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Evaluating the Effect of Visual Quality of Windows' Fields of View, on Mental Health of Apartment Residents, Through the Recording of Brain Waves

Hadi Keshmiri *, Maryam Haghayegh, Khosro Movahed, Malihe Taghipour

Department of Architecture, Faculty of Art and Architecture, Shiraz Branch, Islamic Azad University, Shiraz, Iran
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Abstract
In contemporary urban and modern lifestyles , the house, as the dominant and most important living place, is an opportunity to get rid of the pressures and tensions of the outside world. Also, the house can be a space that compensates for the damages caused by urban life on the physical, mental and psychological aspects of the citizens. One of the solutions that are recommended to improve the health of residents in the home is to benefit from a good view through the window, especially in apartments where it is not possible to be in the natural environment and the window is the only opening of the house to the outside world. However, many of today's houses threaten the residents' health by limiting their field of view to windows with limited visibility. For this purpose, the present study examined the impact of visual quality through windows on the mental health of residents, with a quantitative method. Using the EMOTIV electroencephalography device, and the brain waves of the residents in two states, with and without windows by field of view were examined. The results of this study revealed that the effect of the optimal field of view on the brain is similar to the effects of mindfulness and will result in an increase in attention and an improvement of the attitude and emotional processing of residents. Mindfulness, as a therapeutic and clinical method, is effective in increasing muscle relaxation and reducing anxiety and stress.

***Keywords*:** Apartment Housing; Visual Quality; Field of View; Opening; Brain Waves

1. Introduction

The rapid growth of the urban population in the world has caused new problems for the settlement and establishment of human societies. These problems have crossed the border of economic issues and have found social and environmental dimensions (pourdeihimi & Javadi ,2008). In this regard, several studies have focused on the quality of the urban environment and the place where people live. Visual quality is one of the important qualitative aspects of the environment, especially residential space. It seems that visibility and visual quality affect the perception of residents and their spatial behavior and is considered a significant factor in housing quality and themental health of residents. In the interaction between the inside and the outside space, the openings meet the residents' needs from the outside: the need for natural light, the need for fresh air, the need to obtain information from the outside environment, and the need for a good view. Especially, In today's apartment houses, it is not possible to be in the natural environment, and the window is the only way for the residents to communicate with the outside environment. This shows the importance and effectiveness of windows in the house (Tahbaz, 2003). For this purpose, the present study examined the impact of visual quality through windows on the mental health of residents.

* Corresponding Author Email Address: keshmirihadi@yahoo.com

2. Research Background

There is much scientific evidence regarding the positive effects of the presence of windows and the resulting visual content on people health. In a study conducted by Kent, the subjective responses to the visual content of the window in the building were examined. According to him, windows do not contain the same visual content, and he pointed out factors that can be used to describe the structure of the visual content of the window.These factors include trees, sky, buildings, etc. Also, this study revealed that the visual content of the window affects the concentration, the psychological state of the observer and improves his or her ability to work in the environment (Kent, 2019). Eslami investigated the nature of glass and its effect on spatial transparency in architecture by examining the opinions of architects and theorists. In the mentioned study, he referred to Scheerbart's opinion, as he argues that the only way to change the quality of architecture is to allow sunlight to enter, moon and stars, not just through a few windows, but through transparent walls (Scheerbart, 2014) and (Islami, 2011).

Heydari et al showed that the presence of a window as one of the physical variables does not only lead to distraction, but can be an important factor in restoring mental focus by creating a landscape to the natural elements outside, conscious placement and appropriate dimensions (Heydari et al., 2021).

Also, Ko et al. investigated the emotions, thermal perception, skin temperature and cognitive performance in

a space with windows versus a space without windows in a residential space. Access to a window with a good view enhanced the emotions and active memory and concentration of residents (Ko, et al. 2020). Also, Kent and Schiavon evaluated the effect of landscape distance seen in window views and visual satisfaction.

This study revealed that people tend to have urban views at a further distance and views containing plants at a closer distance to their windows as the visual content of the window (Kent and Schiavon, 2020). The study conducted by Kaplan (Kaplan, 2001) in residential environments showed that the window is a regenerative source and this issue depends not only on the existence of the window but also on the content of the window view. Scientific evidence suggests that the benefits of regeneration come from windows that provide views of the landscape or natural elements, not blind windows. In other words, the psychological benefits belong to the landscape where the minimum man-made changes can be seen in them (Purcell et al, 2001). Even viewing of urban nature (Health Council of the Netherlands, 2004; Kaplan, 2001) and the sky through the window (Masoudinejad ,2013) causes the psychological regeneration of the residents. It is a process during which cognitive abilities are regenerated and mental health is improved. On the contrary, several studies suggest the negative impacts of viewing artificial and abstract elements and communication with man-made environments on cognitive functions (Berto, 2005; Kaplan, 2001; Ozdemir, 2010).

3. Theoretical Framework

Studies in various environments indicate that the view from the window to the buildings and artificial landscapes is similar to the situation where the environment lacks windows (Ozdemir, 2010), while lack of windows in the environment itself causes sensory deprivation and can be a source of stress (Evans & McCoy, 1998) (Ulrich, et al, 1991). In other words, a window with a view of landscapes and natural elements has pleasant sensory stimuli that involve the senses, attracts the person's attention freely and without involving the cognitive capacity, it replaces or limits negative thoughts and relaxes the nerves and improves mental activities (Hartig, et al., 2010). In fact, paying attention to the natural view from the window results in mindfulness. Nowadays, mindfulness is used as a therapeutic and clinical method by most psychologists. Mindfulness techniques are effective in increasing muscle relaxation and reducing anxiety, and consequently in reducing anxiety and stress. It includes three components of intention, attitude and attention (Shapiro, et al, 2006). In contrast, pleasant sensory stimuli and aesthetic features in the natural landscape arouse positive emotions and cause a favorable level of arousal resulting from mindfulness and mental health (Ulrich, et al, 1991). In fact, the environmental stimulus is received through an individual’s senses, neurons and axons and sent to different parts of the brain and causes the person's perception (sensory input). After perception, it enters the stage of cognition and then enters the stage of evaluation and sensory output. These steps are described more after presenting the final research model.

In the other dimension, personality traits is one of the strongest predictors of mental health (Ahadi, 2007). The theory of traits emphasizes that the personality of each person can be described according to his or her traits (Shojaei, 2009). These traits are based on two voluntary and involuntary factors. The voluntary factor includes two components: 1- knowledge and perception and 2- action and behavior, and the involuntary factor includes two components: 1- natural environment and 2- social environment. Housing, as one of the environmental and involuntary factors, can affect people's personality and mental health. Various references are available to explain the role of the natural environment in forming human personality. They show the influence of geographical factors such as weather, cold and heat, dryness and humidity, forest or mountain, plain and desert, physical conditions of the locality and housing, noise pollution, the density of people in the room and housing, air pollution, and the beauty of living space, the architecture of houses, etc., on the formation of human personality (Riahi et al., 2019).

Given what was stated above, it is necessary to review and explain the role of humans in environmental planning, especially those plans and programs that are directly related to human residence, activity, and livelihood. With increasing urbanization and high-rise construction and due to various reasons, less attention has been paid to this issue and the quality of the living environment of the residents. We face houses that limit the residents' fields of view to blind windows and threaten their physical and mental health (Masoodi, 2016). For this purpose, the present research investigates the influence of the visual quality of the field of view through the windows on the residents' brainwaves and their mental health, by using the knowledge of psychology, architecture and neuroscience. To better understand the study method and the results obtained in the next sections of this article, it is necessary to have a brief understanding of the different areas of the brain and the methods of studying these areas in the brain. This knowledge will help us to know which area of the brain we should go to investigate the effect of visual quality on the brain of the sample. Thus, analyzing and reviewing the studies of other researchers will be very useful in identifying the correct areas for the analysis of this study.

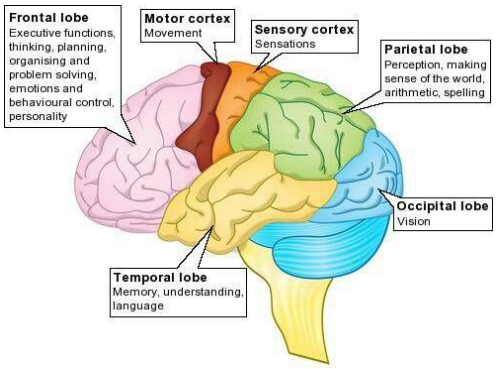

Fig. 1. brain lobes area and Cerebral Cortex Functions
(Source: Jawabri & Sharma,2022)

The brain consists of four parts that determine the personality and the cause of a person's behavior. It includes four frontal, parietal, occipital and temporal lobes. Each of these lobes has different functions and roles in thinking, perception, reaction and behavior with the environment and will be the criteria of the analysis of this study (Figure 1). Knowing the functions of each of these areas will help us in selecting the correct areas for the analysis of this study. These four areas and their tasks are listed in the following table.

Table 1
Cerebral Cortex Functions

Frontal Lobe	Concentration, positive emotions, emotional regulation, planning, reasoning and problem-solving, cognitive and abstract thinking
Parietal Lobe	Sensory information, spatial awareness, attention, communication
Occipital Lobe	The main visual processing center of the brain, visual learning
Temporal Lobe	Hearing, vision and memory information

(Source: Jawabri & Sharma,2022)

To analyze each of these areas, it is necessary to place the wave recording electrode at certain points. The special electrode placement points for each area are presented in the Figure 2, based on international standard 10-20.

Area	
FRONTAL LOBE	F3/F4/ F7/F8
PRE FRONTAL	FP1/FP2
OCCIPITAL LOBE	O1/O2
TEMPORAL LOBE	T3/T4/ T5/T6
PARIETAL LOBE	P3/P4
CENTRAL LOBE	C3/C4

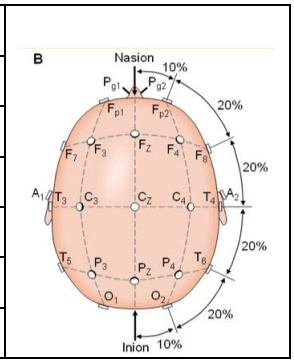

Fig. 2. The electrode placement points for each area based on international standard 10-20
(Source: Mahdinejad j, Sadeghi, 2021)

Senses are received through sensory receptors in the body and through neurons and synapses, and then information and data are collected. This stage is the stage of perception of the architectural environment. In other words, a person achieves the basic perception of the environment with the help of senses. After the initial perception, sensory data enter the stage of cognition as an input according to the person's mental treasure, such as knowledge, taste, and previous memory. Then, after comparing with the mental treasury, it enters the evaluation stage.Finally the person considers these environmental components as relaxing or stressful, pleasant or unpleasant, and evaluates the quality and level of subjective satisfaction of the space. After this stage, it enters the response output stage and sends brain messages to the central nervous system (CNS), peripheral nervous system (PNS) and endocrine glands and finally leads to behavior. In fact, after the output of the response, the target cells secrete a hormone and move a part of the body or lead to behaviors such as stress, attention, excitement, fear, etc.

One of the methods of studying the cortical functions of the brain is electroencephalography (EEG). This method records the electrical activity of the brain by recording the potential of a number of neurons and shows their activity directly (Leuchter et al. 1999). A normal EEG tape consists of a complex combination of multiple frequencies. Alpha waves are waves with a frequency of 8-13 Hz per second that appear when the eyes are closed during awaking. The occipital lobe is the best area for the activity of this wave. Theta waves are waves with a frequency of 3.5-7 Hz that are observed in the first stage of sleep. A small part of theta activity can be observed in many normal EEGs in the waking state, especially in the frontotemporal areas. Beta waves, which are waves with a frequency between 14 and 30 Hz, appear in the state of wakefulness and mental activity, and are common in the waking EEGs of healthy adults, especially in the frontal-central areas. Delta waves are also waves with a frequency of 0 to 3.5 Hz, which are often observed in a deep sleep (Banich & Compton, 2011). Various engineering methods have been used to quantify the pattern of cortical brain activity, which is called QEEG. QEEG or quantitative electroencephalogram provides the possibility of measuring the performance of brain areas and studying the electrical potentials resulting from the processes of brain cells while performing various mental activities such as concentration, memory, decision making, etc (Mahdinejad j, Sadeghi, 2021).

By providing brain mapping, QEEG displays the electrical activity recorded on the surface of the skull in the form of a spectrum of different colors that represent the strength and weakness of brain cell activity in different areas. In QEEG analysis, the band power of a wave is shown as absolute power or relative power (Basharpoor et al, 2021). Another component of QEEG is related to coherence. Coherence evaluates the connection between different cortical areas (Bowyer, 2016). Lack of coherence can cause a disturbance in the regulation of the behavioral activation and inhibition system, which is responsible for regulating behavioral responses to emotional stimuli. In other words, there is an association between the coherence of delta, theta, alpha and beta brain waves and regular emotional processing, and the coherence of the waves is a predictor of emotional response in people (Depue & Zald, 1993).

Based on the researchers' results, in the process of emotional processing, an increase in activity can be seen in the frontal and prefrontal areas. Through the corticolimbic pathways, this area plays a role in regulating attention, identifying the emotional stimulus, regulating the appropriate emotional response, processing positive and negative emotions, and interactions between cognition and emotion (Williams et al, 2008). Additionally, the results of reviewing the studies showed that the brain nervous systems that generate alpha and theta oscillations play a role in sustained attention. Sustained attention helps a person to control interferences and respond to only one stimulus (Behzadnia et al., 2017). Another study refers to the importance of theta band and its role in integrating emotional and cognitive information and its important role in cognitive function (Kawasaki et al, 2010). The results of the researchers indicate that the joint activity of the frontal cortex, especially the left hemisphere, is related to executive functions and cognitive control and attention and there is a positive relationship between cognitive control and EEG coherence in theta and beta bands in the frontal areas of the right and left hemispheres (Basharpoor et al, 2021).

Several studies have been conducted on the effect of mindfulness on brain waves. A systematic review of the neurophysiology of mindfulness revealed that positive emotion is significantly associated with theta waves in the frontal area, and internal attention is related to the reduction of theta and alpha waves (Aftanas & Golocheikine, 2001). The analysis of brain wave revealed higher beta wave activation during rest and higher theta wave activation during transcendental meditation in the frontal lobe. Also, the activation of theta and alpha waves during rest and meditation was proven in the cingulate and precuneus (Travis & Parim, 2017). Gamma waves are related to the highest level of alertness and concentration (McDermott et al., 2018). According to the results of the study conducted by Pourafrouz et al., mindfulness exercises significantly increase beta waves, which are related to the frontal areas of the brain, where complex intellectual activities occur. Mindfulness exercises caused a significant increase in the beta band in the C3 channel (Pourafrouz et al., 2020). Theta waves occur in the most profound meditations and show the indescribable and unique creativity. In this phase, the brain is ready to accept vast and new information and knowledge (Ekstrom, 2005). In the study conducted by Pourafrouz et al., after mindfulness exercises, the theta band in the C4 channel decreased significantly. Thus, based on the obtained results, beta and gamma waves increased significantly after mindfulness compared to before, and theta wave also decreased significantly and thus an increase in concentration and attention was observed (Pourafrouz et al., 2020). Table 2, following presents some effects of mindfulness on the brain briefly.

Table 2
The effect of mindfulness on the brain

Activity	**Psycho-neurological effect**
Mindfulness and stress	Mindfulness reduces the size of gray matter in the amygdala of the brain - an area known for its role in stress - and also decreases the activity of beta waves and increases alpha waves in the anterior cingulate cortex, indicating a decrease in arousal and anxiety in people (Tarrant, et al, 2018).
Mindfulness and creativity	Mindfulness thickens the gray matter in the prefrontal cortex and increases its activity, an area of the brain that is responsible for activities such as planning, problem-solving, and regulating emotions (Singleton, et al, 2014).
Mindfulness and memory	Mindfulness thickens an area of the brain called the hippocampus that helps memory and (Greenberg, et al, 2019).
Mindfulness and concentration	The connection between the prefrontal cortex and five other parts, the inferior frontal gyrus, the middle frontal gyrus, the superior parietal lobule, the middle temporal angular gyrus, and the supplementary motor area of the brain, which are responsible for executive functions, were significantly increased (Taren et al. , 2017),Mindfulness improves attention and reduces theta/beta ratio in people (Sibalis et al., 2019).Also, these exercises to optimize cognitive performance and neural efficiency have led to an increase in the improvement of attention and executive skills of healthy people, resulting in an increase in alpha/beta ratio (Crivelli et al., 2019).

After a general understanding of different brain areas and the function of each area, and reviewing the results of other researchers, it seems that the frontal areas with the abbreviation F, the occipital with the abbreviation of O, and the temporal with the abbreviation of T, as well as examining the absolute power and theta and beta coherence can help us in investigating the effect of the visual quality of visual fields on the brain of samples.

4. Research Methodology

The present study method is quantitative and the main part of it uses electroencephalography device for brain imaging of a person in the architectural space with and without opening in the living space of an apartment unit. The data were collected through library and field methods with the aim of to change the visual quality through the opening and its effect on the person's brain waves in the space by the Emotiv Epoc +14 device (Figure 5). To record the effect of the visual quality of the fields of view through the openings on the brain waves, first three residential apartments were selected based on the criteria of visual quality and optimal field of view. Among the three options, only one option that the opening of the living space had a better view compared to the other two options were selected. Figure 3 illustrates the plan of the selected apartment, the sitting position with a height of 15 meters from the street level and the position of the opening in the living space with the window code w2, which had a better view than other openings (with a view to Eram Garden).

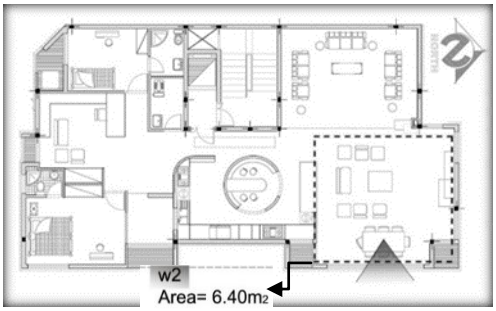

Fig. 3. The plan of the living space and the position of the window in the living space

To select the right time in which the minimum amount of light glare occurs through the windows, three times of 10 am, 1 pm and 5 pm in the June month were examined, and among these three hours, 5 pm had the least amount of glare according to the orientation of the building.

The study subjects were selected at the age group of 30-40 years with a bachelor's degree and above without any history of mental illness and 10 people were selected.

This number was chosen due to the limitations of brain wave recording and its high cost, and according to the number of samples of similar articles and sampling methods and sample size calculation in medical science studies(Chehrai, 2016).

The recording of all samples was done in three consecutive days from September, with an average temperature of 20 degrees, and humidity of 40% in an open space. Also, the space illuminance was measured using a lux meter (Figure 4-A). The average illuminance when watching the window with curtains was 105 lux and after raising the curtain, it was 496 lux. These conditions were kept constant for all samplings.

Fig. 4. A: Lux meter device, X101 model, B: Sound meter, model az 8921,

Also, the background noise level was measured with the help of az 8921 sound meter (Figure4-B) with an accuracy of ± 1.5 dB. The background noise level during recording was in the range of 40-43 dB, which is close to 40 dB. It was (standard background noise level permitted in the interior spaces of the building, taken from topic 18, National Building Code). It should be noted that all these environmental conditions were kept constant during all samplings.

First, the person was asked to sit in front of the w2 window with a dark curtain. Then, the headset device was placed on the person's head. This device includes electrodes that should be adjusted according to the international standard 10-20 on certain skin points

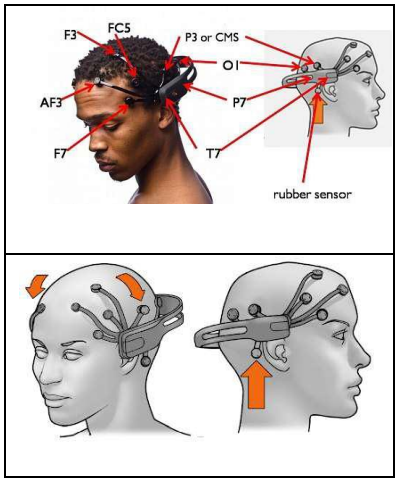

Fig. 5. The placement the electrodes of the device in specific places on the head
(Source: Emotiv Epoc User Manual, 2019)

After ensuring that the electrodes were in their place, the person was asked to stare at the dark curtain with open eyes for three minutes. After three minutes, the opening curtain was removed and the person was again asked to look at the outside views (Figure 6). Finally, two obtained records were analyzed and evaluated.

Fig. 6. Recording of brain waves in two states of viewing the window with and without curtains

After recording the EEG signals, the obtained data were converted into numbers by MATLAB software and entered into the NeuroGuide software and the range of fluctuation of the person brain activity was compared to the normal database and the results were presented in the form of brain maps. By comparing the values obtained from the recording of waves in a person with normal values, it is determined which of the waves and in which area has inappropriate activity. Finally, the obtained results were analyzed and evaluated in two states of without opening (with curtains) and with opening (viewing the outside view). Finally, by matching the obtained results with the theoretical foundations of health and stages of perception, the final model was presented.

5. Results and Discussion

Analyzing the wave dynamics in quantitative brain mapping when viewing window with a view compared to the control group (viewing window with curtains) shows a decrease in the power of theta waves in the left hemisphere (F7-T5) and an increase in the power of beta frequency in the right hemisphere in the right frontotemporal areas (F8-T6). In analyzing the brain maps, if the color changes from blue spectrum to red spectrum, it indicates an increase in absolute power, and if it changes from red to blue spectrum, it indicates a decrease in absolute power. Figure 7 shows the decrease in the power of theta waves in the left hemisphere, F7-T5. The brain map in prestate (window with curtain) shows the frequency of theta waves in the F7-T5 areas with orange and light blue colors. These two points are dark blue after viewing the outside view (post) and this color change from orange to dark blue shows the decrease in the absolute power of the waves.

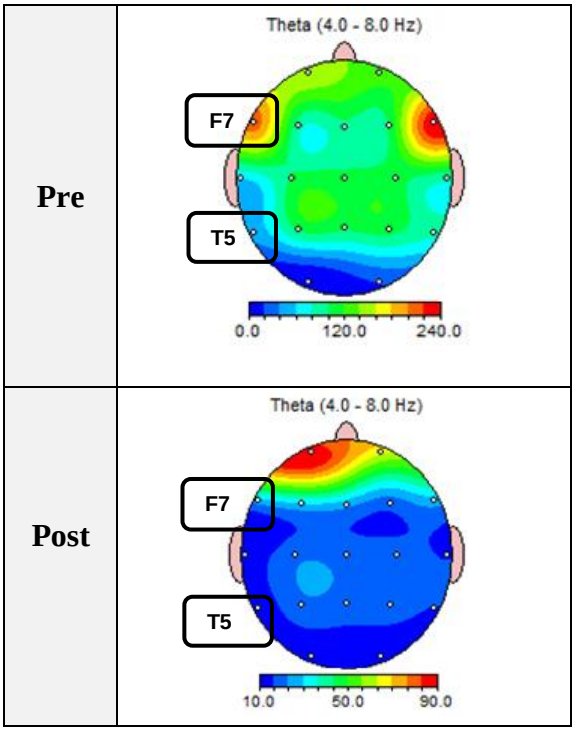

Fig. 7. The reduction in the frequency power of theta waves in the left hemisphere, F7-T5, the orange color means more absolute power and the blue color indicates a reduction in the absolute power of the waves

Figure 8 shows the increase in beta frequency power in the right hemisphere in the frontotemporal areas, F8-T6. The brain map in pre-state (window with curtain) shows the frequency of beta waves in the F8-T6 areas with green and yellow colors. These two areas have turned orange after viewing the outside view (post), which the change of color from green and yellow to orange in the state of a window without curtains indicates an increase in the absolute power of beta waves.

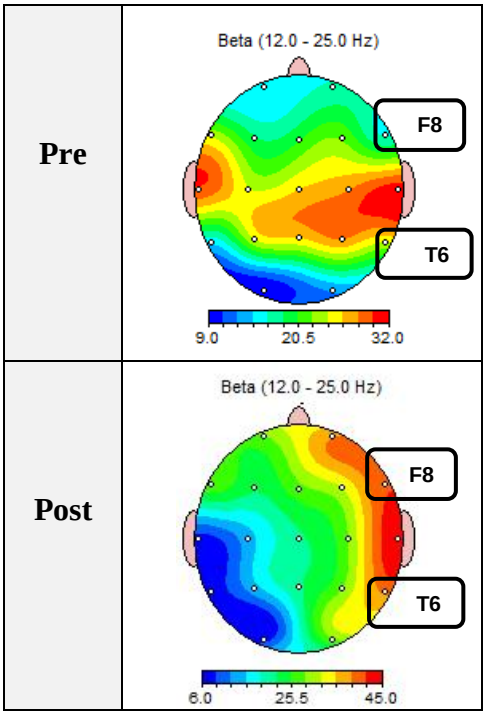

Fig. 8. the increase in beta frequency power in the right hemisphere in the frontotemporal areas, F8-T6, green and yellow colors in the state of the window with curtains indicate lower absolute power, and orange and red colors in the state of the window without curtains indicate an increase in the absolute power of the waves

Also, in both the right and left hemispheres of the brain, the relationship and similarity between the frequency and power of alpha waves increased in the state of viewing the outside view compared to the control state (window with curtains). Also, with regard to the changes and dynamics of coherence of theta waves, exposure to the outside landscape in people compared to the control state (window with curtains) caused an increase in theta wave coherence in F7-T5 and F7-O1 derivations. In analyzing the coherence maps, the thin blue line indicates less connection and activity, and with the thickening and change of the color of this line to red color, connection and activity increase. Figure 9 shows the increase in theta wave coherence in F7-T5 derivations. In pre-state (window with curtain), no line or connection can be seen between F7-T5. However, in the post state (window without curtains), a thin blue line can be observed between these two areas, indicating the connection and increased coherence between these two areas.

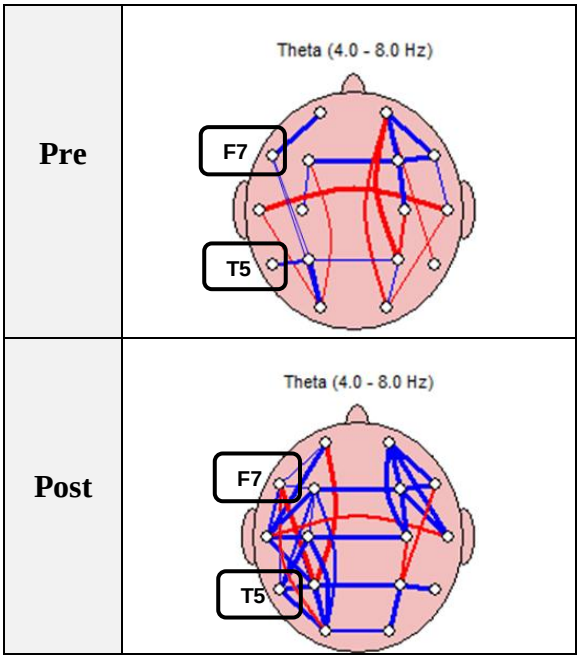

Fig. 9. the increase of theta wave coherence in F7-T5 derivations, the thin blue line indicates the connection and the thicker and red line indicates a stronger connection

Figure 10 shows the increase of theta wave coherence in the F7-O1 derivations. In pre-state (window with curtain), the thin blue line indicates the connection between the two areas. In the post state (window without curtains), this connection has changed to a wide red line, indicating a strong connection between these two areas and an increase in coherence.

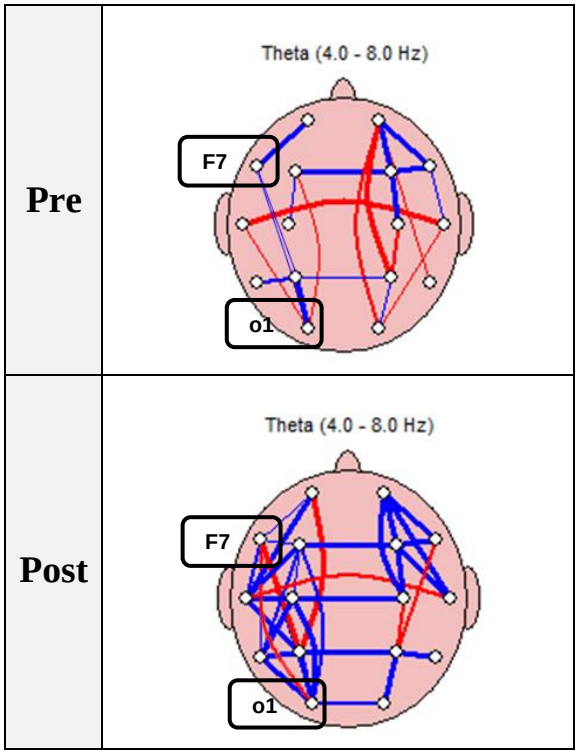

Fig. 10. The increase in theta wave coherence in F7-O1 derivations, the thin blue line indicates the connection and the thicker and red line indicates a stronger connection

Also, in the test state (window without curtains) compared to the control (window with curtains), the coherence of beta waves also increased in the bilateral frontal area.According to the available evidence, the increase in theta coherence in the frontotemporal and occipitofrontal areas can indicate the sustainability of attention and the improvement of the emotional information processing process in the frontotemporal pathway. Accordingly, the index of "sustain attention" in people is somehow related to the reduction of theta wave power in the left frontal areas (F7) and the increase of theta coherence in the occipitofrontal area (F7-O1).

The results of present study showed that the fields of view in the residential space can somehow be related to the sustainability of attention and the improvement of the emotional information processing process, as two important issues in the mental health of the residents. It is suggested to conduct studies with other tools and comparing the visual quality of different fields of view to address more aspects in this regard.

6. Conclusion

The present study aims to investigate the impact of visual quality through openings on the mental health of the residents with a quantitative method. Using the EMOTIV electroencephalography device, the brain waves of the residents in two states of the architectural space with and without windows and field of view were examined. The results of the present study revealed that the natural view through the window can be effective in the sustainability or dynamics of information processing and electrical dynamics of waves in the cortical area of the brain. Conducting studies with other tools and with other experiences is recommended to address more aspects of this issue. The results of this study are in line with the results of studies such as Masoudinejad, and Kent, and Ko, and Kent and Schiavon, which specifically focused on the visual quality of the fields of view through the window using qualitative and visual questionnaire methods. In other words, this study confirmed the results of their qualitative studies, but it was conducted with a newer and experimental and laboratory methods.

Kent and Schiavon showed the subjective satisfaction of the window depends on three parameters, including connection to the outside, visual content and visual privacy. Kent, in his study, divided the subjective satisfaction of the window into four factors of subjective responses to the window view, physical features of the view, physical features of the window, and work-related responses, respectively. By examining the key parameters, all these researches examined the effect of window and its visual content on the human being and his or her mental function. Their results refer to the presence of pleasant sensory stimuli in the landscapes and natural elements from the window that attract the senses, involve the person's attention freely and without involving the cognitive capacity and thus replaces or limits the negative thoughts and reduces stress, mental fatigue and mental problems and ultimately improves the mental health of the person. Their results are consistent with the results of this study on the effect of natural landscape through the

window on mindfulness. Figure 11 shows the final model of the results of this research.

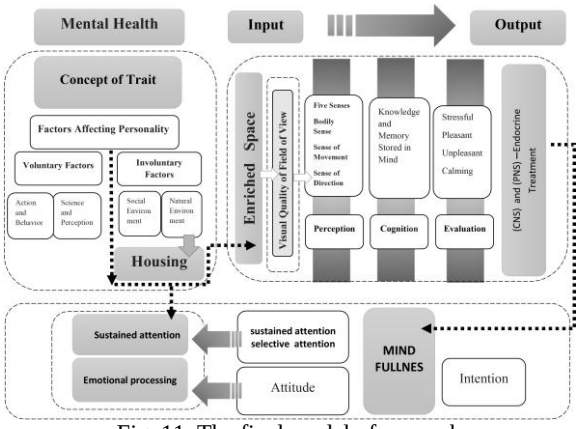

Fig. 11. The final model of research

Based on the final model, the natural environment and housing as one of the key and effective components of involuntary factors can influence the personality traits of residents and their health. Thus, paying attention to the characteristics of the architectural space as an environmental stimulus and also as the first stage of the environment perception process is crucial. An enriched environment means a space in which special attention has been paid to components of that space as stimulus and sensory input.

It means that stimuli such as landscape and field of view and other components such as light, green space, sound comfort, etc., are initially received through one's senses, neurons and axons and are sent to different parts of the brain.

The results of present study revealed that sustain attention and improved emotional processing were two positive effects of the brain on people resulting from the enriched environment. The results of this study were confirmed the mental effect of meditation exercises and mindfulness exercises. In other words, landscape or visual quality as one of the components of the enriched environment results in mindfulness and mindfulness, like meditation exercises, increases attention and improves the emotional processing of people.

As stated, mindfulness is nowadays used as a therapeutic and clinical method by most psychologists and mindfulness techniques are effective in increasing muscle relaxation and reducing anxiety and stress. It leads to the three components of intention, attention and attitude in people. "Increasing attention" and "improving attitude and emotional processing" as two important results of this research, is useful in residential spaces and helps the residents' mental health and peace of mind. Like spaces such as classrooms, office environments, in which concentration plays a key role in the design field , expansion of this relatively young research field with future multidisciplinary approaches can be the subject of future studies.

The results of this study can be a useful guide for policy makers in housing construction and large organizations in health policy making. By relying on the results of studies that critically examine the details of apartment living under the microscope of health, organizations in charge of construction can take important measures in passing rules and regulations that affect the health of residents to improve the quality of life of the residents.

For example, we can refer to the standards of urban landscape and the visual quality of buildings, which require the establishment of more accurate rules for modifying, arranging and maintaining the facades of buildings, roofs, and passages. Also, the design pattern of apartments, ranging from the way of massing to organizing the interior spaces of the building, needs a new look. We hope new achievements in the construction industry and the design of residential units based on all aspects of health in the near future, so that the buildings not only do not threaten the health of the people, but also bring therapeutic property for humans.

The authors of this article are suggested to Future researchers to study the impact of windows on the mental health of residents with both qualitative and quantitative methods. Also, To complete this article, it is suggested to the future researchers that in a new article, the impact of more factors such as different perspectives, window direction, type of area in the analyzes will be investigated.

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