors and Dr. Abbas Erfanian Omidvar and Dr. Reza Khosrow Abadi have been advised. It has been done at the Faculty of Architecture of Iran University of Science and Technology and the Research Institute of Cognitive Sciences and Research Center of Shahid Beheshti University.

Funding: This study was funded of Faculty of Architecture of Iran University of Science and Technology**

Ethical Approval

This study was approved by number IR.SBU.REC.1398.018 and Faculty of Architecture of Iran University of Science and Technology. Also, written informed consent was obtained from all the participants. **Conflict of interest:** The authors declared no conflict of interest.

Conflicts of interest: None to declare.

References

1. ASPIREN A. Language of Landscape Perspective. Second Edition, editor: Tehran, University of Tehran Press, 2005.
2. J W, Busch A M, Weeks C E, and Landes S J . The Nature of Clinical Depression: Symptoms, Syndromes, and Behavior Analysis. *Behav Anal.* 2008; **31**(1): 1-21. doi: **10.1007/BF03392158**.
3. Anttinen E, Hippus H, Sadoun R, Sand E. Depressive illness: Prediction of course and outcome: Springer; 1988.
4. Davari A RA. Structural Equation Modeling with PLS Software. Edition F, editor: Jihad Daneshgahi Publications. doi: **10.13140/2.1.3280.1922**
5. Gehl J, Rogers R, Cities for People. Washington, USA: Island Press; 2013.
6. Hektner JM, Schmidt JA, Csikszentmihalyi M. Experience Sampling Method: Measuring the Quality of Everyday Life: SAGE Publications; 2007. doi: 10.4135/9781412984201.
7. Kaplan R, Kaplan S. The experience of nature: A psychological perspective. New York: Cambridge: CUP Archive; 1989.
8. Paravvsini U. the role of public spaces in cities, Tehran: Kalaq Publishing House; 2015.
9. World Health Organization. Regional Office for E. Burden of disease from environmental noise: quantification of healthy life years lost in Europe. Copenhagen: World Health Organization. Regional Office for Europe; 2011.
10. World Health Organization. Regional Office for E. Action Plan for implementation of the European Strategy for the Prevention and Control of Noncommunicable Diseases 2012–2016. Copenhagen: World Health Organization. Regional Office for Europe; 2012.
11. Devlin AS. Environmental Psychology and Human Well-Being. *Academic Press.* 2018. 313-34.
12. Lowe M, Whitzman C, Badland H, Davern M, Hes D, Aye L, et al. Liveable, healthy, sustainable: What are the key indicators for Melbourne neighbourhoods? Australia: University of Melbourne; 2013.
13. Akbarzadeh M, Adibi Aa. Healing gardens, the approach of the Iranian garden to health. *MANZAR, the Scientific Journal of landscape.* 2014;5(24):18-21. http://www.manzar-sj.com/article_4065.html.
14. Bartels SJ, Dums AR, Oxman TE, Schneider LS, Areal PA, Alexopoulos GS, et al. Evidence-based practices in geriatric mental health care: an overview of systematic reviews and meta-analyses. *Psychiatr Clin North Am.* 2003; **26**(4):971-90. doi: 10.1016/s0193-953x(03)00072-8. [PubMed: 14711131].
15. Barton J, Hine R, Pretty J. The health benefits of walking in greenspaces of high natural and heritage value. *Journal of Integrative Environmental Sciences.* 2009; **6**(4):261-78. doi: 10.1080/19438150903378425.
16. Barton J, Pretty J. Urban ecology and human health and wellbeing. *Urban ecology.* 2010; **12**(1):202-29. doi:10.1017/CBO9780511778483.010.
17. Bornioli A, Parkhurst G, Morgan PL. The psychological wellbeing benefits of place engagement during walking in urban

- environments: A qualitative photo-elicitation study. *Health & Place*. 2018; **53**:228-36. doi: 10.1016/j.healthplace.2018.08.018.
18. Brackett MA, Rivers SE, Shiffman S, Lerner N, Salovey P. Relating emotional abilities to social functioning: a comparison of self-report and performance measures of emotional intelligence. *Journal of personality and social psychology*. 2006;**91**(4):780. doi: 10.1037/0022-3514.91.4.780.
 19. Brunoni AR, Lopes M, Fregni F. A systematic review and meta-analysis of clinical studies on major depression and BDNF levels: implications for the role of neuroplasticity in depression. *Int J Neuropsychopharmacol*. 2008;**11**(8):1169-80. doi: 10.1017/S1461145708009309. [PubMed: 18752720].
 20. Chawla L, Litt J. Improving health and wellness through access to nature. Policy statement, *American Public Health Association*. 2013;20137.
 21. Coensel BD, Vanwetswinkel S, Botteldooren D. Effects of natural sounds on the perception of road traffic noise. *J Acoust Soc Am*. 2011;**129**(4):3567073. doi: 10.1121/1.3567073. [PubMed: 21476622].
 22. Doornbos MM, Zandee GL, DeGroot J, Warpinski M. Desired mental health resources for urban, ethnically diverse, impoverished women struggling with anxiety and depression. *Qual Health Res*. 2013;**23**(1):78-92. doi: 10.1177/1049732312465018. [PubMed: 23166153].
 23. Doornbos MM, Zandee GL, Timmermans B, Moes J, DeGroot J, DeMaagd-Rodriguez M, et al. Women supporting women: Supportive/educative groups for ethnically diverse, urban, impoverished women dealing with depression and anxiety. *Arch Psychiatr Nurs*. 2018;**32**(4):524-9. doi: 10.1016/j.apnu.2018.02.007. [PubMed: 30029743].
 24. Farr SL, Dietz PM, Williams JR, Gibbs FA, Tregear S. Depression screening and treatment among nonpregnant women of reproductive age in the United States, 1990-2010. *Prev Chronic Dis*. 2011;**8**(6):17. [PubMed: 22005615]; [PubMed Central: PMC3221564].
 25. Frumkin H. Healthy places: exploring the evidence. *Am J Public Health*. 2003;**93**(9):1451-6. [PubMed: 12948962]; [PubMed Central: PMC1447992].
 26. Gascon M, Triguero-Mas M, Martínez D, Dadvand P, Rojas-Rueda D, Plasència A, et al. Residential green spaces and mortality: a systematic review. *Environ Int*. 2016; **86**:60-7. doi: 10.1016/j.envint.2015.10.013. [PubMed: 26540085].
 27. Gatrell AC. Therapeutic mobilities: walking and 'steps' to wellbeing and health. *Health Place*. 2013; **22**:98-106. doi: 10.1016/j.healthplace.2013.04.002. [PubMed: 23666145].
 28. Grinde B, Patil GG. Biophilia: does visual contact with nature impact on health and well-being? *Int J Environ Res Public Health*. 2009;**6**(9):2332-43. doi: 10.3390/ijerph6092332. [PubMed: 19826546]; [PubMed Central: PMC2760412].
 29. Hartig T, Bök A, Garvill J, Olsson T, Gärling T. Environmental influences on psychological restoration. *Scand J Psychol*. 1996;**37**(4):378-93. doi: 10.1111/j.1467-9450.1996.tb00670.x. [PubMed: 8931393].
 30. Hartig T, Kaiser FG, Strumse E. Psychological restoration in nature as a source of motivation for ecological behaviour. *Environmental Conservation*. 2007;**34**(4):291-9. doi:10.1017/S0376892907004250.
 31. Heath Y, Gifford R. Post-occupancy evaluation of therapeutic gardens in a multi-level care facility for the aged. *Activities, Adaptation & Aging*. 2001;**25**(2):21-43. doi: 10.1300/J016v25n02_02.
 32. Hegarty M, Richardson AE, Montello DR, Lovelace K, Subbiah I. Development of a self-report measure of environmental spatial ability. *Intelligence*. 2002;**30**(5):425-47.
 33. Huisman ERCM, Morales E, van Hoof J, Kort HSM. Healing environment: A review of the impact of physical environmental factors on users. *Building and Environment*. 2012; **58**:70-80. doi: 10.1016/j.buildenv.2012.06.016.
 34. Jiang B, Chang C-Y, Sullivan W. A dialogue on the impact of urban landscape on human health (I). *Landscape Architecture Frontiers*. 2013; **1**:81-7. doi: 10.1007/sLAF-0102-0081.
 35. Kaplan R. The Nature of the View from Home: Psychological Benefits. *Environment and Behavior*. 2001;**33**(4):507-42. doi: 10.1177/00139160121973115.
 36. Kardan O, Gozdyra P, Misisic B, Moola F, Palmer LJ, Paus T, et al. Neighborhood greenspace and health in a large urban center. *Scientific Reports*. 2015;**5**(1):11610.
 37. Koohsari MJ, Badland H, Mavoa S, Villanueva K, Francis J, Hooper P, et al. Are public open space attributes associated with walking and depression? *Cities*. 2018; **74**:119-25. doi: 10.1016/j.cities.2017.11.011.
 38. Lee I, Choi H, Bang K-S, Kim S, Song M, Lee B. Effects of forest therapy on depressive symptoms among adults: A systematic review. *Int J Environ Res Public Health*. 2017;**14**(3):321. doi: 10.3390/ijerph14030321. [PubMed: 28335541]; [PubMed Central: PMC5369157].
 39. Liu B, Liu J, Wang M, Zhang Y, Li L. From Serotonin to Neuroplasticity: Evolvement of Theories for Major Depressive Disorder. *Front Cell Neurosci*. 2017;**11**(305).doi: 10.3389/

- fncel.2017.00305. [PubMed: 29033793]; [PubMed Central: PMC5624993].
40. Maas J, Verheij RA, de Vries S, Spreeuwenberg P, Schellevis FG, Groenewegen PP. Morbidity is related to a green living environment. *J Epidemiol Community Health*. 2009;**63**(12):967-73. doi: 10.1136/jech.2008.079038. [PubMed: 19833605].
 41. MacKerron G, Mourato S. Happiness is greater in natural environments. *Global Environmental Change*. 2013;**23**(5):992-1000. doi: 10.1016/j.gloenvcha.2013.03.010.
 42. Montazeri A, Mousavi SJ, Omidvari S, Tavousi M, Hashemi A, Rostami T. Depression in Iran: a systematic review of the literature (2000-2010). *Payesh (Health Monitor)*. 2013;**12**(6):567-94.
 43. Nili R, Nili R, Soltanzade H. Studying the Application of Healing Landscapes in Persian Gardens. *Bagh-E Nazar*. 2013;**9**(23).
 44. Nutsford D, Pearson AL, Kingham S. An ecological study investigating the association between access to urban green space and mental health. *Public Health*. 2013;**127**(11):1005-11. doi: 10.1016/j.puhe.2013.08.016. [PubMed: 24262442].
 45. Grace Y, Tam W, Lu Y, Ho C S, Zhang M W, and Ho RC. Prevalence of Depression in the Community from 30 Countries between 1994 and 2014. *Sci Rep*. 2018; **8**: 2861. doi: **10.1038/s41598-018-21243-x**.
 46. Sherman SA, Varni JW, Ulrich RS, Malcarne VL. Post-occupancy evaluation of healing gardens in a pediatric cancer center. *Landscape and Urban Planning*. 2005;**73**(2):167-83. doi: 10.1016/j.landurbplan.2004.11.013.
 47. Tyrer S. Depressive Illness: Prediction of Course and Outcome. Edited by T. Helgason and R. J. Daly. Berlin: Springer-Verlag. 1988. 152 pp. DM 98. *British Journal of Psychiatry*. 1990;**156**(1):148.
 48. Van Den Berg AE, Hartig T, Staats H. Preference for Nature in Urbanized Societies: Stress, Restoration, and the Pursuit of Sustainability. *Journal of Social Issues*. 2007;**63**(1):79-96. doi: 10.1111/j.1540-4560.2007.00497.x.
 49. van den Berg M, Wendel-Vos W, van Poppel M, Kemper H, van Mechelen W, Maas J. Health benefits of green spaces in the living environment: A systematic review of epidemiological studies. *Urban Forestry & Urban Greening*. 2015;**14**(4):806-16.
 50. Walsh CJ, Roy AH, Feminella JW, Cottingham PD, Groffman PM, II RPM. The urban stream syndrome: current knowledge and the search for a cure. *Journal of the North American Benthological Society*. 2005;**24**(3):706-23. doi: 10.1899/0887-3593(2005)024\{0706:TUSSCK\}2.0.CO;2.
 51. Ziari K, Janbabanejad MH. Healthy City Principles and Criteria. *Scientific- Research Quarterly of Geographical Data (SEPEHR)*. 2012;**21**(82):50-6.
 52. Boer L C SA. Traffic noise reduction in Europe, Health effects, social costs and technical and policy options to reduce road and rail traffic noise. *CE Delft; 2007*. Contract No.: KvK 27251086.
 53. Clare M. **Sachs** N A. Therapeutic Landscapes an Evidence Based approach to Designing Healing Gardens and Restorative Outdoor Spaces 1st Edition. WileyNew Jersey..
 54. Greydanus, D. E., Pratt, H. D, Patel, D. R. Health Promotion: Adolescent Well Being. In: Michalos, A. (Ed.). *Encyclopedia of Quality of Life and Well-Being Research*. Springer, Dordrecht, Netherlands; 2013; 2735-2743. doi: 10.1007/978-94-007-0753-5.
 55. Health NIOm. Statistics any mood disorder among adults. Available from: <https://www.nimh.nih.gov/health/statistics/any-mood-disorder.shtml>
 56. Social MuLa. Ministry of cooperatives Labour and Social welfare IRAN .Available from: <https://www.mcls.gov.ir/en/home>