Investigating the Relationship Between Water Element Designs and User Preferences

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Abstract
Water elements are design features that complement the environmental landscape with their natural and artificial appearance, particularly in urban spaces. They are effective in boosting the quality of urban space by supporting perceived and real comfort in the area where they are found. In this study, a face-to-face interview photographic survey was conducted with 500 people chosen randomly in five different city squares in Istanbul, whereas participants were asked why they preferred particular water element forms, such as; (natural / geometric form, still / moving form, light / dark colored ground, angular / curvilinear form, natural / colored light). According to the results of the survey conducted, answers provided were grouped under the headings of 'no reason,' 'physical feature,' 'psychological effect,' 'aesthetic appearance,' 'nature conservation,' 'modern' and 'cleaning.' As a result of the research, it was observed that water elements with natural forms were preferred over those with geometric forms, water elements with light colored floors were preferred over those with dark floors, and water elements illuminated with natural light were preferred over those illuminated with colored light. While physical appearance, psychological effect and aesthetic features of the water elements are the primary factors in the preference of the water element, it was determined that definitions such as cleanliness, nature conservation and modern appearance are not as influential compared to other selection factors.

Keywords:

water element, form, design, landscape perception, color, lighting

1.Introduction

According to White's (1980) book entitled The Social life of Small Urban Spaces, water, together with the sun, trees, food and seating groups, is shown to be amongst the important elements that invariably need to be found in urban open spaces. Landscape theories and research emphasize that human water elements are an important comfort component within the physical environment elements (Ren, Kang 2015; Karr, 1992; McCulley 1976; Moore, Lidz, 1994; Ulrich, 1999). When the studies are evaluated in terms of visual landscape quality, it shows that there are positive correlations between water elements and their preference (Herzog, Barnes, 1999; Polat, Akay, 2015; Purcell et al., 1994). As a result of the studies of Chai, Wengven and Lin (2022), water was deemed considerably higher than other landscape factors, indicating that water had the utmost positive impact on landscaping preference. Water has historically been an important part of gardens and public spaces (Lehrman, 1980; Burmil et al., 1999; Dalley, 1993). Water elements can be described as visual elements in the in-situ environment, when they are considered to balance the arid air in the aquatic environment with the effect of concretion, to vitalize the stability in the

environment, to make people feel good psychologically and aesthetically (Perysinaki, 2010). In designing water elements to be utilized in urban spaces, the function, structural structure and appearance of the water needs to be taken into consideration (Littlewood, 2012). The character of the water in that space has a direct impact on the character of the space and human activity. In urban open spaces, water can originate from a point source, flow from a linear surface, collected in an enclosed form or take on the setting of a boundary element. In their studies, Hami and Emami (2015) state that watery scenery has a stimulating effect on people and break the monotony of the landscape. Some researchers also point out that water has a regenerative effect on people (Francis, 2003; Hartig, Mang, Evans, 1991).

Water elements are set in different forms and shapes in their living environment. Dr. Maslow (1998) indicated that individuals' preferences while choosing a water element are form, simplicity, non-artificial and easy access, scale, integrity of the entire design and the presence of sub-regions; the balance of pliable and hard ground with the material accommodating a multitude of textures; water sound, noise suppression and audible; whereas the presentation qualities of water are broken down into the following headings; reflection, illumination, open appearance, mobility and appealing to more than one sense. Enlivened by sprinklers, illuminated with colorful lights, they can be given natural and informal forms as well as incorporated into formal structures. They can be arranged into various sizes and shapes according to the function, form and dimensions of their *in-situ* space (Erdem, 1995). Hensey (2019) wrote, "Water can be simple and complex, smooth and rough, transparent and almost opaque, quiet and noisy." On the other hand, Booth (1983) emphasized water's physical, emotional and metaphorical appeal, which is calming, exciting, remarkable, as well as prompting.

The forms created can be used in the form of a natural water element, directly imitating nature, with factors such as the use of natural materials, the natural flow of water in the direction of gravity, etc., or it can also create a natural lakeside effect, for example, with the line line softened by making the shape curvilinear based on geometric shapes. The geometric shape deformed in this way can leave the central focus to create an *in-situ* natural effect. Compared to geometric water elements, a larger area is needed for water elements designed by deforming their geometric shape (Brookes, 1991: 244). Cendere grouped the perception of water (1998) beneath five headings such as, "visual, auditory, psychological, tactile and refreshing."

Water elements are divided into two groups as still and flowing waters. Still water elements are one of the design elements frequently used in many fields such as parks, gardens, housing estates, shopping malls, etc. The selection criteria may vary depending on the area of use. Designs using still water have a reflective effect. Despite being a liquid, water can look like glass material when used in still form. Likewise, a design using glass material can create a water effect. This may be one of the reasons that affect the preferences of people within the environment. The research results of Özer and Barış (2012) showed that the majority of users, except the 61-65 age group, prefer moving waters such as flowing, fountain pools and waterfalls. Harris and Dines (1998) also stated that still water, which can create a reflective, calm effect in the design of the water element, conveys aesthetic value, while expressing that it has an attractive feature on people with its humidity and its cool feeling. They emphasized that the use of still water often creates fertile space for people to gather in public places.

Moving water can also be grouped into two groups. This is water under the influence of gravity, that is, natural and artificial elements such as water curtains, streams, cascades and waterfalls flowing downwards, and fountains, fountains that can be directed or released by various movements in the opposite direction of gravity with the effect of pressure. When water elements, which have a remarkable *in-situ* feature, are chosen as flowing, they can be affective in emphasizing the space and attracting people with a sense of curiosity, since they can create a sound effect. When designed together with many factors to be used in design such as sculpture, audio-visual, planting, etc., sound is a factor that can have a psychological effect on people, thus boosting the efficiency of people's

five senses by supporting visual perception (Gencturk, 2006). Moving water elements may produce less bacteria, odor and pollution than still water. Some researchers also draw attention to water's psychological healing effect. For this reason, seeing that water can renew itself, it arouses the feeling of "cleanliness" with its sound and appearance, from both a psychological and physical standpoint. (Mroczek et al., 2005)

Decent quality water gets its clean appearance and color from the surface reflections, its character and the color of its container. While white or reflective containers express the water's transparency, light blue containers emphasize the water's cleanliness and clarity and dark blue or black containers maximize reflection while providing a wetter appearance.

Flat and plain during the daytime, the water surface will take on a different appearance with reflections and refractions caused by nighttime illumination. The loss of light-shadow balance in the areas that are desired to be emphasized in over-illuminated water elements may prevent realization of the targeted effect. Likewise, lighting elements containing too many colors can tire the viewer's eyes and make them difficult to perceive.

2. Method

In 2018, a survey was prepared in order to test visual preference judgements and opinions of perceived water features. To obtain a homogenous and reliable result, 500 people were selected for interviews through a cluster procedure conducted at five different urban squares around Istanbul (Bakırköy, Ortaköy, Kadıköy, Şirinevler and Taksim). The questionnaire included adjective pairs for each component. Participants were told there were no right or wrong answers and were asked to rate each scene on a scale of 1 - 10. The reasons why users prefer water elements were asked open-ended. First, all the answers were listed, then they were listed under the headings of 'physical appearance,' 'psychological effect,' 'aesthetic appearance,' 'nature conservation,' 'modern' and 'other,' whereby the percentages of preference were examined in the SPSS environment.

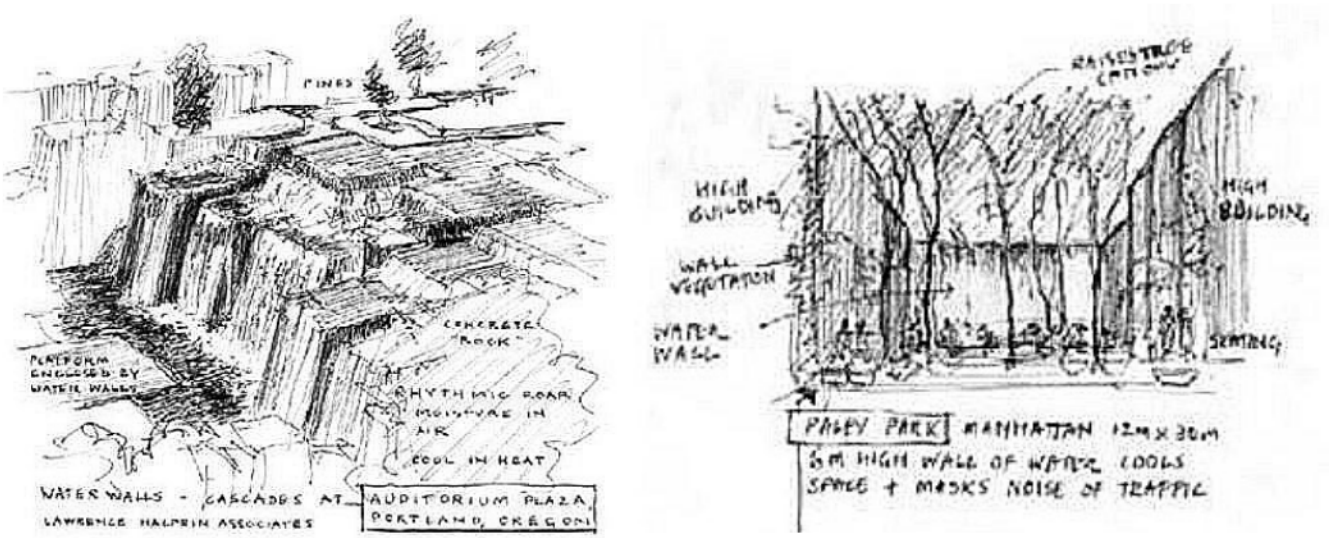

Figure 1. Left: Paley Park, Manhattan (12 x 30 m); Right: Water walls-cascades by Lawrence Halprin and Associates, Auditorium Plaza, Portland, Oregon, Water elements from the Dee drawings (2004)

Table 1. Water feature preferences (N=500) (improved by authors)

	N	%
NATURAL OR GEOMETRIC FORM		
		
Dockside Green Community (Vancouver Island, Ellen Moorhouse, Toronto Star)	Robert and Arlene Kogod Courtyard (Smithsonian American Art Museum, Washington, D.C.)	
Natural	349	70
Geometric	151	30
STILL OR MOVING FORM		
		
Tanner Springs (Atelier Dreiset, Fred Jala/Flickr)	Fort Worth Water Garden, Texas	
Still	216	43
Moving	284	57
DARK COLOR / LIGHT COLOR		
Dark color	198	40
Light color	302	60
ANGULAR / CURVILINEAR		
		
Château de Vaux-le-Vicomte Gardens (Maincy, France). Image © Mark B. Schlemmer/Flickr		
Curvilinear	286	57
Angular	214	43
NATURAL OR COLORIZED LIGHT		
Natural light	193	39
Colorized light	307	61

*Photos from Terrapin Bright Green (2014)

3. Research Findings

As a result of the research, it was determined that natural-form water elements were preferred to geometric ones, light-colored water elements were preferred to dark-colored water elements, and water elements illuminated by natural light were preferred to those illuminated with colored light. It was also determined that the preference rates for the 'still-flowing' and 'angular-curvilinear' elements were close to one another (Table 1).

The majority of those who preferred natural-looking water elements prefer the water element due to its physical appearance (34%) and its psychological effect (23%), whereas it was determined those who prefer geometric forms prefer water due to its aesthetic appearance as well as its physical appearance. It was determined that 13% of those who preferred the natural water element stated the effect conserved nature; it was also determined those who chose the geometric form indicated that conservation wasn't a factor. Again, while some of those who chose the geometric view (10%) found the water element modern, it was also observed that those who chose the natural form didn't consider the water element a modern feature. The majority of users chose still / moving water due to its psychological effect (42%), whereas moving water was more aesthetic than still water. Once again, it was determined that moving water was cleaner than still water (Table 2)

While the majority of users who chose the dark color element did so as they considered them aesthetic (35%), the vast majority of those who chose a light-colored floor did so because of its psychological impact. It was determined that the cleaning factor had a slight impact in selecting either floor. While it was determined that the majority of those who chose the curvilinear / angular form preferred the angular form due to its physical appearance (36%) and aesthetic appearance (30%), whereas it was observed the physical and aesthetic appearance were of equal value in the selection of the curvilinear form (31-31%). It was also determined there were users who chose curvilinear and angular forms, describing these forms as modern. Moreover, it was determined that those who preferred natural light to illuminate also stated that the water element affected their choice of physical appearance (31%) and psychological effect (28%). It was observed that those who chose colored light preferred water for its aesthetic properties (30%) rather than for its psychological effect.

Table 2. Factors affecting water element preferences (improved by authors)

	Natural Appearance		Geometric Appearance		Still Water		Moveable Water		Dark Color		Light Color		Curvilinear Form		Angular Form		Natural Light		Colorized Light	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
1	59	17	27	18	45	21	53	19	36	18	47	16	56	20	43	20	60	20	41	21
2	**119**	**34**	**46**	**30**	49	23	53	19	46	24	54	18	**90**	**31**	**76**	**36**	**96**	**31**	50	26
3	**82**	**23**	22	15	**91**	**42**	**101**	**35**	36	18	**142**	**47**	38	13	21	10	**85**	**28**	45	23
4	44	13	**41**	**27**	31	14	66	23	**69**	**35**	43	14	**89**	**31**	**65**	**30**	66	21	**57**	**30**
5	45	13	–	-	-	-	-	-	-		-		-		-	-	-		-	-
6	-	-	15	10	-	-	-	-	-		-		13	5	9	4	-		-	-
7	-	-	-	-	-	-	11	4	11	5	16	5	-	-	-	-	-	-	-	-
Total	349	100	151	100	216	100	284	100	198	100	302	100	286	100	214	100	307	100	193	100

N: Number

1.No reason 2.Physical appearance 3.Psychological impact 4.Aesthetic appearance 5.Eco-friendly 6.Modern 7. Cleanliness

4. Discussion

The appeal and perception of open water bodies seemed to be significantly dependent on their appearance (Donaldi 2018). Research conducted has demonstrated that water has a strong impact on environmental perception, beneficial physical, psychological and physiological effects of spaces containing water and potentially meeting restorative health needs (Korpela et al., 2002; Sakıcı, 2015, Zube et al, 1983; Ulrich, 1983; Ulrich, Simmons, 1986). Common factors were also encountered in the survey applied in the method of this study. These findings are detailed in the Discussion section.

In a study in which nine water elements in a park were examined by Elinç, Elinç and Kaya (2012), the low cooling (psychological) effect of the geometrical still water element was similar to the results of this study. Again in this study, the fact that the natural look was preferred more than the geometric look supports the results of the Donald (2018) and Elinç et al. studies.

According to the data collected by Kürkçüoğlu (2009) from a survey of 50 people regarding a flowing water element in a public square, 82% of the users preferred the moving water element, while 18% stated they chose the still water element. Moreover, in the study in which aesthetic perception was also questioned, it was determined that the majority of users regarded moving water as more aesthetic. In addition, the impact of still / moving water on human psychology was also observed in the Kürkçüoğlu study. In comparing the psychological and aesthetic expectations of the users' responses, it was determined that while expectations of the water element from a relaxation standpoint were 28.15%, the expectation of aesthetics, that is, visuality, ranked second (25.33%). While the results of the Kürkçüoğlu study indicated there were significant differences in the choice between still and moving water, the percentage of people choosing still and moving water in this study were close. That said, flowing water elements were the most preferred group in the Cendere study (1998). The cleaning factor was also found in the replies compiled from the questions regarding the matter of still / moving water within the scope of this study. While no cleaning response was obtained for still water, the result was 4% for flowing water. Burmill et al. (1999) also pointed out the perception of cleanliness of water. In this study, a result that bolstered Burmill's determination was obtained by specifying the perception of cleanliness as the reason for choosing still over flowing water or vice-versa.

While the floor coating to be used in water elements plays an important role in factors such as spending time around the water element, drawing attracting to itself, and emphasizing the importance and quality of the space, in his investigations on water elements in various urban spaces Erdal (2003) revealed the reflective feature of the floor material used in dark colors acted as a mirror. It was also perceived that a dark-colored water element used in a touristic square affects the preference of visitors as it reflects the surrounding historical structures onto the water. On the other hand, it was emphasized that light-colored water elements evoke the perception of cleanliness. The results of this study showed that light color was preferred because of its psychological impact rather than the cleaning factor. Erdal (2003) emphasized that as the floor color becomes lighter and used in a light color, the water changes from reflectivity to a showcase function, and thus people will focus on the floor covering and the items to be contained within, and not the reflecting structures. Therefore, since the use of light and dark colors affects human perception, it may be concluded that the psychological impact is higher than other groupings. While Erdal's (2003) study in dark color preference underscored increasing human perception by including aesthetic concerns with light colors, dark colors were found to be more aesthetic in this study. In yet another study, it was noted that light color (blue) floor covering used in the water elements was clean and spacious by half of the users, while the others found this color too classic and that different colors needed to be chosen. Contrary to the concept of classicism, it can be understood that users sought contemporariness in the color of water elements with a myriad of color preference expressions (Kürkçüoğlu, 2009). That said, contemporariness wasn't found as one of the factors in the results of this study.

Many studies draw attention to the fact that curvilinear water forms are much more preferred than angular water forms. In one such study, Gençtürk (2006), stated that a circular pool with a fountain is generally aesthetic and well-maintained by users, and embodied an artificial ap-

pearance rather than a natural one. Moreover, it was stated that in the data collected pertaining to the angular water element, it was less aesthetic than the curvilinear pool, whereas an artificial image response was garnered. As for the curvilinear / angular form aspect in this study, physical and aesthetic image factors come to the fore, whereas the physical image factor regarding curvilinear versus angular forms was nearly equal. (%31-%36) As for the aesthetic look, values for the water element for both forms were equal (31%-30%). The results of this study support Gençtürk's findings. In making the water more natural and attractive, the results of the studies of both Cendere (1998) and Kürkçüoğlu (2009) underscored the presence of vegetation and fish, as well as illumination.

5. Conclusion

As a result of this research, it was determined that natural-form water elements were preferred over geometric elements, light-colored water elements were preferred over darker-colored ones, and water elements illuminated with natural light were preferred over those illuminated with colored light, wheres primary factors for their preference were; physical appearance, psychological effect as well as aesthetic features of the water elements in question. Moreover, it was also determined that the definitions of cleanliness, nature conservation and modern appearance were not preferred according to other selection factors.

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