



Visual Perception Evaluation with Semantic Differentiation Method in Design Disciplines: Elazig Balakgazi Park

Research Article
Araştırma Makalesi

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ABSTRACT

Visual perception studies in the public space are important in improving and developing any space's design features. This study aims to evaluate landscape architects' and architects' visual perception of Balakgazi park design in the city of Elazig. Study methodology consists of four stages: (1) Determining the adjective pairs related to the feelings of pleasure, excitement, and dominance that are effective in evaluating the design; (2) preparation of visual perception questionnaires; (3) determination of visual perceptions with semantic differentiation technique (Likert scale); (4) MANOVA statistical analysis of the obtained data. In this study, the responses of 207 participants, 107 of them landscape architects and 98 architects, were evaluated. The data obtained from both groups were evaluated separately. The main results show that "Uninteresting-Interesting" got the lowest score (2.74), and the highest score was "Complex-Simple" (4.67) in the adjective pairs in Balakgazi park by the landscape architects. On the other hand, in architects, "Insufficient Green-Green" (3.19) has the lowest value, while the highest score is "Complex-Simple" (4.48). Landscape architects generally negatively evaluated the adjective pairs. As a result of the EFA, the adjective pairs were grouped under two-factor groups: "Excitement" and "Pleasure and Dominance" according to landscape architects. On the other hand, architects determined two-factor groups: "Excitement and Dominance" and "Excitement". MANOVA results show that while there was no statistical difference in the determination of the factor groups according to gender and whether participants had seen the Balakgazi park ($p>0.05$), there were differences in their responses according to their levels of design education ($p<0.05$).

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Tasarım Disiplinlerinde Görsel Algının Anlamsal Farklılaşım Yöntemi ile Değerlendirilmesi: Elazığ Balakgazi Parkı

ÖZ

Kamusal alanda görsel algılama çalışmaları alanın tasarımsal özelliklerinin iyileştirilmesi ve geliştirilmesi açısından önemlidir. Bu çalışmada Elazığ kentinde yer alan Balakgazi park tasarımının peyzaj mimarlığı ve mimarlık disiplininde eğitim alan bireyler tarafından görsel algı değerlendirmesinin yapılması amaçlanmıştır. Çalışmanın yöntemi 4 aşamadan oluşmaktadır. (1) Tasarımın değerlendirilmesinde etkili olabilecek hoşnutluk, heyecan ve hâkimiyet duyguları ile ilgili sıfat çiftlerinin belirlenmesi, (2) görsel algı anketlerinin hazırlanması, (3) anlamsal farklılaşım tekniği ile görsel algıların belirlenmesi (Likert ölçeği), (4) Elde edilen verilerin istatistiksel analizlerinin gerçekleştirilmesi (MANOVA). Çalışmada 107'si peyzaj mimarı 98'i mimar olmak üzere 207 katılımcıya ait cevaplar değerlendirilmiştir. Her iki gruba ait veriler ayrı ayrı değerlendirilmiştir. Buna göre peyzaj mimarları tarafından Balakgazi parkında sıfat çiftlerinde en düşük puanı "Sıkıcı-İlginç" (2.74) almışken en yüksek puanı "Karmaşık-Sade" (4.67) almıştır. Mimarlarda ise en düşük değeri "Yetersiz yeşil-Yeşil" (3.19) sıfat çifti alırken en yüksek puanı "Karmaşık-Sade" (4.48) almıştır. Genel olarak peyzaj mimarları sıfat çiftlerine daha düşük puanlar vermişlerdir. AFA sonucunda peyzaj mimarları Balakgazi parkının değerlendirilmesinde etkili olan sıfat çiftleri "Heyecan" ve "Hoşnutluk ve Hakimiyet" olmak üzere 2 faktör grubu altında toplanmıştır. Mimarlar ise "Heyecan ve Hakimiyet" ve "Heyecan" olmak üzere 2 faktör grubu belirlemiştir. MANOVA sonuçlarına göre ise katılımcıların cinsiyetlerine ve alanda daha önce bulunmalarına göre faktör gruplarının belirlenmesinde istatistiksel bir farklılık tespit edilmezken ($p>0,05$), tasarımdaki farklı seviyede olmalarına göre yanıtlarında farklılıklar tespit edilmiştir ($p<0,05$)

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INTRODUCTION

Spatial designers/planners aim to create spaces that can meet the user's physiological, psychological, and aesthetic needs to increase the preferability of space and provide space user-balanced (Kurdoğlu & Bekar, 2018; Tarakçı Eren et al., 2018). Perception studies on how the user perceives a space are important to shape future design principles (Surat, 2017). Perception is the state of being or process of becoming aware of something through the senses (Anonymous 1, 2022). But perception is a complex process to define because it is a combination of multiple mental activities. It is the ability to see, hear, or become aware of something through the senses. Perception may differ for each person due to different experiences, cultures, and personality traits of individuals. Therefore, perception is not an instantaneous reaction but a process with a large dimension (Boztepe Taşkıran, 2010; Kösa, 2019; Wang et al., 2010). There are five classes in perception to be visual, auditory, gustatory, olfactory, and tactile. In recognizing and interpreting the stimuli in the outside world, individuals first benefit from the information they obtain through the sense of sight. For this reason, visual perception is one of the most effective perceptions among other types of perception. The main elements of visual perception are shape, color, line, light, space, and structure (Kösa, 2019).

Environmental information must be efficiently collected, processed, stored (in the form of cognitive maps), and adapted. Individuals perceive any image in two different ways, two-dimensional and three-dimensional. The first is the perception of the space only through its characteristic (color, shape, objects, etc.) in the visual. In contrast, the second is the perception formed by imagining that they are physically in the space and developing a projection of what kind of place they will be in (S. Kaplan, 1992). The semantic differential technique (SDT) aims to determine the perceptual differences between concepts that can define a space (Osgood, 1952). Firstly, this method seeks to determine the visual impact factors of space after extensive research and data collection. Secondly, social feelings about visual elements can be measured through photographs, and quantitative data can be produced by considering social feelings. (Kang & Liu, 2022; Mahdavejad & Abedi, 2012).

Although the landscape is defined as all the visible features of an area of countryside or land, it is the spaces we can grasp with our five senses. Landscapes are dynamic areas where we can live, experience, feel and combine with personal perceptions (Tarakçı Eren et al., 2018; Yazıcı & Kiper, 2019). Therefore, visual evaluation of the landscape is essential. With the development of industrialization, the presence of urban open and green spaces contributes to the city's aesthetics and climatic, sociological, and cultural products. For this reason, the presence of open and green spaces in the city is not sufficient, and their sustainability should be ensured in line with aesthetic and updatable data. By determining the user needs with different methods, the importance of functional designs based on user preferences and strategies that prioritize visual

attractiveness has emerged. As a result, visual perception studies that combine the perceptions of different people on space in urban areas are important (Acar & Ayhan Güneroğlu, 2009; Kaptanoğlu, 2006; Özvan & Bostan, 2019).

Visual perception, which is used to determine the visual and aesthetic value of the landscape, has been used by many researchers in the evaluation of different spatial features. These studies are listed as follows: user perception of planting design and plant compositions studies (Acar & Ayhan Güneroğlu, 2009; Acar & Derya, 2010; Demirbaş et al., 2003; Erduran & Kabaş, 2010; Kösa, 2019; Müderrisoğlu & Eroğlu, 2006; Sakıcı et al., 2012; Tarakçı Eren et al., 2018); visual evaluation of different vegetation types (Sarı & Kardeş, 2015); visual perception of pedestrian roads (Aytaş & Uzun, 2015; A. Kaplan & Coşkun Hepcan, 2004; Rezazadeh, 2011; Tsuchiya, 2013); the effect of the visual attractiveness of urban parks on user perception (Altınçekiç & Erdönmez, 2001; Çakıcı & Çelem, 2009; Karmanov & Hamel, 2009; Kurdoğlu & Üstün Topal, 2017; Mahdavejad & Abedi, 2012; Surat, 2017; Yazıcı & Kiper, 2019); studies on the past and current situations of public spaces such as city squares (Acarlı & Kiper, 2018; Çınar & Çetindağ, 2009); evaluation of visual landscape quality of recreational areas (Özhancı & Yılmaz, 2011); quantifying user preferences with visual perception on different subjects such as landscape quality and visual assessment (Engin Dere, 2017; Hacıoğlu et al., 2017). These studies aimed to integrate aesthetics with planning, design, and management.

The study aims to determine the differences and similarities in the perception of the design features of Balakgazi Park by the landscape architects and architects with the semantic differentiation technique. In the visual evaluation of park design, the views of landscape architecture and architecture students, who have come to different levels of design education, and experts will be used. In this research, the design features of the public space will be discussed only at the visual perception level.

Research Questions

There are three research questions. These are as follow:

- 1-Is there a statistically significant relationship between socio-demographic characteristics and the interesting rate of Balakgazi park?
- 2-What are the similarities and differences in the visual perception of the participant from landscape architecture and architecture departments?
- 3-Do participants at different levels in design education have perception differences in evaluating a space?

Limitations

- 1-The distribution of participants according to education level is not homogeneous. The number of post-graduate participants is lower than the number of bachelor-level participants in universities where the study will be

conducted. This is a factor that will affect the homogeneous distribution in statistical analysis.

2-The distribution of the participants according to their departments (Landscape architects and architects) is not homogeneous. However, the study aims to evaluate the perception of space in different professional disciplines (landscape architecture and architecture, it would be acceptable for landscape architects, who are primarily responsible for outdoor design, to have more participants than architects.

3-Users are dominant in area images with high user density. This situation affects the evaluation of some adjective pairs. Therefore, the photos taken from drones and without users were selected from the internet for evaluation. In addition, these images provide a holistic perception of the area.

MATERIAL and METHOD

Balakgazi Park

Balakgazi Park has been selected for visual perception evaluation (Figure 1). It is located in Harput, which is one of the historical districts of Elazig City. The total area of Balakgazi park is 5,800 m2. With the glass terrace construction, one of the important viewpoints and city image for Elazig, the user demand for visiting the park has increased. The glass terrace size is approximately 220 m2. In addition, there are 2,300 m2 of green areas, 120 m2 of playgrounds, many ornamental pools, stepped ornamental pools, a parking lot, and urban furniture, including shading canopies and benches. Revision of Harput Balakgazi Park was completed in 2021 (Anonymous 2, 2022).

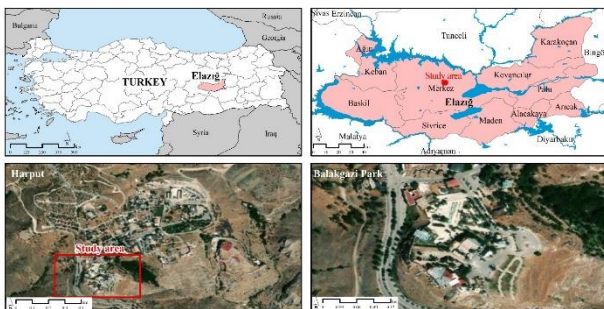


Figure 1: The location of the study area

Methodology

The study consists of four steps:

- determination of visual perception with Semantic Differentiation Method;
- identification of photographs for visual perception evaluation;
- determination of survey measurement and data collection;
- statistical analysis and evaluation of the survey results.

Semantic Differentiation Technique (SDT)

Determining the space-design perceptions are experimental study. In this study, the Semantic Differentials Technique, developed by Osgood (1952), was used to evaluate visual perception. This technique measures the associative meanings of concepts, personalities, or symbols in the mind. SDT, widely used in environmental psychology, is a method used to measure the interaction between the environment and the user and to examine subjective and environmental reactions. Moreover, it enables the semantic measurement of aesthetic perception based on evaluating a concept by different adjective pairs (Acking & Küller, 1972). This method evaluates the subjective perceptions of individuals or groups through the visual evaluation of spaces. In other words, it aims to determine the concept’s perceptual effect on different people. To evaluate visual perception, people should rate a concept on a scale with poles defined by two opposite adjectives (for example: beautiful and ugly) (Mahdavinejad & Abedi, 2012).

In this study, national and international studies, based on the visual perception of planting design, urban parks, pedestrian area and seasonal changes of the plantation, have guided to determine the adjective pairs used to evaluate Balakgazi Park’s design characteristics. Eighteen adjective pairs were obtained from previous studies and grouped into three classes: pleasure, excitement, and dominance line with expert opinions (Table 1).

Table 1: Adjective pairs used in the evaluation of Balakgazi Park (developed by Mahdavinejad and Abedi (2012))

VARIABLE	ADJECTIVE PAIR	
Pleasure: It is based on a feeling of like or dislike.	Unpleasant-Pleasant	
	Neglected-Maintained	
	Irregular-Regular	
	Excitement: It refers to the presence and absence of exciting, interesting features related to the environment. It is mostly based on the design features of the spaces.	Not Aesthetics-Aesthetics
		Ordinary-Original
	Uninteresting-Interesting	
	Complex-Simple	
	Incompatible-Harmony	
	Trivial-Glorious	
Repulsive-Inviting		
Artificial-Natural		
Still-Lively		
Informal-Formal		
Insufficient green-Green		
Traditional-Modern		
Dominance: It is about a sense of personal freedom.	Uncomfortable-Comfortable	
	Closed-Open	
	Unsafe-Safe	

A 7-point Likert scale was used to evaluate adjective pairs with the semantic differentiation technique, and the adjective pairs were graded between -3 and +3. Accordingly, (-) values were effective in negative rating adjectives, while (+) values were effective in rating

positive adjectives. While the negation degrees of negative adjectives increase from -1 to -3, positive adjectives increase their degree of positivity from +1 to +3. A value of zero (0) represents neither a positive nor a negative situation. That means neutral thinking.

Identifying photographs for visual perception evaluation

To evaluate the landscape design of Balakgazi Park, photographs including different points of view of the area were used. The bird's-eye view of August 2021, taken during the green vegetation period of the areas via Google Earth, was preferred because of the clear perception of the area plans. In addition, images taken by a drone on the internet, where the design of the areas can be seen clearly, were preferred. Photographs showing the different reinforcement features and their connections with each other in the area were preferred. Photos without heavy users were chosen to perceive the landscape design better. The main reason for using photographs from the web and Google Earth in the perceptual evaluation of landscape designs is that the resolutions, color, and light distributions show similar characteristics. Thus, the differences in perception arising from the change of these features will be minimized. Five photographs were determined to evaluate the visual perception of design students (Annex-1).

Survey measurement and data collection

In the study, data collection from landscape architects and architecture students was done through web-based questionnaires. The study was carried out at the Department of Architecture of Fırat University and the Department of Landscape Architecture of İnönü University in Turkey. In addition, questionnaires were applied to the graduate and post-graduate people. Participants were selected randomly. The main purpose is to determine the differences and similarities in the visual perception of individuals at different education levels. The questionnaire includes two types of questions (Annex-1). Firstly, the socio-demographic characteristics of the participants (age, gender, department, years of design education, and resident city) were questioned. Secondly, the visual perception of participants was questioned according to SDT. At this stage, for the participants to evaluate the adjective pairs more quickly, they were converted into numbers 1-7 by the 7-point Likert scale ranging from -3 to 3. Moreover, there is also a question about whether the participants have seen these areas before. This question will help determine the perceptual differences between the participants who were physically present in the place and those who will only evaluate in line with the visuals they see in the photo in the study results.

Data analysis

The participant's responses to the questionnaire were evaluated through the IBM SPSS Statistics 22 program, which was obtained from Fırat University. Statistical methods used in the evaluation of the results consist of three stages:

- **Descriptive statistics:** Firstly, each adjective pairs were rated by landscape architects and architects to determine the interest rate of Balakgazi Park. Descriptive statistical methods were used to determine the relationship between the socio-demographic characteristics and the interesting rate of Balakgazi Park according to participants' visual perception. In addition, the lowest, highest, and standard deviation values were obtained for each adjective pair.

- **Explanatory Factor Analysis:** Secondly, factor analysis was carried out to determine which adjective pairs were effective at the interesting rate of Balakgazi Park. Factor analysis is a multivariate statistic aimed at obtaining a small number of identifiable significant variables from a large number of variables measuring the same item (Büyüköztürk, 2002). It is an analytical, statistical method to convert perceptual data into quantities and interrupt it. The aim is to determine and group which adjective pairs are effective or not in the evaluation of visual perception. Factor analysis is based on the high correlation relationship.

In the study, adjective pairs constitute the variables. Each variable group is expected to be in a relationship with a determining factor. Another important point in factor analysis is the sample size, the number of individuals participating in the survey, and the reliability of their answers. The high number of samples increases the reliability of the analysis. Still, in cases where the number of variables is high, it is sufficient for the number of participants to be between 100 and 200 (Büyüköztürk, 2002). The number of participants was determined as 100 for each department due to the high number of variables (18 adjective pairs).

- **MANOVA (Multivariate Analysis of Variance):** Lastly, the evaluation is the application of multivariate analysis of variance (MANOVA) to determine how the factor groups change according to the socio-demographic characteristics of the participants. MANOVA is often used to compare multivariate sample means. In the case of two or more dependent variables, it performs the significance test with each independent variable separately using a multivariate approach. However, achieving MANOVA requires the following assumptions: (i) data must be proportional; (ii) the data have a normal distribution; (iii) group variances should be equal. In addition to the ANOVA assumptions, the correlation between dependent variables should be the same between groups in the independent variable. While the determining factors constitute the dependent variables, the landscape architects' socio-demographic characteristics include the independent variables.

RESULTS

In the study, web-based surveys were carried out from July to September 2022. A total of 259 people were surveyed, but 54 participants were not considered due to missing answers or not completing the survey. Therefore, the visual evaluation of Balakgazi Park was evaluated with the responses of 205 participants.

Socio-demographic Characteristics

The study participants’ distribution according to their socio-demographic characteristics is given separately according to their departments (Table 2). Out of a total of 205 participants, 107 were landscape architects (52.2%), while 98 were architects (47.8%). While most of the landscape architect participants are female (71.0%), the female-male distribution of the architect participants is homogeneous, with 51.0% and 49.0%, respectively. 72.0% of the landscape architects and 80% of the architects are undergraduates. Therefore, in the age distribution of participants, the majority are 18-22 and 23-26. Other age groups generally represent graduated, master’s, and Ph.D. groups. It is a fair distribution that the number of participants in the undergraduate is higher than in the graduate, master, and Ph.D. groups in design education. According to the level of design education, 2nd-level students show the highest participation in landscape architects, while students at 3rd level (13.1%), 4th level (12.1%), and 5th years or more have almost equal participation. While the highest participation in the architect department is 3rd level (13.1%) and 4th level (12.1%) students, the lowest survey rate with 11 (11.2%) participants belongs to 1st level students.

Visual Perception of Balakgazi Park

In the study, the visual perception of Balakgazi park was evaluated according to the 7-point Likert scale for the adjective pairs (Figure 2). Results show that the Balakgazi park design was rated as 4.10 by landscape architects and 4.47 by architects. When the participants were evaluated according to their departments, the same adjective pairs were generally given low or high values by landscape architects and architects. However, the mean rates given to adjective pairs by landscape architects are lower than that of architects. It is generally concluded that Balakgazi park was positively evaluated as pleasant, maintained, regular, simple, formal, and safe, which were the highest-scored adjectives. However, it was negatively assessed as artificial and insufficient green due to the high ratio of the hardcover surface. Moreover, its design was generally perceived as uninteresting, trivial, and traditional. Figure 2 shows that the “Uninteresting-Interesting” adjective pair with 2.74 has the lowest mean rate for landscape architects, while “Insufficient Green-Green” scored the lowest with 3.19 for architects. On the other hand, the “Complex-Simple” adjective pair got the highest mean score from both landscape architects and architects, with 4.67 and 3.19, respectively.

Table 2: Descriptive characteristics of participants

<i>Socio-demographic characteristics</i>	<i>Landscape Architecture (n=107)</i>		<i>Architecture (n=98)</i>		<i>Total (n=205)</i>	
	The number of participants	Percentage	The number of participants	Percentage	The number of participants	Percentage
	n	%	n	%	n	%
Gender						
<i>Men</i>	31	29.0	48	49.0	79	38.5
<i>Women</i>	76	71.0	50	51.0	126	61.5
Age						
<i>18-22</i>	51	47.7	63	64.3	114	55.6
<i>23-26</i>	26	24.3	26	26.5	52	25.4
<i>27-30</i>	13	12.1	4	4.1	17	8.3
<i>31-34</i>	8	7.5	2	2.0	10	4.9
<i>35-45</i>	9	8.4	3	3.0	12	5.9
Level in design education						
<i>1st level</i>	2	1.9	11	11.2	13	6.3
<i>2nd level</i>	40	37.4	13	13.3	53	25.9
<i>3rd level</i>	14	13.1	30	30.6	44	21.5
<i>4th level</i>	13	12.1	32	32.7	45	22.0
<i>5th years or more</i>	14	13.1	7	7.1	21	10.2
<i>Graduated</i>	9	8.4	2	2.0	11	5.4
<i>Master</i>	9	8.4	2	2.0	11	5.4
<i>PhD</i>	6	5.6	1	1.0	7	3.4

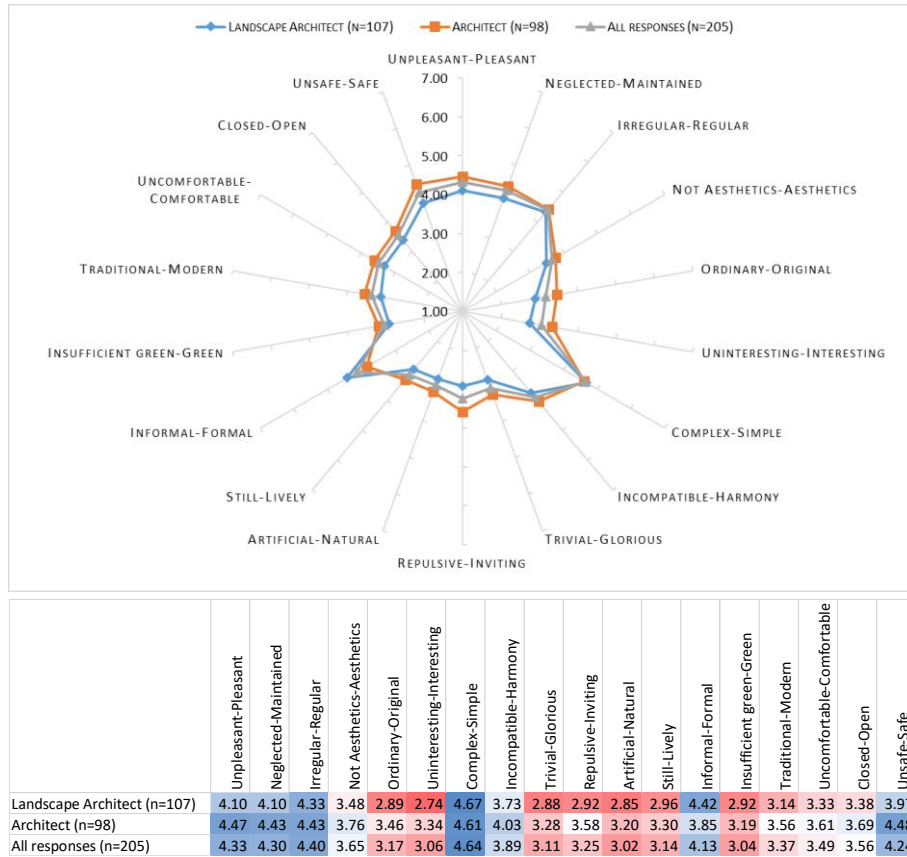


Figure 2: Balakgazi park design perceptions of the participants

Exploratory Factor Analysis (EFA)

Exploratory factor analysis (EFA) was used to determine which adjective pairwise affects the perception of Balakgazi park design. The factors affecting the perception of landscape architects and architects were determined. To carry out EFA, three points must be observed. Firstly, factors with an initial eigenvalue greater than 1.00 were considered. Secondly, adjectives pairwise with a factor load below .50 were excluded from the factor groups. Finally, overlapping adjectives pairwise under more than one factor were excluded from the evaluation, factor analysis was repeated, and factors were determined (Woosnam et al., 2017; Woosnam & Erul, 2017). The adequacy of the sample size in the analysis was tested with Kaiser-Meyer-Olkin (KMO). Accordingly, if the KMO value is more significant than 0.60, the number of samples is sufficient to conduct the EFA. The KMO values obtained as a result of the analysis are above 0.85. The number of samples in the study is sufficient to perform EFA.

Yakin İnan and Özdemir Sönmez (2019) are based on naming the factors that result from EFA. In the study, Mahdavinejad and Abedi (2012) developed the evaluated adjective pairs and gathered them under three groups: pleasure, excitement, and dominance. Mahdavinejad and Abedi (2012) were used in naming the determining factors, and factor names were determined by considering the diversity of adjectives pairwise under the factor group.

As a result of EFA, adjective pairs vary in determining landscape architects’ perceptions. Not all of the 18 evaluated adjective pairs were effective in determining the factors (Table 3). EFA results show that 12 adjective pairs in the perception of landscape architects and 13 adjective pairs in architects’ perception played a role in determining the factors.

According to the perception of landscape architects, two-factor groups were determined, including “Excitement” and “Pleasure and Dominance”. The first factor explains 40.81% of the variances, while the second factor explains 21.72% of the variances. Factor 1 consists of the design characteristics of Balakgazi Park. Factor 2 consists of adjective pairs based on the feelings of enjoying, liking, or disliking and safety of the Balakgazi park design. On the other hand, two-factor groups were determined in the perception of architecture, including “Excitement and Dominance” and “Pleasure”. Factor 1, unlike landscape architects, includes mainly design features in determining the first factor and the adjective pair related to dominance. In addition, it has been seen that the design features of Balakgazi park are also effective in determining Factor 2, which includes the “Complex-Simple” and “Informal-Formal” adjective pairs. Adjective pairs related to the pleasure criterion did not affect the architect’s perception. Factors explain 68.47% of the total variance. The distribution of the factors according to the variance explanation ratio is 58.60% for Factor 1 and 9.86% for Factor 2 (Table 3).

Table 3: EFA results for Balakgazi Park

Landscape Architecture			
Factor	Factor loading	Factor	Factor loading
Factor 1. <i>Excitement</i>^a Eigenvalue= 5.25 Explained variance = 40.81%		Factor 2. <i>Pleasure and Dominance</i> Eigenvalue = 3.01 Explained variance = 21.71%	
Trivial-Glorious	.91	Irregular-Regular	.91
Repulsive-Inviting	.89	Neglected-Maintained	.88
Ordinary-Original	.84	Unsafe-Safe	.75
Still-Lively	.83	Informal-Formal	.66
Uninteresting-Interesting	.82		
Traditional-Modern	.79		
Artificial-Natural	.65		
Not Aesthetics-Aesthetics	.58		
Total Explained Variance (%)			62.52

^a KMO =0,85 and Barlett's Test of Sphericity=0,000

Cross-loaded factors: Insufficient green-Green, Closed-Open, Informal-Formal, Incompatible-Harmony, Uncomfortable-Comfortable

Factor loading less than .50: Unpleasant-Pleasant (.30)

Architecture			
Factor	Factor loading	Factor	Factor loading
Factor 1. <i>Excitement and dominance</i>^a Eigenvalue= 8.80 Explained variance = 58.60%		Factor 2. <i>Excitement</i>^a Eigenvalue = 2.51 Explained variance = 9.86%	
Trivial-Glorious	.95	Complex-Simple	.91
Uninteresting-Interesting	.92	Informal-Formal	.56
Still-Lively	.91		
Repulsive-Inviting	.90		
Insufficient green-Green	.90		
Ordinary-Original	.87		
Artificial-Natural	.87		
Uncomfortable-Comfortable	.82		
Not Aesthetics-Aesthetics	.80		
Traditional-Modern	.70		
Closed-Open	.66		
Total Explained Variance (%)			68.47

^a KMO =0,89 and Barlett's Test of Sphericity=0,000

Cross-loaded factors: Irregular-Regular, Neglected-Maintained, Unsafe-Safe

Factor loading less than .50: Unpleasant-Pleasant (.25), Incompatible-Harmony (.48)

MANOVA

MANOVA was used to determine whether the factors obtained from EFA showed statistical differences according to socio-demographic characteristics. At this stage, while evaluating the characteristics of the participants regarding their gender, education level in design education, and whether they have seen the Balakgazi park before, Age groups were not included in the evaluation as they were parallel to the education level in design education. While these features constitute the independent variables in MANOVA, the factors determined according to EFA constitute the dependent variables. There are some steps to assess statistically significant groups in MANOVA. First, the Box M Test was used to test the assumption that variances and

covariance's are homogeneous. This assumption is essential for the analysis to be carried out correctly. According to the Box M Test, Wilks' Lambda value is considered when $p > 0.05$, and Pillai's Trace value is taken into account when $p < 0.05$. Secondly, Wilks' Lamda or Pillai's Trace p-value of less than 0.05 indicates that at least one of the variables in the factor differs statistically from other groups. However, it does not show which group has a statistically significant difference. Therefore, Levene Test or posthoc Tamphane T2 test ($p < 0.05$) was used to determine which variables caused this significant difference. At this stage, MANOVA analysis was evaluated separately for each determined factor group for both landscape architect and architect participants (Table 4).

Table 4: MANOVA results according to socio-demographic variables

		Landscape Architect	
		Factor 1	Factor 2
Gender	Box's M test ($p > 0.05$)	0.01	0.25
	Wilks's Λ ($p < 0.05$)	0.18	0.02
	Pillai's Trace ($p < 0.05$)	0.19	0.02
	Levene Test ($p < 0.05$)	0.63	0.47
	Tamhane's T2 ($p < 0.05$)	-	-
Level of design education	Box's M test ($p > 0.05$)	0.00	0.22
	Wilks's Λ ($p < 0.05$)	0.51	0.08
	Pillai's Trace ($p < 0.05$)	0.48	0.07
	Levene Test ($p < 0.05$)	0.56	-
	Tamhane's T2 ($p < 0.05$)	-	0.09
Visited before	Box's M test ($p > 0.05$)	0.00	0.82
	Wilks's Λ ($p < 0.05$)	0.49	0.75
	Pillai's Trace ($p < 0.05$)	0.49	0.75
	Levene Test ($p < 0.05$)	0.70	0.67
	Tamhane's T2 ($p < 0.05$)	-	-
		Architect	
		Factor 1	Factor 2
Gender	Box's M test ($p > 0.05$)	0.00	0.30
	Wilks's Λ ($p < 0.05$)	0.84	0.54
	Pillai's Trace ($p < 0.05$)	0.84	0.54
	Levene Test ($p < 0.05$)	0.17	0.15
	Tamhane's T2 ($p < 0.05$)	0.01	0.03
Level of design education	Box's M test ($p > 0.05$)	0.00	0.59
	Wilks's Λ ($p < 0.05$)	0.27	0.26
	Pillai's Trace ($p < 0.05$)	0.23	0.25
	Levene Test ($p < 0.05$)	0.15	0.12
	Tamhane's T2 ($p < 0.05$)	0.02	-
Visited before	Box's M test ($p > 0.05$)	0.02	0.95
	Wilks's Λ ($p < 0.05$)	0.54	0.51
	Pillai's Trace ($p < 0.05$)	0.54	0.51
	Levene Test ($p < 0.05$)	1.54	0.77
	Tamhane's T2 ($p < 0.05$)	0.45	-

MANOVA results for landscape architect

Factor 1 (Excitement): In the variables under the factor, the groups did not differ statistically from each other according to the level of design education ($p > 0.05$), while there was a statistically significant difference in terms of gender ($p < 0.05$). The variable "Not Aesthetic-Aesthetic" perceived fewer aesthetics in men (2.50-3.63) compared to women (3.39-4.11).

Factor 2 (Pleasure and Dominance): The variables under the factor show a statistically significant difference according to socio-demographic characteristics, including

gender and level of design education ($p < 0.05$). In the "Informal-Formal" adjective pair, men (5.03) evaluated the Balakgazi park more formally than women (4.13). In the adjective pairs "Informal-Formal", "Irregular-Regular," and "Neglected-Maintained", the graduate group (graduate, master, and Ph.D.) is statistically separated from the 2nd level, 3rd level, and 4th levels. The graduate group (5.5) perceived the Balakgazi park design as more formal, with an average of 5.5 compared to the undergraduate group (3.7-4.3). In addition, they perceived the area as more well-maintained (5.1) and more regular (5.4) compared to the graduate group. Due to the small number of participants in the 1st level, no statistical significance was found between the 1st level and the other levels. No statistical difference was observed between the different levels in the "Unsafe-Safe" adjective pair ($p > 0.05$). While 9 participants of landscape architects had seen Balakgazi park before, 98 participants had not seen it before. Therefore, no statistically significant difference was detected in the visual perception of the Balakgazi, whether the area was seen by the participants before or not ($p > 0.05$).

MANOVA results for architect

Factor 1 (Excitement and Dominance): There is no perceptual difference in Factor 1 according to gender ($p > 0.05$), while there were statistically significant differences according to the level of design education ($p < 0.05$). 5 years and more in Level in design education "Still-Lively" differs significantly from all other classes. 5 years and more group (5.6) evaluated Balakgazi park as more lively than other classes (2.7-3.9). In the "Trivial-Glorious" adjective pair, the 4th level is statistically different from the 1st level, 3rd level, and 5th year or more students. While the 4th level students (2.6) evaluated the area as trivial, the students in the 1st level, 3rd level, and 5th years and more groups assessed the area as glorious (3.2-4.6). 2nd level is statistically different from the 4th level in "Repulsive-Inviting" and "Closed-Open". In "Insufficient Green-Green" the graduate level and 5th years or more also differs from all undergraduate levels. The graduate group perceived the Balakgazi as insufficient green, giving the lowest mean score average with 1.4; on the other hand, 5th years and more groups separated from other classes by evaluating the area as green with 4.8. In the "Ordinary-Original" 1st level is separated from the 2nd level, 5th years or more and graduate groups. In all adjective pairs, the graduate group is separated from the 1st level, 2nd level, and 5th year and more groups. The graduate group evaluated the Balakgazi more negatively than the other groups.

Factor 2 (Excitement): No statistical relationship was found according to gender and level of design education ($p > 0.05$). While 48 architects had seen Balakgazi park before, 50 participants did not. MANOVA analysis results show that in the evaluation of Factor 1 and Factor 2, it was concluded that whether the participants had seen this area before or not did affect the visual perception evaluation. In other words, no statistically significant relationship was obtained.

CONCLUSION

Visual perception studies are important to determine how individuals or users perceive any space. The semantic differentiation technique is commonly used to evaluate subjective perception (Acking & Küller, 1972). Although there are many studies on public spaces, studies evaluating such personal perceptions are difficult to conduct, and there are limited studies in the literature. For this reason, evaluating Balakgazi park in Elazig City by individuals who received design education fills this gap. This study selected participants from different departments, including landscape architecture and architecture, and the different levels of design education. In addition, participants include individuals who have seen Balakgazi park before. Thus, participant responses include subjective (emotional) data regarding users of these areas, and objective data, combined with scientific knowledge, due to their design education.

Exploratory Factor Analysis was used to determine which emotions were dominant by considering many adjective pairs in the visual evaluation of public spaces. Thus, the emotions reflected by the adjective pairs were gathered under factor groups. These factors describe feelings of pleasure, excitement, and dominance. In the visual perception evaluation of Balakgazi, two-factor groups were determined from landscape architect and architect. While the first factor was "Excitement" and the second was "Pleasure and dominance" according to landscape architects, the first factor was "Excitement and dominance" and the second one was "Excitement" according to architects.

MANOVA was used to determine how these feelings change in individuals with different levels of design education, whether they have visited the area before and how they vary according to gender. Results show no statistically significant differences between the previously seen Balakgazi park and the not seen area ($p>0.05$). However, significant differences were determined according to the level of design education ($p<0.05$). Generally, it has been determined that the graduate-level group has a different perception than the undergraduate level.

While studies in the literature, such as the effect of the visual appeal of urban parks on user perception (Altınçekiç & Erdönmez, 2001; Çakıcı & Çelem, 2009; Karmanov & Hamel, 2009; Kurdoğlu & Üstün Topal, 2017; Mahdavinejad & Abedi, 2012; Surat, 2017; Yazıcı & Kiper, 2019), and visual perception studies conducted on the past and current situations of public spaces mostly used the mathematical comparisons or fundamental statistical analyzes, EFA and MANOVA were used in this study. In this respect, the study differs from other studies. The method of the study and the statistical analyzes applied are guiding for studies involving similar research methods. In addition, the study's results will guide the decision makers in developing the design features of Balakgazi park. However, in the study, only the spatial perceptions of individuals who received design education were evaluated.

Future studies should include participants with different characteristics. In addition, objective data containing numerical values such as the ratio of green area, hard surface, presence of vegetation, etc. should be included. Because the evaluation of public spaces with objective data may not be enough to reflect the positive features of the space. Future studies should include and compare subjective and objective data to guide decision-makers and develop design strategies.

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Author Contribution and Conflict of Interest

All authors contributed equally to the article.

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