


BIOPHILIC INTERIOR DESIGN:
WATER FEATURES AND WELL-BEING IN THE UNIVERSITY INTERIORS

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ABSTRACT

Biophilic Interior Design: Using Water Features to Improve Well-Being in the University Interiors

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The concept of Biophilia is an innate human tendency to seek a connection with nature and biophilic design is the integration of the built environment and nature that offers a chance to design healthier places by lowering stress and improving well-being (Browning et. al, 2014; Kellert, 2005). Water features are considered to be one of the biophilic design elements used in the built environment for betterment through their ability to decrease stress and improve mood (Clouse, 2016). This research aims to find out the interior water features preferences and their influence on the occupants' mood through a survey. A case study was conducted at Izmir University of Economics (IUE), Turkey with different water features for the main entrance area of the Faculty of Fine Arts and Design (FFAD). In total, 74 individuals voluntarily participated in the survey, 62% were female and 32% were male while 5% said they did not want to mention their gender. Most of the participants were from 20 – 29 years of age (68%) and they were students from different departments. According to the results of the survey, the study proposes various design installations with different water features for the related building. It is concluded that although the occupants are mostly satisfied with the presence of interior water features, they prefer a direct access to nature in order to feel more connected with nature. Additionally, the study finds that interior water features can reduce stress and bring relaxation.

Keywords: Biophilic Design, Interior Water Features, Educational Environments, Well-Being

ÖZET

Biofilik İçmimari:
Üniversite İç Mekanlarında Refahı Artırmak İçin Su Elemanı Kullanımı

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Biofili kavramı, bireyin doğuştan gelen doğayla bağlantı kurma eğilimidir ve biofilik tasarım ise yapılı çevre ve doğanın bütünleştirilmesi ile daha düşük stres ve refahın (iyi-olmanın) artırılması ile daha sağlıklı yaşam mekanları tasarlama şansı sunmaktadır (Browning et. al, 2014; Kellert, 2005). Yapılı çevrede kullanılan su elemanları, stress seviyesini azaltması ve ruh halini geliştirmesi ile ıslah sağlayan biofilik tasarım elemanlarından biri olarak dikkate alınmaktadır (Clouse, 2016). Bu araştırma, bir anket çalışması ile iç mekanlarda su elemanı tercihleri ve bunların mekan kullanıcılarının ruh hali üzerindeki etkilerini ortaya çıkarmayı hedeflemektedir. Çalışma, Türkiye’de İzmir Ekonomi Üniversitesi (İEU), Güzel Sanatlar ve Tasarım Fakültesi (GSTF) Binası giriş alanında farklı su elemanı önerileriyle gerçekleştirilmiştir. Ankete toplamda 74 kişi gönüllü olarak katılmıştır; katılımcıların %62’si kadın, %32’si, erkektir ve %5 için cinsiyet belirtilmemiştir. Katılımcıların büyük bölümü (%68) 20-29 yaş grubundadır ve farklı bölümlerin öğrencileridir. Anket sonuçları doğrultusunda çalışma, çeşitli tasarım uygulamaları önermektedir. Sonuç olarak, kullanıcıların iç mekanlarda su elemanı kullanımları konusunda çoğunlukla memnuniyet göstermelerine rağmen, doğaya daha yakın bir bağ hissedebilmek için, iç mekandan doğaya doğrudan mekansal bir bağlantı şeklini tercih ettikleri görülmektedir.

Anahtar Kelimeler: Biofilik Tasarım, İç Mekan Su Elemanları, Eğitim Çevreleri, Refah (iyi-olma)

To the ones who believe in me.



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CHAPTER 1

INTRODUCTION

As a common ancient notion, human beings' exposure to nature is considered to have positive effects on their psychological health, therefore, being in an environment that stimulates well-being is feasible by restorative methods that improve mood and increase the vitality that rejuvenates from fatigue. Keeping a contact with water, plants and other natural elements can calm anxiety and help people cope with life's stresses more easily (Ulrich, 1979; Kellert, 2005).

The concept of biophilia put by E.O. Wilson as the "urge to affiliate with nature" explains the human actions, needs and appreciation of great satisfaction that come from nature, whether directly or indirectly (Wilson, 1984). Biophilia is defined as the inborn need to connect to nature and livings aiding in humans' physical and mental health and well-being (Kellert 2012, 2014; Wilson, 1984; Kellert and Wilson 1993; Ulrich, 1992).

Biophilic design is a way of designing an environment that invites people into reuniting with their nature. It is important because it gives people a chance to have a healthier life and work in healthier places with a decreased level of stress, added well-being, and greater mental health. Applying biophilic design in workplaces, healthcare facilities, schools, and neighbourhoods is known to be in a favour of the global health, and economy (Browning et. al, 2014; Kellert, 2005).

The thesis is composed of five chapters. The second chapter examines the concept of biophilia itself by interpreting it through the former studies and researchers in the field. The subheading of biophilic design is clarifying the roots of biophilia and biophilic design and its patterns, which integrated the study to work with the interior water features. The biophilic approaches in architecture and interior architecture include a short history of biophilic design through examples from the Neolithic to the contemporary period. This subheading also includes information on how to apply biophilic design in an environment. The effects of biophilic design describe the advantages and disadvantages of including nature and biophilic design in an interior environment specifically about the restorative effects of nature on humans (Hidalgo, 2014).

It is crucial to understand that the value of biophilic design is more than just a trend for making people feel more efficient and that its implementation weights on understanding nature and its benefits on the humans' physical and mental health. Therefore, the closer look of the biophilic design is given at the beginning of chapter 3 by looking at its effects on humans and the built environment

through previously done research as well as through different examples from interiors in offices, universities, houses and hospitals.

Water features are considered to be architectural design elements used in the interior with a purpose of improving the interiors in means of aesthetics, noise pollution, humidity and the mood of the users of the space. Hydrotherapy (a curing method through water) has been used as a method to various illnesses during the history of humans but with the advancement of engineering, on the contrary, the contemporary world is facing a shortage of clean water which can even cause health problems (Heerwagen and Mador, 2011). A closer look of the water element as a biophilic strategy for application in interiors is given in 3.2 discussed through previously done research in the connection between water and the built environment.

The case study for this research project was conducted in the settings of the Izmir University of Economics (IUE) and the entrance space of the Faculty of Fine Arts and Design (FFAD) suggesting a new design for space by using the biophilic principles such as interior water features. The study conducted surveys in order to classify the preferences of participants on interior water features and measure the effects caused by the same. Participants were mostly from 20 – 29 years of age from different departments containing more females than males participated to the survey.

A statistical analysis has been conducted regarding the overall findings from the conducted surveys. Accounting the second research question about the participants' interior features preferences according to gender, the results show an overall satisfaction of the participants from both males and females, however, they prefer direct access to nature view for a better connection with nature while indoors. In addition, both females and males chose the water walls, fountains, waterfalls and the like, as more preferred in the interior. Regarding the third research question concerning the relationship between interior water features preferences and the stress factor, females agreed more on lowered stress when in the presence of interior water features whereas males were more on the neutral side.

Finally, findings showed that designers are experiencing higher levels of stress than non-designers. The findings from the 3D visualizations showed the water installation of water wall as more preferred whereas the ocean view wallpaper and the aquarium had the same level of preferences as an application in the entrance of the FFAD building.

1.1 Aim of the study

This study hypothesizes that applying water features in the interiors using biophilic design approaches may help in the improvement of the occupant's environment for a state of well-being. Furthermore, applying biophilic approaches using the water elements expands the chances of creating amusing, sustaining, inspiring and cost-effective environments for human habitation (Kellert, Heerwagen and Mador, 2011). Additionally, this study aims to find the preferences of interior water features and measure the feelings of participants when in presence of biophilic design.

One of the concerns that lead to the construction of this research project is the well-being of students that are constantly exposed to stress and work overload during their academic year which leads to mental fatigue. Mental fatigue occurs when the brain is experiencing a continual mental effort which may reduce the ability of students' academic successes (Felsten, 2008). Accordingly, students are constantly dealing with stress and mental fatigued state of mind, therefore, applying interior water features in their everyday spaces may improve their mental health and well-being.

1.2 Objectives

It is beneficial and important for the mental health and well-being of the college students to find places in their campus where they can experience mental restoration and continue their work cognitively revitalized. For this reason, there are 4 different types of interior water features proposed for the entrance of the D block so the students of the campus area can use these biophilic elements for a mental rejuvenation and continue their work refreshed. For the measurement of their preferences on interior water features an online and a hard copy survey was conducted, one of which included a part where 3D visualizations for the proposal of the application of interior features in the building's entrance were shown, however, this part was only given to the participants who were familiar with the space in order to get a more precise opinion.

CHAPTER 2

THE CONCEPT OF BIOPHILIA

The concept of biophilia, as well as the one of biomimicry, emphasize the human and nature relationship relying on the fact that the human welfares can be developed ones the processes of the evolutionary adaptations are understood, particularly in the design of the built environment and in adopting more from the sustainable world (Kellert, 2014).

The concept of biophilia put by E.O. Wilson as the “urge to affiliate with nature” explains the human actions, needs and appreciation of great satisfaction that come from nature, whether directly or indirectly, therefore, there is no doubt that people benefit from the connection to nature (Wilson, 1984). At this point, biomimicry and biophilia are different by their focus. Biophilia is defined as the inborn need to connect to nature and livings aiding in humans’ physical and mental health (Kellert 2012, 2014; Wilson 1984; Kellert and Wilson 1993).

On the other side, biomimicry is defined as nature’s examiner by all the elements, patterns and systems to follow and motivate with an attention to evolution by natural selection in the inhuman environment and sorts, while biophilia underscores the evolved reactions of humans to nature (Kellert, 2014). Furthermore, Joye (2007) points out additional reasons why biomimicry in architecture can also cause biophilic responses as more empirical in nature. First, research on environmental preference is usually using imitation of nature (photos, posters, videos, paintings). In this case, the data collected out of this type of stimuli suggest that the reality is no different than the imitation. Second, nature has been used during the whole history of art for the betterment of aesthetic in a figurative way, in acknowledgement of biophilic design. Three, research also proves that geometric abstractions from nature identify valid response (Joye, 2007).

Janine Benyus (2008), an expert in the field of biomimicry, proposes a collected nature inspired biophilic design elements such as organic form and structure, daylight, natural ventilation, natural sounds, a dynamic palette of colours, mimicking and restorative landscapes, and bio-inspired gardens (Hidalgo, 2014).

2.1 Biophilic Design

Biophilic design is a way of designing an environment that invites people into reuniting with their nature. It is important because it gives people a chance to have a life and work in healthier places with a decreased level of stress, added well-being and greater mental health. Applying biophilic design in workplaces, healthcare facilities, schools and neighbourhoods is known to be in a favour of the global health and economy (Browning et al, 2014).

As mentioned before, biophilia brings the attention of the innate human need for the contact with nature and their adaptations to the natural world over the evolution showing maintenance in humans' physical and mental health and well-being. Therefore, biophilic design is the integration of this appreciative and the design of the built environment (Kellert, 2014).

Accordingly, the fulfilment from the contact with nature in the built environment is called "positive environmental impact" or "biophilic design". As a result, there are two basic dimensions of the biophilic design: organic design and vernacular design as the use of shapes and forms in the built environments or sites that either directly or indirectly provoke the humans' inborn attraction to the natural world. Organic design's outcome is realized over the practice of natural lighting, ventilation, and materials; the presences of water and vegetation; decoration and ornamentation mimicking natural forms and processes etc. Whereas the buildings and landscapes that nurture a link to places through the connection to culture, history, and ecology refer to the vernacular design (Kellert, 2005).

The reason why biophilia is biologically encoded is that it is verifying physical, emotional, and intellectual health in humans' development during the evolution. Therefore humans' necessity for the contact with nature reveals the accuracy of humans' evolution in nature and not in an artificial or constructed world. Put differently, the background of the human evolution regarding the human mind and body originates from a sensory world led through an environment structured by light, sound, odour, wind, weather, water, vegetation, animals, and landscapes. The development of the last 5,000 years of extensive industries, technology, and mass production, engineering and modern city represents a minor section of the history of humans not in charge for the welfares of the natural environment (Kellert, 2008). However, any biophilic explanation for human behaviours must also recognize that as the dominant habitat of humanity, cities should be taken seriously as 'ecological' not just socio-cultural entities (Byrne, 2010).

Low-environmental-impact design results in a little net benefit to productivity, health, and well-being. Biophilic design is, thus, viewed as the largely missing link in prevailing approaches to sustainable design. Low-environmental-impact and biophilic design must, therefore, work in complementary relation to achieve true and lasting sustainability. (Kellert, 2008).

Browning et al. (2014) provide a combination of 14 patterns (Table 2.1) offering a service during the design process as an extra tool in the designer's toolkit with a purpose to integrate the sides of the built and natural environments. Consequently, each of the biophilic design patterns can influence and redesign each and every space differently. In the last two decades, the science of biophilic design has rapidly been developing and as a consequence, it is likely that some patterns will be supported more over the other ones but, new patterns will always occur since a growing interest on biophilia in research have been shown lately. Seeing it from a spatial point of view, biophilic design patterns are perspective of shuffling the designer's attention towards the connection between people, health, high-performance design and aesthetics (Browning et al, 2014).

Table 2.1 demonstrates how the 14 patterns aid in stress reduction, cognitive performance, emotions and mood improvement. The patterns marked with up to three stars (***) are supported by more demanding empirical data, specifying that the pattern has a great potential for a great effect, and no stars means that there is less research evidence provided for supporting the biological relationship between health and design, however, it contains a possible effect and significance as a unique pattern.

Table 2.1. Biophilic Design Pattern and Biological Responses. (Source: Browning et al. 2014, pg.12).

| 14 PATTERNS | * | STRESS REDUCTION | COGNITIVE PERFORMANCE | EMOTION, MOOD & PREFERENCE |
|----------------------------|-----------------------------------|--|--|--|
| NATURE IN THE SPACE | Visual Connection with Nature | * * * * Lowered blood pressure and heart rate (Brown, Barton & Gladwell, 2013; van den Berg, Hartig, & Staats, 2007; Tsunetsugu & Miyazaki, 2005) | Improved mental engagement/ attentiveness (Biederman & Vessel, 2006) | Positively impacted attitude and overall happiness (Barton & Pretty, 2010) |
| | Non-Visual Connection with Nature | * * Reduced systolic blood pressure and stress hormones (Park, Tsunetsugu, Kasetani et al., 2009; Hartig, Evans, Jamner et al., 2003; Orsega-Smith, Mowen, Payne et al., 2004; Ulrich, Simons, Losito et al., 1991) | Positively impacted on cognitive performance (Mehta, Zhu & Cheema, 2012; Ljungberg, Neely, & Lundström, 2004) | Perceived improvements in mental health and tranquility (Li, Kobayashi, Inagaki et al., 2012; Jahncke, et al., 2011; Tsunetsugu, Park, & Miyazaki, 2010; Kim, Ren, & Fielding, 2007; Stigsdotter & Grahn, 2003) |
| | Non-Rhythmic Sensory Stimuli | * * Positively impacted on heart rate, systolic blood pressure and sympathetic nervous system activity (Li, 2009; Park et al., 2008; Kahn et al., 2008; Beauchamp, et al., 2003; Ulrich et al., 1991) | Observed and quantified behavioral measures of attention and exploration (Windhager et al., 2011) | |
| | Thermal & Airflow Variability | * * Positively impacted comfort, well-being and productivity (Heerwagen, 2006; Tham & Willem, 2005; Wigö, 2005) | Positively impacted concentration (Hartig et al., 2003; Hartig et al., 1991; R. Kaplan & Kaplan, 1989) | Improved perception of temporal and spatial pleasure (alliesthesia) (Parkinson, de Dear & Candido, 2012; Zhang, Arens, Huizenga & Han, 2010; Arens, Zhang & Huizenga, 2006; Zhang, 2003; de Dear & Brager, 2002; Heschong, 1979) |
| | Presence of Water | * * Reduced stress, increased feelings of tranquility, lower heart rate and blood pressure (Alvarsson, Wiens, & Nilsson, 2010; Pheasant, Fisher, Watts et al., 2010; Biederman & Vessel, 2006) | Improved concentration and memory restoration (Alvarsson et al., 2010; Biederman & Vessel, 2006) Enhanced perception and psychological responsiveness (Alvarsson et al., 2010; Hunter et al., 2010) | Observed preferences and positive emotional responses (Windhager, 2011; Barton & Pretty, 2010; White, Smith, Humphryes et al., 2010; Karmanov & Hamel, 2008; Biederman & Vessel, 2006; Heerwagen & Orians, 1993; Ruso & Atzwanger, 2003; Ulrich, 1983) |
| | Dynamic & Diffuse Light | * * Positively impacted circadian system functioning (Figueiro, Brons, Plitnick et al., 2011; Beckett & Roden, 2009) Increased visual comfort (Elyezadi, 2012; Kim & Kim, 2007) | | |
| | Connection with Natural Systems | | | Enhanced positive health responses; Shifted perception of environment (Kellert et al., 2008) |
| NATURAL ANALOGUES | Biomorphic Forms & Patterns | * | | Observed view preference (Vessel, 2012; Joye, 2007) |
| | Material Connection with Nature | | Decreased diastolic blood pressure (Tsunetsugu, Miyazaki & Sato, 2007) Improved creative performance (Lichtenfeld et al., 2012) | Improved comfort (Tsunetsugu, Miyazaki & Sato 2007) |
| | Complexity & Order | * * Positively impacted perceptual and physiological stress responses (Salingaros, 2012; Joye, 2007; Taylor, 2006; S. Kaplan, 1988) | | Observed view preference (Salingaros, 2012; Hägerhäll, Laike, Taylor et al., 2008; Hägerhäll, Purcella, & Taylor, 2004; Taylor, 2006) |
| NATURAL ANALOGUES | Biomorphic Forms & Patterns | * | | Observed view preference (Vessel, 2012; Joye, 2007) |
| | Material Connection with Nature | | Decreased diastolic blood pressure (Tsunetsugu, Miyazaki & Sato, 2007) Improved creative performance (Lichtenfeld et al., 2012) | Improved comfort (Tsunetsugu, Miyazaki & Sato 2007) |
| | Complexity & Order | * * Positively impacted perceptual and physiological stress responses (Salingaros, 2012; Joye, 2007; Taylor, 2006; S. Kaplan, 1988) | | Observed view preference (Salingaros, 2012; Hägerhäll, Laike, Taylor et al., 2008; Hägerhäll, Purcella, & Taylor, 2004; Taylor, 2006) |
| NATURE OF THE SPACE | Prospect | * * * Reduced stress (Grahn & Stigsdotter, 2010) | Reduced boredom, irritation, fatigue (Clearwater & Coss, 1991) | Improved comfort and perceived safety (Herzog & Bryce, 2007; Wang & Taylor, 2006; Petherick, 2000) |
| | Refuge | * * * | Improved concentration, attention and perception of safety (Grahn & Stigsdotter, 2010; Wang & Taylor, 2006; Wang & Taylor, 2006; Petherick, 2000; Ulrich et al., 1993) | |
| | Mystery | * * | | Induced strong pleasure response (Biederman, 2011; Salimpoor, Benovoy, Larcher et al., 2011; Ikemi, 2005; Blood & Zatorre, 2001) |
| | Risk/Peril | * | | Resulted in strong dopamine or pleasure responses (Kohno et al., 2013; Wang & Tsien, 2011; Zald et al., 2008) |

2.1.1 Biophilic Approaches in Architecture

The evidence of its existence since the early human ages through natural themes in structures and places can be found even before naming it biophilia for example decorated pillars with animal and vegetative themes of the Neolithic Göbekli Tepe, the Egyptian sphinx, Greek temples (Figure 2.1) with acanthus leaves, leafy ornamentations of Rococo design et cetera. The appearance of biophilic design through the history indicates it as an old phenomenon in the field of applied sciences. In the 19th century when the human population size started increasing people started to feel worried about their health due to the loss of natural resources and the growth of urban areas. For this reason, large public parks were the most valuable recreational areas for staying healthy and decreasing stress while living in urban environments (Browning et al. 2014).



Figure 2. 1. Biophilic design examples through the history of humans. (Source: From left to right <https://tepetelegrams.wordpress.com/tag/t-pillars/>; <https://egyptianmuseum4.wikispaces.com/The+Great+Sphinx+at+Giza> ;<http://manqal.hellenes.co/corinthian-architecture/>; <https://www.wondermondo.com/ottobeuren-abbey/>).

As the most obvious example of the inspiration that comes from natural objects, shapes and processes that have been drawn as an inspiration through the history of architecture, is ornament itself. This type of decoration consists of representations which might be closely similar, or reminiscent of, the animal and plant world. Apart from such exact biomimicry, a few architects, especially Antonio Gaudi, took helpful lectures from the structural power commanding natural structures, in the outcome of efficient and economically constructed architecture. Currently, there appears to be improved sympathy towards nature and architecture, namely in zoomorphic or biomorphic architecture. That specific architecture, in particular, adopts digital design software that allows creating curved shapes and geometry that are identically representing the existing organisms and creatures in the natural world. When looking back for thousands of years, it is obvious that humans were more involved in nature and were depending on it. For example, trees were used as a protection from sun, rain and wild predators. In the sense of these circumstances, it is almost

known why components and settings containing vegetation are still a matter of aesthetic or have preferring responses to contemporary humans (Joye, 2007).

Therefore, it is crucial to understand that the value of biophilic design is more than just a trend for making people feel more efficient. Its effective implementation weights on understanding nature, being aware of the physical and mental well-being and the connection to the other worlds beyond the humans' one which is from the others' (Kellert, 2015).

The building or a landscape that has undergone a biophilic design implementation can change its settings in the short term, however, later on, it is expected to shift into an ecologically tough and sustainable natural community. Efficacious implementation of biophilic design brings consequences in an extensive variety of physical, mental and behavioural benefits. Some of these benefits include improved physical health, lower blood pressure, improved mood, fewer diseases, more work satisfaction, creativity and motivation, better concentration and enriched social interaction, and the like (Kellert and Calabrese, 2015).

Applying a single building in a natural environment does not certainly explain its own architectural form or humans' inherited connection to their nature. Most of the time, people occupy environments where buildings dominate nature and apply biophilic design affecting its architectural form. However, in what way should such applications be considered? A first approach is to copy natural objects i.e. vegetation which can be done in various abstractive ways. This technique is already known from the old-aged tradition with floral and vegetal patterns in the traditional ornament. However, exceeded symbolic or schematic interpretation of nature can cause reactions and responses from architects and be seen as kitsch (Joye, 2007).

In order to avoid misinterpretation of the biophilic design in an environment, Joye (2011) offers two possible strategies for people to feel the existence of biophilic design. The first strategy suggests that people experience real nature for example greenery in architecture through harmonizing buildings with plant life (potted plants or trees); bring a view to nature; maintaining exterior vegetation (for ex: "green roofs") etc. The second strategy suggests implementing vegetation in architecture by mimicking the natural elements through three approaches:

1. To combine roughly identical vegetative imitations in architecture design (for ex: plant-based ornaments);
2. To mimic nature in architecture in a more artistic and abstract way. This method is known to provoke Biophilic responses in the human brain by interpreting these frames as a mirror of nature itself. A good example is the interior of Gaudi's Sagrada Familia with the stylized columns of forest-like trees.

3. Copying minor visual characteristics of nature in architecture like fractal characteristics. According to some Biophilic design theorists, a three-dimensional architecture with fractal elements are most likely to evoke biophilic reactions. Accordingly, the cases of Gothic and Hindu temples are preeminent models of fractal architecture (Joye, 2011).

2.1.2 Biophilic Approaches in Interior Architecture

In order to revise the early historical evolution of space planning and interior design, one needs to devise the interconnection between the disciplines of architecture and decorative arts, including ornamentation and furniture as a track to the elevation of architecture. In ancient time, architecture, space planning and the decorative arts were without a doubt an image of every day's life. Therefore, the size of rooms and walled spaces were regulated by many social factors including engineering too. Over 6,000 years ago, the Mesopotamians developed a system of linear measurements (Figure 2.2) as a precondition of the construction of many monumental buildings like the Tower of Babel, the Pyramids and the Parthenon (Kubba, 2003).

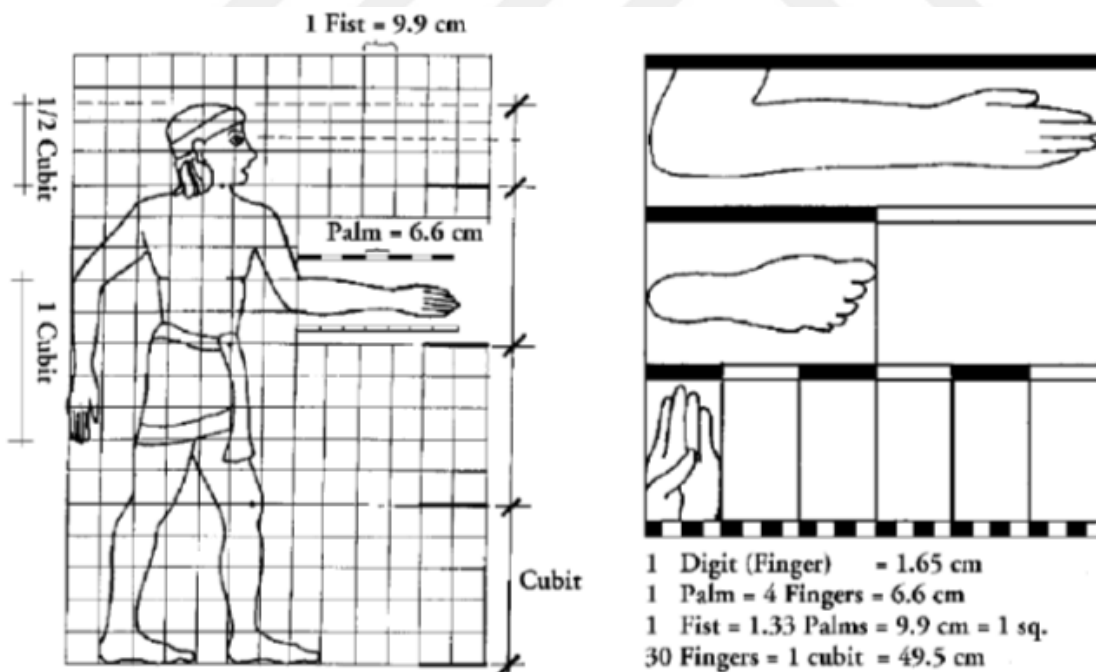


Figure 2. 2. Sumerian units of measurement based on parts of the body. (Source: Sam Kubba, 2003, pg. 3.)

Thus, the cubit was established based on the human body parts. Early space planning can be traced in Mesopotamia during the Early Dynastic Period (c.3000 to 2350 B.C) when the monumental temple the Ziggurat of Babylon (Figure 2.3) was built with the use of optical illusion for the first time in history. Regarding early design and production of furniture, the ancient designers of both Mesopotamia and Egypt were familiar enough with ergonomics (Kubba, 2003).



Figure 2. 3. Ziggurat of Babylon. (Source: <http://www.europexplor.fr/babylone-conference-projection/>).

In the later years, a huge role in the space planning and design are playing the environmental issues which brought out a squad of conscious designers and space planners including the oldest firms Hellmuth Obata + Kassabaum (HOK) and Herman Miller as heads of sustainable design. Sustainable design is striving for less negative impacts on the environments, also known as “Green design” (Kubba, 2003)

Furthermore, the interior designers of the 21st century are more than ever cultivating biophilic design by applying it in workspaces for clients around the world (Figure 2.4). Workspaces of this type consist of natural ventilation, radiant cooling systems, dynamic lighting capable of circadian

programming with diffuse appearance, and ceiling systems with textured appearances mimicking different qualities of nature (Trott, 2016).



*Figure 2. 4. 21st Century Biophilic Design Workspace, Caddo Holdings, Dallas TX.
(Source: <https://www.metropolismag.com/interiors/workplace-interiors/designing-workplaces-for-clarity-of-mind/>).*

2.1 Restorative Effects of Biophilic Design

Apart from the constructional aspects of built environments, researchers have tested that worker performance, well-being and comfort has been influenced by access to nature justified by several theories that made it easier to comprehend why contact with nature is considered to be in favour for workers. From the viewpoint of attention restoration theory (Kaplan and Kaplan, 1989), interiors with nature transmit restorative environments due to their power to efficiently attract one's attention and deliver calmness and recovery. Even a brief occasion of relaxation (e.g., looking out the window at a tree or at a plant indoors) is capable of offering what Kaplan (1993) refers to as micro-restorative experiences (Mangone et al. 2017).

Biophilic strategies are known to deliver a good nature-like feeling to an office that improves collaboration and productivity. Greenery and nature imagery bring extra advantages but there

should be a studied way of using it in the design process. A study by Heerwagen and Orians has found that people working in offices without windows often placed images of nature, including murals, in their offices (Heerwagen and Orians, 1986; Kellert, 2005). A 1992 scientific study by Roger Ulrich shows that ill patients that were facing tranquil pictures (including water or other nature scenes) while laying on their hospital beds have shown a better recovery process than the patients that were facing random pictures or no pictures at all.

There is a particular inspection of people using specific places for self and emotional regulation, which is known to research on place identity, place attachment, and restorative environment. Generally, psychological restoration is a person's capability of beating stress and mental fatigue together with practising mental revitalization (Hidalgo, 2014).

Seen from a psychological point of view, being exposed to nature can have a restorative effect on people. Restoration (from Latin recreation, recreationis = restoration, refreshment, recovery), stands for the refreshment of person's psychological and physiological condition through an experience in a particular environment (Joye and Berg, 2013). However, restoration of natural threats and further forces of nature are not effective on humans but unlikely they outgrow biophobia in dissimilar ways. These statements do not indicate that nature's restorative effects are incorrect, however, there are cons and pros to study when it comes to working with nature (Hidalgo, 2014).

CHAPTER 3

ELEMENTS OF BIOPHILIC DESIGN

Biophilic design creates a decent atmosphere in the modern built environment for people improving their health, fitness and well-being. Its effective implementation requires obeying some of the elementary principles such as:

1. Requires repeated and sustained engagement with nature
2. Focuses on human adaptations to the natural world that over evolutionary time have improved people's health, fitness and well-being
3. Encourages an emotional attachment to particular settings and places
4. Promotes positive interactions between people and nature that encourage an expanded sense of relationship and responsibility for the human and natural communities
5. Encourages mutual reinforcing, interconnected, and integrated architectural solutions (Kellert and Calabrese, 2015).

The building or a landscape that has undergone a biophilic design implementation can change its settings in the short term, however, later on, it is expected to shift into an ecologically tough and sustainable natural community. Efficacious implementation of biophilic design brings consequences in an extensive variety of physical, mental and behavioural benefits. Some of these benefits include improved physical health, lower blood pressure, improved mood, fewer diseases, more work satisfaction, creativity and motivation, better concentration and enriched social interaction, and the like. (Kellert and Calabrese, 2015).

Interior designers are more than ever cultivating biophilic design by applying it in workspaces for clients around the world. Workspaces of this type consist of natural ventilation, radiant cooling systems, dynamic lighting capable of circadian programming with diffuse appearance, and ceiling systems with textured appearances mimicking different qualities of nature (Trott, 2016).

3.1 Examples of Biophilic Design

A project with a good example of biophilic design applied in the interior is the U.S. Green Building Council (Figure 3.1) headquarters in Washington, D.C. in 2009 by the architecture firm Perkins and Will. The project's goals were to reduce energy and maximize natural light. Therefore,

the office space plan was widely open and clear, letting the workers look to the outside but also allow them to see at each other, unlike the old cubicle worker's desk (Figure 3.2) that do not allow you to see anything beyond your working desk and computer which also blocks the direct passing of the natural light into the working space. Research has shown that the reason employees do not feel productive enough, have poor working principles, face a hard time focusing and have low energy is the bad office design. Further useful supplements in biophilic design are the natural elements such as the two-story waterfall in the USGBC's main public area bringing the sound and the movement of the water accessible to every passenger. In addition to that, plants and images of nature are also included at every single workstation in the USGBC offices (Wilson, 2016).



3.1. Biophilic Office, U.S. Green Building Council headquarters in Washington, D.C.
(Source: <http://abpcx.com/2012/04/usgbc-hq/>).



*Figure 3.2. Non-Biophilic Office (British Telecom in Debrecen, Hungary).
(Source: <http://www.debrecensun.hu/eco/2015/09/16/200-new-jobs-at-british-telecom/>).*



*Figure 3.3. Nixon Peabody law firm (Washington, D.C.).
(Source: <https://workdesign.com/2016/08/nixon-peabodys-cutting-edge-dc-law-office/>).*

Similarly, the law firm Nixon Peabody in their office in Washington, D.C. (Figure 3.3) embraces biophilic design strategies with a cutting-edge 36-foot tall living wall located against the perimeter window line. This supreme biophilic element connects three floors while improving the indoor air quality and at the same time showing firms dedication to sustainability. Few employees say that they have seen a significant increase in the number of people getting up from their desks and moving around more frequently. Collectively they have witnessed an improvement of both their physical and emotional health after taking a walk around the green wall by consequently feeling the ‘calming’ effect, says reports the Work Design magazine from an interview with Jeff Lesk, managing partner of the DC office (Grasso, 2015). Architectural projects that best represent sustainability usually get awarded with a LEED certification by earning points on several categories like save energy, water, resources, generate less waste and support human health. LEED awarded buildings are known to draw the attention of the inhabitants by costing less to operate while boosting employees’ productivity and work efficiency. However, even architecture that is not characterized by a LEED certification can import characteristics of a biophilic structure. This can be seen in the case of some modernist architecture such as Mies van der Rohe’s iconic Farnsworth House, 1951 (Figure 3.4) constructed in glass within an organic environment surrounded by nature. House’s own characteristics can possibly lead to biophilic reactions in the inhabitants (Joye, 2007).



Figure 3.4. Farnsworth House by Mies van der Rohe, Plano, IL, USA. (Source: <https://farnsworthhouse.org/>).

Another example of what is meant by biophilic architecture is done by two Spanish architects of Selgas Cano who designed their own architecture office located in the woods near Madrid (Figure 3.5). This rare glass office is made of two centimetres thick curved windows, eleven centimetres thick insulated fibreglass and polyester, protecting the workers from the direct sunlight by giving them a shade and stopping the tube office from becoming too hot. The long curved up windows exclude the need for artificial lighting through the day.



Figure 3.5. Selgas Cano architecture office in Madrid, Spain.
(Source: <https://www.archdaily.com/21049/selgas-cano-architecture-office-by-iwan-baan>).

The practice of biophilia in the interior is mostly known in hospitals even since its early appearance when research had shown that good design can shorten hospital stays. Later on, the awareness was starting to raise among healthcare managers for designing hospitals with a design that will be ‘psychologically supportive’, enhance the quality for patients, enhance the quality of health care and low certain costs (Ulrich, 1992).

So far, this method has been applied to the Khoo Teck Puat Hospital in Singapore (Figure 3.6) which is serving healthcare to more than 700,000 inhabitants. Bedding districts are divided into two sections, each with a private toilet and shower facilities. To avoid patient injury, the hospital does

not have any protruding sinks or cupboards in the wards. The building's walls are considered to prevail in north-east winds which would enhance the airflow by twenty to thirty per cent.



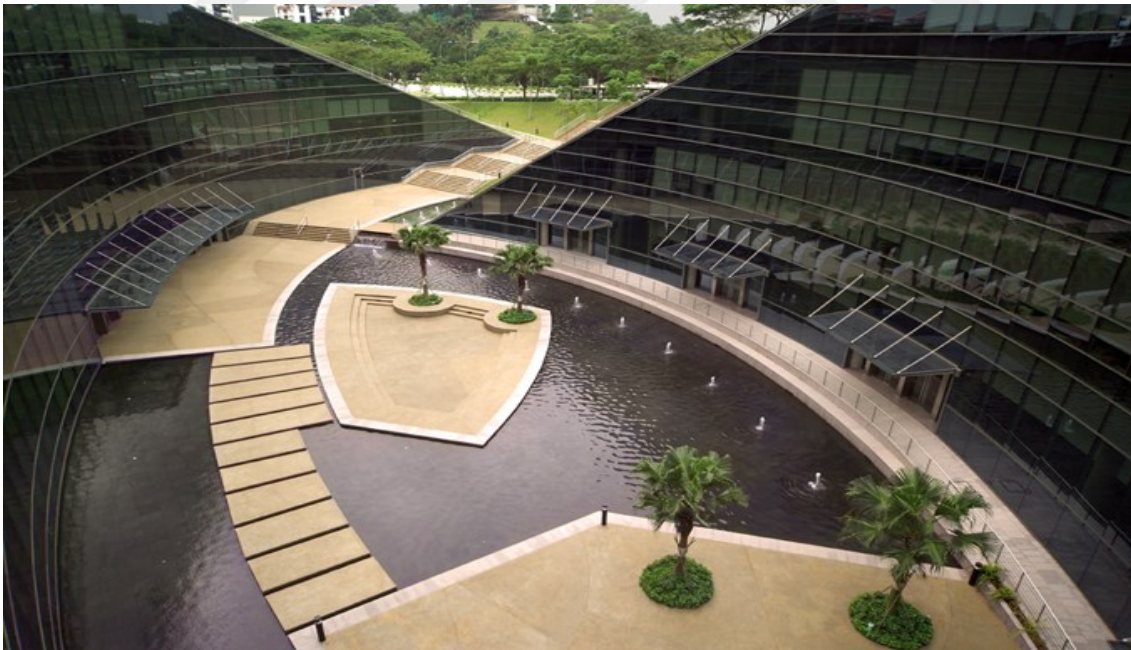
Figure 3.6. Khoo Teck Puat Hospital (Yishun, Singapore). (Source: <https://gbdmagazine.com/2018/singapore-hospital>).

There are window sunshades that protect patients from direct sunlight which also redirect light towards the ceiling for enhancing the brightness of the wards and save energy. The public areas are powered by solar panels and the air-conditioning system itself is supplying air from internal courtyards, where the air stays cooler.

Another example is the major biophilic project of the two hundred-hectare university campus of the Nanyang Technological University School of Art, Design and Media (Figures 3.7) situated on a wooded valley with preserved green lung shape according to the master plan. Following the original plan, the shape of the building originated by carving the constraints of the valley. The building is characterized by its interior and exterior transparency and connectivity, and a unique green roof covering up all the building with internal allowing sight towards the fountains at the entrances of the ground floor.



*Figures 3.7. School of Art, Design & Media, Nanyang Technological University, Singapore – exterior view.
(Source: https://www.cpgcorp.com.sg/CPGC/Project/Project_Details?ProjectID=1022).*



*Figures 3.8. School of Art, Design & Media, Nanyang Technological University, Singapore – backyard.
(Source: https://www.cpgcorp.com.sg/CPGC/Project/Project_Details?ProjectID=1022).*

3.2 Interior Water Features

Water takes an important part in humans' lives and it's obvious when thinking about how long the human body can stay without being hydrated. However, the effects of water on the psychological health of humans are less observable. Looking back at history, early humans were involved in aquatic environments with access to fresh water as a key to survival and a reason for migratory. Furthermore, salty waters that delivered food rich in Omega 3 fatty acids found in seafood may have been important in the improvement of the brain and the evolution of modern humans (White et al., 2010).

Additionally, lots of ancient civilizations (Egyptians, Greek, and Romans etc.) honoured the presence of water features in their interiors religions make rituals by using water while the aquatic environments carry on having spiritual meaning (Solomon, 2010). As for instance the Ganges in Hinduism, the Well of Zamzam in Islam and Lordes in Roman Catholicism (White et al, 2010). Sumerians on the other side, when referring to a doctor, they used the word "water", in ancient Greece, there were more than 200 medical centers using hydrotherapy as a cure to illnesses (Aristides, XXVII – LIII as cited in Moss, 2010) and Romans used to spend therapeutic and peaceful times in their public baths believing that warm waters improved their circulation, digestion and appetites (Moss, 2010). Furthermore, studies have shown that people are willing to give a higher fee for houses and hotel rooms that have a direct view of the water (Lange and Schaeffer, 2001; Luttik, 2010), people favour places including water features (Kaplan and Kaplan, 1989).

For the past centuries, the engineering dominance has invaded nature by diminishing the water resources in them usually in disregard to biophilic odds in the built environment. As a consequence, the opportunities that water gives for the betterment of the quality of humans' life and the improvement of the built environment as a far more delightful domain are usually being neglected. In this regard, humans are being indifferent towards the water and have brought it to the point that natural water becomes even an unhealthy influence referring to the pollution and the utilitarianism. However, in the past half-century, the situation is slowly being reversed as humans started accepting and implementing sustainable and environmentally friendly approaches, therefore, there is a chance of the rebirth of the connection between humans and biophilic approaches. The step to overcome is to be able to move from the strong utilitarian approach towards water in the built environment into the one that rejoices humans' aesthetic, symbolic, naturalistic and humanistic connections and revolving towards applying biophilic approaches on water in order to expand the chances of creating amusing, sustaining, inspiring and cost-effective environments for human habitation (Kellert, Heerwagen and Mador, 2011).

There are several strong biophilic characteristics of water, such as:

1. Water and sunlight work together. Water speaks many stories when its mirror image sparkles through its own surface.
2. Tranquil water has astonishing reflective abilities that give a chance for the grasping of the environment.
3. Water has an ability to cooperate with other natural features, for example, the surface of the rocks are brightly enriched by water or when the water enters the surface of the rocks it moves around its surface dancing.
4. Water in motion has a solid biophilic charm by adding elements of animism and life to the water whether it is a waterfall, a flow, a stream, or pond with circulation. (Kellert, Heerwagen and Mador, 2011).

However, along with the water's application in the built environment, there are some dares to be considered such as algae, humidity (depending on the conditions, can be a plus), moisture damage from the leakage, filtration equipment, energy requirements for pumps, insect-borne disease, obligatory maintenance etc. (Kellert, Heerwagen and Mador, 2011).

The placement and existence of the water feature not only in the exteriors but in the interiors as well are known to improve the condition of the surrounding targeting the sustainment of indoor aquariums, regulation of indoor humidity, protection from circumstantial noise, maintenance of cold and breezy spaces or improvement of interior aesthetics. Moreover, water sound has been chosen as more favourable over the environmental sounds and it has been known to arise states of restoration and meditation and that the sound of water in combination with other natural sounds, for example, the chirping of the birds has positive mental effects (White et al. 2010). Furthermore, Alvarsson et al. found that water sounds had effects of meditation. A mixture of sounds from a water fountain and tweeting birds helped increase the physiological recovery of sympathetic activation speed (Alvarsson, Wiens and Nilsson, 2010).

The water element is placed in various fields but it is crucial to provide enough data whether water features are beneficial to the humans' psychology. For this reason, Clouse (2016) determined enough information through two different surveys. Clouse (2016) aimed to examine if water features in the interior are in favour of people in commercial and residential spaces. Most of the attendants admitted the overall positive effect of water over them, including decreased stress and improved mood. Only 12% of both surveys denied the fact that water has a positive effect on their state of mind. However, this study validates the theory that there are huge advantages from the

connection with water. Whether placed at work, home, health facilities or educational facilities, sounds of gently flowing water are known to bring a healing atmosphere (Clouse, 2016).

A research made by Barton and Pretty (2010) on activities conducted in green environments have proved that presence of water shows more efficient progress in both confidence and mood than activities conducted in green environments without water presence. In account to that, hearing and touching water likewise decreases stress as well (Alvarsson et al., 2010). Furthermore, Browning et al. (2014) argue that nature images with water features give higher expectations for lowering the blood pressure and heart rate rather than nature images that do not include water features (Browning et al, 2014).

3.3 The Use of Water Features in Educational Spaces

The recent development of biophilic design has reached the educational buildings as the research demonstrates that cognitive functioning gets restored as well as creativity, productivity and well-being as soon as children and students engage with nature. Following this, Tracy Flynn, Development Project Manager, sought to deliver students and staff at the Water Sciences Department at Cranfield University (Figures 3.9 and 3.10) an area to work freely and collectively for discussing new ideas. Tracy Flynn adopted the principles of biophilic design as the root of the interior plan for the 1,000 m² space consisting of a coffee shop, two levels of offices and a boardroom.

The American business magazine 'Forbes' reported that workplace stress costs the United States around \$190 billion in annual health care. Other than that, workplace stress contributes to at least 120,000 deaths per year (Forbes, 2015). However, MODEL each American office with different visual and spatial conditions can reduce stress by 60% costing \$114 billion per year in health care costs alone (Hosey, 2016).

From a biological point of view, stress is seen as a human's reaction to the imbalance of environment and the capacity of humans (Steg et al., 2013). According to Ulrich (1986), a constant exposure to stress can have consequences on the physical health due to the biological processes or behavioural patterns that cause risk of disease. Therefore, when people's state of well-being is threatened by stress, they tend to react through a psychological, physiological and behavioural attitude (Ulrich, 1986).



*Figures 3.9 and 3.10 Coffee area at Cranfield University.
 (Source: <https://gbdmagazine.com/2018/singapore-hospital/> in May 2018).*

University students spend plenty of time inside the campus involved in accomplishing tasks that require complete directed attention that many times causes attentional fatigue. Mental fatigue occurs when the brain is experiencing a continual effort, which may reduce the ability of students' academic successes (Felsten, 2008). Tennessen and Cimprich (1995) examined a study on college students with a direct natural view from their dormitory windows and students with partial or no natural view at all. The group of students exposed to natural view scored higher on tests of direct attention than the other group of students (Tennessen and Cimprich, 1995). Similarly, the study of Berto (2005) examined the attentional capacity of college students exposed to restorative (nature scenes) and non-restorative (non-nature scene) photographs on the computer, finding refreshment from mental fatigue in students exposed to the restorative environments alone (Berto, 2005).

For the reason that the activities that students are involved in during their academic year, they often find themselves in mental - fatigued conditions. Therefore, it is beneficial and important for the mental health and well-being of the college students to find places in their campus where they can experience mental restoration and continue their work cognitively revitalized. Even though most of the college campuses have outdoor expanses and access to outdoor green spaces, lots of campus building do not even have a direct access to nature view. In this case, during winter, cold or rainy weather, students' connection to nature becomes consequently crippled, the chances of

experiencing cognitive restoration in nature are almost none. In accordance to this, the constraint of restorative experiences in nature cold weather was associated with signs of depression and the use of antidepressants in Sweden (Hartig, Catalano and Ong, 2007; Felsten, 2008).

Another Norwegian study made on the adolescence mental health and well-being shows higher scores of mental well-being and self-related health on boys and higher scores on PMeHL (positive mental health literacy), stress, and loneliness on girls referring to influences like family's financial situation, parental education, loneliness and stress. This study suggests that it is more important to focus on promoting mental health rather than preventing mental illness for the effective approach in adolescent mental health education (O'Mara and Lind 2013; Weare and Ninds, 2011; Bjornses et al. 2017).

The adolescence's mental well-being international World Health Organization report of the years between 2010 and 2014 show that girls scored lower in perceived health, life satisfaction and higher in frequents health complaints whereas youngsters from less well-off families regularly show poorer life fulfilment, repeated illnesses and poor health. This study demonstrates that constant mental health problems can cause harm on youngsters' social, intellectual and emotional growth as well as influence their future since the adolescence years are known to be critical times for sustaining a healthy mental health and well – being (World Health Organization, 2016).

CHAPTER 4

CASE STUDY

The benefits of applying biophilic design in the interiors are already well-known from the various done research showing results of improved physical health, lower blood pressure, improved mood, fewer diseases, more work satisfaction, creativity and motivation, better concentration, and enriched social interaction (Kellert and Calabrese, 2015; Ulrich, 1992). Similarly, this study focuses on finding the positive outcomes of biophilic design in a built environment. The purpose of conducting this study is the constant battle of students and workers with mental fatigue, stress, loss of attention and drained mental state during their work.

Nature is known to be effective for the refreshment of those who spend too much time focusing on their work, by suggesting that contact with nature has an ability to refresh the persons' psychological condition through an experience in a particular environment (Joye and Berg, 2013). In addition to that, students usually are threatened by stress during their academic life as a reaction to the imbalance of the circumstances and their capacity (Steg et al., 2013). According to Ulrich (1986), a constant exposure to stress can have consequences on the physical health and cause risk of disease (Ulrich, 1986). Therefore, it is beneficial and important for the mental health and well-being of the students to find places where they can connect with nature during their work to cognitively revitalize and continue their work refreshed (Felsten, 2008).

4.1 Research Questions and Hypothesis

Throughout this research project, three questions have been addressed:

1. What kind of interior water features do the occupants prefer according to gender?
2. How do the occupants feel around interior water features?
3. What is the relationship between interior water features preferences and the stress factor?

Regarding the above-mentioned research questions, the thesis states the following hypothesis, applying water features in the interiors using biophilic design approaches may help in the improvement of the occupant's environment for a state of well-being. Furthermore, applying biophilic approaches using the water elements expands the chances of creating amusing, sustaining, inspiring and cost-effective environments for human habitation (Kellert, Heerwagen and Mador, 2011). Additionally, studies have shown that people are willing to give a higher fee for houses and hotel

rooms that have a direct view of the water (Lange and Schaeffer, 2001; Luttik, 2010), people favour places including water features, (Kaplan and Kaplan, 1989). On the subject of the connection between people and the built environment, nature is particularly of significance to the humans' well-being and positive state of mind but unfortunately, it has lost its value during the modern times (Kellert, 2005). Therefore, applying biophilic design in workplaces, healthcare facilities, schools and neighbourhoods is known to be in a favour of the global health and economy (Browning et al, 2014).

4.2 Setting

The location selected for conducting the study is the entrance lobby of the building of the Faculty of Fine Arts and Design, at the İzmir University of Economics in Balçova, İzmir, Turkey. As seen from Figures 4.1 and 4.2, the lobby does not have any specific character, but it has been transformed from a security guard station with a desk to a blank space used only during the students' final presentations as an exhibition platform.



Figure 4.1. The entrance of D block, FFAD, IUE. The photograph was taken in April 2018 by the author.



Figure 4.2. The entrance of D block, FFAD, IUE. The photograph was taken in April 2018 by the author.

This space is central to the main entrance, stairs, elevators, toilets, the canteen and electrical room, but as a very eye-catching and welcoming extent of the faculty of fine arts and design building, this area has been left to be very unnoticed and only passed by. However, the application of biophilic design elements of water can add an importance to this existing place. The placement of interior water features in these surrounding can improve the condition of the current state like buffer the circumstantial noise, maintain a cold and breezy natural space, improve the interior aesthetic etc. Moreover, water sound has been chosen as more favourable over the environmental sounds and it has been known to arise states of restoration and meditation which brings positive mental effects that can aid the students' and staff's well-being and positive state of mind (White et al. 2010).

For these reasons, the idea was to propose a new biophilic design for the entrance of the D block. Proposed are different types of water features, a water wall (Figure 4.3), a fountain (Figure 4.4), an ocean view wallpaper (Figure 4.5), and an aquarium (Figure 4.6). Many different types of water features are proposed as the aim of the study was to find out the most preferred type of interior water feature of the students as users of the space through the conducted surveys and 3D visualizations (See Appendix B).



*Figure 4.3. Suggestion for a new lobby design – water wall.
3D visualizations prepared by the author.*



*Figure 4.4. Suggestion for a new lobby design – fountain.
3D visualizations prepared by the author.*



*Figure 4.5. Suggestion for a new lobby design – ocean view wallpaper.
3D visualizations prepared by the author*



*Figure 4.6. Suggestion for a new lobby design – aquarium.
3D visualizations prepared by the author.*

4.3 Participants

Participants of this research project were mostly female (62.2%) than male (32.4%), most of the participants were students from different backgrounds (67%) between 20 – 29 years old (Tables 4.1, 4.2).

TABLE 4.1. Gender Distribution

| | | Frequency | Percent % |
|-------|-----------------------|-----------|-----------|
| Valid | Male | 24 | 32.4 |
| | Female | 46 | 62.2 |
| | Don't want to mention | 4 | 5.4 |
| Total | | 74 | 100.0 |

TABLE 4.2. Age Group Distribution

| | | Frequency | Percent |
|-------|-------|-----------|---------|
| Valid | 20-29 | 50 | 67.6 |
| | 30-39 | 11 | 14.9 |
| | 40-49 | 11 | 14.9 |
| | 50-59 | 2 | 2.7 |
| | Total | 74 | 100.0 |

The participants were students or currently graduated students enrolled in bachelors and masters programs from different disciplines including participants from the departments of the Izmir University of Economics and from other universities as well. The majority of participants came from either architecture, interior architecture and environmental design or industrial design education. There were also participants from non-design department such as the departments of linguistics, computer sciences, economics, robotics, animal biotechnology, software engineering, business, political sciences, geodesy, law, marketing, mechanical engineering, sociology, anthropology etc. (Tables 4.3 and 4.4).

TABLE 4.3. Level of Study

| | | Frequency | Percent |
|-------|-------------------|-----------|---------|
| Valid | Bachelor’s Degree | 38 | 51.4 |
| | Master’s Degree | 31 | 41.9 |
| | PhD | 3 | 4.1 |
| | Staff (Academic) | 1 | 1.4 |
| | N/A | 1 | 1.4 |
| Total | | 74 | 100.0 |

TABLE 4.4. Professional/Educational Background

| | | Frequency | Percent |
|-------|---------------|-----------|---------|
| Valid | Designers | 30 | 40.5 |
| | Non-Designers | 41 | 55.4 |
| | N/A | 3 | 4.1 |
| Total | | 74 | 100.0 |

4.4 Procedure

The instruments used for the conduction of this study are two types of surveys, an online and a hard-copy version (Appendices). The online format of the survey was shared through social media and through direct emails sent as a separate link, which directs the participants to the Google Forms platform where the online survey was formed. The hard – copy format of the survey was shared in the area of the entrance of FFAD, IUE. The distribution and collection of the surveys lasted for a whole day, the survey reached students who were passing by the entrance of the building mostly reaching the students enrolled in the programs of the FFAD rather than the other departments.

The first part of the surveys was asking for demographic data such as gender, age, level of study and department or profession questions. In the following part of the survey, participants responded to the addressed 8 questions by selecting one of the five items for each statement on a Likert Scale from “5 – Strongly Agree”, “4 – Agree”, “3 – Neutral”, “2 – Disagree”, “1 – Strongly Disagree” and “0 – Not Applicable”. This type of method is used for the first part of the survey concerning occupants’ feelings when exposed to interior water features.

Second part of the survey addressed questions about their preferences on interior water features, referring to the first research question, by showing the participants a checkbox option for each of the given questions by not allowing more than one answer to a question since the study's aim was to find the exact preferences of water features in the interior. All the participants of both of the surveys joined voluntarily and anonymously. The completion of the surveys took approximately five minutes each.

The other instruments for the examination of this research project are the 3D visualizations shared above (Figures 4.5, 4.6, 4.7 and 4.8). These 3D visualizations were used in order to explain the suggested idea for the redesign of the entrance of the FFAD building. Therefore, these instruments were able to visually present the proposed idea for the new biophilic concept of the entrance of the building through the application of interior water features.

The 3D visualizations were also included in an additional part the hard-copy and online survey (see Appendices) that has been only shown to the participants who were familiar with the entrance of the FFAD building. The data collected from this part was helpful in the examination of the preferences of interior water features dedicated for that particular space that gave a clearer idea about what would the users of that particular space prefer more and how would they be able to use it.

This study used a mixed type of methodology in both quantitative and qualitative research methods. The quantitative research methods used measurable data from both online and hard-copy surveys transformed into usable statistics. The data was used to measure the opinions of the participants in the presence of interior water features according to gender through the use of t-tests, and Pearson Correlation tests. As the qualitative data, personal comments and opinions of the participants' about interior water features were collected through face-to-face interviews. As well as, participants' opinions were also asked on the 3D visualizations done as a proposal for the new application of biophilic design using water features in the entrance of the FFAD building.

4.5 Results and Discussion

Results show that participants mostly feel less stressful when they encounter any water features in the closed environments in accordance with the third research question concerning the relationship between interior water features preferences and the stress factor. According to the independent *t-tests* scores (the group variances are treated as equal $p>0.05$). There is a statistically

significant difference between the responses of males and females, $t(67) = -2.041, p = 0.045$ ($p < 0.05$) while females agreed more on lowered stress when in the presence of interior water features, males were more on the neutral side. Regarding the hypothesis applying water features in the interiors using biophilic design approaches may help in the improvement of the occupant's environment for a state of well-being, when the participants were being asked if any kind of 2D water images like a photograph and/or painting installation in the interior is relaxing, there was again a statistically significant difference noted between male and female participants, $t(68) = -4.399, p = 0.0001$ ($p < 0.01$). Females responded positively on the statement ($M = 4.196, \text{std. dev.} = 0.859$), while males remained indecisive ($M = 3.000, \text{std. dev.} = 1.41$) (Tables 4.5 and 4.6).

Table 4.5. Independent *t*-test Scores According to Gender

| | t | df | Sig. (2-tailed) |
|--|--------|----|-----------------|
| Whenever I am stressed, water features make me feel less stressful** | -2.041 | 67 | 0.045* |
| Water features positively affect my mood** | -1.883 | 68 | 0.064 |
| I feel better when there are water features in the interior** | -1.700 | 68 | 0.094 |
| Any water feature in the built environment can be a good representation of nature** | -.479 | 68 | 0.633 |
| An interior water feature makes me feel same as if I am near a natural water element** | -1.886 | 68 | 0.064 |
| Water visuals such as photography, painting etc. in the interior are relaxing** | -4.399 | 68 | 0.000** |
| I feel better when there are water sounds in the interior** | -1.067 | 68 | 0.290 |
| I find water sound relaxing** | -1.785 | 68 | 0.079 |

* $p = 0.05$, ** $p = 0.01$

** See appendix A for a detailed explanation of the items

Table 4.6 Mean and Std. Deviation of Genders According to Participants' Opinions on Interior Water Features

| Survey Statements ** | | N | Mean | Std. Deviation | 95% Confidence Interval for Mean | |
|--|--------|----|--------|----------------|----------------------------------|-------------|
| | | | | | Lower Bound | Upper Bound |
| Whenever I am stressed, water features make me feel less stressful** | Male | 23 | 3.4783 | 1.37740 | 2.8826 | 4.0739 |
| | Female | 46 | 4.0870 | 1.05042 | 3.7750 | 4.3989 |
| | Total | 69 | 3.8841 | 1.19480 | 3.5970 | 4.1711 |
| Water features positively affect my mood** | Male | 24 | 3.8333 | 1.16718 | 3.3405 | 4.3262 |
| | Female | 46 | 4.3261 | .96734 | 4.0388 | 4.6134 |
| | Total | 70 | 4.1571 | 1.05824 | 3.9048 | 4.4095 |
| I feel better when there are water features in the interior** | Male | 24 | 3.4167 | 1.24819 | 2.8896 | 3.9437 |
| | Female | 46 | 3.9130 | 1.11208 | 3.5828 | 4.2433 |
| | Total | 70 | 3.7429 | 1.17567 | 3.4625 | 4.0232 |
| Any water feature in the built environment can be a good representation of nature** | Male | 24 | 3.7083 | 1.26763 | 3.1731 | 4.2436 |
| | Female | 46 | 3.8478 | 1.09478 | 3.5227 | 4.1729 |
| | Total | 70 | 3.8000 | 1.14967 | 3.5259 | 4.0741 |
| An interior water feature makes me feel same as if I am near a natural water element** | Male | 24 | 2.4167 | 1.47196 | 1.7951 | 3.0382 |
| | Female | 46 | 3.0870 | 1.37963 | 2.6773 | 3.4967 |
| | Total | 70 | 2.8571 | 1.43745 | 2.5144 | 3.1999 |
| Water visuals such as photography, painting etc. in the interior are relaxing** | Male | 24 | 3.0000 | 1.41421 | 2.4028 | 3.5972 |
| | Female | 46 | 4.1957 | .85945 | 3.9404 | 4.4509 |
| | Total | 70 | 3.7857 | 1.21456 | 3.4961 | 4.0753 |
| I feel better when there are water sounds in the interior** | Male | 24 | 3.1667 | 1.30773 | 2.6145 | 3.7189 |
| | Female | 46 | 3.5217 | 1.32898 | 3.1271 | 3.9164 |
| | Total | 70 | 3.4000 | 1.32315 | 3.0845 | 3.7155 |
| I find water sound relaxing** | Male | 24 | 3.6250 | 1.27901 | 3.0849 | 4.1651 |
| | Female | 46 | 4.1522 | 1.11490 | 3.8211 | 4.4833 |
| | Total | 70 | 3.9714 | 1.19141 | 3.6873 | 4.2555 |

**See Appendix A for a detailed explanation of the items

In accordance with the first research question, when the participants were asked about their preferences on interior water features, the responses of both females and males were almost the same choices of water walls, fountains, waterfalls etc. over the second group including fish ponds, aquariums and the third group including water photographs, ocean view wallpapers, water paintings etc. Additionally, as their second choice males preferred fish ponds and aquariums while females chose the visual group of interior water features (photographs, wallpapers, paintings with water in them) (Figure 4.7).

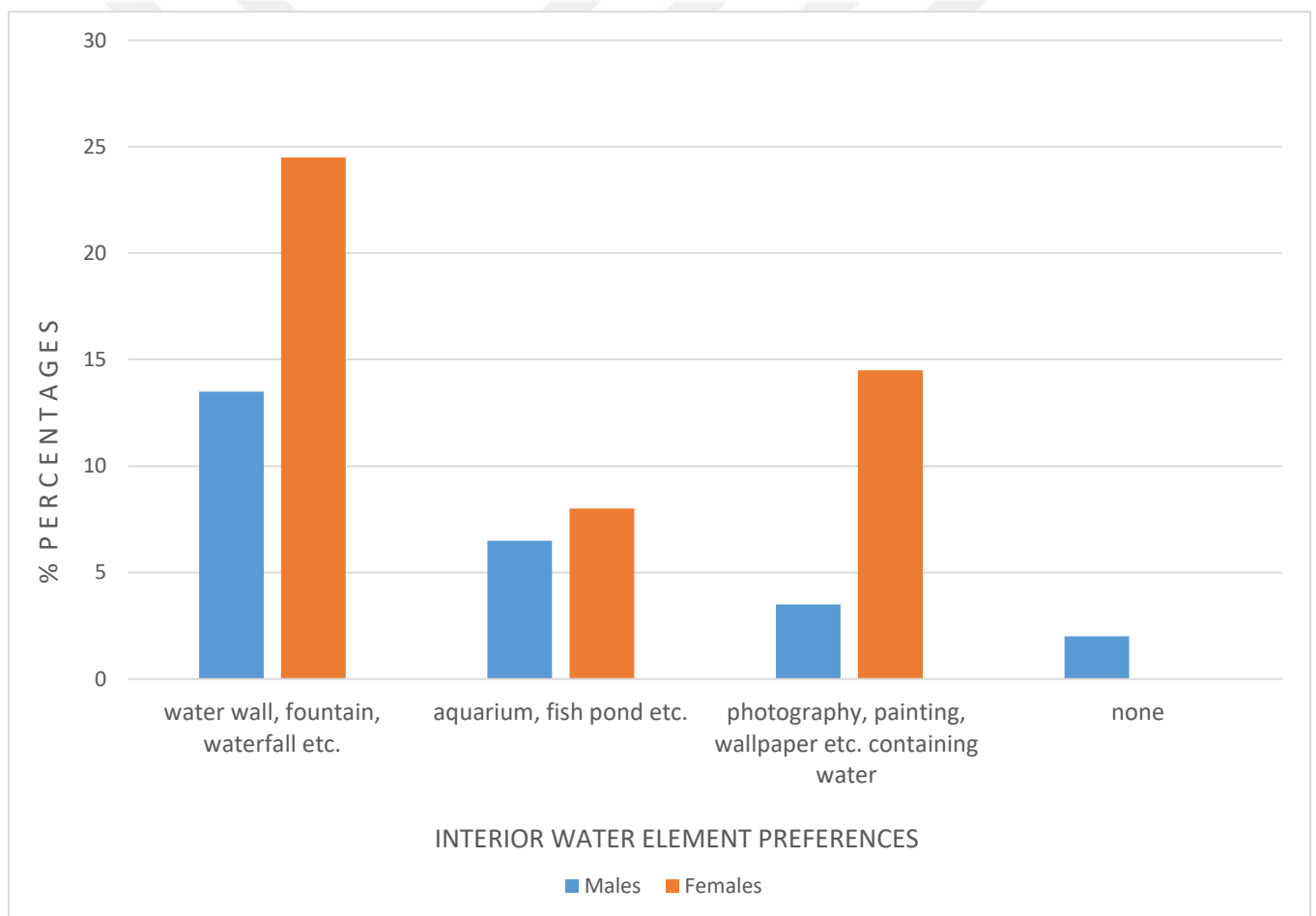


Figure 4.7. Preferences on interior water features considering gender

When the participants were asked in which conditions they feel more connected to nature indoors the most preferred answer was direct access to nature view for both genders (Figure 4.8). Any interior water feature is the least preferable response from all the participants.

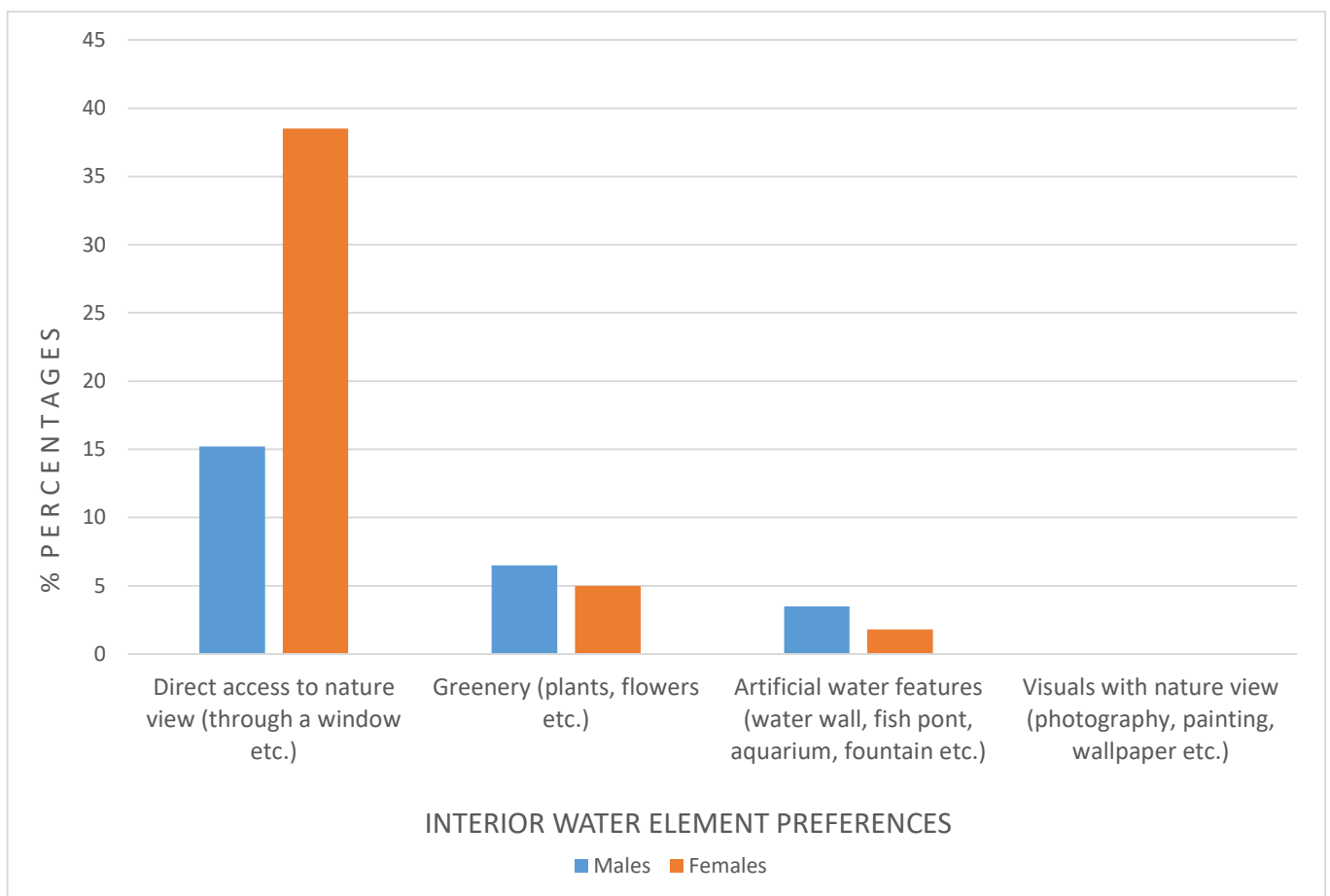


Figure 4.8. Preferences on the connection to nature according to gender

According to the Independent *t*-test scores (Table 4.7), considering the grades as a stress factor there is a statistically significant difference between males and females, where males find grades factor more stressful $t(68) = 2.069, p = 0.042$ ($p < 0.05$).

Table 4.7. Independent *t*-test scores according to the gender and stress factors

| Survey statements** | t | df | Sig. (2-tailed) |
|---------------------|--------|----|-----------------|
| 3.1** | .689 | 68 | .493 |
| 3.2** | 2.069 | 68 | .042* |
| 3.3** | .900 | 68 | .371 |
| 3.4** | -.121 | 68 | .904 |
| 3.5** | .671 | 68 | .505 |
| 3.6** | -.269 | 68 | .788 |
| 3.7** | -1.995 | 68 | .050 |
| 3.8** | -.735 | 68 | .465 |

* $p = 0.05$

**See Appendix A for a detailed explanation of the items

Participants of the study are from different departments and universities. Rather than dividing them into small groups in relation with every single department that they belong to, participants were grouped into two as 'designers' and 'non-designers'. Since the main concern was a design criterion as biophilic design and the selected case study site is the Faculty of Fine Arts and Design building of IEU, this classification of the participants is rational. It is found out that there are statistically significant differences between designers and non-designers regarding the stress level of stress from workload and time constraints factors. Independent *t*-test scores for workload are $t(69) = 2.115, p = 0.038$ ($p < 0.05$), where *t*-test results for time constraints and deadlines are $t(66) = 3.619, p = 0.001$ ($p < 0.01$). For both of the cases, designers have shown results of higher stress level than non-designers (Table 4.8).

Table 4.8. Independent *t*-test scores according to the professional backgrounds and stress factors

| Survey statements** | t | df | Sig. (2-tailed) |
|---------------------|-------|----|-----------------|
| 3.1** | 1.263 | 69 | .211 |
| 3.2** | 1.361 | 69 | .178 |
| 3.3** | 1.604 | 69 | .113 |
| 3.4** | 1.000 | 69 | .321 |
| 3.5** | 1.484 | 69 | .142 |
| 3.6** | 1.291 | 69 | .201 |
| 3.7** | 2.115 | 69 | .038* |
| 3.8** | 3.619 | 69 | .001** |

* $p = 0.05$, ** $p = 0.01$

**See Appendix A for a detailed explanation of the items

In order to see the correlations between preferences of the participants with stress factors Pearson Correlations tests have been done (Table 4.9). According to Pearson Correlation results the individuals who have stated that they feel stressed because of general academic processes also think that any water feature in the built environment could be considered to be a good presentation of nature ($r = 0.251$, $p = 0.031$). Negative correlations have been found out between the statement of water visuals (photographs, paintings, wallpaper) in the interior spaces as relaxing and the statement of stress because of grades (3.2, $r = -0.251$, $p = 0.031$) and assessment mediums (exams, assignments etc., 3.5, $r = -0.277$, $p = 0.017$). According to these results, it could be interpreted that participants who feel stressed because of assessment processes do not feel any water visuals as a positive interior application that helps them feel more relaxed. An interesting result is the positive statistically significant correlation between the health factor for stress and the claim that any water features as an interior element are a good representation of nature ($r = 0.329$, $p = 0.004$). This might be interpreted as, especially the ones who are feeling stressed because of possible health problems feel better when they are close to nature, therefore, that is why they find water features as interior architectural elements as a good representation of nature in the built environment.

Table 4.9 Pearson Correlation

| | 2.1*** | 2.2*** | 2.3*** | 2.4*** | 2.5*** | 2.6*** | 2.7*** | 2.8*** |
|--------|--------|--------|--------|---------|--------|---------|--------|--------|
| 3.1*** | -0.041 | 0.070 | 0.095 | 0.251* | 0.195 | -0.177 | -0.020 | -0.165 |
| 3.2*** | -0.005 | 0.069 | -0.045 | 0.120 | 0.031 | -0.251* | -0.072 | -0.066 |
| 3.3*** | 0.047 | 0.041 | 0.045 | 0.216 | 0.076 | -0.139 | -0.123 | -0.215 |
| 3.4*** | -0.016 | 0.094 | -0.022 | -0.060 | 0.042 | -0.068 | -0.095 | -0.111 |
| 3.5*** | 0.185 | 0.159 | 0.053 | 0.329** | 0.176 | -0.277* | 0.019 | -0.068 |
| 3.6*** | 0.122 | 0.203 | 0.025 | 0.040 | 0.012 | -0.161 | -0.140 | -0.059 |
| 3.7*** | -0.049 | 0.056 | 0.098 | -0.077 | 0.075 | 0.044 | -0.009 | -0.056 |
| 3.8*** | 0.013 | 0.022 | 0.033 | -0.024 | 0.055 | -0.017 | -0.104 | -0.073 |

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

*** See Appendix A for a detailed explanation of the items

When looking at the overall findings of the survey it can be seen that the majority agreed on the positive effects of interior water features on them, as in accordance with the hypothesis that applying water features in the interiors using biophilic design approaches may help in the improvement of the occupant’s environment for a state of well-being. However, when indoors, participants feel most connected to nature when having a direct access to nature view as 77% of the respondents regardless of the gender or any other specification. These findings are inconsistency with Tennessen and Cimprich (1995) who examined a study on college students who have a direct access to nature view from their dormitory room and the ones who do not have. The study found that the group of students exposed to natural view scored higher on tests of direct attention than the other group of students (Tennessen and Cimprich, 1995).

Accordingly, with the previously mentioned research questions concerning the feelings of the participants around interior water features, it has been found that whenever they feel stressed water features help them feel less stressful by 70.4% of the participants (Figure 4.9) water features positively affect their mood by 74% (Figure 4.9) and they feel better when in presence of interior water features by 57% (Figure 4.9) of the participants. In account to that, hearing and touching water likewise brings relaxing effects as well (Figure 4.11) (Alvarsson et al., 2010). Furthermore, Browning et al. (2014) argue that nature images with water features give higher expectations for lowering the

blood pressure and heart rate rather than nature images that do not include water features (Browning et al, 2014).

Surprisingly, participants did not noticeably relate real natural water elements such as a lake, waterfall, sea etc. to the artificial water features in the interior such as fountains, aquariums, waterfalls and the like (Figure 4.10) since 33.5% of the answers of the statement remained neutral, whereas 27% disagreed and 31% agreed. This might suggest that real natural features either awaken deeper and more unique feelings on humans' mental and physical state or it can mean that real nature has the power to arise more than few senses together. For example, a single installation of a water wall in a shopping mall can make the occupant hear the water sound always in a fusion with other surrounding sounds like chattering, footsteps, elevators, cash machines and the like, see the water motions, touch but only by the tip of the fingers or the palm and as well smell the chemicals that keep the installation clean or similar. While being in nature, real natural water elements, for example, a waterfall, has a different level of satisfaction with the human senses as touching or taking a bath and feeling the breeze or the sunshine afterwards, smelling mixed natural features of the surrounding like mud, flowers, grass and the like, synthesized smell of real natural fragrances since water does not have a specific smell but it usually absorbs other natural components, taste a natural spring water or sometimes even drink it and hear a powerful water splash and fall.

EFFECTS OF INTERIOR WATER FEATURES ON PARTICIPANTS' HEALTH

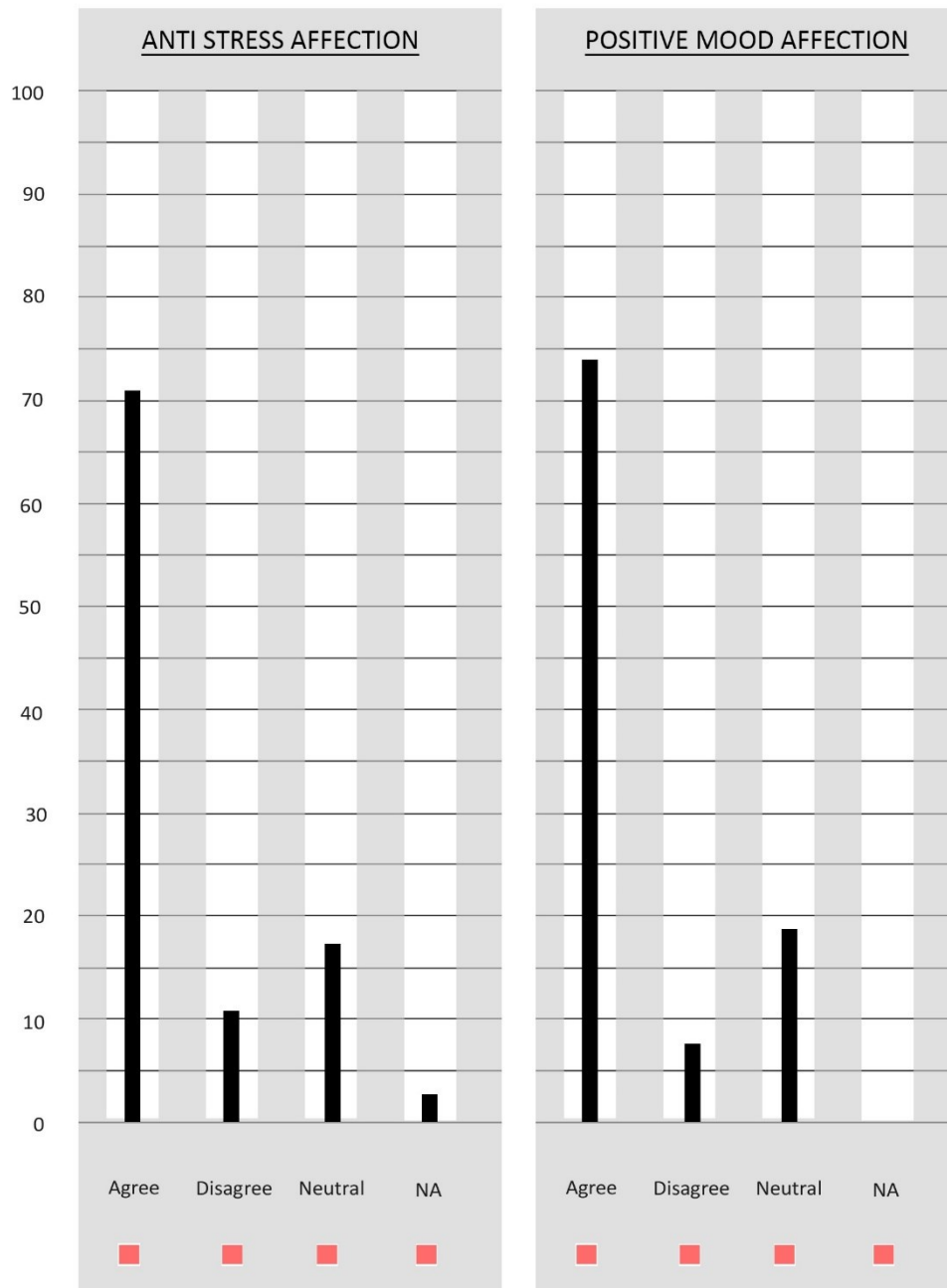


Figure 4.9. Effects of interior water features on participants

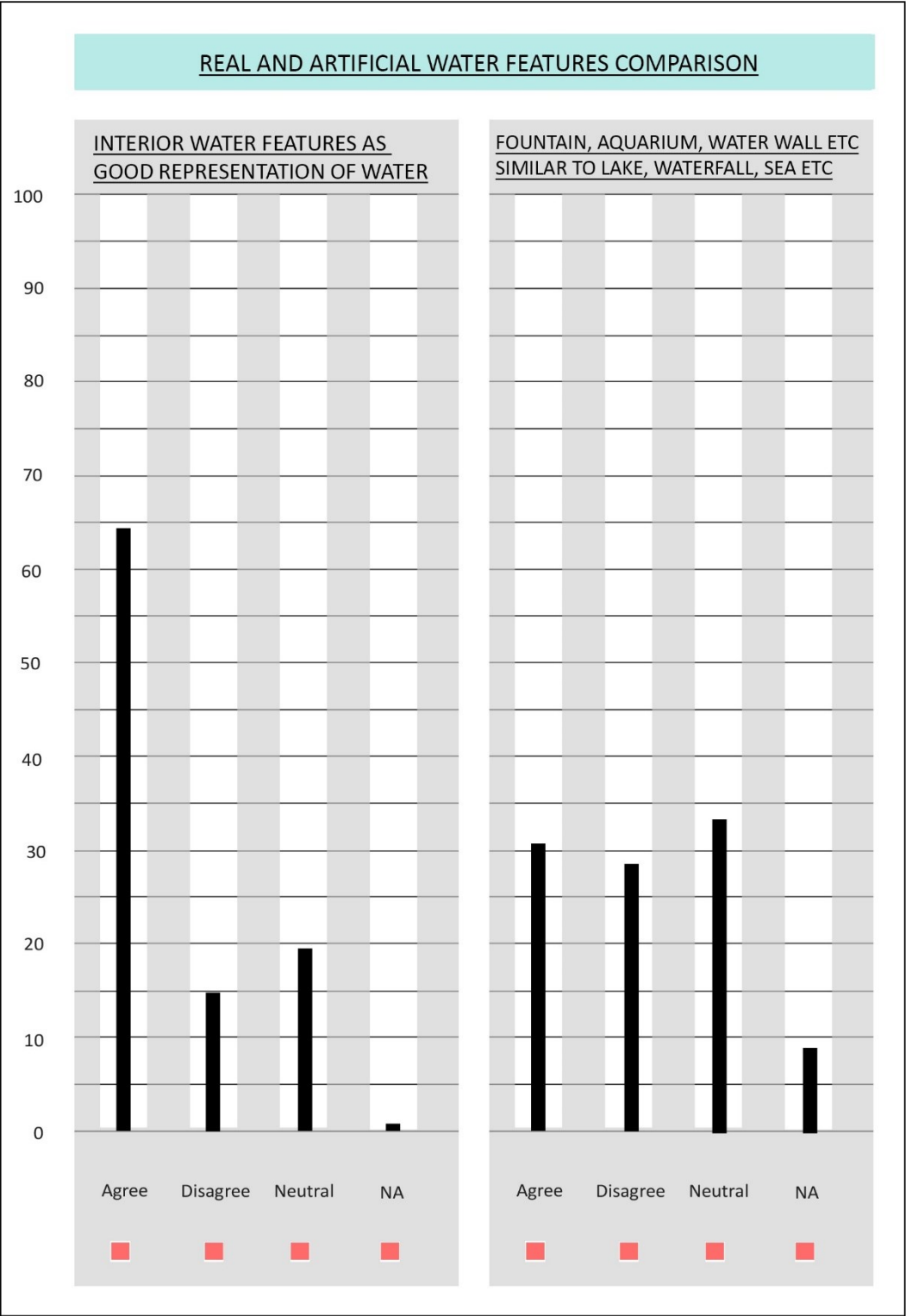


Figure 4.10. Real to artificial water features comparison

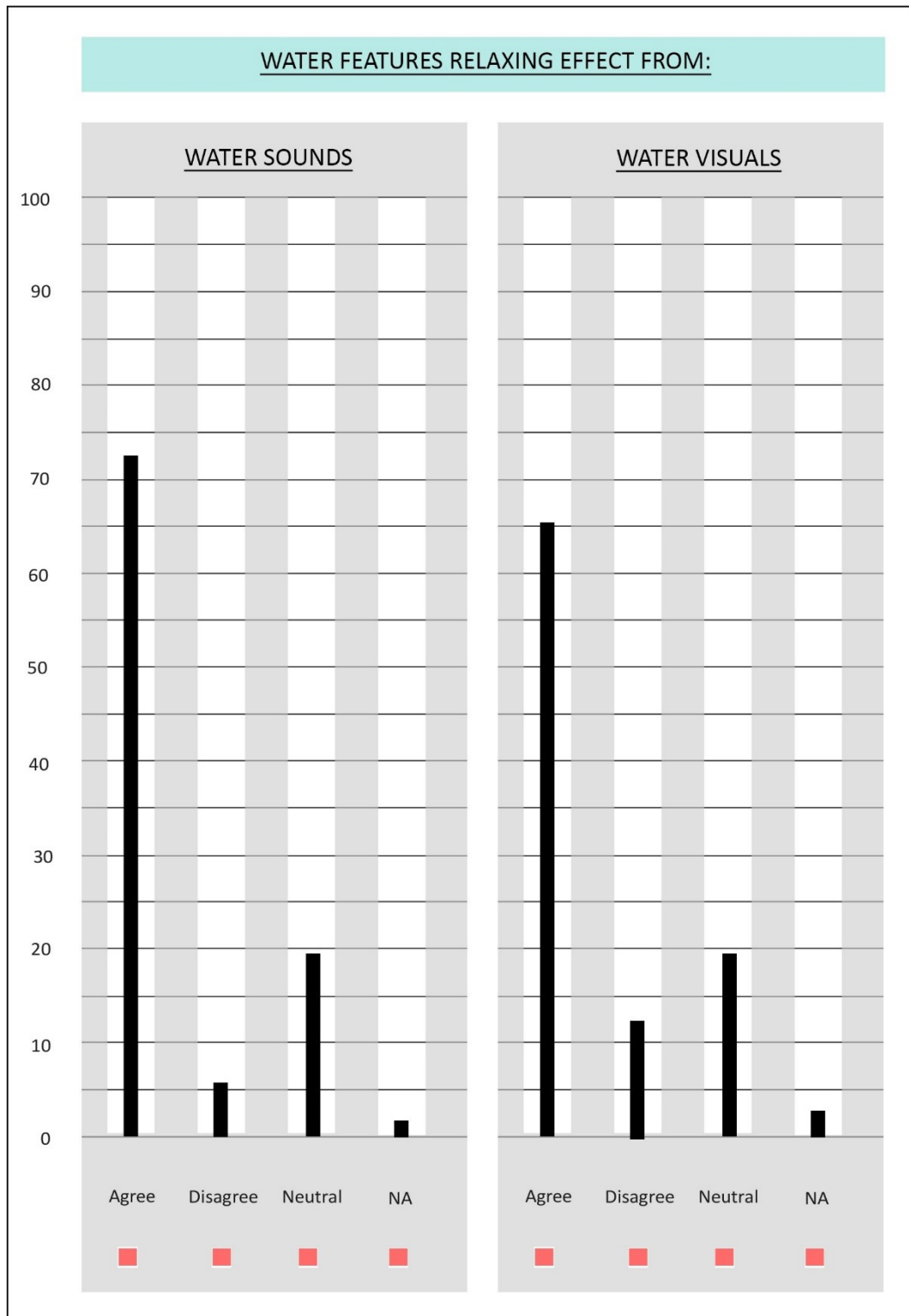


Figure 4.11. Water features' relaxing effects

Regarding the sounds, 71.6% of the participants find the water sound relaxing. Water visuals such as photographs, paintings etc. (Figure 4.11) in the interior were also found to be relaxing as per 66.3% of the participants. Alvarsson et al. found that water sounds had effects of meditation and a mixture of sounds from a water fountain and tweeting birds helped increase the physiological recovery of the nervous system (Alvarsson, Wiens and Nilsson, 2010). Whether placed at work, home, health facilities or educational facilities, sounds of gently flowing water are known to bring a healing atmosphere (Clouse, 2016).

Although almost 75% of the participants were positive for the first two questions, in the third question (Figure 4.9) the positive response percentage was dropped by almost 15%. This question asks a general feeling about their mood in the presence of interior water features whereas the first question asks how they feel around interior water features especially when they are stressed. This question can analyze the difference between the statements of “feel better” and “have a positive mood” as not having the same meaning amongst the correspondents. Although there is not a huge difference between the outcomes (about 15%) when the participants were asked if they have a positive effect on their mood more people said yes but when they were asked if they feel better some of the participants who previously answered positively were either indecisive or negative.

Additionally, when asked to comment on their personal opinion for the improvement of the physical environment of the campus area in order to lower their stress level, 10% of the overall participants of the study mentioned nature sounds and the reduction of noise pollution in the campus; 22.5% preferred nature in general referring to it as fresh air, natural light, sunlight, warmer wall colors and less use of concrete and direct access to nature; 32.5% preferred water features such as fountains, ponds, water visuals, water elements and sources whereas 35% preferred indoor greenery such as plants, gardens, flowers and green wall. This suggests that the participants themselves are also aware of the importance of the contact to nature and its benefits and they are looking for more sustainable and green places in their campus where they can relax, rejuvenate and spend some of their free time. The findings from the 3D visualizations showed the water installation of water wall as more preferred whereas the ocean view wallpaper and the aquarium had the same level of preferences as an application in the entrance of the D block. Therefore, this might suggest that applying an installation of a water wall might be beneficial for the participants’ well-being and help them reduce stress.

CHAPTER 5 CONCLUSION

Biophilia brings the attention of the innate human need for the contact with nature and their adaptations to the natural world over the evolution showing maintenance in humans' physical and mental health and well-being (Kellert 2012, 2014; Wilson 1984; Kellert and Wilson 1993). Biophilic design is a way of designing an environment that invites people into reuniting with our nature. It is important because it gives people a chance to have a life and work in healthier places with a decreased level of stress, added well-being and greater mental health.

Applying biophilic design in workplaces, healthcare facilities, schools and neighbourhoods is known to be in a favour of the global health and economy (Browning et al, 2014). The evidence of its existence dates since the Neolithic period evident in the pillars with animal and vegetative carvings, temples, ornamented interior designs and the like. Therefore, its effective implementation weights on understanding nature, being aware of the physical and mental well-being and the connection to the other worlds beyond the humans' one which is separated from the others' (Kellert, 2015).

From the viewpoint of attention restoration theory (Kaplan and Kaplan, 1989), interiors with nature transmit restorative environments due to their power to efficiently attract one's attention and deliver calmness and recovery. Even a brief occasion of relaxation (e.g., looking out the window at a tree or at a plant indoors) is capable of offering what Kaplan (1993) refers to as micro-restorative experiences (Mangone et al. 2017).

Interior designers of the 21st century are more than ever cultivating biophilic design by applying natural ventilation, radiant cooling systems, dynamic lighting capable of circadian programming with diffuse appearance, and ceiling systems with textured appearances mimicking different qualities of nature (Trott, 2016).

Several ancient civilizations (Egyptians, Greek, and Romans etc.) honoured the presence of water features in their interiors (Solomon, 2010) and used to spend therapeutic and peaceful times in their public baths believing that warm waters improved their circulation, digestion and appetites (Moss, 2010). Furthermore, studies have shown that people are willing to give a higher fee for

houses and hotel rooms that have a direct view of the water (Lange and Schaeffer, 2001; Luttik, 2010), people favour places including water features (Kaplan and Kaplan, 1989).

Water can be also beneficial for the students' mental health. They spend plenty of time inside the campus involved in accomplishing tasks that require complete directed attention that many times causes attention fatigue. The study made by Tennessen and Cimprich (1995) showed that the group of students exposed to natural view scored higher on tests of direct attention than the other group of students (Tennessen and Cimprich, 1995; Berto, 2005). Similarly, this study focuses on finding the positive outcomes of biophilic design in a campus environment.

The purpose of conducting this study is the constant battle of students and workers with mental fatigue, stress, loss of attention and drained mental state during their work. In addition to that, students usually are threatened by stress during their academic life as a reaction to the imbalance of the circumstances and their capacity which can cause consequences on the physical health and cause risk of disease (Steg et al., 2013; Ulrich, 1986). Therefore, it is beneficial and important for the mental health and well-being of the students to find places where they can connect with nature during their work to cognitively revitalize and continue their work refreshed (Felsten, 2008).

This study hypothesizes that applying water features in the interiors using biophilic design approaches may help in the improvement of the occupant's environment for a state of well-being. On the subject of the connection between people and the built environment, nature is particularly of significance to the humans' well-being and positive state of mind but unfortunately, it has lost its value during the modern times (Kellert, 2005). Therefore, applying biophilic design in our workplaces, healthcare facilities, schools and neighbourhoods is known to be in a favour of our global health and economy (Browning et al, 2014).

The location selected for conducting the study is the entrance lobby of FFAD building at IUE, Turkey. The placement of interior water features in these surrounding can improve the condition of the current state like buffer the circumstantial noise, maintain a cold and breezy natural space, improve the interior aesthetic etc. (White et al. 2010). For these reasons, the idea was to propose a new biophilic design concept for the entrance of the building using the water element through interior water features (water wall, fountain, aquarium and ocean view wallpaper). The participants of the research project were mostly satisfied with the installation of water wall and the ocean view wallpaper whereas aquarium took the second place.

The survey conducted data regarding the preferences of participants on interior water features from different given groups such as water wall, fish pond, aquarium, water photography and so on where the most preferable types of water features were water walls, waterfalls and fountains were (more preference from females than males). When participants were asked what is the best natural interior features in order to connect to the outside nature in the best possible way, participants most favourable choice was the direct access to nature view and artificial water features (water wall, fish pond, aquarium etc.) as the least favourable one. Regarding their stress level, designers showed higher levels of stress than non-designers. According to the results of the Pearson Correlation tests, participants who feel stressed because of assessment processes do not feel any water visuals as a positive interior application that helps them feel more relaxed.

Contrasting the hypothesis participants did not noticeably relate artificial interior water features such as water walls, aquariums, fountains etc. to the real water features such as lakes, fish ponds, seas and the like. This might suggest that although they like the idea of having water features in the interior, in order for them to give a more accurate data, the participants should not relate to only 2D images and their past experiences with nature and water features in the interior in particular. Accordingly, testing the participants in the presence of real water features installation could be more accurate.

As a summary, this study examined the participants' preferences on interior water features through two types of surveys, an online and a hard copy versions using a quantitative methodology. This research project reached a total number of 74 participants, more females than male, between 20 – 29 years old coming from a different educational background. The results of this study show that interior water features help in the reduction of stress and provide an overall positive effect on their feelings and moods. However, water features are less likely related to the representation of nature since the participants favoured direct access to nature view. The findings contribute to the fields of biophilia and biophilic design delivering the preferences of interior water features on a gender level.

For a more accurate and stronger evidence on the connection between students' and interior water features in the university campus, an extended version of this study can be done. In this case, the instruments should include a real installation of water features in the interior or at least a representation of it through a virtual reality projection. In this case, the participants of the research project can be triggered by different sense like touching, hearing and feeling the presence of water features during the examination and the findings might be more precise because of the more realistic impressions. A future research on the connection between interior water features and

students might extend the explanation of the source of well-being, restoration effects and positive mood after being exposed to interior water features.



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APPENDICES

Appendix A: Online and Hard Copy Survey (Google Forms)



Graduate Research Project Survey

Dear participants,

This survey is a part of a graduate research project under Design Studies program of the School of Social Sciences at Izmir University of Economics. It should take about 5 minutes to complete. Your responses are voluntary and will be confidential.

Thank you for sharing your thoughts

* Required

1. A: Gender *

Mark only one oval.

- Female
 Male
 Prefer not to say

2. B: Age *

Mark only one oval.

- 20 - 29
 30 - 39
 40 - 49
 50 - 59
 60 and above

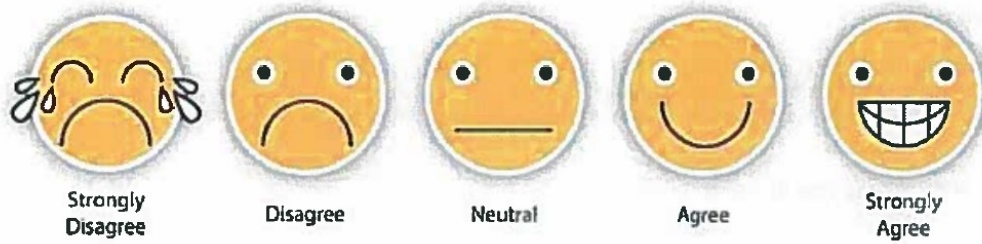
3. Level of study

Mark only one oval.

- Bachelor's
 Master's
 Doctorate
 Other: _____

4. Department / Profession *

Using a one-to-five scale, by selecting the most appropriate response as: Not Applicable "0", Strongly Disagree "1", Disagree "2", Neutral "3", Agree "4", Strongly Agree "5"



5. 2.1 Whenever I am stressed, water features (i.e.fountains, aquariums,water walls etc.) make me feel less stressful *



Mark only one oval.

| | | | | | | | |
|----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------|
| | 0 | 1 | 2 | 3 | 4 | 5 | |
| Not Applicable | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Strongly Agree |

6. 2.2 Water features positively affect my mood *

Mark only one oval.

0 1 2 3 4 5

Not Applicable Strongly Agree

7. 2.3 I feel better when there are water features in the interior *

Mark only one oval.

0 1 2 3 4 5

Not Applicable Strongly Agree

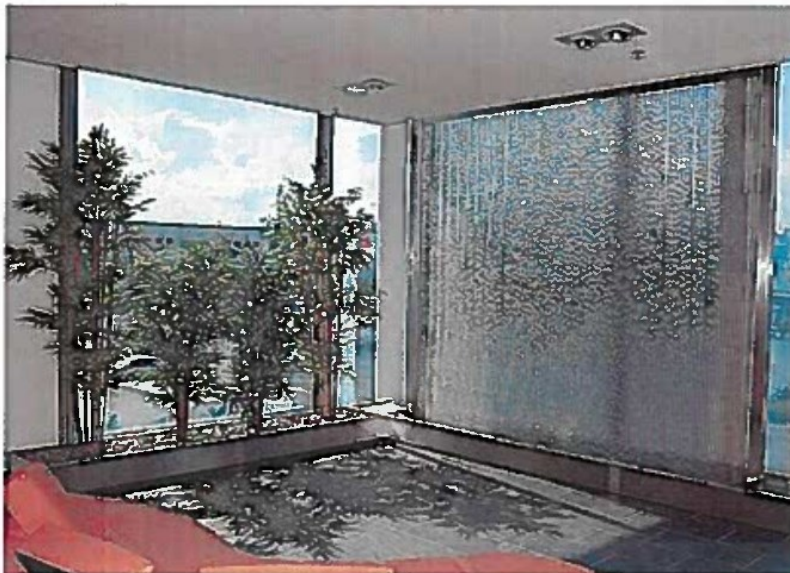
8. 2.4 Any water feature in the built environment can be a good representation of nature *

Mark only one oval.

0 1 2 3 4 5

Not Applicable Strongly Agree

9. 2.5 When I sit near to artificial water features in the interior (fountain, aquarium, water wall etc.) I experience similar feelings as I do when I am near a natural water element like a lake, waterfall, and ocean. *



Mark only one oval.

0 1 2 3 4 5

Not Applicable Strongly Agree

10. 2.6 Water visuals such as photography, painting etc. in the Interior are relaxing *



Mark only one oval.

| | | | | | | | |
|----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------|
| | 0 | 1 | 2 | 3 | 4 | 5 | |
| Not Applicable | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Strongly Agree |

11. 2.7 I feel better when there are water sounds in the interior *

Mark only one oval.

| | | | | | | | |
|----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------|
| | 0 | 1 | 2 | 3 | 4 | 5 | |
| Not Applicable | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Strongly Agree |

12. 2.8 I find water sound relaxing *

Mark only one oval.

| | | | | | | | |
|----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------|
| | 0 | 1 | 2 | 3 | 4 | 5 | |
| Not Applicable | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Strongly Agree |

Water Sound example



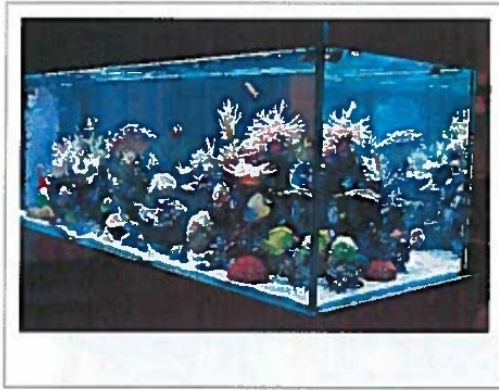
<http://youtube.com/watch?v=zVXnoloWu88>

Part 2.1

Please select only one option of each question below

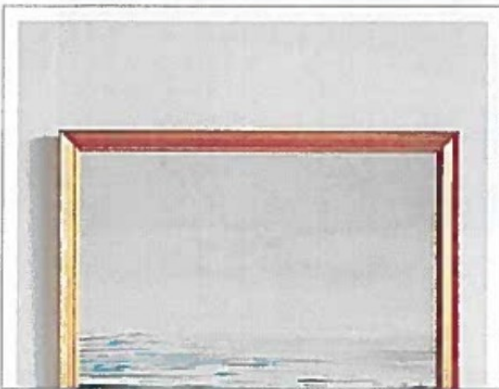
13. 2.1.1 Which water features do you prefer in the interior? *

Mark only one oval.



Aquarium, fish pond, water garden etc.

Water wall, fountain, waterfall, pond etc.)



Any visual with water element in the composition (photography, painting, picture etc.)

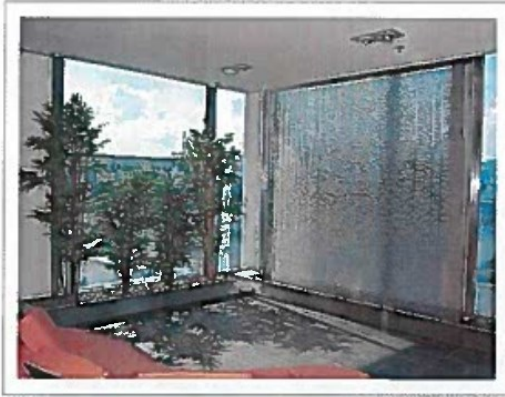


None, I don't think that water features have any positive contribution to the interior

Other:

14. 2.1.2 When you are indoors, you feel most connected to nature when near*

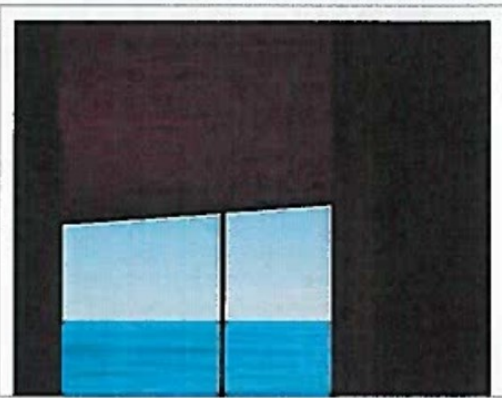
Mark only one oval.



Water features (aquarium, water wall, fountain etc.)



Greenery (plants, grass, trees etc.)



Direct access to nature view



Any visual with a natural view (photography, picture, painting etc.)

Other:

Part 3

Please mark the level of stress/anxiety that you have in daily life according to the below listed factors

15. 3.1 Academic process *

Mark only one oval.

- No stress
- Slight stress
- Average
- Above average
- Extreme

16. 3.2 Grades *

Mark only one oval.

- No stress
- Slight stress
- Average
- Above average
- Extreme

17. 3.3 Classmates *

Mark only one oval.

- No stress
- Slight stress
- Average
- Above average
- Extreme

18. 3.4 Assessment (exams, homework etc.) *

Mark only one oval.

- No stress
- Slight stress
- Average
- Above average
- Extreme

19. 3.5 Health *

Mark only one oval.

- No stress
- Slight stress
- Average
- Above average
- Extreme

20. 3.6 Money *

Mark only one oval.

- No stress
- Slight stress
- Average
- Above average
- Extreme

21. 3.7 Workload *

Mark only one oval.

- No stress
- Slight stress
- Average
- Above average
- Extreme

22. 3.8 Time constraints and deadlines *

Mark only one oval.

- No stress
- Slight stress
- Average
- Above average
- Extreme

23. 3.9 What could be done to improve the physical environment of the campus area that will lower the stress level of the users? *

24. 3.10 If you have any other additional comments, please put them in the space below

THANK YOU FOR YOUR TIME AND PARTICIPATION!

For any further comments or questions, contact me: fionanevzati@gmail.com
With respect,
Fiona Nevzati

HOW TO OVERCOME ACADEMIC STRESS??

Find out why the academic stress is increasing and ways to manage it from the article below:

<https://cheekyscientist.com/9-ways-to-manage-and-overcome-academic-stress/>

Powered by

 Google Forms

Appendix B:
Online and Hard Copy Survey Containing 3D Visualizations
(Google Forms)



25. WHAT DO YOU FIND MOST ENGAGING IN THE PROPOSED ENTRANCE LOBBY DESIGN?

Mark only one oval.



Water installation



Ocean view wallpaper



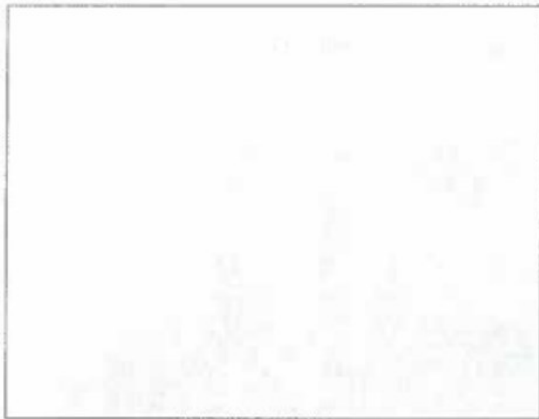
Framed pictures of an ocean view



Fountain



Aquarium



None, I don't think that water features have any positive contribution to the interior

26. HOW WOULD YOU USE THIS SPACE?

Mark only one oval.

- For waiting
- For relaxing and resting
- Just passing by (circulation and junction)
- No specific use in this area
- Other: _____

27. WHAT IS YOUR FAVORITE PLACE IN THE CAMPUS AND WHY? *

28. ARE YOU HAPPY WITH THE EXISTING SITUATION OF THE ENTRANCE LOBBY OF "D" BLOCK? IF NOT, WHAT COULD BE DONE TO IMPROVE THIS INTERIOR, PLEASE EXPLAIN VERY BRIEFLY *

29. WHAT COULD BE DONE TO IMPROVE THE PHYSICAL ENVIRONMENT OF THE CAMPUS AREA THAT WILL LOWER THE STRESS LEVEL OF THE USERS? *

30. IF YOU HAVE ANY ADDITIONAL COMMENTS, PLEASE PUT THEM IN THE SPACE BELOW

THANK YOU FOR YOUR TIME AND PARTICIPATION!

For any further comments or questions, contact me: fionanevzati@gmail.com

With respect,
Fiona Nevzati

