The Eurasia Proceedings of Science, Technology, Engineering and Mathematics (EPSTEM), 2026

Volume 40, Pages 110-121

ICBAST 2026: International Conference on Basic Sciences and Technology

Evaluation of Konya Selcuklu Kanyon Park Landscape Design Using Eye Tracking Technique

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Abstract: Eye-tracking technology is a method that provides qualitative and quantitative results by monitoring pupil movements with the aid of infrared rays. In this study, visual perception and behaviors regarding the landscape design of Konya Selçuklu Kanyon Park were evaluated through the eye-tracking method with the participation of volunteers. In this context, images obtained from the research area were shown to 28 participants using eye-tracking technology. In the study, Areas of Interest (AOIs) were defined as landscape components (plants, urban furniture, and pavements). Based on these defined areas of interest, heatmaps and eye-tracking metrics (average fixation duration and fixation count) were obtained through eye-tracking software. Repeated Measures ANOVA analysis was performed using the data obtained from the eye-tracking metrics. The findings revealed statistically highly significant differences between the landscape components in terms of both eye-tracking metrics ($p < 0.001$). It was determined that participants showed the highest visual interest in plants (61.68 units; 3.48 sec), followed by urban furniture (20.79 units; 3.20 sec), while pavements received the lowest visual interest (16.25 units; 1.42 sec). Bonferroni-corrected pairwise comparison (post-hoc) tests showed that plants significantly differed from all other landscape components in terms of fixation count, while they had similar values to urban furniture in terms of average fixation duration. This situation indicates that plants play an "attention-grabbing" role, while urban furniture undertakes an "information processing" role. Pavements, which received the lowest visual interest in both metrics, ranked at the bottom of the visual hierarchy.

Keywords: Eye-tracking technology, Konya Selçuklu Kanyon Park, Landscape design, Visual behavior, Visual perception.

Introduction

Eyes, being one of the sensory organs, are the window to the mind and hold a very important place in our perception of the world. Therefore, the eye-tracking technique is one of the methods used for understanding the processes occurring in the mind through the tracking and recording of eye movements (Çağıltay, 2011).

Eye-tracking technology is a useful tool that provides objective insights for researchers and scientists who wish to examine human behaviors. The close relationship between eye movement and human behaviors has made this technique a reliable method through which individuals' eye movements can be measured. Thus, the eye-tracking method has enabled the observation of where a person is looking at any given time and the sequence of their eye movements (Coşkun, 2019).

The concept of landscape has a broad scope that expresses all natural and cultural, living and non-living components on earth, and incorporates all possible definitions thereof (Orgin, 1998; Çelik, 2004). According to the European Landscape Convention, landscape denotes an area, as perceived by people, whose character is the result of the action and interaction of natural and/or artificial factors (Simensen et al., 2018).

Landscape design, which is the field of study of landscape architecture at sub-scales, is the process in which the outdoor space is shaped in line with planning decisions. In landscape design, the use of the site is established according to needs. The main goal in this process is the creation of the best possible spatial composition regarding the study area within the context of sustainability and in the light of design principles. Attributes such as the designer's vision, cultural background, and aesthetic understanding allow for the production of an infinite number of solutions in landscape design (Korkut et al., 2010).

The primary objective of this research, in which the eye-tracking method—one of the neuroscientific data collection techniques—is used, is to evaluate the visual perception and behaviors regarding the landscape design of Konya Selçuklu Kanyon Park through volunteer participants. Within the scope of the research process; first, a literature review on the subject was conducted, and then, by performing fieldwork, high-resolution representative photographs best reflecting the landscape character of the study area were obtained from the site. Additionally, interviews about the site were held with officials working at Selçuklu Municipality prior to the eye-tracking experiments. After the eye-tracking experiments were carried out, the eye-tracking data (average fixation duration and fixation count) were converted into numerical data via Tobii Pro Lab and subjected to statistical analysis. In light of these findings, the landscape design of Konya Selçuklu Kanyon Park was evaluated using the eye-tracking method, and conclusions and recommendations were developed in line with the data achieved.

Materials and Methods

Study Area

Konya Selçuklu Kanyon Park is located in the Selçuklu district of Konya province, Türkiye. Selçuklu is one of the central districts of Konya province (Figure 1). The Selçuklu district was established on the plain, which is a lakebed, and the Takkeli and Loras mountains are located to its west. It has an arid climate; therefore, summers are hot and dry, and winters are cold and rainy (Anonymous, 2026a).

The reasons for choosing Konya Selçuklu Kanyon Park as the study area are that it constitutes a successful example of the recreational reclamation (rehabilitation) of areas degraded as a result of anthropogenic activities (mining) and that the visual perception hierarchy in areas with such extreme topography has not been previously analyzed using the eye-tracking method.

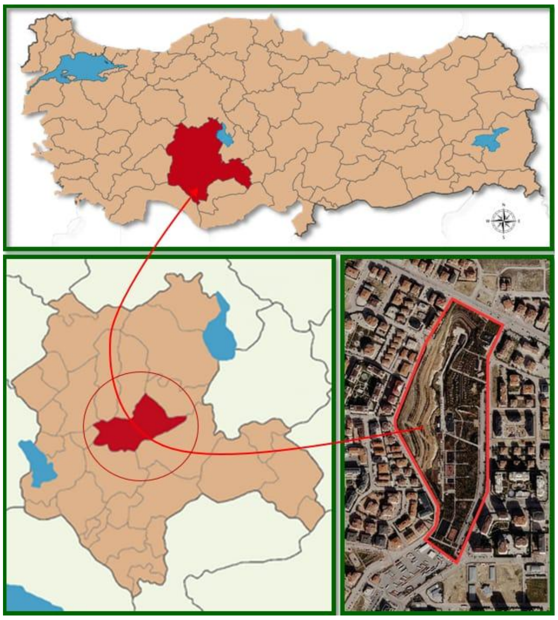
Figure 1. Location and plan of Konya Selçuklu Kanyon Park (Google Earth, 2026)

The study area, located within the borders of the Yazır Neighborhood of the Selçuklu district, was transformed into a neighborhood park through the rehabilitation of an idle site previously used as a stone quarry. This characteristic area, through which an active fault line passes, was designed after the termination of stone quarrying activities and opened for service under the name of Konya Selçuklu Kanyon Park with a total surface area of 122,500 m². While designing the landscape of the area, it was aimed to create a multi-functional recreation area including resting, entertainment, and sports activities. At the end of the landscape planning and design processes, the area was created as a functional landscape area that both preserves its natural features and responds to the needs of the users. In this direction, the park was presented to the public as a social and recreative space where local people can spend their leisure time by getting away from their daily routines (Anonymous, 2026b).

Stimuli

Static landscape images collected from the study area were used as stimulus material in the eye-tracking experiment. As emphasized in the literature (Liu et al., 2022; Jiang et al., 2017), landscape images provide an effective alternative for on-site environmental assessments. During the photo shoots, care was taken to determine the viewpoints that best reflect the landscape design and user perception of the area. A total of 40 images were obtained from the field. The images were standardized in terms of size and color tolerance using Adobe Photoshop software. Considering the areas where visitors spend the most time in the site, it was decided to use 8 high-resolution photographs in the eye-tracking studies (Figure 2).

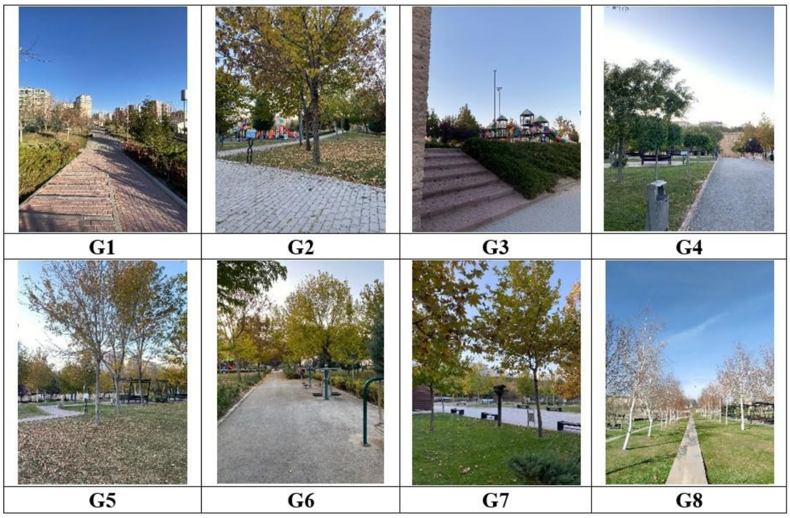

Figure 2. Selected experimental images (Original, 2025)

Selection of Participants

In academic research conducted using eye-tracking devices, determining the optimum sample size is of great importance in order to reach qualified data. In this direction, power analysis must be performed to ensure the success and statistical validity of the study. In eye-tracking experiments, the process of participants using the device individually and sequentially extends the duration, which reveals the necessity of efficient use of research resources. For this reason, the minimum sample size required to reach the targeted statistical power was calculated using G*Power software (v3.1.9.7).

In the study, a single-factor, within-subjects design consisting of three levels (plants, urban furniture, and pavements) was used to evaluate visual behaviors toward different landscape components. In the preliminary power analysis conducted to guarantee statistical power, parameters of medium effect size ($f = 0.25$), $\alpha = 0.05$ significance level, and 0.8 power value were used. According to these parameters, the minimum sample size required for one-way repeated measures ANOVA analysis was determined as 28.

The research included 32 individuals consisting of volunteer undergraduate and graduate students and faculty members from the Department of Landscape Architecture at Selçuk University. It was confirmed that all participants had normal or corrected-to-normal visual acuity and normal color vision. During the data cleaning process, 5 participants exhibiting low data quality, excessive blinking, or eye movements incompatible with device calibration were excluded from the analysis. The final analyses were performed with data obtained from a total of 28 participants (18 females, 10 males) ranging in age from 20 to 50.

Experimental Equipments

In order to collect eye-tracking data in the study, a screen-based Tobii Pro Nano (Tobii Technology AB, Sweden) eye-tracking device with a 60 Hz sampling rate was used. Data recording and visualization processes are carried out through Tobii Pro Lab (Full Edition v1.171) software. Visual stimuli were shown to the participants via a 15.6-inch laptop monitor with a resolution of 1920 × 1080 pixels.

G*Power (v3.1.9.7; Heinrich Heine University, Düsseldorf, Germany) software was utilized in calculating the sample size. Statistical analyses were performed using SPSS 27.0 (IBM Corp., Armonk, NY, USA) software. Adobe Photoshop 2021 (Adobe Inc., San Jose, CA, USA) and AutoCAD 2022 (Autodesk, USA) software were used during the preparation, standardization, and technical drawing stages of visual materials. Current satellite images and location data of the research area were obtained through the Google Earth (Google LLC, Mountain View, CA, USA) platform based on the location of Konya, Türkiye.

Experimental Procedure

The eye-tracking study was conducted individually in a controlled environment isolated from external factors (weather conditions, etc.) (Gao et al., 2021; Cottet et al., 2018; Amati et al., 2018). Prior to the experiment, participants were provided with detailed information regarding the experimental procedure and their ethical rights, followed by the acquisition of their written consent via the "Volunteer Informed Consent Form." Participants were positioned in front of the laptop, to which the eye-tracking device was integrated, ensuring an optimum distance of approximately 65 cm from the screen. A 9-point calibration procedure was applied to verify measurement accuracy, and validation values below 0.50 were accepted as successful.

During the experimental phase, 8 landscape images, each presented for a duration of 5 seconds, were shown to the participants. This duration was determined in accordance with similar methodological approaches in the literature (Dupont et al., 2016; Dupont et al., 2015). To ensure that participants perceived the landscape in the most natural way, no guidance was provided, and they were allowed to perform "free viewing" (Huang & Lin, 2019; Berto et al., 2008). Throughout the experiment, the physical health, safety, and confidentiality of the personal data of the participants were meticulously protected. The research protocol was approved by the Scientific Ethical Evaluation Board of the Faculty of Architecture and Design at Selçuk University on November 13, 2024, and full compliance with the principles of the Declaration of Helsinki was maintained throughout the process.

Eye-Tracking Metrics and Definition of Areas of Interest (AOI)

In this research, a multi-indexed collaborative study was conducted using fixation count (FC), average fixation duration (AFD), area of interest (AOI), and heatmaps to reveal the visual perception and behaviors of participants toward the landscape design of Konya Selçuklu Kanyon Park (Table 3.1). Fixation count refers to the amount of fixation a participant makes on a specific region and is informative in examining the participant's interest or the ease of understanding information (Tullis & Albert, 2013). Fixation duration reflects the level of interest and the depth of cognitive processing in a specific region; this metric is frequently used in evaluating subjective preference and satisfaction (Negi & Mitra, 2020). Average fixation duration is calculated by dividing the total fixation duration in a defined area by the fixation count (Xue & Zhu, 2024). An increase in the average fixation duration indicates greater targeted interest and engagement toward a region (Poole and Ball, 2006).

Before the participants were included in the eye-tracking experiment, the selected landscape images were first uploaded to the eye-tracking software. Subsequently, Areas of Interest (AOI) were created on these images transferred to the software. AOIs refer to specific regions in the stimulus space considered important and relevant for the experimental design of the study (Orquin et al., 2015). In the context of monitor-based eye tracking, these areas are generally defined by screen pixel boundaries. In the study, plants (trees, shrubs, flowers, and groundcover plants), urban furniture (equipment elements such as benches, trash cans, camellias, sports equipment, and children's playgroups), and pavements (walking paths and floor coverings) were determined as areas of interest. In this study, AOI boundaries were meticulously defined to follow the outer contour of each landscape component using the manual marking tools in the Tobii Pro Lab interface. To account for oculomotor bias, AOI boundaries were expanded one mm beyond the actual areas analyzed. The software then used a specific algorithm to assign gaze points to the relevant AOIs (Benjamins et al., 2018). Heatmaps, on the other hand, were created by overlapping and visualizing all fixation counts and durations obtained from the participants using the Tobii Pro Lab software.

The creation of areas of interest is a methodological necessity for obtaining eye-tracking metrics from the eye-tracking software. These marked areas of interest pertain to the pre-experimental process, and participants do not see these markings during the experiment.

Data Analysis Methods

The eye-tracking data were processed by filtering using the Tobii I-VT fixation filter, which aims to exclude fixations in raw data. In the context of Tobii Pro Lab software, this filter includes a comprehensive set of procedures to define fixations. The procedural steps within the scope of the Tobii visualization infrastructure and the Tobii fixation filter include gap filling, eye selection, velocity calculation, I-VT classification, merging adjacent fixations, and discarding short fixations (Olsen & Matos, 2012). After the data were prepared and processed according to the specified criteria, statistical analyses were performed to examine the relationships between eye movement patterns and other variables of interest. To ensure data quality, samples with an eye movement sampling rate higher than 90% were selected for the analysis process (Ouzts and Duchowski, 2012). This criterion assists in providing accurate information regarding the visual behavior patterns of the participants while increasing the reliability of the data used in the study. Within the scope of statistical analyses, first, the mean values (M) and standard deviation (SD) values of the eye-tracking data (average fixation duration and fixation count) of the participants across all images were obtained. Subsequently, to test the statistical significance of the differences between the areas of interest (plants, urban furniture, pavements), Repeated Measures ANOVA analysis was performed separately for both 'average fixation duration' and 'fixation count' metrics.

In the analyses, the assumption of sphericity of variance was checked with Mauchly's Sphericity test; in cases where this assumption was not met, the Greenhouse-Geisser correction was taken into account depending on the epsilon value. Bonferroni-corrected Post-Hoc pairwise comparison tests were performed to determine between which categories significant differences occurred. In all statistical evaluations, the significance threshold was accepted as $p < 0.05$.

Results

Creating Eye-Tracking Heat Maps

Within the scope of the research, a qualitative visual analysis was conducted based on the participants' fixation locations, counts, and durations on the landscape images. The total fixation data obtained from 28 participants were aggregated through Tobii Pro Lab software to produce 8 heatmaps (Figure 3).

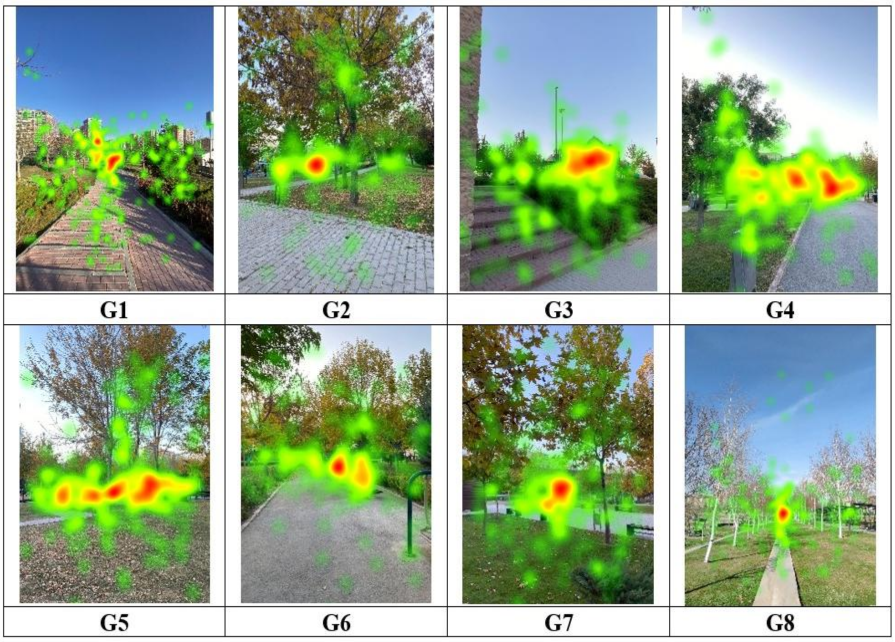

Figure 3. Heat maps (Output from Tobii Pro Lab)

The color scale used in the heatmaps expresses the intensity of visual attention. In this direction, red-colored areas represent the highest intensity fixations, while yellow and green-colored areas represent the lowest intensity fixations. This intensity distribution in the heatmaps visually reveals the perceptual hierarchy between plants, urban furniture, and pavements within the park.

Qualitative examinations conducted via heatmaps reveal that visual focal points vary depending on the stimulus content. Accordingly, it was determined that the participants' attention primarily concentrated on urban furniture in images coded G1, G2, G3, and G6. In contrast, it is observed that plants stand out as the dominant visual stimuli in images coded G4, G5, and G7. In the image coded G8, unlike the other images, visual interest was found to be on the pavements. This distribution shows that the position and visual salience of landscape components within the composition directly affect the scanning strategies of the users.

Descriptive Statistics of Eye-Tracking Metrics

In the first stage of the statistical analyses, the arithmetic mean (M) and standard deviation (SD) values for the metrics of fixation count and average fixation duration were calculated for each area of interest (AOI). These data provide a comprehensive preliminary assessment of visual behaviors across landscape components. The data obtained from the eye-tracking experiment conducted on the landscape components show that participants directed the highest fixation toward plants, followed by urban furniture and pavements (Table 1).

Table 1. Descriptive statistics

Landscape Components	Eye tracking Metrics	Mean (M)	Standard Deviation (SD)
Plants	Fixation Count	61,68	14,94
	Average Fixation Duration (s)	3,48	0,79
Urban Furniture	Fixation Count	20,79	7,16
	Average Fixation Duration (s)	3,20	1,18
Pavements	Fixation Count	16,25	6,36
	Average Fixation Duration (s)	1,42	0,66

Assumptions of Statistical Analysis

The equality of variance-covariance matrices, which is one of the fundamental assumptions for the validity of the repeated measures ANOVA analysis, was controlled with Mauchly's Test of Sphericity. This test determines whether the data meet the necessary mathematical prerequisites for ANOVA analysis by answering the question, "Are the differences between error variances equal?"

Table 2. Mauchly's test of sphericity results regarding eye-tracking metrics

Eye Tracking Metrics	Mauchly's W	Approx. Chi-Square ($\chi 2$)	Degrees of Freedom *(df)*	p-value
Fixation Count (FC)	0,912	2,415	2	0,284
Average Fixation Duration (AFD)	0,875	3,120	2	0,162

When Table 2 is examined, it is seen that the Mauchly's test of sphericity results for both fixation count ($W = 0.912$; $p = 0.284$) and average fixation duration ($W = 0.875$; $p = 0.162$) metrics are not statistically significant ($p > 0.05$). These findings show that the assumption of sphericity is met and the data are suitable for repeated measures ANOVA analysis. Since the assumption was verified, there was no need for a Greenhouse-Geisser or similar correction coefficient.

Evaluation of Visual Behaviors across Landscape Components

In the research, since the same group of participants examined all visual stimuli, Repeated Measures ANOVA analysis was performed instead of standard ANOVA to determine the differences between groups. The primary objective of this analysis is to identify whether the landscape components consisting of plants, urban furniture, and pavements show a statistically significant difference in terms of fixation count and average fixation duration.

Table 3. Repeated measures ANOVA results regarding eye-tracking metrics

Eye Tracking Metrics	Degrees of Freedom *(df)*	F-value	p-value	Effect Size (η^2_p)
Average Fixation Duration (AFD)	(2, 54)	48,12	< 0,001*	0,64
Fixation Count (FC)	(2, 54)	148,32	< 0,001*	0,84

*Significant level 99.9 % (p<0.001)

The repeated measures ANOVA results reveal that the examined landscape components (plants, urban furniture, and pavements) created a statistically highly significant effect on the participants' visual behaviors ($p < 0.001$) (Table 3). The analysis findings confirm that highly significant differences were detected in terms of both fixation count ($F(2, 54) = 148,32$; $p < 0,001$; $\eta^2_p = 0,84$) and average fixation duration ($F(2, 54) = 48,12$; $p < 0,001$; $\eta^2_p = 0,64$) metrics.

These data show that the type of landscape component has an explanatory power of 84% over the variability in participants' fixation counts and 64% over the variability in average fixation durations. The high effect size (η^2_p) values obtained prove that different landscape components play a non-random, systematic, and decisive role in the participants' visual behaviors. Consequently, the quality of the material used in landscape design has been identified as a fundamental variable that directly shapes the user's way of perceiving the space and visual focusing strategies.

Pairwise Comparisons of Landscape Components

A separate Repeated Measures ANOVA analysis was conducted for each eye-tracking metric (AFD and FC). Following the detection of statistical significance at the $p < 0.001$ level in the analysis results, Bonferroni-Corrected (Post-Hoc) pairwise comparison tests were applied to determine which landscape component established dominance as a visual stimulus and to identify specific variations between groups. The test results are presented in Table 4. The obtained findings revealed significant differences and some perceptual similarities between landscape components for both eye-tracking metrics.

Table 4. Post-Hoc (Bonferroni-Corrected) pairwise comparison test results

Eye tracking Metrics	(A) Group	(B) Group	Mean Difference (A-B)	Standard Error	p-value
Fixation Count (FC)	Plants	Urban Furniture	40,89*	2,45	< 0,001
	Plants	Pavements	45,43*	2,82	< 0,001
	Urban Furniture	Pavements	4,54	1,98	0,082
Average Fixation Duration (AFD)	Plants	Urban Furniture	0,28	0,14	0,154
	Plants	Pavements	2,06*	0,22	< 0,001
	Urban Furniture	Pavements	1,78*	0,19	< 0,001

*Significant level 99.9 % (p<0.001)

Pairwise comparisons for the fixation count metric indicate that plants achieved a statistically highly significant superiority compared to other landscape components ($p < 0.001$).

- Plants received an average of 40.89 more fixations than urban furniture and 45.43 more fixations than pavements. This situation confirms that plants are the primary visual stimuli in landscape design.
- The difference in fixation count between urban furniture and pavements ($p = 0.082$) remained above the significance threshold (0.05) and did not show a statistical difference. This finding reveals that participants fixated on these two components with similar frequency.

The pairwise comparison results for the average fixation duration metric are as follows:

- The difference in average fixation duration between plants and urban furniture was not found to be statistically significant ($p = 0.154$). This result indicates that although plants are noticed visually faster, once participants fixate, they examine urban furniture with a cognitive process as long as that of plants.
- Pavements were examined for a significantly shorter duration compared to both plants (2.06 s difference, $p < 0.001$) and urban furniture (1.78 s difference, $p < 0.001$). This situation reveals that the visual attention-grabbing potential and cognitive processing depth of pavements are at the lowest level.

Discussion

The eye-tracking data obtained in the study reveal that landscape components create a statistically highly significant hierarchy in user perception. The high effect size in the analysis results confirms that the primary variable governing visual attention is directly the quality of the landscape components.

The fact that participants reached the highest total fixation count and duration on plants strongly supports the "Biophilia" (Wilson, 1986) hypothesis in the literature. According to visual perception mechanisms, artificial elements such as urban furniture have the potential to attract instantaneous attention thanks to the form and texture contrast they create with their surroundings. This situation also explains the local concentrations in the heatmaps. Indeed, Amati et al. (2018) state that the human eye shows high sensitivity toward artificial elements even if they occupy a small part of the scene. However, in this study, the fact that plants received the highest values in terms of both count and duration indicates that natural elements create not just an instantaneous arousal, but a sustainable cognitive interest in the human mind.

Humanity's evolutionary predisposition toward natural elements ensures that these components are processed more deeply in cognitive processes and that attention is fixed at this point for a long duration (Ulrich, 1983). This situation scientifically proves that while artificial elements are stimuli perceived quickly, natural elements are spiritual and restorative components focused on for long periods. These highly significant differences confirm that the function of plants in recreation areas goes beyond being an aesthetic background and serves as a fundamental primary focal point guiding spatial perception. This finding is consistent with Kaplan’s (1989) "Attention Restoration Theory," revealing that plants are the primary stimuli initiating the mental restoration process.

Although urban furniture lags behind plants in terms of fixation count, it shows similar values to plants in terms of average fixation duration. This situation reveals that the functional details, ergonomic forms, and structural features of urban furniture trigger a more intense cognitive processing in the participants. In other words, it is confirmed that equipment elements are not seen by the user merely as objects, but that these components are spatially analyzed in depth. This result proves that equipment elements are perceived as 'action points' in recreation areas and that users examine these areas in detail not just to look at them, but to analyze their usage potential.

The fact that pavements received the lowest values in both metrics indicates that floor coverings play a passive role in the space. The low fixation values reveal that participants did not feel the need to keep their gaze on the pavements and perceived these surfaces as a visual plane creating a low cognitive load.

Limitations and Future Research

Although this study provides important insights into visual perception and behavior in recreation areas, it includes several limitations. First, the fact that the sample group largely consists of landscape architecture students and academics carries a risk of "expert bias." The visual scanning strategies and aesthetic preferences of individuals with design education may differ significantly from others. This situation, combined with the limited sample size, may restrict the external validity and generalizability of the findings to the general public. Therefore, for future research, it is recommended to increase the sample size and include a more heterogeneous participant population with diverse professional and educational backgrounds.

Second, this research was conducted solely using eye-tracking data. Future studies could adopt a "mixed-method" approach where these data are supported by research methods such as surveys or interviews. Examining the correlation between eye-tracking data and participants' subjective preference and satisfaction surveys would simultaneously reveal both the cognitive and psychological dimensions of the perception toward landscape components.

Third, this study was carried out using static stimuli at a specific point in time. However, landscape areas are in a state of continuous change over time. Future research could investigate the phenological cycles of plants (foliated/non-foliated periods) and different seasonal characters, as well as the effects of artificial lighting conditions, such as night lighting, on urban furniture and spatial hierarchy. Such variable-oriented approaches would provide comprehensive contributions to literature in terms of understanding the perceptual performance of landscape components under dynamic environmental conditions.

Finally, in addition to eye-tracking data, other biometric measurements such as Galvanic Skin Response (GSR) or EEG could be included in the study to more comprehensively examine the stress-reducing and restorative effects of landscape components on users.

Conclusion and Recommendations

This study, through the example of Konya Selçuklu Kanyon Park, has empirically revealed the visual perceptions and behaviors of users toward landscape design components in urban recreation areas via eye-tracking technology. The eye-tracking data obtained from volunteer participants have demonstrated that landscape design components are not only aesthetic elements but also create a measurable visual hierarchy. The data obtained are of strategic importance for making sense of the local landscape identity specific to Konya and for creating an evidence-based basis for future design decisions. The fundamental conclusions reached as a result of the research are presented below:

- Plants are not just complementary aesthetic elements in recreation areas; they are primary focal points that establish the visual hierarchy, dominate attention, and spatially guide the user experience.
- Urban furniture components are critical design elements that are subjected to an in-depth information processing process due to their functional details and ergonomic forms, beyond being elements merely noticed superficially by users.
- Pavements, occupying the lowest step of the visual hierarchy, serve a function that brings components on the vertical plane (plants and equipment) to the fore and provides continuity to the space.
- The statistically proven perceptual differences have methodologically confirmed that landscape design can now be evaluated based on measurable cognitive evidence obtained through biometric methods such as eye-tracking, rather than only intuitive approaches.

In light of the findings obtained within the scope of this research, the recommendations developed for future landscape design applications are presented below:

- In urban areas like Konya, where continental climate and structural elements are dominant, green space continuity and visual accessibility to these areas should be addressed as a fundamental design parameter for the psychological restoration and visual comfort of users. The biometric data obtained specifically for Konya Selçuklu Kanyon Park prove that the density of plant material is directly proportional to the level of visual fixation and increases spatial quality. In this context, strengthening the urban green infrastructure by disseminating recreation areas in the Kanyon Park typology throughout Konya is a strategic necessity for a sustainable urban life.
- The high fixation count of plants reveals that these elements should be positioned especially at park entrances and orientation points in accordance with the principle of emphasis. At these strategic points, choosing species that contrast with the environment in terms of form, color, or texture (for example, coniferous or species with striking flowering characteristics) will strengthen the visual hierarchy. The high number of fixations also shows that the eye performs a dynamic scanning movement within the space. To balance this visual mobility, a rhythm can be created through the repetition of similar plant groups at certain intervals. This rhythmic design will allow the user to carry their visual attention throughout the space without creating cognitive fatigue and to perceive different parts of the park within a holistic continuity.
- The high average fixation duration of plants confirms that users not only notice these vertical elements but also examine them in an in-depth and detailed manner. In line with this finding, a quantitative increase in green space should not be the only goal in landscape designs; qualified compositions based on the principle of plant diversity, offering different heights, textures, forms, and seasonal color transitions, should be designed. The use of species adapted to the local climate within this diversity should be handled not only as an ecological necessity but also as a strategic element of local landscape identity that extends the user's dwell time in the space and maximizes their perceptual satisfaction.

- The similarity of the average fixation duration of urban furniture with that of plants confirms that in the park usage culture in Konya, equipment is not just a functional fixture but also an aesthetic object analyzed in depth. Therefore, material quality, ergonomics, and richness of visual detail should be prioritized in the selection of equipment elements such as benches, lighting, and trash cans. Original urban furniture designs reflecting the local landscape identity, containing Seljuk motifs or a modern-local synthesis, will strengthen the cognitive bond and sense of belonging that users establish with the space.
- The characteristic topographical structure of Kanyon Park (canyon form) naturally increases the visual salience of landscape components located on the vertical plane. The fact that plants and urban furniture become the main focal points in heatmaps proves that components creating strong forms, shadow effects, and vertical silhouettes should be prioritized in the construction of local identity, rather than horizontal planes such as pavements.
- The perception of pavements as a "passive background" offers designers the opportunity to use these areas as a "base" that will highlight plant forms and equipment elements. A correct proportion-balance balance to be established between the vertical forms of plants and the horizontal plane of the pavement will increase the visual comfort of users. In this direction, the ground should be transformed into a visually more active component through material changes, color contrasts, or original pattern studies. Thus, in Konya's landscape identity, the ground will cease to be a transition area and become a qualified design element that increases the perceptual richness of the space.
- The dominance of plants in visual perception should be designed in a balance with hard ground and equipment elements. Considering that pavements have the lowest visual interest; wide and static pavement areas should be fragmented with plant textures, thus breaking visual monotony with a setup that goes from the part to the whole in the design. This approach will provide continuity in spatial perception by reducing the passive effect of the ground and will bring the user's visual discovery process within the park to a more dynamic structure.

Scientific Ethics Declaration

* The author declares that the scientific ethical and legal responsibility of this article published in EPSTEM journal belongs to the author.

* The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Scientific Ethics Evaluation Board of the Faculty of Architecture and Design, Selçuk University (Decision No: 05/01, approved on 13 November 2024).

Conflict of Interest

* The author declares that there is no conflict of interest

Funding

* This study was produced within the scope of project number 24401229, supported by the Selçuk University Scientific Research Projects (BAP) Coordination Unit.

Acknowledgements or Notes

* This article was presented as an oral presentation at the International Conference on Basic Sciences and Technology (www.icbast.net) held in Konya/Türkiye on April 02-05, 2026.

* I would like to thank the twenty-eight participants who volunteered for the eye-tracking experiments, the experts who assisted throughout the research process, and all my colleagues who contributed to the success of this study. I would also like to express my gratitude to the Scientific Research Projects (BAP) Coordination Unit for supporting this research.

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To cite this article:

Gemici, R. O. (2026). Evaluation of Konya Selçuklu Kanyon Park landscape design using eye tracking technique. *The Eurasia Proceedings of Science, Technology, Engineering and Mathematics (EPSTEM),* 40, 110-121.