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Examination of the psychological impact and brainwaves functioning of the users of buildings and environments built based on promoting relaxation and spiritual sense

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ABSTRACT

Religious buildings have a significant role in Muslims' culture. The architects have developed some features in designing such buildings that create a unique sense of comfort and spiritual state in humans. By more precise examination of the spiritual sense whose results are in mental health for the audience, the paper tried to analyze the impact of buildings with religious characteristics on the brain functioning of the people using such buildings.

The results showed that seeing the interior of the mosque building strongly affects the brainwaves associated with peace and spiritual sense that proves "The relaxation and spiritual sense."

KEYWORDS

Brainwaves; mental health; religious buildings; built environment; spirituality

Introduction

Spirituality has been defined differently. Culliford (2002) considers it as a term "including religious attitudes, practical aspects, mental and physical health, supernatural beliefs, and religious practices." While religion is seen as humans' connection to a larger being, they consider spirituality equal to life. Spirituality refers to strengthening one's soul. Schroder (2003) considers it as a set of values and beliefs about oneself and the world, the care for one's own and others' mental health. Spirituality is beyond words and can be felt and experienced in a very simple way.

Spirituality is considered as the forgotten aspects of mental health (Schroder, 2003). Spirituality has been inferred as an individual's deep connection to the world and the human experience spiritual realm (Culliford, 2005). This concept has to do with the discovery of meaning and purpose in life and the sense of belonging to the society, especially spirituality looks to have a significant role in dealing with stress, suffering, physical and mental illness, and depression in medicine and psychiatry. Even in those not believing in God, spirituality has to

do with the effort for inspiration, praise, extol, meaning-seeking, and purpose. According to the World Health Organization (WHO) (Swinton, 2001), spirituality can be discussed under four titles: perfection, personal communication, life mystery, and specific beliefs. Perfection has to do with the concepts of connection to spiritual power or being, meaning of life, reverence, divine love, inner peace and harmony, inner power, integration of birth and death, attachment, separation, hope and prosperity, and control of life. A person's relationship with kindness is related to kindness to others, humility, acceptance, and forgiveness. Some spiritual values act as the mystery of life and encompass issues such as being upfront, encouragement, tolerance, patience, mercy, kindness, pleasure, hope, and love. Personal beliefs encompass all the perceptions of an individual of oneself, the world, and others.

A religious and sacred space has some architectural characteristics that instead of mere focus on its form have a relation to the underlying principles of life quality and the spiritual attitudes related to the human soul (Mahdi Nejad, Taher Tolodel, Azemati, & Sadeghi Habib Abad, 2017). The spiritual sense is the active and dynamic aspect of the "soul" independent of form and shapes. These forms where the spiritual energy flows reflect the divine sense of quality that gives the building a sacred like quality (Pei-lin, 1996). Moreover, these types of buildings are built based on the geometries that allow the flow of this spiritual energy to flow in a suitable way (Simpson, 2007). Thus, the architecture of sacred buildings has always had to do with a rigorous system of measurements, ratios, and geometrical relationships throughout history. It is this very precise geometry that enables the transmission and flow of sacred energy (Gordon, 2009; Macchia, 2008).

Review of studies and literature

In many studies, architects and scholars have examined the fundamental factors associated with the quality of the spiritual space in their studies. In some studies, spirituality has been defined as an attempt to nurture sensitivity to self, others, inhuman beings, and God (the supreme power), or to search for what is required for human and a quest for full humanity (Hinnells, 1995). In some other studies, this spiritual quality is ascribed to concepts like meaning, spirituality, spiritual space, and some have focused on ontological experiences.

By examining the interior space of Vakil Mosque, Shiraz, Sadeghi et al. (Sadeghi, MahdiNejad, Azemati, & Matracchi, 2019) have examined the color and its effect on promoting spirituality. The results showed that the color with turquoise and green spectrum had the most effect on spirituality. Moreover, in another study entitled "Strategic explanation of the components of spirituality in Iranian mosques architecture" the factors affecting spiritual sense in mosque architecture have been examined (Mahdi Nejad, Azemati, &

Sadeghi Habibabad, 2019b). Its results prove that decorations, form, and proportions have a significant effect on spiritual sense perception but no significant relationships have been seen for the components of the materials.

In the paper entitled “Review and evaluation of the influential components on the creation and promotion of ‘sense of spirituality’ in the architecture of the Mosques,” Sadeghi Habibabad, Nejad, and Azemati (2018) examined sensory factors (color, light, and sound) and physical factors (Form, geometry, motifs, and materials) in promoting “sense of spirituality” in the interior architecture of mosque. Other results of the study showed significant differences between gender and age and their effects on the level of understanding “sense of spirituality;” women feel a sense of “spirituality” earlier than men and older people. In another paper, the same researchers (Mahdi Nejad, Azemati, & Sadeghi Habib Abad, 2019a) ranked spiritual indices in mosque architecture in Yazd where based on eight predefined spiritual indices, nine mosques in Yazd are ranked according to Vikor method.

In Shahroudi et al. (Shahroudi, Hosseini, & Momeni, 2014), gender is one of the determinants of the desirability of the mosque’s physical indices from the perspective of its users. All user groups, especially women, raise their sense of spirituality in the mosque space, considering the physical and psychological needs of women in the design of mosque architecture. The results showed that physical factors have a critical say in the general sense of viewer in shabestân (bedroom) and the spirituality of the prayer. This means that the more desirable the physical factors are, the greater the sense of spirituality in shabestân is. Hence, physical factors can have a significant effect on one’s psychological well-being and degree of enjoyment from the space.

The study tries to examine the effect of the environment on the human brain. It is done using brainwave recording of the audience who are using the mosque’s architecture.

Definition of spirituality

The definition of spirituality is difficult as the definition of religion (Nasr, 1990). Dr. Nasr argues that the term has been used very vaguely over the past few decades. The origin of this word in European languages is very recent; i.e., meaning that it was in the past one or two centuries that was used for the first time in Catholic coteries. The term has just recently been being widely used, usually as a substitute for religion, and in some cases against religion. The terms used in Eastern languages to denote spirituality often show the etymology of the word, which is from “spiritus” or “Spirit”. For instance, in the Arabic language, the word “Rouhaniyeh” is a usual equivalent, which comes from “Al-rouh” that exactly means spiritus, without the meaning of the Arabic word being vague at all. However, what meaning can spirituality have in the modern world – characterized either by denial of the “spirit” as

an objective and ontological reality or its attachment to the psyche? The word usually involves a vague desire for the meaning and experience of the essence of the thing affairs. While ignoring the fact that the “spirit” divulges according to certain principles and only within the great traditions of heavenly origin, it suffices to psychological affairs instead of the essence of things affairs. Moreover, if the holy book says that “the spirit blows wherever it pleases,” it is only an exception that proves the rule (Nasr, 1968).

If the traditional criteria of the reality of the “spirit” and its manifestation laws as in traditions like Hinduism, Buddhism, Christianity, and Islam, are denied (or ignored), then everything that can be called spiritual – and the word spirituality, loses both its rational dimension and its sanctity – is compounded by the vast complexity of the sensual world with the luminous heaven of the “spirit” and that kind of spirituality that comes from this book can be applied to almost anything, including science. Hence, in this discussion, we define spirituality as the intrinsic and spiritual dimension of traditional religions that deals with the essence of a thing and anomalous affairs that can be directly experienced and are beyond subjective issues but are not anti-rational. In contrast, when the intellect is understood in its original sense as intellectus or buddhi rather than just partial reason, spirituality and rationality become inseparable (Nasr, 2013).

The necessity of spirituality

The necessity of spirituality in humans is like the necessity of the existence of the inhale and exhale for the vitality of the body (MahdiNejad, Azemati, & Sadeghi, 2019d). Spirituality can be detected by all humans in all communities and throughout the world. Spirituality is a vital principle of human existence and has been accepted by many religions, cultures, and traditions around the world. Furthermore, there are still some beliefs that consider spirituality to exist intrinsically in a static form and such spirituality will have human progress by gaining life experiences. Spirituality is a way to experience the transcendent sense of connection to power beyond the self that is both a guide in life and gives meaning to death (Koenig, Al Zaben, & Khalifa, 2012; Omidvari, 2008).

Spirituality is a human value, positive, existential, and dependent on the ontology of the human dimension with a significant role in creating a desire for life to search for meaning and purpose in life – and beyond life (MahdiNejad et al., 2019d). Spirituality is an internal, dynamic and evolutionary process whose effect is shown in the individual and in all stages and areas of life and even the way of life. Spirituality refers to internal experience, both a connection to transcendental power and a reality for heightened awareness and communication with oneself and with others and a larger reality (Safayi, Karimi, Shomoossi, & Ahmadi, 2011).

Spirituality is a universal phenomenon all humans require to look for meaning and acceptance of their lives by connection to themselves, others, and the sacred stuff (Abbasi, Azizi, Gooshki, Rad, & Lakeh, 2012).

Mosque architecture and the quality of the spiritual environment

With a glance at Islamic arts in the architecture of traditional Islamic mosques in the Islamic era, one can understand that these works are both functional and conceptual (Mahdi Nejad, Azemati & Sadeghi Habib Abad, 2019c). Considering the various aspects of spirituality, spirituality refers to the purpose and goal of the universe and in architecture to the relationship of humans to the creator of the universe and God. This concept has been referred to as sacred architecture in most Islamic studies, where sacred architecture is a place where the association between our world and the other world, the upper and lower worlds, the world of gods and the world of the dead, becomes possible showing divine mystery and reflection. It is the mystery of divine art (Nejad & Abad, 2016). That sacred art and architecture are, in fact, religious art and esthetic experience of the sublime (Nejad, Zarghami, & Abad, 2016) and the sacred affair is exported beyond the celestial matter (MahdiNejad & Sadeghi, 2019).

In the architecture of Islamic mosques and its sacred arts, the features are based on fundamental facts expressing a range of organized vocabulary (Zomrashedi & Sadeghi Habibabad, 2016), at the center of which is the divine monotheism as if the designer has filled architecture with divine light and spirituality. The first condition to have spirituality is that each individual adjusts all his behavior and actions in life according to a single goal inherently desirable.

According to the above, one can state that spirituality has to do with a dimension beyond and a kind of perfection or finality. In other words, spirituality qualities in humans are manifested in his feelings beyond the truth. Spirituality makes human life meaningful and directs it. Moreover, Islam has provided the most perfect teachings to reach and evolve human spirituality. Recognizing the divine truths, past architects created their architecture accordingly and tried to express these meanings in their architectural framework (Zomorshidi & Sadeghi, 2018). Currently, humans are now in a time of spiritual bewilderment, whereas many people are thirsty for spirituality. A postmodern human tries to return to spirituality, and social scientists have well understood this. Spirituality in Islam is a basic issue, and moving toward it as Islam can be a solution to the spiritual crisis in the current era, but the noteworthy point is the significance of spirituality in modern architecture. Given the significance of spirituality and spiritual features in everyday life, especially in today's architecture, scholars try to find a way to spiritual architecture and relaxation in Islamic mosques.

Spiritual spaces and health

Mental health involves mental comfort, self-empowerment, and autonomy, sufficiency, understanding intergenerational interdependency, and recognizing one's ability to realize one's intellectual and emotional capacities. Mental health means that a person can have an excellent and successful performance in thinking, temperament, and behavior (Koenig, 2010). Moreover, it has useful activities in the society, builds positive relationships with others, lives with problems, stresses and life difficulties, and can help others.

Some studies indicate that spirituality has to do with better results for human health, coping skills, and life health quality, as well as lower rates of anxiety, depression, and committing suicide (Rodrigues, 2008).

According to the positive and significant role of spiritual health in mental health, strengthening the spiritual dimension (Naghbi, Ashari, Rostami, & Hosseini, 2015) can promote mental health and reduce mental disorders (Reed, 1991; Weber & Pargament, 2014).

Cognitive neuroscience

Cognitive neuroscience deals with correlates of human cognitive functions and has a basic role in cognitive science as one of the new sciences. Cognitive science and technology, like an interdisciplinary field, has attracted the attention of professors of basic sciences, medicine, engineering, social and behavioral sciences, arts and humanities in recent decades. The neuroscience course is one of the major courses in most disciplines of cognitive science and technology. Examining this (cognitive sciences) takes us into an unknown world that lies within us.

The architects need using neuroscience principles and principles in their design process to design healthy environments in line with the physical and mental health and user preferences (Roe, 2008). The surrounding physical environments can affect human cognition, their ability to solve problems, and their moods. This is because one can enhance the ability to understand and orient the surrounding world through the advancement of neuroscience (Bissell et al., 2015). Proper understanding of the support of the human nervous system can direct human behaviors toward interaction with the environment. The significance of this section is because "architects rely on visual stimuli to think, design, present and even create environmental experiences. Neuroscientists use visual stimuli to examine the emotional and cognitive demands of users in the field of neuroscience. Based on the results of these experiments, "negative emotions, fear, pain, anxiety, and concern could easily be pushed into positive moods by reasonably thoughtful design. According to this knowledge, one can clarify the ways and causes of the effects created by the effects of the interactions between the architectural

components of the environment and the human nervous system” (Nanda, Pati, Ghamari, & Bajema, 2013). Based on the achievements of this knowledge and complicated processes, and the neural activities of the brain, and an appropriate architectural structure can be reached to create a pleasant sensation in the users of the environment.

According to cognitive neuroscience, the sections for religious and “self” experiences are the same in the brain. Many human ethical reactions like patience, righteousness, justice, and refraining from anger are all inhibitory behaviors and when it comes to self controlling, it is the control of the emotional and limbic system in the language of cognitive neuroscience .

Neurologists indicated that the parietal lobe of the brain is effective in creating a sense of “unity with the world” (Soufian, 2011). They believe that human brain structures lead to spiritual eagerness (Newberg, Pourdehnad, Alavi, & d’Aquili, 2003).

By experiments conducted on Franciscan monks and Tibetan Buddhists using positron emission imaging, increased activity in the frontal lobe (Soufian, 2011) and decreased activity in the posterior upper lumbar lobe were observed (Persinger, 1983).

Much evidence was reviewed to correlate neural and neurochemical mediators with religious experiences (Soufian, 2011). It is determined that the neuroanatomies of self and religious experiences are both located in the anterior temporal lobe of the rectum and the limbic system and the prefrontal network. This means that religious experiences and the “self” use a neural network, and therefore religious experiences need “self” to form (Persinger, 1983) (Figures 1, 2).

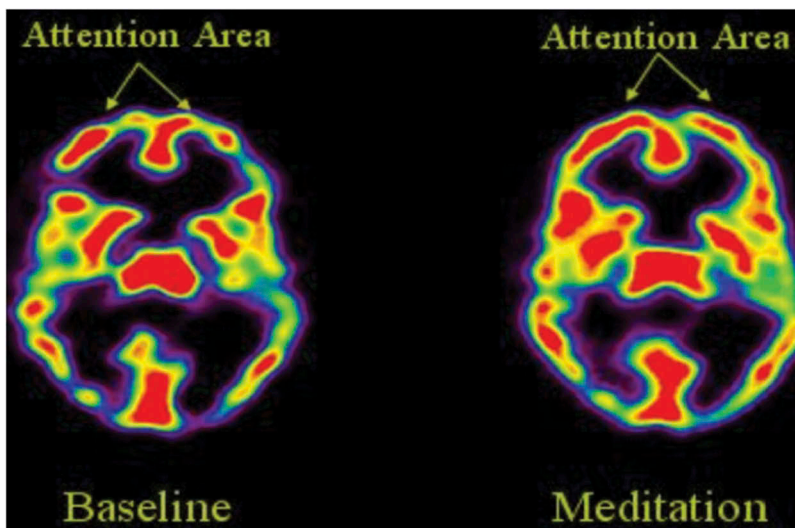


Figure 1. Comparison of SPECT images of the brain in the normal individuals and the one meditating (Soufian, 2011). Pictures are from the Cognitive neuroscience section.

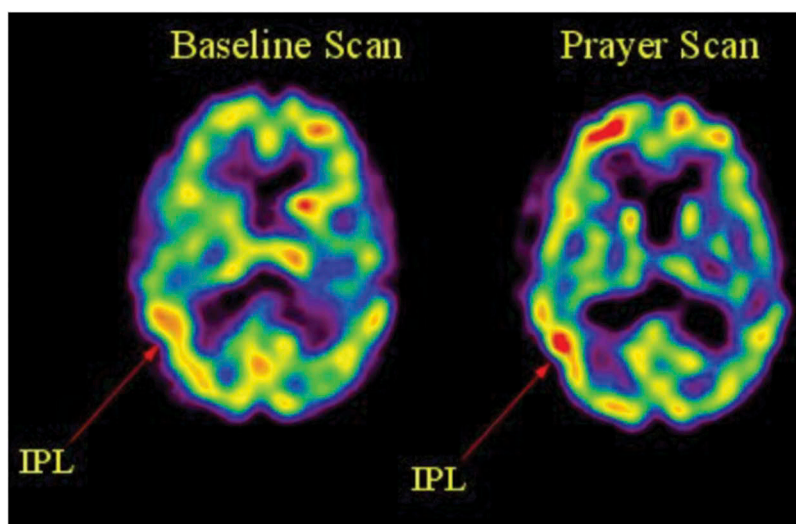


Figure 2. Comparison of the brain image between a religious person and an ordinary person (Soufian, 2011). Pictures are from the Cognitive neuroscience section.

Brainwaves

Human brainwaves were first measured in 1924 by Hans Berger. Nowadays, electroencephalogram (EEG) is one of the most useful tools in the diagnosis of epilepsy and other neurodegenerative diseases. The fact that a device can read brain signals has rendered the scientists, artists, and researchers imagine. The cerebral cortex has large values of neurons. The activities of these neurons are partly synchronized with the regular activation rhythms (brainwaves). Electrodes placed as paired on the skull can record the electrical potential changes resulting from these brain activities. EEG signals are affected by the state of sleep or wakefulness of the Cerebral cortex and show characteristic changes at different stages of sleep. EEG signals are affected by external stimuli as well, and brainwaves can be produced followed by external stimuli.

The human brain is the center of the human nervous system and a very complicated organ. This organ that is surrounded in the skull has a general structure similar to that of other mammals but is three times larger than that of a mammal of the same body size (Abdullah & Omar, 2011). The human emotion and its association with brain activity in EEG are completely recognized yet.

The human brain is the center of the human nervous system and is a very complex organ. Surrounded by the skull, this organ has an overall structure similar to that of other mammalian brains but is more than three times larger than that of a mammal of the same body size (Daly & Pedley, 1990). The cerebral cortex is somehow symmetrical from outside, and has two right and left hemispheres. Anatomists usually divide each hemisphere into four lobes:

frontal lobe, parietal lobe, temporal lobe, and occipital lobe. Brain electrical activities can be recorded with the help of an EEG.

Brain theta waves emit between 4 and 7 Hz. The only case below this frequency is Delta waves – which is the deep dreamless sleep state (it is even difficult for Zen masters to stay alert at these levels). A deep sense of deep relaxation is produced when the human brain produces theta waves. Nonetheless, Thomas Budzynski, who is one of the most renowned biofeedback researchers, argues that brain theta waves produce a “sense of detached relaxation” whose outcomes range from “sleepiness, hypnosis-like states to seeing brilliant and pseudo-holograms” (Budzynski, Budzynski, & Sherlin, 2012). This state of mind as to do with more creativity called super learning. The increase in the theta state creates a sense of equilibrium and relaxation in the individual and contributes to greater health.

Alpha brainwaves happen when the person is alert and calm and relax at the same time. In this state, it will be much easier for the person to come up with creative ideas. According to therapist report, Patt Lind-Kyle in his book “Heal your mind, rewrite your brain: using new brain science to synchronize the brain for creativity, peace, and relaxation” states when alpha waves emit the right side of the brain becomes more active and when the beta waves are produced, the left side of the brain becomes more active. When the two hemispheres of the brain are synchronized, the person will be in a calm awareness state. Alpha waves improve emotions like thinking, peace, relaxation, and solace.

ECG signals are scarcely used to specify individuals’ emotional states. These signals are usually used for medical purposes like the diagnosis of cardiac diseases. It is usually thought that the heart is only a machine for pumping blood. Nonetheless, one paper has used empirical state decomposition to identify emotional patterns on ECG signal where it is claimed that the one enjoying the sensation has an ECG signal with a frequency range between 0 to 40 Hz and a frequency range between 0.5 up to 1.2 mV. (Figure 3).

When the amplitude and frequency of momentary ECG are above or below these ranges, then one has a feeling of fear, anger, and sadness. If an individual feels sad, there will be an instantaneous frequency of less than 10 to 40 Hz and amplitude less than 0.2 to 0.25 mV. The individual will experience a frequency higher than 40 to 100 Hz and an amplitude greater than 1.5 mV for anger. When a person feels fear, then the ECG signal will have an instantaneous frequency of between 40 and 100 Hz and a range of between 0.3 and 1.5 mV (Shalini & Vanitha, 2013). Another study examined the timing of the ECG signal response when people were shocked by the shout (Ming, 2000). On the contrary, many studies have been done to identify individuals’ emotions using EEG signals. In this paper, new

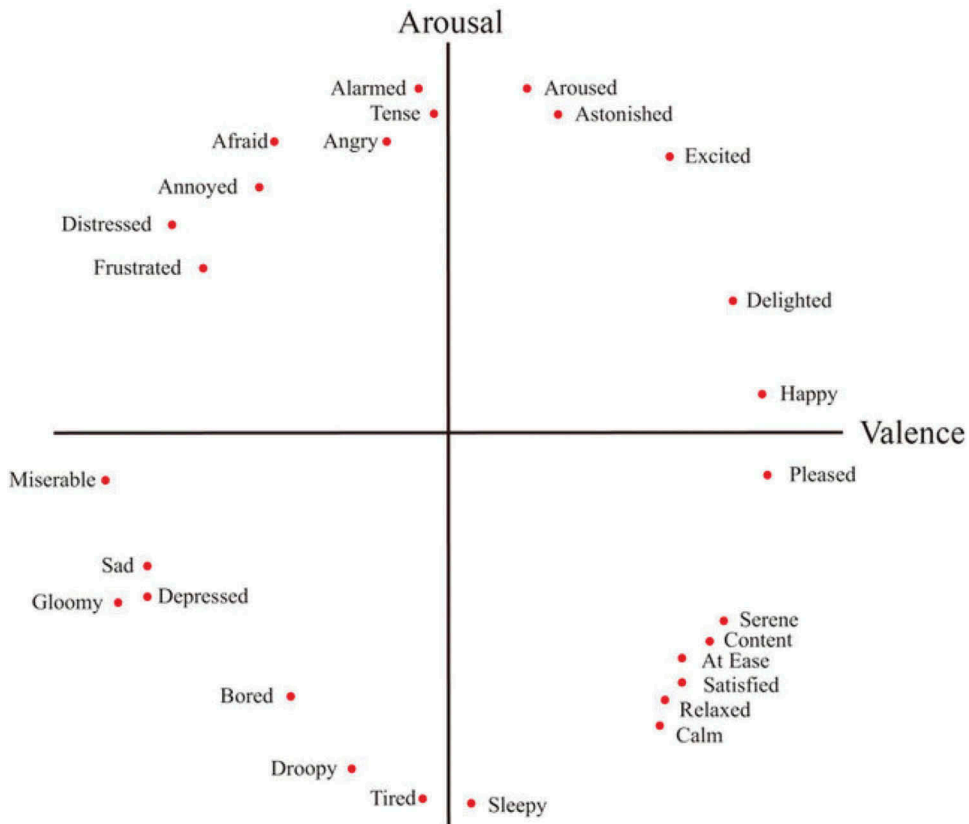


Figure 3. Russell's circumplex model. The circumplex model is developed by James Russell. In the model, emotions are distributed in a two-dimensional plane. The x-axis represents valence and the y-axis represents arousal. Valence refers to the positive and negative degree of emotion and arousal refers to the intensity of emotion. Using the circumplex model, emotional states can be presented at any level of valence and arousal (Seo & Huh, 2019). Pictures are from the Cognitive neuroscience section.

technologies have been suggested to examine how to measure memory effectiveness by dynamic EEG path analysis (Alarabi, Wahab, Karim, & Malaysia, 2013).

Imam Mosque of Isfahan, Iran

Investigating the components of environmental peace in an architectural work, especially Islamic mosques, requires a detailed understanding of this concept and its influential factors. In the architecture of the mosques of the past, certain patterns have always followed a continuous trend that made a logical relationship with the time before and after (MahdiNejad, Azemati, & Sadeghi Habibabad, 2020).

In the Safavid era, as the period of the emergence of Isfahan school of art and architecture, and with the assuming of power by Shah Ismail Safavid in

95 AH, the first national government in Iran after Islam was established. The security and prosperity created in the Safavid era was a suitable platform for the rise of Shiite intellectual life, fertility and the growth of Islamic art in all areas. Indeed, this era is one of the most creative eras of Islamic art as well as Islamic philosophy and metaphysics. Various disciplines of art such as literature, paintings, and music, which have deep bonds to Shiite religion and thought-philosophical bases, turn into the update language of this religion (Parvizi & Pourmand, 2013).

Imam Mosque is located in the southern part of Naghsh-e Jahan Square. This mosque is built as a four-iwan pattern with an area of about 12264 square meters and approximate dimensions of 130 * 100 meters in the style of comprehensive mosques in Iran. Four-iwan pattern is built in the four main directions and porches and booths are on either side (Azadi & Taghipour, 2017). From the south entrance, the porch can access the dome space, which is the most beautiful and important part of the mosque. This building shows the thousand-year peak of mosque construction in Iran.

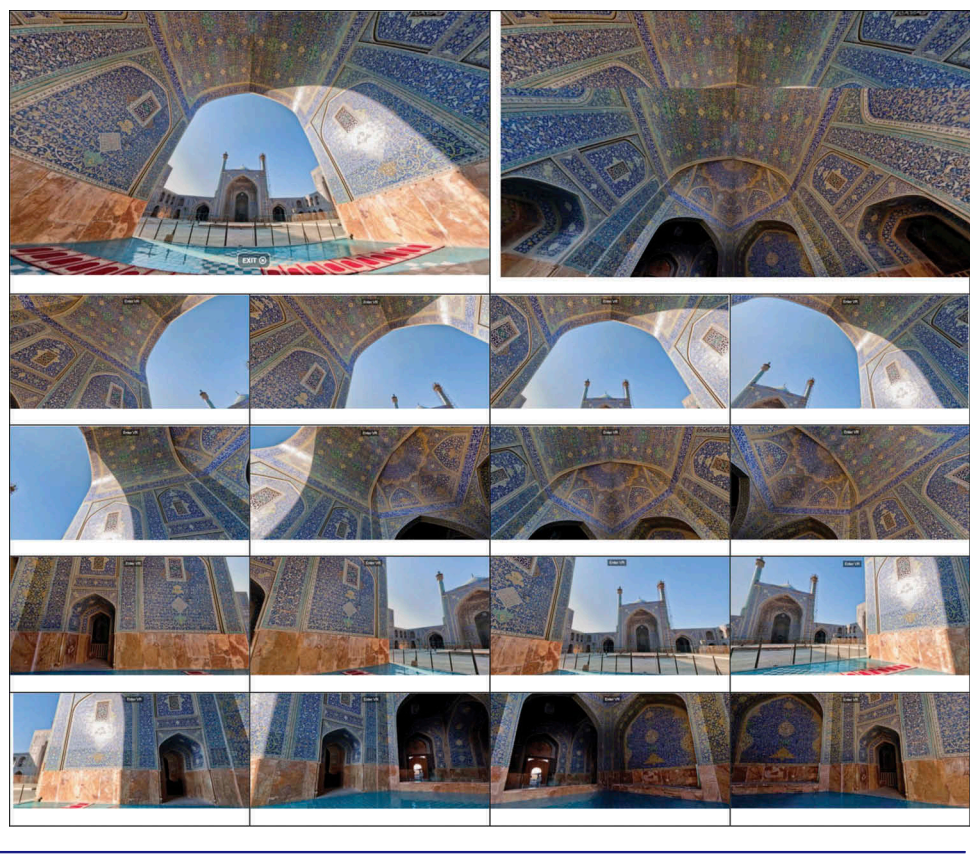
We will examine the users of this mosque's interiors according to their brainwave recording method and the mental and psychological effects created on the subjects are analyzed.

Methodology and data analysis

Sample: The sample size was 15 males and females at the age range from 20 to 38 years examined while seated on a chair. All subjects had normal health levels and showed similar vital results in general tests. For example, they were normal blood pressure, lack of diabetes mellitus, and lack of background to any disease or malfunction of vital organs.

Wave recording was done using a 16-channel EEG device, filter adjustment options, and automatic calibration mechanism. The electrodes were placed as caps using a special gel for electronic conduction and recording accuracy. The image of the porch in front of the dome of the mosque (Table 1) was rotated 360 degrees through a 30-degree angle monitor (Asgarzadeh, 2012; Hwang, Yoshizawa, Munakata, & Hirate, 2007) in front of the people (The image used can be accessed from this link: <https://www.360cities.net/image/imam-mosque-esfahan-iran>). Every individual was asked to see the images played through the monitor. After calibration, brain signals were recorded before the observation of the mosque's interior and after observation by individuals using a brain tape device using NEUROGUIDE software. The laboratory environment was in a comfortable condition to help people's peace of mind. It was repeated for all subjects with the waves recorded.

Table 1. A 360-degree image of Imam Isfahan Mosque taken from the porch of the mosque.



Discussion and data analysis

Data analysis was done in NEUROGUIDE software. The main focus of the study was on the four parameters of alpha and theta; and beta and theta; and alpha frequency.

The changes and fluctuations of brainwaves in those seeing the images of the mosque were different from the data before doing so (normal brainwaves before seeing the images). The results showed that the presence of people in the mosque building had a significant physical and psychological effect on the spiritual sense and creating comfort for the users of the building space.

One of the most measurable effects over a short period is anxiety shown in the frequency of brainwaves (Essawy, Kamel, & El-Sawy, 2014). This scale is measured using an EEG (based on brainwave frequency) and the recorded results are presented in charts (Charts 1 and 2).

The strong negative correlation between peak frequency and theta/beta ratios in both experimental conditions in Imam Mosque was vividly seen. Those showing an increase in energy levels at higher frequencies had a lower theta-

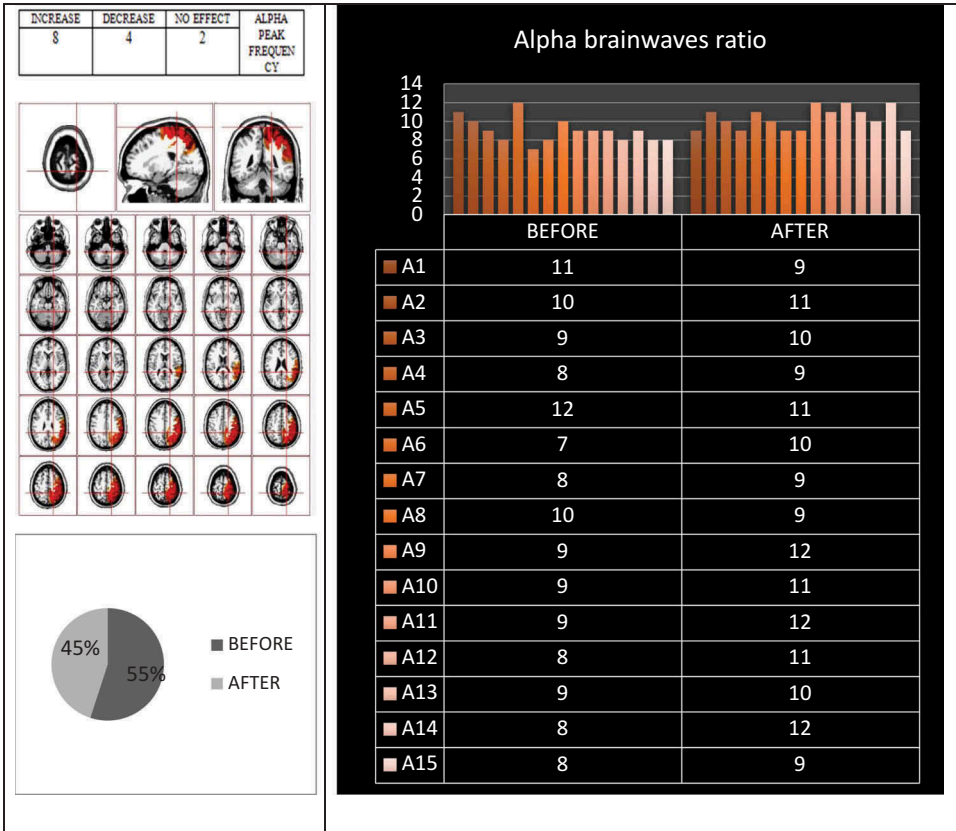


Chart 1. Alpha brainwaves ratio before and after seeing Imam Mosque in Esfahan.

beta ratio as well. However, the subjects showed a lower level of theta-to-beta ratio and a higher alpha peak frequency (healthier EEG). Theta-to-beta, alpha peak, and peak frequencies were measured to specify the relationship between subject brain modes using EEG.

According to Lubar (1991), using theta-to-beta ratios were used because this ratio is more appropriate than beta or theta ratios alone and produces an overall figure for use in statistical comparisons. In this study, only one active EEG channel was used and no corrections were made for repeating testing. However, according to this experiment, significant and important results were obtained that will be discussed.

Conclusion

According to the mean and standard deviation of the theta and alpha waves measured and analyzed, one can state that the mean alpha had an increasing value after viewing the mosque images and decreasing in the case of some other people. Moreover, theta wave amplitude had an increasing trend for most of the

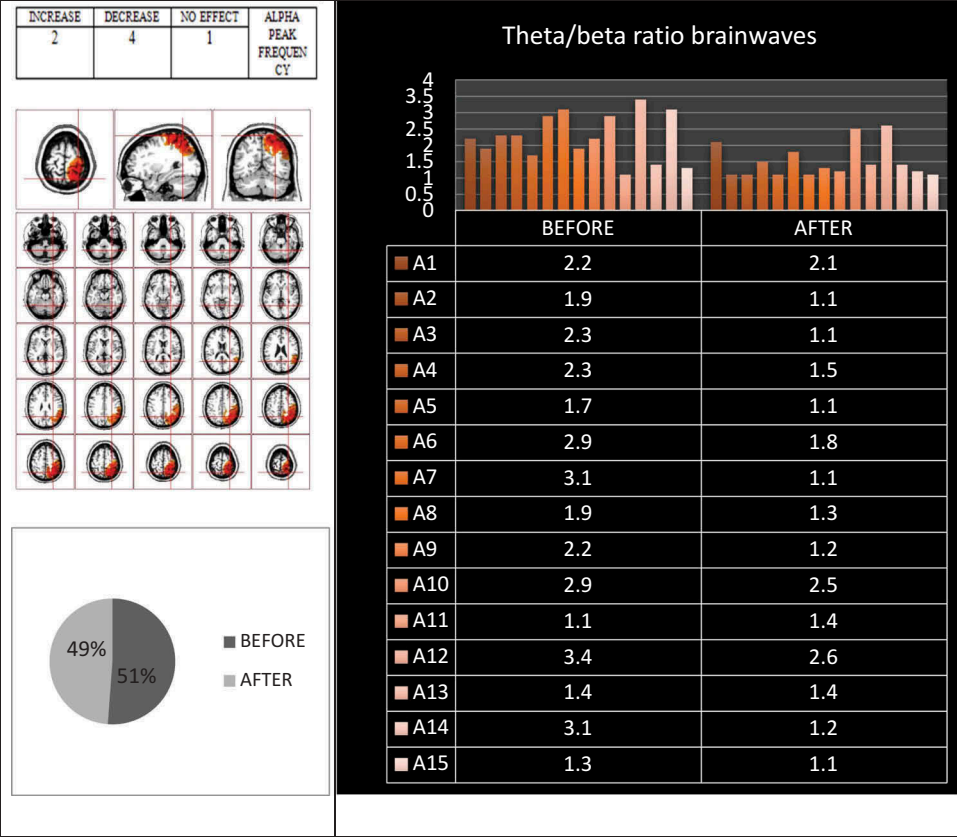


Chart 2. Theta-beta ratio brainwaves before and after seeing Imam Mosque in Esfahan. According to Lubar (1991), using theta-to-beta ratios were used because this ratio is more appropriate than beta or theta ratios alone and produces an overall figure for use in statistical comparisons.

people and decreasing for some others. Accordingly, one can state that given the increase in alpha and theta parameters in individuals after seeing the images of the Imam Mosque, the sense of peace and spiritual sense increased in people.

The effects of using religious buildings and experiencing being present in them led to peace and spiritual feeling. Human mental health largely depends on human relaxation. In other words, if it is overlooked in life, the individual's health will be compromised. Architecture and the physical characteristics of the buildings built have a significant role in individuals' reaching a sense of peace and spirituality.

The results indicated that while seeing the interior of the mosque building, the brainwaves of the individuals related to peace and spiritual sense are strongly affected that proves the experience of "soothing quality and spiritual sense". Accordingly, the physical features of such buildings can provide an educational process for other buildings, so that the architects build buildings with such unique features according to these teachings.

One has to note that the effects of the architectural body and buildings built affect people's minds. Thus, if this issue is ignored, the created space will cause confusion and a negative effect on the minds of the users of the space for sure. The results indicated that the architecture effects (architecture of religious spaces) on human are significant that has to be considered and used for other buildings.

Disclosure statement

The authors declare that they have no conflict of interest.

Informed consent

"Additional informed consent was obtained from all individual participants for whom identifying information is included in this article."

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