

The assessment of the relationship between various waterscapes and outdoor activities: Edirne, Turkey

Çiğdem Sakıcı

Received: 30 July 2013 / Accepted: 21 January 2014 / Published online: 27 February 2014
© Springer International Publishing Switzerland 2014

Abstract The environment is very important in terms of the behaviours and actions of human beings, and activity–environment correlation is used frequently in outdoor arrangements. The environment must meet the requirements and expectations of society. Outdoor activities are the activities that contribute to the well-being of human beings in physical (heartbeat, respiration, blood pressure, etc.) (Ulrich, *Journal of Environmental Psychology* 11:210–230, 1991), psychological (fear, anxiety, depression, loneliness, stress, etc.) (Marcus and Barnes 1999) and behavioural (insomnia, nervousness, restlessness, passivity, etc.) (Ulrich 1999) terms. It is known that human beings are affected significantly by the environments they are in, and more importantly, it is known that the environment they are in affects their happiness status. The causes of this effect are the features and appearances of the spatial elements and components that mainly make up such environments. One of the elements that is used frequently in landscape is water. If one examines designed or natural open spaces, it may be observed that water has very distinctive features. Dynamic (in the form of a leak, with intense flow rate, cascade, foamy, squirting, jet, graded, etc.) and still water elements may be used with sculptures, plants, rocks and elevations (on land). This study aims to reveal

which age groups of students enjoy the different types of activities with regards to water features and emotional associations that motion and characteristics of water bring out in human beings and also to reveal the water preferences of human beings, including their reasons for such preference. Thus, 20 different water compositions located in Edirne Province were selected, and in 2-min camera reels, the students of various age groups assessed water with various characteristic features via a survey. As a result, it was revealed that human beings from various age groups wish to perform different activities with water elements having distinctive characteristic features, and the types of water elements that are subject to various age groups' like and dislike were determined. Kruskal–Wallis test was used during testing the effect of age differences. Chi-square analysis was used in order to examine the effect of age differences on preferences with regards to the activities that shall be performed at locations that include utilization of various water elements. The results reveal that while the use of water should be allowed in landscaping, selections regarding the elements of these water features should be made based on the type of activity and the age group of users in relation to the location.

Keywords Preference for water · Water elements and activity · Waterscapes

Ç. Sakıcı (✉)
Kastamonu Üniversitesi, Kuzeykent Kampüsü, Mühendislik
ve Mimarlık Fakültesi, Peyzaj Mimarlığı Bölümü,
Merkez-Kastamonu, Turkey
e-mail: csakici@kastamonu.edu.tr

Ç. Sakıcı
e-mail: csakici@hotmail.com

Introduction

It is an important requirement for today's society to benefit from nature and in particular from open green

spaces. Open green spaces which are/must be present in our cities are of great importance in terms of both the health of the city and of humans. Nature being the source of life is a concept that is always associated with humans. Ulrich (1984, 1992), Kaplan and Kaplan (1989), Lewis (1990, 1994) and other researchers determined in their research that being close to natural areas is very important for the mental health of humans. It is revealed that spending time in natural areas stimulates all types of emotions and decreases stress hormone levels (Kaplan 1987; Lundberg 2001), usage of open green spaces minimizes the risk of diseases that are aggravated by stress in terms of human health, visiting outdoor open spaces on a daily basis ensures that people stay strong against physical and psychological problems, such as stress (Astrand 1987; Blair et al. 1989; Jonsson et al. 1993; Paffenberger and Asnes 1994; Küller and Küller 1994; Pate 1995; Perk 1998), natural day light has an effect on hormones and works as a biological clock that is effective on stress levels, day light decreases anxiety and depression and increases sleep quality, which has an effect on stress levels (Küller and Lindsten 1992; Küller and Wetterberg 1996; Marcus 2001), and art, cultural and aesthetic experiences have a positive impact on stress (Rapp 1999; Dilani 2001).

Several studies suggest that water has a positive effect on environmental preferences. Herzog (2005) determined that environments that include water elements are preferred more in comparison to those that do not include any water elements, and it is revealed in Ulrich's studies that water has healing psychological effects (Sakıcı 2009). Litton suggested that, as a result of the film he shot on two rivers with different flow rates in California, water which flows irregularly is preferred more (Burmil et al. 1999). Ulrich (1981) studied the psychological effects of natural and artificial environments. In this study, subjects were presented with nature samples that include water and plants and city samples that are not water or plant weighted via slides. It was revealed that, on the basis of the adjective pairs presented, water has a relaxing effect, decreases mental fatigue and diminishes anger (Campbell 1994).

The motion of water is attractive to humans because of its variety and continuity. As a result of perceptual studies performed since the 1960s, it has been revealed that water has a great effect on environmental perception (Zube 1974, 1982; Ulrich 1981, 1983; Kaplan 1995).

Research has compared water locations and non-water locations and suggested that water has psychological and physiological benefits. In a study performed by Brown and Daniel (1991) in a riverside in Colorado, they examined the relationship between the beauty of the perceived space and water flow rate by using a psychophysical approach. The effect of the flow rate, width and vegetation intensity of the water and other environmental features was studied, and consequently, it was determined that as the water flow rate increases, so does scene perception. The effects of water on perception, environmental preference and psychology are discussed in several studies. The following question is examined in a study made by Loomis (1987): "Is any type of water suitable for any location?" In the study performed by Loomis (1987), it is suggested that water with a high flow rate is satisfying, but this satisfaction is also dependent on the activity in the space and suitable flow rate determines the activity in the space (Burmil et al. 1999).

Results from research that studies the effects of the motion of water on users differ from each other. Booth (1983) suggests that moving water awakens humans, Hannebaum (1998) claims that such water is a source of relaxation and Sorvig (1991) states that such water causes calming or incentive gloomy thoughts. However, researchers agree that still water has calming effects. Booth (1983) stated that still water promotes tranquillity and serenity, and Hannebaum (1998) stated that such waters create calmness. However, no clear information can be obtained on which type of water features should be used with which activity.

Today, as we look at various water usage methods in landscape designs, it may be observed that water elements showing distinctive characteristic features are used in several activity areas. Water is used mostly for visual purposes without considering the type of activity that is performed in such location. However, the following questions form the basis of this study. Is it more accurate to determine the preferred water component on the basis of the activity performed at a location? Does moving or still water or various flow forms encourage humans to perform various activities? Does moving and loud water used in an enclosed space disturb users who are chatting or resting, after a while? Or, on the contrary, does it encourage a person to perform an active activity? Is there a correlation between these emotions and user age?, i.e., in brief, is there any correlation between water element and activity?

This study aims to reveal the activities that students from various age groups wish to perform with water that shows various characteristic features. It is also aimed to determine whether activity preferences differ on the basis of age groups. Finally, the types of water most preferred and not preferred by students from various age groups are revealed together with the reasons for these preferences.

Method

Study area and selection of water elements

The study was performed in Edirne Province, which is located in the Marmara Region of Turkey, shares borders with Greece and Bulgaria and serves as the capital of the Ottoman Empire for 90 years (41°40'41"N, 26°33'34"E). Edirne was established on a plane where the Tunca, Arda and Meriç rivers meet. Having served as the capital city of the Ottoman Empire, the city is filled with historical areas, such as inns, mosques and bazaars. The city's history dates as far back as the seventh century BC. Summers are quite hot in the city since a continental climate is dominant; therefore, in summer months, several water applications may be observed in and around the vicinity in order for citizens to benefit from the cooling effects of water. The urban distribution of water filmed in the study may be seen in Fig. 1. All of the water applications used in the study were selected from Edirne City centre and surrounding area.

In order to determine the water with various characteristic features that shall be assessed within the scope of the study, all of the waterspaces (35 designated points) in Edirne were initially filmed via camera and photo camera, and the water was assessed using a pre-designed water feature measurement scale. Scenes were assessed by a group of specialists which comprised of eight landscape architects, and it was decided that 20 scenes with distinctive features will be assessed by the associations and by the subjects.

Definition of the water elements used in the study

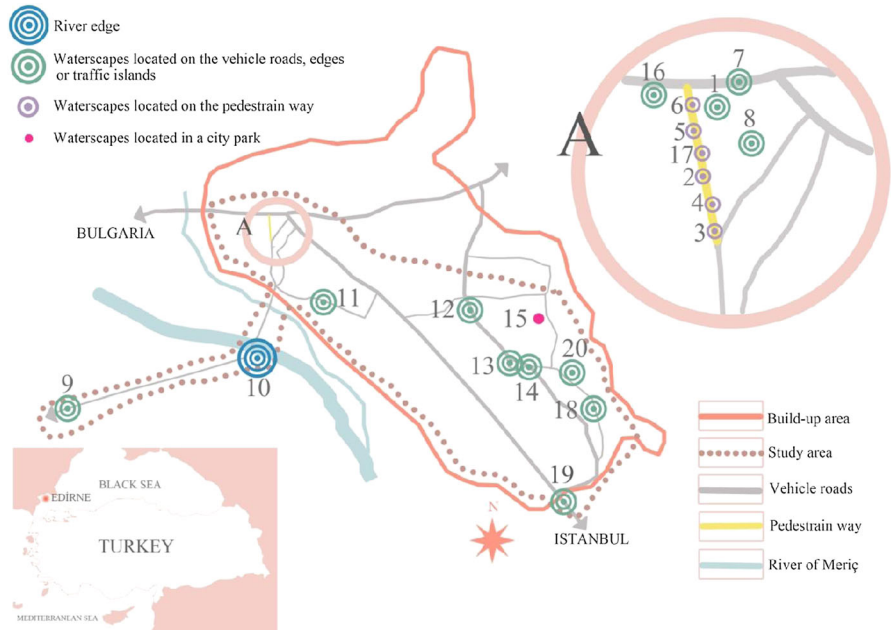
In a review of designed open spaces, usage of water can be observed in the following forms: nozzle, jet, flowing, still, leakage, intense flow rate, cascade, sparkling, squirting, music with gloomy feeling, graded, with sculptures, plants and elevations (on land). Water

elements can be basically classified in two categories: still and moving. Still water is comprised of plain, static, silent and stable water, such as lakes, ponds, pools, puddles, etc., and moving water signifies falling water that flows and moves with the support of step-shaped flows, cascades, slopes, nozzles and jetties (Booth 1983). Moving water elements may be examined under three categories: top-down, bottom-up and both. Although the motion that both flows and falls in the direction of top-down is the type of motion that is frequently observed in nature, bottom-up (via jet, nozzle) is contrary to nature and is therefore a challenge to gravity. Nasar and Lin (2003) considered flowing, falling and jet water categories in their studies and assessed motions of water under five subcategories, namely, still, flowing, falling, jet and both flowing and falling. This assessment is also used in our study, but falling water is divided into three subcategories, namely, flowing, flowing with jet and falling in steps via nozzles, and water is assessed under seven categories in the study. Categories of the selected water elements are shown in Table 1. Flowing water is the motion of water both in natural and artificial channels (Booth 1983). It moves downwards through various surfaces and forms (McCulley 1976). The velocity of water changes according to the inclination, size and features of the channel and the amount of water. Flowing water is the sudden fall of water from a higher platform to a lower platform. The velocity of water varies according to the way the water falls, free fall, obstructed fall and sloped fall, and based on vertical surface and skin friction. Finally, the category 'jets' refers to water rising to a higher elevation and then falling back. Jets force water up into the air through a nozzle in defiance of gravity (Booth 1983). The volume and pressure of water, the force and height of the jet, the light and the sculptural form give different visual effects. The features, flow directions and intensities of 20 water scenes are determined in Fig. 2.

Description of the survey

As a result of various methods of implementation, water is used in various forms and extends both in indoors and outdoors in landscape works. Good water feature designs have been a source of joy and relaxation, appealing to both the eyes and ears of humans. Water has always been one of the most significant design elements in successful designs from the past to the present day.

Fig. 1 Study area (adapted from 20 samples of waterspaces)



Designs related to water have always attracted humans and have always attracted interest.

The study aims to show how effective water elements are on the activities that students from various age groups perform around water elements with different motions and features. Twenty water elements (Fig. 2) with different features that are selected for this purpose were shown to the subjects together with 2-min camera films, and we questioned, via surveys, which activities or events they would like to perform in a location that includes such water features. The survey was comprised of four chapters. These are as follows:

- Part A Demographic features of the respondents, such as gender, age, level of education
- Part B Determination of which active (playing, sports, dancing, throwing stones, jumping, shouting,

trekking-rambling, running, driving bicycle) or passive (singing songs, listening to music, chatting, eating and drinking, examination of wildlife, taking photos, painting, laying down and sleeping, reading books and newspapers, relaxation, sitting down and watching) activities they would like to perform with such water

- Part C Questioning which of the water scene(s) is admired the most and reasons
- Part D Questioning which of the water scene(s) is disliked and reasons

In the study, camera scenes were used in order to investigate water elements, and after viewing every water scenes, we used the benefit of still photographs to remind ourselves of all the water elements. The representative validity of the photos was proven in

Table 1 Classification of water elements used in the study

Features of water elements	Still and still looking	Flowing jet	Falling			Jets and fountains	Flowing and falling and jet
			Falling	Falling Jet	Gradual falling + jet		
Scene no.	10 (still looking)	7	5	13	2	1	9
	15	8	6	17	3	4	14
		18		20	12	11	16
						19	

Water scenes		Water scenes	
	<p>1.Space that is pepped up via several jets that flow at various times on a plain square platform Jets+ loud sound</p>		<p>2.Water falling gradually in top-down direction from three platforms fixed at different heights Water+cascade+sculpture+jet+loud sound</p>
<p>Scene 1 (jets)</p>		<p>Scene 2 (gradual falling+ jet)</p>	
	<p>3.Water that is pepped up via nozzles in bottom-up direction from four platforms fixed at different heights, and that falls gradually in top-down direction Water+cascade+nozzle+moderate sound</p>		<p>4.Water pepped up via jets that are fixed around a small rounded platform Sculpture+jet+rock+light sound</p>
<p>Scene 3 (gradual falling+fountains)</p>		<p>Scene 4 (jets)</p>	
	<p>5.Water drops that flow in top-down direction in the form of a raindrop fall in the puddle with the depth of 10 cm. Water+artificial tree+very light sound</p>		<p>6. Water that falls into the puddle with the depth of 10 cm in top-down direction via fishline Architectural element+water+fishline+very light sound</p>
<p>Scene 5 (falling)</p>		<p>Scene 6 (falling)</p>	
	<p>7.Water that reaches to the water on surface by flowing in top-down direction on the surface covered with pots and that is pepped via jet Architectural element+water+rock+plant+wildlife+light sound</p>		<p>8.Natural looking water that flows in the form of surface flow from various platforms, and where waves are formed by being pepped up via jets Water+plant+rock+jet+elevationdifference+light sound</p>
<p>Scene 7 (flowing+jet)</p>		<p>Scene 8 (flowing+jets)</p>	
	<p>9.Water that initially flows vertically in top-down direction and then falls from the upper platform to the lower platform and that is also pepped up via jet Water+architectural element+jet+plant+loud sound</p>		<p>10.The river that has an undetectable surface flow exhibits a still attitude. Also, reflectivity of water is benefitted</p>

Fig. 2 Twenty test scenes selected for surveying

several studies during the assessment of landscape character, and it was revealed in these studies that the

preferences that are expressed by photography-based perceptual decisions and responses given to the direct

<p>Scene 9 (flowing+falling+jet)</p> 	<p>Broad water surface+architectural element+plant</p>	<p>Scene 10 (still looking)</p> 
<p>Scene 11 (jets)</p> 	<p>11. Water that is pepped up via jets that are fixed in horizontal form in bottom-up direction Water+architecturalelement+rock+ moderate sound</p>	<p>Scene 12 (gradual falling+jet)</p> 
<p>Scene 13 (falling+jets)</p> 	<p>13. Water that is pepped up via jets fixed on a platform falls into the pool area after splashing on the platform. Architectural element+water+jets+ rock+loud sound</p>	<p>Scene 14 (flowing+falling+jet)</p> 
<p>Scene 15 (still)</p> 	<p>14. Water that flows and falls on rocks and that is also pepped up via a jet Plant+rock+water+jet+moderate sound</p>	<p>Scene 16 (flowing+falling+jet)</p> 
<p>Scene 17 (falling+jets)</p> 	<p>15. Still, broad water surface. Reflectivity of water is in the forefront Water surface+plant+wildlife+ architectural element</p>	<p>Scene 18 (flowing+jet)</p> 
<p>Scene 19 (jets)</p> 	<p>16. Water that flows from small overlapped rocks, and then fallen water reaches to the main water body Rock+water+jet+moderate sound</p>	<p>Scene 20 (falling+jets)</p> 
<p>Scene 20 (falling+jets)</p> 	<p>17. Water that is pepped up via jets falls to the puddle below through a small platform Jet+rock+water+cascade+light sound</p>	<p>Scene 19 (jets)</p> 
<p>Scene 18 (flowing+jet)</p> 	<p>18. Water pepped up via jet flows from upper platform in the form of surface flow and then reaches to the puddle on lower platform Architectural element+jet+water+very loud sound</p>	<p>Scene 17 (falling+jets)</p> 
<p>Scene 16 (flowing+falling+jet)</p> 	<p>19. Water that flows to the broad water surface via jets fixed in top-down direction at various heights Architectural element+jets+water+ plant+ moderate sound</p>	<p>Scene 15 (still)</p> 
<p>Scene 14 (flowing+falling+jet)</p> 	<p>20. Water that is pepped up via jets from the side and upper surfaces of a platform also falls on the water surface from the upper platform Architectural element+rock+ water+ jet+moderate sound</p>	<p>Scene 13 (falling+jets)</p> 
<p>Scene 13 (falling+jets)</p> 	<p>11. Water that is pepped up via jets that are fixed in horizontal form in bottom-up direction Water+architecturalelement+rock+ moderate sound</p>	<p>Scene 11 (jets)</p> 

Fig. 2 (continued)

usage of the landscape being expressed received parallel responses and that there is high level of conformity between the two (Zube 1974; Hershberger and Cass 1974; Daniel and Boster 1976; Craik 1983; Law and Zube 1983; Kellomaki and Savolainen 1984; Stewart et al. 1984; Brown and Daniel 1987; Trent et al. 1987; Zube et al. 1987; Stamps 1990, 1993; Hull and Stewart 1992; Nasar 1998; Clay and Daniel 2000; Palmer and Hoffman 2001; Nasar and Lin 2003). Although photographs and slides were used as environmental symbols for perceptual assessment, they could not express environmental diversity with dynamic environmental conditions, such as motion and sound. Therefore, some studies claim that this is not completely representative of the environment. Brown and Daniel (1991) found systematic differences between static and dynamic environmental expressions. They determined that static symbols such as slides and photographs may not represent dynamic environmental features sufficiently, such as a river flowing, but dynamic symbols, such as camera shots, reveal the details of the flow. Also, the results of the research conducted by Anderson et al. (1983) and Hetherington (1991) revealed that scene preference is affected by sound and motion. Therefore, camera shots are used in the study in order to determine the effect of the sound and motion of water, like in the case of the actual scene, and photographs are used in order to remind the scenes. These photos may be seen in Fig. 2.

Camera shots and photos were taken in the summer of 2011 between 15:00 and 18:00 hours in a position where the sun was located behind the photographer. Photos were taken by using a Nikon Coolpix 4100 digital camera, and shots were filmed by using a Canon MV800 digital video camera. While making the shots, we initially paid attention to filming the water composition from a distance as a whole, then filming the flow of water by zooming in from a general shot to a more detailed shot to emphasize the splashing water on the ground. The size and flow form of the water feature were also emphasized by the researcher verbally while scenes were shown to the subjects.

A survey study was performed in a silent environment with groups of 10–15 persons. The objective of the study was explained to the survey participants, and scenes were shown to the subjects via a projector, and after each scene, we asked the subjects to respond to the relevant questions. The survey study took approximately 50 min which included 40 (2 min × 20 scenes) of viewing scenes and 10 min for completing the survey form.

Four different age groups were determined on the basis of the education they were receiving in order to reveal the differences between age groups. Students in the first age group comprised of primary school students in the 8–11 age bracket, the second age group comprised of secondary school students in the 12–14 age bracket, the third age group comprised of high school students in the 15–18 age bracket and the fourth age group comprised of university students aged 19–26. Each age group included an equal quantity of subjects and the study included 37 subjects in total.

Data analysis

The Mann–Whitney *U* test was used to test the effects of gender on preferences, and the Kruskal–Wallis test was used to test the effect of age differences. In terms of the responses given, the Cronbach's alpha method was used to inspect the internal consistency of the responses given with regards to the reasons for prominent preferences. The chi-square analysis was used in order to examine the effect of age differences on preference with regards to the activities performed at locations that utilized various water elements. The statistical analyses that were performed within the scope of research were made by using the Statistical Package for Social Science 15.0 software.

Results

Demographic profile

The survey was conducted on 148 persons in total, which included 78 females and 70 males. While selecting these persons, we ensure that each of the four distinctive age groups included an equal amount of participants and that all subjects were students. The age groups and details with regards to the males–females that form these groups are as follows: a total of 37.8 % of the first age group was female, 45.9 % of the second, 56.8 % of the third, 70.3 % of the fourth age group and 52.7 % of the subjects in total.

Waterspace perception and preferences

According to the results of the Mann–Whitney *U* test, gender is not an effective factor in terms of preferences ($p=0.412$). According to the results of the Kruskal–Wallis test, age is an effective factor in preferences

($p=0.001$). The preference distribution of three of the most preferred scenes according to age groups is shown in Table 2 and Fig. 3. The reliability analysis was performed with the aim of testing the reliability of the responses to 13 different options in relation to the reasons for subjects preferring the listed as the top three preferred scenes. The resulting Cronbach's alpha values were calculated as follows: $\alpha=0.753$ in relation to the first preferred scene, $\alpha=0.775$ in relation to the second preferred scene and $\alpha=0.831$ in relation to the third preferred scene. And as it may be understood from the obtained α values, responses given with regards to the reasons for such preference are found quite reliable in terms of all of the three preferences.

From Table 2, the most preferred scene by the subjects in the first age group was the first photo that included the group of jets and fountains (16 persons, 43 %), in the second age group was the ninth photo that included the group of flowing, falling and jets (19

persons, 51 %), in the third age group was the 15th photo that included the group of still-still looking (19 persons, 51 %) and in the fourth age group was the eighth photo that included the group of flowing jet (21 persons, 57 %). From these results, the most preferred scenes differed according to age group. Preference statuses for the reasons for the most preferred scenes in each age group are given in Table 3. The first photo was the most preferred scene in the first age group because the subjects found it beautiful, effective, entertaining and refreshing. The ninth photo was the most preferred scene in the second age group because the subjects found it beautiful, effective and attractive. The 15th photo was the most preferred scene in the third age group because the subjects found it beautiful, clear and relaxing. Finally, the eighth photo was the most preferred scene in the fourth age group because the subjects found it beautiful, relaxing and soothing.

Table 2 Preference distribution of preferred water spaces according to age groups

Age groups														
1st (8 to 11 years old)				2nd (12 to 14 years old)			3rd (15 to 18 years old)			4th (19 to 26 years old)			Grand total	General ranking
Scene no.	Number	%	Item no.	Number	%	Item no.	Number	%	Item no.	Number	%	Item no.		
1	16	43.2	1	2	5.4	11	12	32.4	4	20	54.1	2	50	3
2	10	27	4	1	2.7	14	1	2.7	12	5	13.5	7	17	8
3	3	8.1	12	–	–	17	1	2.7	12	–	–	15	4	16
4	5	13.5	10	2	5.4	11	2	5.4	10	8	21.6	6	17	8
5	4	10.8	11	11	29.7	5	12	32.4	4	10	27	4	37	6
6	6	16.2	9	2	5.4	11	2	5.4	10	–	–	15	10	12
7	2	5.4	13	1	2.7	14	1	2.7	12	–	–	15	4	16
8	11	29.7	3	18	48.6	2	15	40.5	3	21	56.8	1	65	1
9	12	32.4	2	19	51.6	1	9	24.3	6	4	10.8	9	44	5
10	7	18.9	7	18	48.6	2	17	45.9	2	18	48.6	3	60	2
11	1	2.7	18	1	2.7	14	1	2.7	12	0	–	15	3	18
12	2	5.4	13	6	16.2	6	1	2.7	12	1	2.7	11	10	12
13	7	18.9	7	6	16.2	6	5	13.5	7	5	13.5	7	23	7
14	2	5.4	17	6	16.2	6	4	10.8	8	1	2.7	11	13	11
15	9	24.3	6	12	32.4	4	19	51.6	1	9	24.3	5	49	4
16	–	–	19	–	–	17	–	–	19	2	5.4	10	2	19
17	–	–	19	–	–	17	–	–	19	–	–	15	–	20
18	10	27	4	2	5.4	10	1	2.7	12	1	2.7	11	14	10
19	2	5.4	13	3	8.1	9	1	2.7	12	1	2.7	11	7	14
20	2	5.4	13	0	–	17	3	8.1	9	–	–	15	5	15

The bold items signifies the first three preferences of the groups

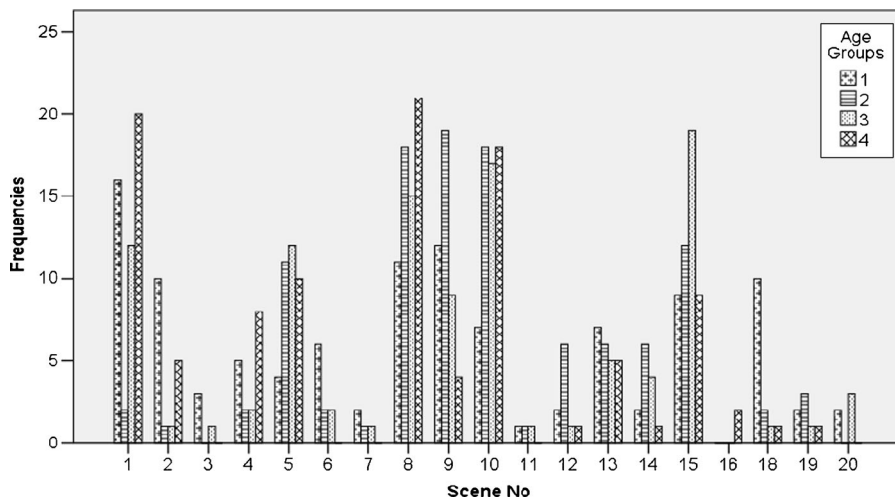


Fig. 3 Preference distribution of preferred waterspaces according to age groups

According to the results of the Mann–Whitney *U* test that was performed during the assessment of the most disliked scenes, gender has an effect on preferences ($p=0.011$). However, according to the Kruskal–Wallis test we conducted, age group has no effect on preferences ($p=0.659$). Preference distribution of the top three disliked scenes is shown in Table 4 and Fig. 4. In the reliability analysis aimed at testing the reliability of the responses to 11 different options given for the reasons why subjects disliked a particular scene that was listed in the top three disliked scenes, the Cronbach’s alpha

values were calculated as follows: $\alpha=0.790$ in relation to the first disliked scene, $\alpha=0.844$ in relation to the second disliked scene and $\alpha=0.844$ in relation to the third disliked scene. As it may be understood from the obtained α values, responses given with regards to the reasons for such preference are found quite reliable in terms of all of the three preferences.

As we assessed the obtained results as a whole, since age group has a significant impact on preferences with regards to disliked scenes ($p>0.05$), the most disliked scenes were 16, 4 and 7, respectively. Preference

Table 3 Preference statuses of the reasons that may be effective in preferring the most preferred scene in each age group

Reasons	1st age group Photo no. 1 (16 persons)	2nd age group Photo no. 9 (19 persons)	3rd age group Photo no. 15 (19 persons)	4th age group Photo no. 8 (21 persons)
	Number and ratio of persons who preferred such reasons			
Beautiful	15 (0.94)	16 (0.84)	13 (0.68)	19 (0.90)
Effective	14 (0.88)	15 (0.79)	7 (0.37)	12 (0.57)
Entertaining	15 (0.94)	11 (0.58)	5 (0.26)	2 (0.10)
Exciting	10 (0.63)	8 (0.42)	5 (0.26)	2 (0.10)
Soothing	8 (0.50)	5 (0.26)	9 (0.47)	14 (0.74)
Safe	9 (0.56)	1 (0.05)	5 (0.26)	2 (0.10)
Attractive, emphatical	9 (0.56)	12 (0.63)	7 (0.37)	6 (0.29)
Plain	7 (0.44)	2 (0.11)	5 (0.26)	6 (0.29)
Relaxing	12 (0.75)	9 (0.47)	11 (0.58)	15 (0.71)
Clear, understandable	8 (0.50)	3 (0.16)	5 (0.26)	2 (0.10)
Delighting	10 (0.63)	10 (0.53)	10 (0.53)	10 (0.48)
Lucid	11 (0.69)	5 (0.26)	12 (0.63)	4 (0.19)
Refreshing	14 (0.88)	4 (0.21)	8 (0.42)	5 (0.24)

The bold items signifies the first three preferences of the groups

Table 4 Preference distribution of disliked water scenes according to age groups

Age groups														
Scene no.	1st (8 to 11 years old)		Item no.	2nd (12 to 14 years old)		Item no.	3rd (15 to 18 years old)		Item no.	4th (19 to 26 years old)		Item no.	Grand total	General ranking
	Number	%		Number	%		Number	%		Number	%			
1	5	13.5	5	13	35.1	2	5	13.5	7	4	10.8	8	27	4.
2	5	13.5	5	–	–	16	4	10.8	9	1	2.7	13	10	15
3	3	8.1	15	10	27	4	3	8.1	13	7	18.9	3	23	6
4	11	29.7	1	18	48.6	1	7	18.9	4	2	5.4	12	38	2
5	3	8.1	15	1	2.7	14	2	5.4	16	1	2.7	13	7	17
6	2	5.4	18	3	8.1	8	8	21.6	2	1	2.7	13	14	13
7	8	21.6	2	10	27	4	4	10.8	9	9	24.3	2	31	3
8	1	2.7	20	–	–	16	–	–	19	–	–	18	1	20
9	2	5.4	18	1	2.7	14	2	5.4	16	3	8.1	10	8	16
10	3	8.1	15	–	–	16	1	2.7	18	1	2.7	13	5	19
11	5	13.5	5	3	8.1	8	3	8.1	13	1	2.7	13	12	14
12	4	10.8	9	–	–	16	4	10.8	9	7	18.9	3	15	11
13	4	10.8	9	3	8.1	8	6	16.2	5	4	10.8	8	17	8
14	4	10.8	9	2	5.4	11	5	13.5	7	7	18.9	3	18	7
15	5	13.5	5	2	5.4	11	–	–	19	–	–	18	7	17
16	6	16.2	4	11	29.7	3	8	21.6	2	14	37.8	1	39	1
17	4	10.8	9	10	27	4	6	16.2	5	6	16.2	7	26	5
18	4	10.8	9	–	–	16	9	24.3	1	3	8.1	10	16	10
19	8	21.6	2	4	10.8	7	3	13.5	13	–	–	18	15	11
20	4	10.8	9	2	5.4	11	4	10.8	9	7	18.9	3	17	8

The bold items signifies the first three preferences of the groups

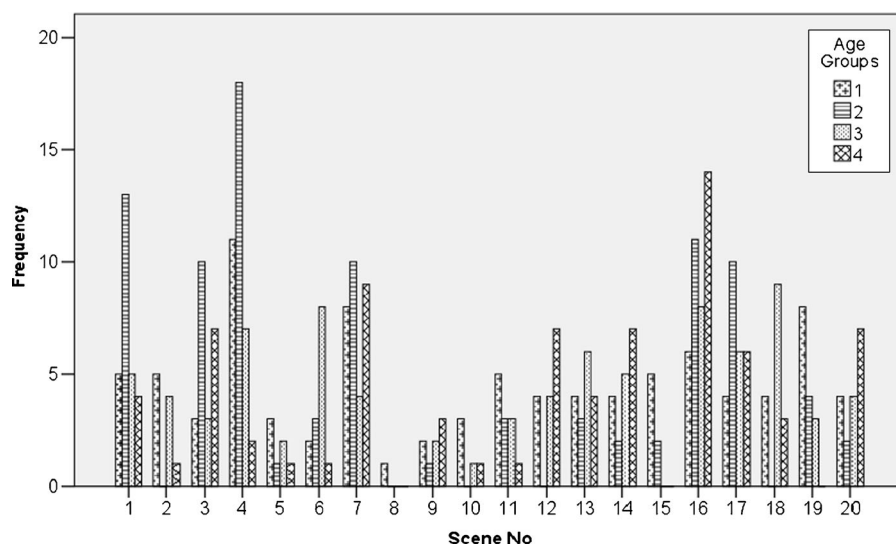
**Fig. 4** Preference distribution of disliked water scenes according to age groups

Table 5 Preference statuses of the reasons that may be effective in disliking the most disliked scene

Reasons	Photo no. 16 (39 persons)	Photo no. 4 (38 persons)	Photo no. 7 (31 persons)
	Number of persons who preferred such reasons		
Bad	23 (0.59)	26 (0.68)	18 (0.58)
Ineffective	23 (0.59)	23 (0.61)	23 (0.61)
Boring	21 (0.54)	21 (0.55)	15 (0.48)
Uncomfortable	8 (0.21)	10 (0.26)	4 (0.13)
Ordinary	18 (0.46)	17 (0.45)	18 (0.58)
Unattractive	15 (0.38)	19 (0.50)	12 (0.39)
Tiresome	11 (0.28)	9 (0.24)	4 (0.13)
Complicated	15 (0.38)	15 (0.39)	8 (0.26)
Uncomfortable	17 (0.44)	15 (0.39)	13 (0.42)
Blurry	18 (0.46)	9 (0.24)	10 (0.32)
Depressing	17 (0.44)	16 (0.42)	7 (0.23)

The bold items signifies the first three preferences of the groups

statuses of the reasons that may be effective in determination of these most disliked scenes are given in Table 5. Accordingly, scenes in the most disliked three photos were found to be bad, ineffective and boring, and these facts formed the basis for disliking these photos. Regarding scene no. 7, ordinariness was revealed as an important reason for disliking this scene.

Although the most disliked scene preferences did not differ statistically between age groups, the most disliked scene preferences of each age group were as follows: scene no. 4 in the jet and fountain group was preferred by the first and second age group, scene no. 18 in the flowing jet group was preferred by the third age group and scene no. 16 in the flowing falling jet group was preferred by the fourth age group.

Correlation between water features and activities that are required to be performed in such locations

Analyses were performed in order to determine which activities the students from various age groups would like to perform with water features that include different features and whether these activities vary according to age groups. Table 6 presents the preference ratios that were prepared separately for each age group, as well as cumulatively for all of the subjects according to the passive or active preferences made among 12 passive and 9 active activities with regards to the activities that the subjects who participated in the survey wish to

perform at each of the scenes located at such spaces. As we examined whether these preferences differ between age groups statistically (*chi-square test was performed*), regarding scenes nos. 1, 10 and 15, passive and active activity preference ratios of subjects were not affected by age differences ($p > 0.05$). In other scenes, except for the aforementioned scenes, passive and active activity preference ratios of subjects were statistically significantly different between age groups ($p < 0.05$ for scene no. 13 and $p < 0.01$ for other scenes).

In Table 6, in all of the scenes that were significantly different or not in terms of the active and passive activity preferences of age groups, the preference ratio of active activities was observed to be lower than passive activities both in the preferences made by all of the age groups individually and in all of the general preferences without making any age group distinction. As we assessed all of the scenes in general, it was revealed that 41 % of the first age group, 32 % of the second age group, 29 % of the third age group, 23 % of the fourth age group and 34 % of all of the participants in general preferred active activities. Table 7 shows the highest scoring scenes in which various age groups would like to perform active and passive activities.

Table 8 shows the distribution of activities that came to the forefront in each scene according to age groups by examining the preference statuses of activities individually.

Discussion and conclusion

This study aims to reveal the water features that people from various age groups like and dislike the most, the activities which people like to participate in around these features and the reasons for their preferences. A further aim was to determine whether these activities differ according to various age groups. Thus, designs that are consistent with the wishes and requirements of the user shall be realized by ensuring that the water feature—which is one of the most frequently used spatial elements in landscaping procedures—is designed on the basis of user group, spatial features and activity that is performed in the space. In addition to benefiting only from the visual value of water, usage of water shall also make a positive impact on the space from the perspective of providing encouragement with regards to the activity that is considered to be performed, and thus, water shall be used more consciously.

Table 6 Active and passive activity preference ratios of users for each scene

Scene 1			Scene 2			Scene 3			Scene 4		
Age group	Passive	Active	Age group	Passive	Active	Age group	Passive	Active	Age group	Passive	Active
1	0.55	0.45	1	0.58	0.42	1	0.60	0.40	1	0.58	0.42
2	0.55	0.45	2	0.70	0.30	2	0.71	0.29	2	0.70	0.30
3	0.51	0.49	3	0.80	0.20	3	0.78	0.22	3	0.84	0.16
4	0.58	0.42	4	0.80	0.20	4	0.75	0.25	4	0.85	0.15
All	0.55	0.45	All	0.67	0.33	All	0.67	0.33	All	0.68	0.32
Scene 5			Scene 6			Scene 7			Scene 8		
Age group	Passive	Active	Age group	Passive	Active	Age group	Passive	Active	Age group	Passive	Active
1	0.59	0.41	1	0.62	0.38	1	0.60	0.40	1	0.58	0.42
2	0.69	0.31	2	0.74	0.26	2	0.77	0.23	2	0.66	0.34
3	0.84	0.16	3	0.74	0.26	3	0.78	0.22	3	0.66	0.34
4	0.92	0.08	4	0.88	0.12	4	0.84	0.16	4	0.73	0.27
All	0.72	0.28	All	0.71	0.29	All	0.70	0.30	All	0.65	0.35
Scene 9			Scene 10			Scene 11			Scene 12		
Age group	Passive	Active	Age group	Passive	Active	Age group	Passive	Active	Age group	Passive	Active
1	0.59	0.41	1	0.62	0.38	1	0.58	0.42	1	0.60	0.40
2	0.70	0.30	2	0.66	0.34	2	0.63	0.37	2	0.70	0.30
3	0.78	0.23	3	0.63	0.37	3	0.75	0.25	3	0.68	0.32
4	0.77	0.23	4	0.62	0.38	4	0.75	0.25	4	0.77	0.23
All	0.67	0.33	All	0.63	0.37	All	0.63	0.37	All	0.65	0.35
Scene 13			Scene 14			Scene 15			Scene 16		
Age group	Passive	Active	Age group	Passive	Active	Age group	Passive	Active	Age group	Passive	Active
1	0.59	0.41	1	0.60	0.40	1	0.61	0.39	1	0.58	0.42
2	0.68	0.32	2	0.68	0.32	2	0.63	0.37	2	0.66	0.34
3	0.64	0.36	3	0.63	0.37	3	0.66	0.34	3	0.71	0.29
4	0.71	0.29	4	0.80	0.20	4	0.64	0.36	4	0.79	0.21
All	0.63	0.37	All	0.66	0.34	All	0.63	0.37	All	0.64	0.36
Scene 17			Scene 18			Scene 19			Scene 20		
Age group	Passive	Active	Age group	Passive	Active	Age group	Passive	Active	Age group	Passive	Active
1	0.60	0.40	1	0.59	0.41	1	0.58	0.42	1	0.57	0.43
2	0.79	0.21	2	0.67	0.33	2	0.59	0.41	2	0.65	0.35
3	0.77	0.23	3	0.68	0.32	3	0.66	0.34	3	0.70	0.30
4	0.87	0.13	4	0.80	0.20	4	0.83	0.17	4	0.79	0.21
All	0.71	0.29	All	0.65	0.35	All	0.62	0.38	All	0.64	0.36

In the perceptual studies made since the 1960s (Zube 1974; Ulrich 1981), it is revealed that water makes a strong impact on environmental perception. However, there are several natural and artificial water usage forms, and the effect of each of them is different from the other. Water element ensures that the impact that is required to be generated in design is achieved by inducing various reactions on people via various

compositions. Various usages of water give life to space utilization in landscape design (Simonds 1983). In the study made by Burden in Greenacre Park (in New York) in 1977, it is revealed that the users, who perform sitting and chatting activities near a waterfall, stop chatting and leave the relative location when the flow of water stops in the waterfall (Huang Shu-Chun 1998). Also, Crowhurst-Lennard and Lennard (1987) revealed that

Table 7 Highest scoring scenes in which various age groups would like to perform active and passive activities

Age groups	Numbers and ratios of the top 3 scenes where active activity is preferred to be performed			Numbers and ratios of the top 3 scenes where passive activity is preferred to be performed		
	First	Second	Third	First	Second	Third
Group 1	1 (0.45)	20 (0.43)	2, 4, 8, 11 (0.42)	6, 10 (0.62)	15 (0.61)	3, 7, 12, 14, 17 (0.60)
Group 2	1 (0.45)	19 (0.41)	11, 15 (0.37)	17 (0.79)	6 (0.74)	7 (0.77)
Group 3	1 (0.49)	10.14 (0.37)	13 (0.36)	4, 5 (0.84)	2 (0.80)	3, 7, 9 (0.78)
Group 4	1 (0.42)	10 (0.38)	15 (0.36)	5 (0.92)	6 (0.88)	17 (0.87)
All	1 (0.45)	19 (0.38)	10, 11, 13, 15 (0.37)	5 (0.72)	6, 17 (0.71)	7 (0.70)

elements, such as nozzles, increase interaction in urban open spaces. These studies also verify the strong correlation between flow of water and activity, just as we revealed in our study.

In Brown and Daniel’s (1991) study, it is revealed that the differences in the composition of water cause differences in perception of space. Our study has also revealed that differences in composition are effective in inclinations and activity preferences that are required to be performed in the relative space. Also, such difference may also be observed between various age groups. In the study performed by Loomis (1987), it is determined that waters flowing with high velocity make people glad, but this gladness is also based on the activity in the space. According to Loomis, suitable flow velocity is determined by the activity in the space (Burmil et al. 1999). The judgement revealed by Loomis where he stated that suitable flow velocity is determined by the activity in the space is obtained in our study as well.

Natural waters are generally used as studying material in the works related to waters, and visual perceptions related to the motion and stillness of these waters are assessed. This study reveals the effects of natural, natural-like and artificial water compositions on admiration and activity preferences. As we assessed all of the scenes in general, it was revealed that 41 % of the first age group, 32 % of the second age group, 29 % of the third age group, 23 % of the fourth age group and 34 % of all of the participants in general preferred active activities. In consideration of these results, it is revealed that preference of active activities decreases as age decreases, and passive activities are required to be performed more. Several studies also verify the desire to perform passive activities during transition from childhood to youth (Andersen et al. 1998; Herrington and

Studtmann 1998; Fjörtoft and Sageie 2000; Özdemir and Yılmaz 2008).

As we examine the activities that are required to be performed with water scenes, it is revealed that, out of 20 different water scenes, none of the subject groups desire to perform any activity in scene nos. 3, 4, 6, 16, 17, 19 and 20.

In scene no. 1 that is pumped out of several jets that flow at various times on a plain square platform with loud sound, active activities are preferred to be performed more by all of the groups in comparison to other scenes. It is determined that the subjects in the first, third and fourth groups would like to perform jumping activity in such a space, the subjects in the third and fourth groups would like to perform dancing activity in such a space and the subjects in the first and third groups would like to perform playing activity in such a space.

The subjects in the fourth group stated that they would like to perform a photo taking activity in scene no. 2 where water falls gradually in a top-down direction from three platforms fixed at different heights and that makes a loud sound.

It is revealed that the subjects in the third age group would like to sit down in scene no. 5 where water drops flow in a top-down direction and form light sound.

Scene no. 7—where water with light sound that is pumped out of jet and drank by birds reaches to the water on surface by flowing in top-down direction—was preferred by the first group in terms of examination of wildlife activity.

The subjects in the first group would like to perform playing, sports and dancing activities, subjects in the second group would like to dance and subjects in the third group would like to relax, shout and trek and ramble in scene no. 8 which is natural looking with light sound, flows in a large area and flows in the form of

Table 8 Distribution of activities that are required to be performed in each scene according to age groups

Scene no.	Activity that is required to be performed and relative ratio			
	Age group 1	Age group 2	Age group 3	Age group 4
1	Playing (0.84) Jumping (0.68)		Jumping (0.41) Dancing (0.32) Playing (0.27)	Jumping (0.46) Dancing (0.30)
2				Taking photos (0.81)
5			Sitting down (0.51)	
7	Examination of wildlife (0.78)			
8	Playing (0.84) Sports (0.73) Dancing (0.46)	Dancing (0.43)	Trekking-rambling (0.68) Relaxation (0.54) Shouting (0.16)	
9	Trekking-rambling (0.78) Chatting (0.70) Shouting (0.49)		Taking photos (0.76) Listening to music (0.41)	Taking photos (0.81)
10	Throwing stones (0.68)	Shouting (0.19)	Eating and drinking (0.62) Throwing stones (0.49) Biking (0.49) Running (0.38) Painting (0.32) Singing (0.32) Playing (0.27)	Trekking-rambling (0.95) Throwing stones (0.62) Listening to music (0.59) Painting (0.41) Shouting (0.14)
11	Running (0.78) Listening to music (0.73)			
12	Watching (0.97) Dancing (0.46)			
13				Taking photos (0.81)
14	Singing (0.59) Shouting (0.49)	Reading (0.73) Laying down and sleeping (0.62) Examination of wildlife (0.76) Listening to music (0.51) Singing (0.35) Shouting (0.19)		
15	Taking photos (0.89) Biking (0.89) Relaxation (0.86) Eating and drinking (0.76) Reading (0.73) Laying down and sleeping (0.73) Painting (0.73)	Watching (0.95) Sitting down (0.86) Trekking-rambling (0.86) Biking (0.84) Relaxation (0.81) Taking photos (0.81) Examination of wildlife (0.78) Chatting (0.73) Playing (0.68) Running (0.68) Eating and drinking (0.62) Painting (0.57) Throwing stones (0.54) Sports (0.49) Jumping (0.27) Shouting (0.19)	Examination of wildlife (0.76) Watching (0.68) Chatting (0.57) Sitting down (0.51) Biking (0.49) Reading (0.43) Listening to music (0.41) Sports (0.41) Laying down and sleeping (0.38)	Watching (0.89) Sitting (0.84) Relaxation (0.81) Taking photos (0.81) Biking (0.76) Eating and drinking (0.73) Chatting (0.73) Running (0.70) Playing (0.62) Reading (0.59) Sports (0.57) Laying down and sleeping (0.51) Examination of wildlife (0.43) Painting (0.41) Singing (0.32)
17				Sitting down (0.84)
18	Sitting down (0.84) Throwing stones (0.68)			

surface flow from various platforms and where waves are formed by being pumped out of jets.

It is revealed that the subjects in the first group would like to chat, shout and trek and ramble, the third group would like to take photos and listen to music and the fourth group would like to take photos in scene no. 9 that includes a fairly dynamic water with loud sound that initially flows vertically in a top-down direction and then falls from the upper platform to the lower platform and that is also pumped out of jet.

Subjects in the first group would like to perform throwing stone activity, the second group would like to shout, the, third group would like to paint, eat and drink, sing, play, throw stones, run and bike and the fourth group would like to paint, listen to music, throw stones, shout and trek and ramble in the natural river scene no. 10 which has a surface flow and that forms a large water surface.

Scene no. 11 that includes water that is pumped out of jets that are fixed in horizontal form in bottom-up direction is preferred by the subjects in the first age group to perform listening to music and running.

Scene no. 12 that includes water that falls gradually from platforms fixed at four different heights in a top-down direction, where the flow of water looks linear—thanks to the patterns formed on cascades—is preferred by the subjects in the first age group to perform the watching and dancing activities.

Scene no. 14 that includes water with moderate sound that flows and falls on overlapped rocks, which is also pumped out of a jet and exhibits a natural look, thanks to its intense vegetal cover, is preferred by the subjects in the first age group for singing and shouting activities and by the second age group for reading, laying down and sleeping, examination of wildlife, listening to music, singing and shouting.

Scene no. 15 that includes a natural-looking artificial lake view where water is still and broad water surface comes to the forefront as the water element is where each group would like to perform the highest quantity of activities. The subjects from the following age groups would like to perform the following activities in scene no. 15: the first age group would like to relax, read, lay down and sleep, paint, take photos, eat and drink and bike; the second age group would like to watch, sit down, relax, paint, take photos, examine wildlife, eat and drink, chat, play, sports, throw stones, jump, shout, trek and ramble, run and bike; the third group would like to watch, sit down, read, lay down and sleep, examine

wildlife, chat, listen to music, sports and bike; and the fourth group would like to watch, sit down, relax, read, lay down and sleep, paint, take photos, examine wildlife, eat and drink, chat, sing, play, sports, run and bike.

Scene no. 18 that includes water with loud sound that is pumped out of jet and flows from upper platform to the lower platform in the form of surface flow is preferred by the subjects in the first age group to perform the activities sitting down, reading and throwing stones.

Huang (1998) revealed that the most preferred waterspaces are the water compositions that encourage performing active activities and the least preferred waterspaces are the spaces where passive activities are performed. Brown and Daniel (1991) revealed that the preference ratio of a waterspace increases as the flow rate of water increases. This situation is different in our study. Still water compositions (scenes nos. 10 and 15) are also preferred at fairly high ratios.

According to the results revealed by the study, if water elements shall be used during designing a space, types of waters that would encourage users to perform activities must be used rather than making a design based on the taste of designer. Thus, a contribution shall be made to the activity that is considered to be performed in the space, and such space may be used more accurately in the direction of the intended purpose.

According to the results of the study, the activities sports, running, examination of wildlife, watching and chatting are desired to be performed by all of the age groups in still or still-looking waters, except for the first age group, and the activities reading and laying down and sleeping are desired to be performed by all of the age groups in still or still-looking waters, except for the second age group, and the activity relaxation is desired to be performed by all of the age groups in still or still-looking waters, except for the third age group. All of the age groups preferred still and still-looking water elements to perform the activities painting, eating and drinking, throwing stones and biking. The first and second age groups desire to take photos in still waters, while the third and fourth age groups preferred symbolic water elements that may be perceived better from a distance and where intense architectural elements that flow in a top-down direction are used. In order to perform the activities listening to music and singing, the first and second age groups preferred water elements where closure phenomenon is a fact and where water is pumped out of jets and then flows and falls from rocks,

while the subjects in the third and fourth age groups preferred still and still-looking waters. The subjects in the second and fourth age groups preferred still-looking waters to play, while the subjects in the first and third age groups preferred the water elements that include water that is pumped out of jets. The subjects in the first, third and fourth age groups preferred the water elements that include water games that are pumped out of jets in order to jump and bounce, while the subjects in the second group preferred still-looking waters.

Beyond benefiting only from the visual value of the water, using water to induce and encourage certain types of social activity that is focused around water elements would make a positive impact on that space, and it would ensure that the space is used more consciously.

References

- Andersen, R. E., Crespo, C. J., Bartlett, S. J., Cheskin, L. J., & Pratt, M. (1998). Relationship of physical activity and television watching with body weight and level of fatness among children. *Journal of American Medical Association*, *279*(12), 938–942.
- Anderson, L. M., Mulligan, B. E., Goodman, L. S., & Regen, H. Z. (1983). Effects of sound on preferences for outdoor settings. *Environment and Behavior*, *15*, 539–566.
- Astrand, P.O.: 1987, Exercise physiology and its role in disease prevention and in rehabilitation. *Archives of Physical Medicine and Rehabilitation*, *68*, 5, 1, 305–9.
- Blair, S. N., Kohl, H. W., Paffenberger, R. S., Clark, D. G., Cooper, K. H., & Gibbons, L. W. (1989). Physical fitness and all-cause mortality, a prospective study of healthy men and women. *JAMA*, *262*, 2395–2401.
- Booth, N. (1983). *Basic elements of landscape architecture design*. New York: Elsevier Science.
- Brown, T. C., & Daniel, T. C. (1987). Context effects in perceived environmental quality assessments: scene selection and landscape quality ratings. *Journal of Environmental Psychology*, *7*, 233–250.
- Brown, T. C., & Daniel, T. C. (1991). Landscape aesthetics of riparian environments: relationships of flow quantity to scenic quality along a wild and scenic river. *Water Resource Research*, *27*, 1787–1795.
- Burmill, S., Danial, T. C., & Hetherington, J. D. (1999). Human values and perception of water in arid landscapes. *Landscape and Urban Planning*, *44*(2), 99–109.
- Campbell, M., H.: 1994, An informational approach to preference of urban waterscapes, Los Angeles, CA
- Clay, G. R., & Daniel, T. C. (2000). Scenic landscape assessment: the effects of land management jurisdiction on public perception of scenic beauty. *Landscape and Urban Planning*, *49*(1–2), 1–13.
- Craik, K. H. (1983). The psychology of the large scale environment. In N. R. Feimer & E. S. Geller (Eds.), *Environmental psychology: directions and perspectives* (pp. 47–105). New York: Praeger.
- Crowhurst-Lennard, S. H., & Lennard, H. (1987). *Livable cities: people and places: social and design principle for the future of the city*. Southampton: Gondolier Press.
- Daniel, T.C. and Boster, R.S.: 1976, Measuring landscape esthetics: the scenic beauty estimation method. USDA Forest Service Research Paper RM-167, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo:U.S., 66p.
- Dilani, A.: 2001, Design and health: the therapeutic benefits of design. Stockholm.
- Fjörtoft, I., & Sageie, J. (2000). The natural environment as a playground for children: landscape description and analyses of a natural landscape. *Landscape and Urban Planning*, *48*(1), 83–97.
- Hannebaum, I., G.: 1998, Landscape design: a practical approach (4th edn), Upper Saddle River, N., Prentice-Hall.
- Herrington, S., & Studtmann, K. (1998). Landscape interventions: new directions for the design of children's play environments. *Landscape and Urban Planning*, *42*, 191–205.
- Hershberger, R., G. & Cass, R.: 1974, Predicting user responses to buildings. in: G. Davis and D. Vachon (eds), Field applications, pp. 117–134, volume 4 of Carson, H. (Ed.) *Man-Environment Interactions: EDRA 5: Evaluations and Applications* (Washington, DC, Environmental Design Research Association).
- Herzog, T. R. (2005). *A cognitive analysis of preference for waterscapes*. Grand Valley State College, Allendale, Michigan, USA: Department of Psychology.
- Hetherington, J. (1991). Representing the environment: visual surrogates in environmental assessment. *Healthy Environments*, *22*, 246–252.
- Huang, & Shu-Chun, L. (1998). *A study of people's perception of waterscapes in built environments*. Texas: Texas A&M University. Doctor of Philosophy.
- Hull, R. B., & Stewart, W. P. (1992). Validity of photo-based scenic beauty judgements. *Journal of Environmental Psychology*, *12*, 101–114.
- Jonsson, B., Gardsell, P., Jahnell, O., Sembo, I., & Gullberg, B. (1993). Lifestyle and different fracture prevalence. *Calcified Tissue International*, *52*, 425–433.
- Kaplan, S. (1987). Mental fatigue and the designed environment. In J. Harvry & D. Henning (Eds.), *ELN: public environments* (pp. 55–60). Edmond: Environmental Design Research Association.
- Kaplan, S. (1995). The restorative benefits of nature: toward an integrative framework. *Journal of Environmental Psychology*, *15*, 169–182.
- Kaplan, R. and Kaplan, S.: 1989, Experience of Nature: A Psychological Perspective, New York: Cambridge: Cambridge University Press.
- Kellomaki, S., & Savolainen, R. (1984). The scenic value of the forest landscape as assessed in the field and the laboratory. *Landscape Planning*, *11*, 97–107.
- Küller R. and Küller M.: 1994, The urban open green spaces, old people's outdoor activities and health. Swedish, R24, Stockholm.
- Küller, R., & Lindsten, C. (1992). Health and behavior of children in classroom with and without windows. *Journal of Environmental Psychology*, *12*, 33–52.
- Küller, R., & Wetterberg, L. (1996). The subterranean work environment: impact on well-being and health. *Environment International*, *22*, 33–52.

- Law, C. S., & Zube, E. H. (1983). Effects of photographic composition on landscape perception. *Landscape Research*, 8, 22–23.
- Lewis, C. A. (1990). Gardening as healing process. In R. Hester & M. Francis (Eds.), *The meanings of gardens: idea, place, and action* (pp. 244–251). Cambridge, MA: MIT Press.
- Lewis, C. A. (1994). The evolutionary importance of people-plant relationships. In J. Flagler & R. P. Poincelot (Eds.), *People-plant relationships: setting research priorities*. Binghamton, NY: Food Products Press.
- Loomis, J. (1987). The economic value of in stream flows: methodology and benefit estimates for optimum flows. *Journal of Environmental Management*, 24, 169–179.
- Lundberg, T. (2001). Stress: a physiological defense reaction. *Swedish*, 3, 36–38.
- Marcus, C.: 2001, Gardens and health, the therapeutic benefits of design. in: A. Dilani (eds), Design & Health, pp. 61–71.
- Marcus, C. C., & Barnes, M. (1999). *Healing gardens: therapeutic benefits and design recommendations*. New York: John Wiley and Sons, Inc.
- McCulley, E. B. (1976). Water, pools and fountains. In J. D. Carpenter (Ed.), *Handbook of landscape architectural construction* (pp. 479–498). Washington, DC: The Landscape Architecture Foundation.
- Nasar, J. L. (1998). *The evaluative image of the city*. Thousand Oaks, CA: Sage.
- Nasar, J., & Yi-H, L. (2003). Evaluative responses to five kinds of water features, short communication. *Landscape Research*, 28(4), 441–450.
- Ozdemir, A., & Yilmaz, O. (2008). Assessment of outdoor school environments and physical activity in Ankara's primary schools. *Journal of Environmental Psychology*, 28(3), 287–300.
- Paffenberger, R. S., and Asnes, D. P.: 1994, Chronic disease in former college students. American College of Sports Medicine 40, Annual Lectures, pp. 93-109
- Palmer, J. F., & Hoffman, R. E. (2001). Rating reliability and representation validity in scenic landscape assessments. *Landscape and Urban Planning*, 54(1–4), 267–281.
- Pate, R. (1995). Physical activity and public health. *JAMA*, 273, 402–407.
- Perk, J. (1998). Older patients receive the same benefits from exercise as do younger patients. *Swedish*, 95, 3778–3784.
- Rapp, B. (1999). *Culture in health care vis-a-vis health care as culture*. Stockholm: Swedish.
- Sakıcı, Ç.: 2009, Open space therapy unit in psychiatric hospitals: a case study of Ataköy Psychiatric Hospital. PhD Thesis, The University of Karadeniz Technical, Department of Landscape Architecture, Trabzon, Turkey.
- Simonds, J., O.: 1983, Landscape architecture, second edition. A manual of site planning and design. Chapter 3: Water, Mc Graw-Hill.
- Sorvig, K. (1991). Water design: special effects. *Landscape Architecture*, 81(12), 72–75.
- Stamps, A. E. (1990). Use of photographs to simulate environments: a meta-analysis. *Perceptual Motor Skills*, 71, 907–913.
- Stewart, T. R., Middleton, P., Downton, M., & Ely, D. (1984). Judgements of photographs versus field observations in studies of perception and judgement of the visual environment. *Journal of Environmental Psychology*, 4(4), 283–302.
- Trent, R. B., Neuman, E., & Kvashny, A. (1987). Presentation mode and question formal artifacts in visual assessment research. *Landscape and Urban Planning*, 14, 225–235.
- Ulrich, R. S. (1981). Natural versus urban scenes: some psychological effects. *Environment and Behavior*, 13, 553–556.
- Ulrich, R. S. (1984). Views through a window may influence recovery from surgery. *Science*, 224, 420–421.
- Ulrich, R. S. (1992). Effects of health facility interior design on wellness: theory and scientific research. *Journal of Health Care Design*, 3, 97–109.
- Ulrich, R. S. (1999). Effects of gardens on health outcomes: theory and research. In C. Cooper-Marcus & M. Barnes (Eds.), *Healing gardens: therapeutic benefits and design recommendation* (pp. 27–86). New York: John Wiley & Sons.
- Zube, E. H. (1974). Cross-disciplinary and intermode agreement on the description and evaluation of landscape resources. *Environment and Behavior*, 6(1), 69–90.
- Zube, E. H., Simcox, D. E., & Law, C. S. (1987). Perceptual landscape simulations: history and prospect. *Landscape Journal*, 6, 62–80.