

# Measuring place satisfaction by university campus open space attributes

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## Abstract

Campuses, which are a whole with education, teaching, cultural structures and open spaces, are spatial organizations where students, academicians and staff come together. In this respect, in the design of university campuses, it is necessary to focus not only on physical and aesthetic features, but also on spatial organizations that can create the meaning and social interaction of the place. The purpose of this research is to determine the performance levels of existing campus open spaces and to investigate their effects on place satisfaction. The present study, constructed to determine the impact of functional, social and perceptual attributes of campus open spaces on place satisfaction, was conducted at Karadeniz Technical University-Kanuni Campus. When the campus open spaces were selected in the study, open spaces that allowed socio-cultural activities in the campus were preferred, excluding the educational buildings. Within the scope of the study, in which the analysis of the space as an attitude element constitutes the general framework and originality of the study, a total of 240 people were surveyed in 3 regions selected. In conclusion, the present study discussed the environmental attributes of campus open spaces with a 3-dimensional approach and determined that not only perceptual attributes affected place satisfaction. The study findings suggested that functional and social attributes, occupancy frequency and duration variables had positive effects on place satisfaction. The study findings are considered important for both urban planners and administrators, who are responsible for protection and development of campus open spaces, and the users.

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## Keywords

Campus open space, Space and place, Place satisfaction.

## 1. Introduction

Universities are social institutions where educational, research and practice activities are conducted. Universities educate the students who are the future of society and produce and share scientific knowledge, as well as fulfilling the physical and social requirements of the users. An analysis of the historical development of universities would demonstrate that the term means the community of teachers and scholars (Yilmaz et al., 2005). These dimensions describe the universities as institutions that provide the highest level of education, research and produce knowledge, and are spatial constructs with a dense student, support staff, academician and administrator population.

Campus open spaces are defined or undefined spaces that are outside of the buildings, and the relationships that are established with other spaces expressed as green spaces and gray spaces (Pascual and Peña, 2012). With this dimension, they can be expressed as accessible urban ecosystems (Tudorie, 2020). The success of campus open spaces is also very important for the implementation of the needs of the university education system. In particular, they should be evaluated in terms of creating a good learning environment and promoting social interaction through everyday encounters, relationships and interactions.

The historical development of higher education institutions would also reveal that the development of social and cultural requirements along with educational activities has been the cornerstones of college campuses. The campus should be considered as a complete learning environment that provides a complete learning experience also in open spaces outside the educational and cultural buildings (Kenney et al., 2005; Düzenli et al., 2012; Scholl and Gulwadi, 2015; Özkan et al., 2017). Thus, in university campus design, open spaces that provide physical and social opportunities to fulfill the physical and social needs of students and ensure their individual and social development should be included along with the indoor spaces (educational and instructional, etc.). In the literature, previous studies tackled the develop-

ment of university campuses, as well as studies that of the open space facilities and campus life. Campus open spaces should be considered as spaces that allow students, academicians and staff to socialize, interact and conduct activities to meet their needs (Dober, 2000; Aydın, 2008). Thus, Hanan (2013) analyzed the campus as a behavioral setting and reported that the campus was a combination of human or social and non-human or physical dimensions. The above-mentioned studies that approached the campus open spaces as a space of social interaction rather than spaces of aesthetic appeal or physical activities emphasized the significance of open spaces. Thus, it is very important to focus on physical and aesthetic elements, as well as creating spaces for events that allow social interaction and associated spatial organizations in university campus open spaces design. When we think of the campus as a behavioral position, we should consider it as a combination of physical dimensions and human and social dimensions. With this aspect, in the design of university campuses, it is necessary to focus only on physical and aesthetic features, as well as spatial organizations that can create a social interaction and sense of place. The present study aimed to focus on open spaces where students could interact with themselves, their friends and their environment, as well as architectural structures. It should be known that the voids between the campus buildings were not designed to allow social interaction between the students, but they are at least as important as the campus buildings. Thus, it is known that the voids created in the architectural space determine, guide and enforce the relationships between the spaces beyond the spatial design (Kuloğlu, 2013). When the campus open spaces are considered based on this approach, spaces or "places" where experiences, memories, reminiscences and social interaction occur could not be created without campus open spaces.

- Is each void or space in campus open spaces a place?
- What are the physical, social and perceptual characteristics that lead to user satisfaction in these places by fulfilling user needs?

The above-listed questions constituted the baseline of the present research. The aim of the present study was to determine the performance of existing campus open spaces based on user needs and to investigate the effects of the performance of these spaces on place satisfaction. In the present study that aimed to investigate the satisfaction with campus open spaces, the analysis of the space as an attitude element constituted the originality of the research. Thus, it primarily focused on the concepts of place satisfaction, university campus open spaces, and physical and social characteristics that these spaces should offer.

### 1.1. University campus open spaces

It was determined that not only educational activities but also various functions required for the current education system should be provided by the universities in Turkey and abroad; and thus, the importance of campus planning and design criteria was recognized. Campus open spaces are places where campus users carry out their activities and interact within the scope of their needs. These places of interaction where students, academicians and staff come together are the centers that make up campus life. In campus life, it is known that these centers, apart from education and training activities, undertake very important tasks and are socialization centers. Therefore, in recent years, there has been a renewed interest in campus open spaces and the features it offers. According to Aydın (2003), the above-mentioned functions, which should be consistent with non-educational requirements and include dimensions such as study, entertainment, sports, recreation, health and nutrition. Yaylali-Yıldız et al., (2014) reported that campus spaces similar to open space organizations, although the occupancy differs from that of urban streets, squares and commercial areas. Thus, the campuses could be considered a small city. While designing university campuses, functions such as accommodation, study, transportation, recreation, socialization are designed within the system, just like the city. To provide adequate functions in the campus, a systematic approach is required. Although

this systematic organization required in planning and design varies, it has been discussed within the context of campus settlement systems.

Instead of focusing on campus planning and design criteria, the present research aimed to investigate the current common campus spaces and the effects of physical and social characteristics of these spaces on place satisfaction. Therefore, it was necessary to focus on the characteristics of common campus spaces. According to Carmona (2010), the importance of open spaces was not only due to the fact that they fulfill specific human needs but also the comfort, relaxation, socialization, etc. they provide. Campus open spaces offer learning opportunities by allowing informal and social relationships as well as physical opportunities. Carr et al. (1992) included 'comfort', 'relaxation', 'passive engagement', 'active engagement' and 'discovery' among the facilities that open spaces should provide. These dimensions were simply based on Maslow's (1954) hierarchy of needs. Preiser (1983) argued that people can live in an environment when their basic needs are met, but personal high-level needs should be met for environmental satisfaction. Previous studies reported that successful open spaces lead to a sense of satisfaction in the users (Herting and Guest, 1985; Ramkissoon et al., 2013; Stedman, 2002).

According to Hanan (2013), students' active experiences, memories and remembrances are generally dependent on meaningful open spaces and symbolic structures that make the campus unique. These meaningful spaces that students will remember and miss are related to the success criteria it offers. The more successful the physical, social and perceptual features of a location, the more space satisfaction occurs. As a result, they turn into places with a high level of use, experienced and missed.

The success of open spaces could be analyzed within several categories. Salama and Azzali (2015) categorized open space properties into three groups. These were functional attributes, social attributes and perceptual attributes. Lutzkendorf et al. (2005) considered these properties as performance criteria and grouped them

in 6 categories: functional, economic, environmental, social and process performance. Since the economic and process dimensions of campus open spaces was not included in the present study, the focus was on perceptual, functional and behavioral-social features as categorized by Salama and Azzali (2015). In place satisfaction, which is discussed in the next section, analysis criteria was determined based on previous studies on satisfaction.

### 1.2. Place satisfaction

As determined by Canter (1977) in the theory of place, individuals establish emotional relationships with places, similar to those they with people and objects. The qualities/features of a place affect the interaction and behavior of the individual with that place and consequently individual satisfaction or dissatisfaction. The interaction between individuals and open spaces leads to a satisfaction or dissatisfaction with that space/place. Thus, place satisfaction and the factors behind satisfaction level should be discussed. Stedman (2002) described place satisfaction as the perceived quality of the environment that meets the physical, social and service characteristics. If we substitute place with campus open space in the previous statement, the level where the place meets the needs, that is, the perceived quality of the place corresponds to the level of satisfaction for campus open spaces.

In the literature, place satisfaction is used in different fields. It is a frequently used concept especially in tourism research (Hosay and Prayag, 2013). However, there are very few studies evaluating location satisfaction within the scope of open campus spaces. Especially, there are no studies focusing on the relation of physical, social and perceptual features offered by campus open spaces with place satisfaction. When the concept of satisfaction with the place comes up, it is called place satisfaction. Mesch and Manor (1998) defines place satisfaction as an expression of experience regarding the physical and social dimensions of a place. Canter and Rees (1982) defined the concept of satisfaction as the contribution level of the physical and social

spatial characteristics to the user goals, objectives, and expectations. Thus, it could be suggested that satisfaction is an emotional response to the space as a result of the individual's analysis of the environment based on individual needs, expectations and achievements. In this context, Amerigo and Aragones (1997) and Bonaiuto et al. (1999) focused on the interaction between the individual and the place along with environmental criteria in their studies on satisfaction. Kahana et al. (2003) discussed the dimensions of person, environment and person-environment in their study on satisfaction. They analyzed personal preferences in the person dimension and physical and social characteristics in the environment dimension. Similarly, Mesch and Manor (1998) focused on the physical and social environment among the environmental variables and investigated these variables based on the relationship between human and place. Stedman (2002) summarized satisfaction as the perceived quality of the location and analyzed it based on the concepts of place attachment and identity.

According to Fleury-Bahi et al. (2017), these studies that investigated satisfaction based on emotional ties such as place attachment, place identity, and place dependency, and the correlations between satisfaction experiences and psychological ties in human-place relationships in the literature were theoretically productive, albeit their unclear findings. However, current studies on satisfaction are conducted to include not only the physical properties of the environment but also the social characteristics. All these trends in the literature gained momentum with the realization that the place is a total of its social and physical attributes within the human-place relationship and the focal point of environmental experiences that include personal, social, cultural and psychological elements (Canter, 1983). Later, the sense of place concept (Montgomery, 1998), which addressed the dimensions of physical properties, activities and meaning in the relationship between the individual establishes and the place, was included in satisfaction studies.

**Table 1.** Sense of place and open space attributes (Source: Montgomery, 1998; Lewicka, 2010; Salama & Azzali, 2015).

Concepts	Dimensions	Attributes	Authors
Sense of Place	Activities	Land Uses Pedestrian Flow Behaviour Patterns Noise&Smell Vehicle Flow	Montgomery (1998)
	Physical Setting	Townscape Built Form Permeability Landscape	
	Meaning	Furniture Legibility Cultural Associations Perceived Functions Attractions Qualitative Assessments	
Sense of Place	Physical	Type of housing Building size Yard House	Lewicka (2010)
	Social	Social Relation Feeling of security	
	Social Demographic and	Age and Education Period of stay Family size	
Attributes of Urban open Space	Functional attributes	Diversity of use Environmental responsiveness Appropriateness of form Accessibility Diversity Visibility Clarity Quality Adaptability Opportunities	Salama and Azzali (2015)
	Social attributes	Promoting User experience Social inclusivity Diversity Interaction Serving different social group Social accessibility	
	Perceptual attributes	Human experience Comfort and relaxation Personal space and privacy Safety and security Memorable architectural Signage system Navigation and movement Spatial experience Reflecting local identity Attractiveness	

Ajzen (1975), where sense of place could provide a theoretical framework. When campus users encounter campus open spaces, they analyzed the space through emotional cognition and behavior processes. This analysis is determined by the physical properties, social attributes and socio-demographic properties of the place. These criteria correspond to the categories employed by Lewicka (2010) in the definition of the sense of place. In the present study, campus open space satisfaction was determined based on the categories proposed by Salama and Azzali (2015), Montgomery (1998), and Lewicka (2010) were employed (Table 1).

**2. Material and method**

**2.1. Study area**

The research, constructed to determine the impact of physical, social and perceptual attributes of campus open spaces on place satisfaction, was effected at Karadeniz Technical University (KTU) Kanuni Campus, which was established in 1955 in Trabzon province, Turkey (Figure 1).

KTU includes 12 faculties, 6 institutes, 1 college, 8 vocational schools and more than 40,000 students, 2105 faculty staff, and 3339 administrative staff. The campus where the study was conducted has educational, administrative, social and cultural buildings and student and staff accommodations, spanning an area of 1000000 m2. When the campus open spaces were selected in the study, open spaces that allowed socio-cultural activities in the campus were preferred, excluding the educational buildings. These campus open places were coded as COP1, COP2 and COP3 as shown in Figure 1.

COP 1 is a location named “July 15 Democracy Square”. This location was redesigned in 2009 and implemented in 2010. It is a more recently designed space than COP 2 and COP 3. Before this area was redesigned, it was an area where events such as festivals were held only on certain days of the year. This 40,000 m2 area has been redesigned to transform it into a lively location that is used every day of the year. In this context, a design setup consisting of a wide grass surface, water element and amphitheater was realized. Some activities



**Figure 1.** The study area location.

In the present study that aimed to investigate place satisfaction in campus open spaces, campus open spaces could be considered as an element of attitude as proposed by Fishbein and

**Table 2.** Attitude scale items (Developed from Montgomery, 1998; Project for Public Space, 2000; Lewicka, 2010; Salama & Azzali, 2015; Özkan and Yılmaz (2019).

SETTING (CAMPUS OPEN SPACE)		
FUNCTIONAL	SOCIAL	PERCEPTUAL
· Providing facilities for various activities	· Common uses	· Reflecting local identity
· Vitality	· Participation in informal and formal activities	· Safety and Security
· Popularity	· Security (Social)	· Aesthetics
· Usefulness	· Availability for Daily meetings	· Well-kept, clean
· Management	· Diversity	· Unique character
· Appropriateness of form	· Interactive	· Legibility
· Clarity		· Attractive
· Quality		· Popularity
· Adaptability		
· Opportunities		

performed at the location are: sitting, resting, walking, walk the dog, running, doing exercise, dance, concert, biking, theater, sunbathe, sit on Lawn etc. COP 2 is called the “Lovers Park”. It includes the following activities: It enables its users to activities such as walking, sitting, resting, watching the environment and eating with its walking paths, sitting benches, dining tables. COP3, on the other hand, is one of the oldest points of the campus and has no revisions. Its proximity to the library structure and its role as a meeting place increase the importance of the location. In this area, activities such as meeting, sitting, resting, watching the environment, listening to music, watching the sea, meeting are carried out.

## 2.2. Survey and participants

The place satisfaction level is determined with the analysis the physical and social attributes of the environment based on the needs, expectations and achievements of the individual. In the present study that aimed to investigate the satisfaction with campus open spaces, the analysis of the space as an attitude element constituted the general framework of the research design. Thus, the research included the following stages:

- The assessment of campus open spaces by the users based on functional, social and perceptual attributes
- The analysis of general place satisfaction level
- The analysis of overall study data to determine the correlations.

The survey questions were organized under two main titles to conduct the above-mentioned analyses. The first was the determination of the func-

tional, social and perceptual attributes of campus open spaces, and the second was the determination of the total place satisfaction. Each item was measured on a 5-point Likert-type scale. Participants were randomly selected from the users of campus outdoor spaces. The survey was conducted face-to-face with a total of 240 participants, including 80 participants from each setting. Data were entered, organized, and analyzed with SPSS 24.0.

### 2.2.1. Campus open spaces functional, social and perceptual attributes survey

The satisfaction with open spaces, in other words, place satisfaction is a result of the interaction between the individual and the environment. In the first stage of the study, campus open spaces were analyzed as an attitude element based on the functional, social and perceptual attributes. Thus, in the determination of the attributes of the place, the criteria proposed by Montgomery (1998), Project for Public Space (2000), Lewicka (2010), Salama and Azzali (2015) and Özkan and Yılmaz (2019) were employed. (Table 2).

Functional features offered by location; It is restricted to, vitality, popularity, usefulness, management, appropriateness of form, clarity, quality, adaptability and opportunities. Social features are; common uses, participation in informal and formal activities, security (social), availability, diversity and interactive. Perceptual features are; reflecting local identity, safety and security, aesthetics, well-kept, clean, unique character, legibility, attractive and popularity dimensions. Expressions regarding these physical, social and perceptual features of the location are shown in Table 3.

**Table 3.** Principle component analysis for environmental attribute items with varimax rotation.

Dimension	Factor	Variance (%)	Mean	$\alpha$
<b>Functional Attributes (13 items)</b>				
10. The area is intensively used by people.	0.866	<b>42.982</b>	<b>2.89</b>	<b>.96</b>
17. I use the space, albeit not for a particular activity.	0.830			
24. The space enables me to meet different people.	0.830			
13. The space is known and used by all.	0.825			
12. People form groups in the area.	0.819			
15. The activities conducted in the area involve more than one.	0.816			
19. The number of female users of the area are more than male	0.814			
16. I use the area regularly or to conduct a particular activity.	0.812			
22. I always want to participate in the activities when I visit this	0.794			
25. I can establish eye contact with others in this space.	0.788			
21. I want to introduce the area to a friend of mine.	0.763			
18. I can safely use the area at night.	0.757			
11. The area can be used actively.	0.731			
<b>Social Attributes (9 items)</b>				
7. I can easily walk in this area.	0.908	<b>18.142</b>	<b>2.94</b>	<b>.96</b>
3. The furniture elements are comfortable and practical in this	0.905			
1. The activity spaces are sufficient in this area.	0.883			
2. The furniture elements are sufficient in this area.	0.881			
4. The pavement elements are comfortable and practical to walk.	0.856			
6. The location of the area is quite close to other spaces.	0.841			
5. The locations of the area activity spaces are well-connected.	0.725			
9. The area makes it possible to conduct several activities.	0.705			
8. The area activity spaces serve their purpose.	0.701			
<b>Perceptual Attributes (7 items)</b>				
26. This area reminds the local identity of the region.	0.963	<b>12.415</b>	<b>3.36</b>	<b>.89</b>
28. I like the form, texture and color of the green fields in this area	0.963			
31. The activity spaces in this area is different when compared to the surroundings.	0.945			
27. I feel that this area has certain responsibilities and security.	0.908			
29. Security services are sufficient in this area	0.763			
30. The green fields in this area are clean and well maintained.	0.699			
32. I can see the area activities from a distance.	0.652			
<b>Total variance</b>		<b>73.539</b>		

\* Items coded on 5-point scales: strongly agree (1), mildly agree (2), unsure (3), mildly disagree (4), strongly disagree (5)

**Table 4.** The mean functional, social and perceptual attribute scores based on spaces and ANOVA test results.

Factors	Open Spaces	Mean		Sum of Squares	df	Mean Square	F	p	Post-hoc analysis
Functional	COP1 (n:80)	3.74	Between G.	95.486	2	47.743	53.811	0.00	1-2
	COP2 (n:80)	2.68	In. G.	210.276	237	0.887			1-3
	COP3 (:80)	2.23	Total	305.762	239				2-3
Social	COP1 (n:80)	3.50	Between G.	43.650	2	21.825	20.976	0.00	1-2
	COP2 (n:80)	2.82	In. G.	246.590	237	1.040			1-3
	COP3 (:80)	2.48	Total	290.240	239				
Perceptual	COP1 (n:80)	3.41	Between G.	.613	2	0.307	0.405	0.66	
	COP2 (n:80)	3.36	In. G.	179.386	237	0.757			
	COP3 (:80)	3.29	Total	179.999	239				

**2.2.2. Place satisfaction survey**

In the second stage of the study, the satisfaction with campus open spaces was determined. The analysis of the selected open spaces was conducted with the 3-item (SAT1- I believe I did the right thing when I chose to visit this Campus open spaces, SAT2-Overall, I am satisfied with my decision to visit this Campus open spaces, SAT3 - I am happy about my decision to visit this campus open spaces) place satisfaction scale developed by Yuksel et al. (2010), which was determined as valid and reliable.

**3. Results**

**3.1. Socio-demographic and visit attributes**

The survey was conducted with 240 individuals in 3 regions, where 80 individuals were surveyed in each open space in the study. It was determined that the respondents included 48 females, 32 males in COP1, 42 females, 38 males in COP2, and 32 females and 48 males in COP3. Participants in COP1 were 18 freshmen, 22 sophomores, 24 juniors, 16 seniors, while COP2 participants were mostly juniors, and COP3 participants were mostly seniors. The analysis of outdoor space occupancy frequency revealed that COP1 users mostly visited daily, COP2 users visited every weekend, and COP3 users visited once a week. Finally, the analysis of occupancy duration demonstrated that ASP users mostly spent 1-2 hours, while AP users predominantly spent less than half an hour in the space.

**3.2. Campus open place functional, social and perceptual attributes**

The mean scores for 33 items developed to analyze functional, social and perceptual attributes of campus open spaces were found. The mean environmental attribute scores were 3.61 for COP1, 2.95 for COP2, and 2.41 for COP3. Factor analysis was conducted to determine the open space environmental attribute sub-dimensions. Factor analysis was required to determine the correlation and prediction of the sub-dimensions and place satisfaction in further analyses. Through the Varimax method was conducted in 5 repetitions and factor loads that were lower than 0.40 were omitted.

The 33-item environmental variables scale was reduced to 29 items (Table 3) in 3 factors. Three factors explained 73.539% of the total variance. To determine the fitness of the scale for factor analysis, Kaiser Meyer Olkin (KMO) coefficient was determined as 0.937 and Bartlett sphericity test revealed  $\chi^2$ : 14149,257, sd820, p <0.001.

Based on the analysis results, the first factor was named “functional attributes” (items 10, 17, 24, 13, 12, 15, 19, 16, 22, 25, 21, 18, 11). This factor alone explained 42.982% of the total

variance and included 13 items. The second factor was named “social attributes” (items 7, 3, 1, 2, 4, 6, 5, 9, 8). This factor explained 18.142% of the total variance and included 9 items. The third factor was named “perceptual attributes” (items 26, 28, 31, 27, 29, 30, 32). This factor explained 12.415% of the total variance and included 7 items.

The analysis revealed a 3-factor structure with 29 items and these three factors explained 73.539% of the total variance and the reliability coefficient ( $\alpha$ ) was 0.922.

The mean factor scores for campus open spaces were calculated and the differences between the places were analyzed with one-way ANOVA. In the ANOVA test conducted to determine whether environmental attribute sub-factors differed based on open spaces, it was found that there were no significant differences between perceptual attributes factors based on open spaces, while there were significant differences between functional attribute and social attribute factors (Table 4). As seen in Table 4, there were significant differences between functional attributes of all places and between the social attributes of spaces 1 and 3 and 1 and 2, there was no significant difference between spaces 2 and 3.

### 3.3. Place satisfaction

The mean user place satisfaction scores and standard deviation for campus open space environmental attributes are shown in Table 5. Then, The results of the factor analysis of the place satisfaction produced single factors and explained 76.666% of the variance (Table 6). While the mean of place satisfaction score was 3.99 for COP1, the same value was 2.72 for COP2 and 1.99 for COP3. One-way ANOVA was conducted to determine whether there was a significant difference between these three campus open space scores and place satisfaction. As seen in Table 7, there was a significant difference between campus open space scores and place satisfaction ( $F: 100.430; p < 0.00$ ).

### 3.4. Correlations between place satisfaction and environmental dimensions

It was aimed to determine the relationship between environmental features including functional attributes, social attributes and perceptual attributes dimensions and space satisfaction (Table 8). Correlation analysis results revealed a significant, high and positive correlation between functional attributes and place satisfaction ( $r = 0.847^{**}; p = .000$ ). There was a

**Table 5.** Frequency distribution of place satisfaction.

Environmental attributes	COP1		COP2		COP3	
	Mean	SD	Mean	SD	Mean	SD
PS1 I believe I did the right thing when I chose to visit this Camp	3.87	1.07	2.67	1.00	1.98	1.19
PS2 Overall, I am satisfied with my decision to visit this Campus open	4.03	0.80	3.00	1.54	1.93	0.74
PS3 I am happy about my decision to visit this Campus open spaces	4.07	0.94	2.50	1.59	2.08	0.91

**Table 6.** Principle components analysis of place satisfaction with varimax rotation.

Dimension	Factor	Variance (%)	Mean	Cronbach $\alpha$
Place Satisfaction (3 items)		76.766	2.82	0.844
PS1. I believe I did the right thing when I chose to visit this Campus open spaces	0.893			
PS2. Overall, I am satisfied with my decision to visit this Campus open spaces	0.882			
PS3. I am happy about my decision to visit this Campus open spaces	0.853			

**Table 7.** The mean place satisfaction based on campus spaces and ANOVA test results.

Factors	Open Spaces	Mean	Sum of Squares	df	Mean Square	F	p	Post-hoc analysis	
Place satisfaction	COP1 (n:80)	3.98	Between	177.368	2	88.684	100.430	0.00	1-2
	COP2 (n:80)	2.56	In. G.	209.282	237	0.883			1-3
	COP3 (:80)	1.93	Total	386.650	239				2-3

**Table 8.** Environmental Factors and Place Dependence: Bivariate correlations.

Environmental Factors	Place Satisfaction
Functional attributes	0.847**
Social attributes	0.518**
Perceptual attributes	0.119
Gender	0.096
Year	0.091
Frequency of Use	0.217**
Length of Use	0.248**

Note. Significance indicated by \* $p < .05$ , \*\* $p < .01$

**Table 9.** Regression analysis conducted on place satisfaction to predict environmental attribute dimensions

Model	B	Std. Hata	$\beta$ (Beta)	t	p
4 Constant	0.102	0.018		5.609	0.000
Functional attributes	0.601	0.006	0.713	100.156	0.000
Social attributes	0.359	0.006	0.415	58.301	0.000

R=0.851; R<sup>2</sup>=0.725; Adj. R<sup>2</sup>=0.722; Model F (2-237) = 311.808; p<0,01

positive correlation between social attributes and place satisfaction, and this correlation was moderate ( $r = 0.518^{**}$ ;  $p = .000$ ). No significant correlation was determined between perceptual attributes and place satisfaction. Similarly, there was no significant correlation between age and year variables and place satisfaction; however, there was a significant and positive correlation between the frequency of campus outdoor occupancy ( $r = 0.217^{**}$ ;  $p = .000$ ) and occupancy duration ( $r = 0.248^{**}$ ;  $p = .000$ ).

Regression analysis revealed that the occupancy frequency and duration variables that were associated with place satisfaction could not be included in the model. In Table 11, it could be observed that the functional and social environmental attributes predicted place satisfaction. The analysis was fit for the linear model ( $F(2-237) = 311.808$ ;  $p = 0.000$ ) and there was no autocorrelation. Thus, it was demonstrated statistically that the functional and social environmental attributes has a significant and positive effect on place satisfaction.

In conclusion, the study findings on the environmental attributes of campus open spaces, place satisfaction and overall analysis are presented.

#### 4. Conclusion and recommendations

The present study aimed to determine the environmental attributes that a place should offer to the users, the correlations between these attributes and their predictive power on place satisfaction. Thus, three campus open spaces with different environmental attributes were selected as the study area.

Although there are previous studies in the literature on campus open space planning and design criteria, no studies are available on the correlation between successful open spaces and place satisfaction. Thus, initially, the environmental attributes and sub-dimensions of open spaces and space satisfaction scores were determined and the correlations between these variables were investigated.

The analysis of the distribution of environmental attributes across campus open spaces demonstrated that the highest score was determined in COP1 and the lowest score was determined in COP3. The analysis of place satisfaction scores revealed similar findings. These study findings were consistent with the results of previous studies (Herting & Guest, 1985; Ramkissoon et al. 2013; Stedman, 2002) which reported that as the success of the environmental attributes of open spaces increased, user satisfaction increased as well. When defining space satisfaction, Stedman (2002) stated that it was the success of the space in meeting individual requirements due to physical properties and social attributes. Then, what are the environmental dimensions that are associated with place satisfaction and have a high impact on it? To determine this, factor analysis was conducted on the environmental variables. Then, all study data were analyzed and correlation and regression analyzes were conducted to determine the correlations and effects.

The analysis of the environmental attribute sub-dimension findings revealed 3 factors including functional

attributes, social attributes and perceptual attributes. The analysis of variance conducted on these factors demonstrated functional, social and perceptual explained the total variance, respectively. This 3-factor environmental attribute structure was consistent with the criteria that Salama and Azzali (2015) utilized in open space classification. In the one-way ANOVA analysis conducted to determine whether there were differences between the environmental factors based on open spaces, it was determined that functional and social dimensions exhibited differences based on open spaces, and perceptual dimension did not significantly differ.

Place satisfaction was determined with the scale developed by Yuksel et al. (2010) and it was determined that  $\alpha$  was 0.84. The analysis of place satisfaction findings demonstrated that the highest satisfaction was observed in COP1 and the lowest satisfaction was observed in COP3, similar to the environmental attribute analysis. It was determined that there were significant and high correlations between functional and social attributes and place satisfaction, while no significant correlation was determined between perceptual attributes and place satisfaction. There were significant correlations between occupancy frequency and duration and satisfaction, while no significant correlation was determined between gender and year variables and satisfaction. The analysis conducted to determine the variables that predicted place satisfaction revealed that only functional and social dimensions were included in the model. This finding was consistent with previous study findings that campus open spaces created are of interaction due to physical and social facilities rather than the aesthetic appeal. These results were similar to those reported by Hannan (2013), who considered campus open spaces as behavioral locations and emphasized the social relations between individuals and space.

When the physical, social and perceptual opportunities offered by the open spaces of KTU Kanuni Campus were evaluated, it was seen that COP1 received the highest averages in terms of its location and facilitating different usage types. Marcus and Francis (1997) stated in their open space design pro-

posals that large lawn surfaces facilitate different types of use. Research results are consistent with this recommendation. Especially, COP1's relationship with the campus open spaces and the wide grass surface created a free behavioral environment for students (sunbathing, exercising, dancing, listening to music, studying, organizing outdoor shows, etc.). Thus, the level of usage and space satisfaction has turned into a high position.

Campus open spaces are interactive locations where human-place relations are intensely established. The programming and design phase of these areas is very important. Because campus open spaces are to meet the different needs of young people of different profiles and to create spatial organizations for this. The need-activity and space setup should be created by evaluating the changing user needs, determining the appropriate activities for them, and finally constructing the spatial organizations within the framework of flexible design accordingly. In this context, as stated by Gür (1996); Holistic approaches that are sensitive to the needs and lifestyles of the users should be displayed in a way that the structural components and elements of the space are harmonious, useful, and provide a happy and peaceful life (Düzenli et al., 2019).

In the literature (Günaydın, 2011), he conducted a research to determine the leisure time needs of students on the campus campus and to reveal the current situation. The difference of this research from those conducted in open campus spaces is that it evaluated open spaces as an object of attitude. In conclusion, the present study discussed the environmental attributes of campus open spaces with a 3-dimensional approach and determined that not only perceptual attributes affected place satisfaction. The study findings suggested that functional and social attributes, occupancy frequency and duration variables had positive effects on place satisfaction. It was determined that age and seniority in the university were not effective on place satisfaction. It could not be claimed that all spatial attributes were analyzed in the present study, which was conducted specifically on campus open spaces. Instead of analyzing all possible

spatial attributes, it could not be suggested that the present scale, which was developed based on previous studies and theories in the literature, included all variables that would predict place satisfaction. This fact was among the limitations of the present study. Thus, it was aimed to conduct further studies to control and improve the overlaps by applying the scale in different spaces to overcome this limitation. In particular, future studies should analyze different university campuses to determine the similarities and differences between the perceptions of campus open space users and correlations between these perceptions and place satisfaction. The study and study findings are important and guiding for both urban planners and administrators, who are responsible for protection and development of campus open spaces, and the users.

### 5. Limitation of study

The research was carried out in open spaces of KTU Campus with a total of 240 participants. Among the socio-demographic factors of the participants, only gender and time spent on campus were evaluated. Apart from these variables, which are thought to have an effect on place satisfaction within the scope of the research, preferences, outdoor use perceptions, etc. variables can also be included in the research. The limitation of socio-demographic variables with gender and time spent on campus can be considered as the limitations of the study. Another is that the spatial organization of the locations included in the study (their design features such as existing plantation, walkways, size of material used) were not evaluated on a micro scale.

### 6. Future research

As stated in the limitations of the study, socio-demographic factors can be discussed more comprehensively in future studies that will examine the effects of campus open spaces on place satisfaction. Especially since universities are the meeting points of students from different cultures, the relationship between place satisfaction and intercultural differences can be discussed.

As we stated in the limitations of the research, studies that will question the

relationship of space organizations with place satisfaction can be detailed in future studies on campus open spaces. In particular, the effects of outdoor design features, locations, design and application details on space satisfaction can be examined in future research. This research will serve as a basis for future studies on the relationships between spatial organizations that will be evaluated on a micro scale and place satisfaction. At this point, it is very important to reveal the effects of the functional and social characteristics of the place on place satisfaction from the results obtained in the study. These two dimensions should be investigated more comprehensively in studies on campus open spaces to be researched in the future. At the same time, it is thought that the results obtained from this research will form a basis for all administrative units that are involved in campus layout, design and implementation.

Campus open space use and the importance of campus life have been understood more clearly with the COVID-19 pandemic we are in. With the transformation of education and training in universities into a distance learning model, campus open spaces have turned into empty spaces where students are not the main users. The pandemic situation will cause differences in outdoor use in cities, as well as in campus outdoor use. Especially the needs of the users and their outdoor usage expectations will vary. "What kind of changes can occur in outdoor designs in the post-pandemic period? It is clear that their questions will need to be answered. In this context, in future studies, the differences in campus outdoor use after the epidemic can be investigated and compared with this research.

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