

THE EFFECT OF INDOOR ORNAMENTAL PLANT GROUPS ON SPATIAL PERCEPTION: EXPERT EVALUATIONS ON AESTHETIC AND FUNCTIONAL USE

Kübra Yazici^{1*}

¹*Yozgat Bozok University, Faculty of Agriculture, Department of Landscape Architecture, Yozgat, Türkiye;*

*Corresponding Author Kübra Yazici, e-mail: k-yazici-karaman@hotmail.com;
kubra.yazici@yobu.edu.tr;

Received December 2024; Accepted January 2025; Published February 2025;

DOI: <https://doi.org/10.31407/ijeess15.123>

ABSTRACT

The rapid growth of cities and high population density have limited people's access to natural environments, leading to more time spent indoors. Because of this, biophilic design elements that incorporate natural elements into spaces have become even more important, highlighting the healing properties of plants on a physical and mental level. Indoor decorative plants foster a connection with nature, alleviate stress, enhance air quality, and augment comfort in living environments. Besides their aesthetic value, indoor decorative plants enhance air quality and provide oxygen. Psychologically, they enhance living environments by promoting comfort through their tranquil and stress-alleviating properties. Research indicates that the incorporation of natural elements in indoor environments enhances individuals' connection to nature and positively impacts their health. For this study, visualizations are made based on how indoor ornamental plants (like evergreens, flowering plants, bromeliads, and succulent cacti) are used, along with the opinions of experts. We assess the spatial perception of indoor decorative plants using aesthetic, psychological, health, and tactile characteristics. Furthermore, we comprehensively evaluate the area and the plant and assess contrasting viewpoints using the semantic differentiation scale. Consequently, they introduce dynamic and visual allure to the environment with their chromatic diversity, seasonal fluctuations, and blooming intervals. Consequently, it contributes vibrancy and visual allure to the environment with its chromatic variety, seasonal fluctuations, and blooming phases. Species with vividly colored blooms render the room amiable, welcoming, and dynamic. Conversely, Cactaceae plants provide a more static and stable source of energy. Their symmetrical structures and unique form characteristics enhance the perception of balance, simplicity, and tranquility. They achieve uniform results, particularly in the "Ordinary-Impressive" and "Tiring-Relaxing" categories. Figures 2 and 4 caused disagreement among experts, leading to a wide range of ratings for specific criteria.

Keywords: Spatial analysis, spatial perception, indoor plants.

INTRODUCTION

Humanity has derived physical and spiritual benefits from nature throughout its history. Contemporary workplace environments compel humans to labor for extended hours. People work in congested, noisy, and secluded settings,

devoid of natural light, and characterized by expansive, intricate layouts. Existence in such circumstances results in psychological issues, including concentration difficulties, diminished job productivity, and insufficient privacy, while elements such as poor air quality, unsuitable air conditioning, and inadequate lighting induce physical discomfort. This study aims to perform a spatial analysis of plant diversity in indoor environments and to explore potential design strategies. This study examined the application of biophilic design in residential buildings to fulfill the requirements of contemporary interior spaces. We used document analysis and descriptive analysis to examine the shape and function of natural objects. Han and Ruan (2019) performed a review of research encompassing 50 articles featuring quantitative data on indoor ornamental plants, which they also assessed for quality.

The study examined and analyzed individuals' perspectives (emotion, cognition, health, restoration, thermal comfort, productivity, and contentment) about indoor decorative plants. The analyzed research found that the most significant effects of indoor plants on individuals are the enhancement of pleasant emotions, the reduction of negative emotions, and the alleviation of physical discomfort. Jumeno and Matsumoto (2013) asserted that research has proliferated over the past three decades regarding the advantages of plants in the workplace. Numerous studies indicate that indoor ornamental plants alleviate work-related stress, enhance job satisfaction, boost productivity, and diminish health concerns among employees. Other research has indicated that attractive plants positively influence individuals by enhancing satisfaction, improving focus, reducing errors, and augmenting attention ability. Montacchini et al. (2017) asserted that indoor decorative plants significantly contribute to the health, comfort, and psychological well-being of users, as well as the overall quality of the environment. In their study, they assessed the beneficial and detrimental impacts of implementing an interior green wall at a university based on environmental feasibility. Sezen et al. (2017) conducted a questionnaire study to assess the impact of indoor plants on individuals and their environment in Erzurum, administering it to 150 participants individually. The survey concluded that indoor plants positively influence human psychology, enhance environmental vitality, alter the atmosphere, and mitigate boredom. Yazıcı (2020) executed a survey in Tokat province to assess the significance of indoor ornamental plants and consumer preferences. The study was conducted by a florist who administered questionnaires directly to his customers, concluding that the most favored plants were succulents, cacti, orchids, and violets. Numerous studies suggest that indoor ornamental plants offer psychological, aesthetic, and physical benefits (Ulrich, 1981; Ulrich, 1991; Ulrich and Parsons, 1992; Ulrich and Simons, 1986; Kaplan, 1973; Kaplan and Kaplan, 1989). In their 2007 study, Bringslimark et al. showed that indoor plants can reduce stress, improve task performance, and help sick people get better. They did this through laboratory experiments and semi-experimental field studies, saying that indoor ornamental plants are a useful resource in health situations. In a survey of 385 manufacturing and workplace employees in Norway, hierarchical regression analysis was used to look at the link between indoor ornamental plants and stress, absences, and productivity at work. It is suggested that using these plants indoors, where they are thought to help with mental health, is a cheap, easy, and safe solution. Raanaas et al. (2011) conducted a controlled laboratory experiment to investigate the appeal and advantages of indoor plants.

The participants comprised 34 students randomly assigned to one of two conditions: an office environment featuring four indoor ornamental plants and the same office environment devoid of plants. These kinds of studies show that indoor plants are pleasing to look at and useful in homes and businesses, which encourages people to use indoor decorative plants. Rapid and dense urbanization has led individuals to spend increased time indoors, diminishing their connection to the natural environment. Because of this, biophilic design elements have become more important, and the effects of indoor decorative plants on the mind, body, and appearance have to be studied. Indoor decorative plants offer numerous benefits, including stress reduction, enhancement of air quality, and increased comfort in living environments. The point of this study is to look at how indoor ornamental plants, broken down into usage groups like evergreen, blooming, bromeliad, succulent, and cactus, affect how people think about space. The study will also use expert opinions to help it do this. In this study, we created indoor visuals based on specific plant groups and evaluated them based on aesthetic, psychological, health, and tactile factors. Furthermore, we evaluated divergent viewpoints using the semantic differentiation scale to comprehensively examine the interaction between space and plants. The study intends to demonstrate that indoor ornamental plants serve not merely as decorative elements but also exert considerable influence on human health and spatial perception. Therefore, encouraging the use of indoor plants in line with biophilic design principles would lead to the creation of healthier and more aesthetically pleasing spaces.

MATERIAL AND METHOD

This study involved the computerized evaluation of photographs featuring indoor decorative plants, generated by artificial intelligence-assisted designs, by 12 expert landscape architects. The six different room designs used different types of plants, such as flowering plants, leafy and flowering plants, thick-leafed cacti, green-leafed plants, and combinations of cacti, to see how plants affect how people feel about space inside. The evaluation process considered aesthetic, psychological, health, and tactile aspects, analyzing the effects of plants on human perception. The experts also used a semantic differentiation scale to look at the different points of view in order to get a full picture of how space and plants work together. This scale made it easier to compare different ways of perceiving things, like "Ordinary-Impressive," "Cold-Warm," and "Negative-Positive." It also let researchers look closely at how plants affected the atmosphere of a space. The study offers a thorough examination of how botanical design components in indoor environments shape spatial perception and affect human preferences. The results will significantly enhance future landscape design research and indoor planting methodologies.

Table 1. Content information of the designed images.

Figure 1	Two groups of flowering and evergreen plants were placed in the same perspective, same color tone furniture and same size space.
Figure 2	Two groups of cactus and evergreen plants were placed in the same perspective, same color tone furniture and same size space.
Figure 3	Same perspective, same color tone furniture and cactus plants were placed in the same size space.
Figure 4	Flowering plants are placed in the same perspective, same color tone furniture and same size space.
Figure 5	Bromeland's plants were placed in the same perspective, same color tone furniture and same size space.
Figure 6	The same perspective, the same color tone furniture and the same size evergreen plants were placed in the space.

RESULTS AND DISCUSSION

Twelve experts assessed six distinct figures using semantic differentiation criteria. The findings show that aesthetic, psychological, and tactile factors influence spatial perception. Figures 1 and 6 exhibit a balanced distribution of scores. Their scores were consistently high, particularly in the "Ordinary-Impressive" and "Tiring-Relaxing" categories. Experts' disagreements were evident in Figures 2 and 4, which showed a wide range of scores across specific criteria. Experts expressed varying opinions regarding the criteria of "Repulsive-Attractive" and "Disturbing-Peaceful." Figures 3 and 5 exhibit more extreme evaluations and have received negative assessments in certain criteria. It received notably low scores in the dimensions of "Suffocating-Spacious" and "Cold-Warm." The hierarchical clustering analysis reveals that expert evaluations show a close relationship between specific criteria.

Aesthetic criteria, including natural appearance, elegant appearance, and impressive qualities, are categorized collectively. This suggests that professionals interact with the visual components of the environment in a similar way. There is a significant relationship among the psychological criteria, which include perceptions of spaciousness, warmth, safety, and comfort. This indicates a strong correlation between psychological comfort perception and spatial and aesthetic perception. Health-related criteria, including air quality, mental calmness, and Fresh Impact, exhibited partial overlap with psychological criteria; however, they constituted a more distinct category. We group the criteria for tactile perception (smooth and thin, fleshy, leafy, prickly, and rough) separately from the other criteria.

This demonstrates the distinct evaluation methods for material and surface perception. This analysis suggests that several key factors influence spatial perception: Design Form: Figures with sharper and more regular lines scored lower on the "Restrictive-Free" criterion, while shapes with more organic shapes made people feel freer. Color and Contrast: People perceived designs with bright and high contrast as more "impressive," while they regarded pale and low-contrast figures as "ordinary." Material perception indicates that textural surfaces are characterized as prickly. People perceive rough or rough surfaces as "disturbing," while they view soft and smooth surfaces as "peaceful."

Table 2. Semantic Differentiation Table by considering Place and Plant Holistically.

Figure 1							
Criteria	Very much	Middle	Less	Equivalent	Very much	Middle	Less
Ordinary - Impressive	1	2	1	3	1	3	1
Pusher - Tow Truck	0	0	2	4	2	3	1
Unsettling - Soothing	3	0	2	1	3	1	2
Strenuous- Relaxing	4	0	0	4	0	3	1
Restrictive-Free	3	3	0	0	1	4	1
Cold - Hot	4	1	3	0	2	0	2
Sultry - Spacious	2	0	2	1	4	3	0
Extravagant - Simple	0	1	0	1	2	1	7
Negative - Positive	3	4	4	0	0	0	1
Bad Energy Good Energy	2	2	3	2	3	0	0
Figure 2							
Criteria	Very much	Middle	Less	Equivalent	Very much	Middle	Less
Ordinary - Impressive	1	2	1	3	1	3	1
Pusher - Tow Truck	0	0	2	4	2	3	1
Unsettling - Soothing	0	0	3	2	3	0	4
Strenuous- Relaxing	0	3	1	1	0	4	3
Restrictive-Free	3	3	3	3	0	0	0
Cold - Hot	1	1	0	4	3	1	2
Sultry - Spacious	2	0	0	4	4	2	0
Extravagant - Simple	3	1	1	1	4	2	0
Negative - Positive	0	0	2	1	3	1	5
Bad Energy Good Energy	2	1	4	2	3	0	0
Figure 3							
Criteria	Very much	Middle	Less	Equivalent	Very much	Middle	Less
Ordinary - Impressive	1	2	1	3	1	3	1
Pusher - Tow Truck	0	0	2	4	2	3	1
Unsettling - Soothing	4	0	3	2	0	3	0
Strenuous- Relaxing	1	3	1	0	2	4	1
Restrictive-Free	4	3	4	1	0	0	0
Cold - Hot	1	2	1	0	2	4	2
Sultry - Spacious	3	0	2	4	2	0	1
Extravagant - Simple	4	1	4	2	1	0	0
Negative - Positive	1	3	0	3	3	1	1
Bad Energy Good Energy	3	1	1	1	1	3	2
Figure 4							
Criteria	Very much	Middle	Less	Equivalent	Very much	Middle	Less
Ordinary - Impressive	1	2	1	3	1	3	1
Pusher - Tow Truck	0	0	2	4	2	3	1
Unsettling - Soothing	2	3	2	3	2	0	0
Strenuous- Relaxing	3	0	1	1	3	4	0
Restrictive-Free	4	1	4	2	1	0	0
Cold - Hot	3	3	2	0	3	1	0
Sultry - Spacious	1	1	0	4	3	2	1
Extravagant - Simple	2	1	0	1	3	2	3
Negative - Positive	0	2	4	4	0	0	2
Bad Energy Good Energy	0	3	1	3	0	1	4
Figure 5							
Criteria	Very much	Middle	Less	Equivalent	Very much	Middle	Less
Ordinary - Impressive	1	2	1	3	1	3	1
Pusher - Tow Truck	0	0	2	4	2	3	1
Unsettling - Soothing	2	1	2	0	0	4	3
Strenuous- Relaxing	4	2	1	0	1	2	2
Restrictive-Free	3	3	1	3	0	0	2
Cold - Hot	0	1	3	0	1	1	6
Sultry - Spacious	0	0	0	1	2	0	9
Extravagant - Simple	1	4	3	3	0	1	0
Negative - Positive	4	4	4	0	0	0	0
Bad Energy Good Energy	4	4	1	1	2	0	0

Criteria	Very much	Middle	Less	Equivalent	Very much	Middle	Less
Ordinary - Impressive	1	2	1	3	1	3	1
Pusher - Tow Truck	0	0	2	4	2	3	1
Unsettling - Soothing	4	1	1	2	3	1	0
Strenuous- Relaxing	3	0	2	0	3	1	3
Restrictive-Free	3	2	2	1	2	2	0
Cold - Hot	2	2	1	2	3	1	1
Sultry - Spacious	1	1	3	4	3	0	0
Extravagant - Simple	3	1	0	0	0	2	6
Negative - Positive	4	4	4	0	0	0	0
Bad Energy Good Energy	2	3	2	1	4	0	0



Figure 1. Distribution of expert evaluations across criteria.

Figure 1 illustrates the distribution of landscape architects' evaluations based on the established criteria. Each row corresponds to a criterion, with the ratings from the 12 experts distributed such that the total number of ratings equals 12. The horizontal axis represents the quantity of points assigned for each criterion. The vertical axis presents ten distinct criteria. Colors signify the levels of scoring. High (Green): The top rating is Medium (Blue and Orange, shades): Moderate evaluations. Reduced (red and pink hues): Evaluations at Diminished Tiers; equivalent (light blue): Denotes impartial evaluations.

Table 3. Spatial perception of indoor ornamental plants.

Criteria	Very Important	Important	Neutral	Unimportant	Very Unimportant
Aesthetic - Natural Appearance	4	4	3	0	1
Aesthetic - Elegant and Showy	1	0	2	0	9
Aesthetic - Impressive	4	3	2	0	3
Aesthetic - Unique	1	3	4	0	4
Psychological - Feeling of Spaciousness	2	0	3	0	7
Psychological - Warmth	1	1	4	0	6
Psychological - Sense of Security	1	3	1	0	7
Psychological - Comfort	3	1	2	0	6
Health - Physical Refreshment due to Air Quality	3	4	4	0	1
Health - Mental Relaxation	4	4	2	0	2
Health - Spacious Effect	1	0	1	0	10
Health - Reduction of Blood Pressure and Stress due to Indoor Air Quality	2	0	4	0	6
Tactile - Smooth and Thin	2	2	2	0	6
Tactile - Smooth and Thick	1	0	1	0	10
Tactile - Thorny and Rough	1	2	3	0	6

Tactile - Succulent Leaves	0	4	0	0	8
Tactile - Rough and Thin	3	2	2	0	5
Figure 2					
Criteria	Very Important	Important	Neutral	Unimportant	Very Unimportant
Aesthetic - Natural Appearance	3	1	4	0	4
Aesthetic - Natural Appearance	3	1	4	0	4
Aesthetic - Elegant and Showy	2	3	3	0	4
Aesthetic - Impressive	3	2	0	0	7
Aesthetic - Unique	4	2	1	0	5
Psychological - Feeling of Spaciousness	4	4	2	0	2
Psychological - Warmth	4	4	1	0	3
Psychological - Sense of Security	1	1	2	0	8
Psychological - Comfort	3	1	1	0	7
Health - Physical Refreshment due to Air Quality	3	1	2	0	6
Health - Mental Relaxation	1	2	4	0	5
Health - Spacious Effect	1	1	2	0	8
Health - Reduction of Blood Pressure and Stress due to Indoor Air Quality	2	1	0	0	9
Tactile - Smooth and Thin	3	1	0	0	8
Tactile - Smooth and Thick	3	0	1	0	8
Tactile - Thorny and Rough	1	0	2	0	9
Tactile - Succulent Leaves	3	3	3	0	3
Tactile - Rough and Thin	0	0	3	0	9
Figure 3					
Criteria	Very Important	Important	Neutral	Unimportant	Very Unimportant
Aesthetic - Natural Appearance	4	0	4	0	4
Aesthetic - Elegant and Showy	3	3	4	0	2
Aesthetic - Impressive	1	0	0	0	11
Aesthetic - Unique	0	2	4	0	6
Psychological - Feeling of Spaciousness	4	1	1	0	6
Psychological - Warmth	0	3	1	0	8
Psychological - Sense of Security	3	1	3	0	5
Psychological - Comfort	4	0	4	0	4
Health - Physical Refreshment due to Air Quality	4	3	0	0	5
Health - Mental Relaxation	1	4	0	0	7
Health - Spacious Effect	4	3	0	0	5
Health - Reduction of Blood Pressure and Stress due to Indoor Air Quality	3	0	4	0	5
Tactile - Smooth and Thin	2	0	1	0	9
Tactile - Smooth and Thick	3	1	2	0	6
Tactile - Thorny and Rough	2	1	2	0	7
Tactile - Succulent Leaves	2	4	0	0	6
Tactile - Rough and Thin	4	3	3	0	2
Figure 4					
Criteria	Very Important	Important	Neutral	Unimportant	Very Unimportant
Aesthetic - Natural Appearance	0	3	3	0	6
Aesthetic - Elegant and Showy	0	0	4	0	8
Aesthetic - Impressive	3	0	2	0	7
Aesthetic - Unique	1	3	3	0	5
Psychological - Feeling of Spaciousness	0	3	4	0	5
Psychological - Warmth	3	1	1	0	7
Psychological - Sense of Security	3	2	4	0	3
Psychological - Comfort	1	2	0	0	9
Health - Physical Refreshment due to Air Quality	1	3	0	0	8
Health - Mental Relaxation	1	4	1	0	6
Health - Spacious Effect	1	3	0	0	8

Health - Reduction of Blood Pressure and Stress due to Indoor Air Quality	2	1	3	0	6
Tactile - Smooth and Thin	3	2	3	0	4
Tactile - Smooth and Thick	0	1	2	0	9
Tactile - Thorny and Rough	2	2	2	0	6
Tactile - Succulent Leaves	2	3	2	0	5
Tactile - Rough and Thin	1	0	3	0	8
Figure 5					
Criteria	Very Important	Important	Neutral	Unimportant	Very Unimportant
Aesthetic - Natural Appearance	0	2	4	0	6
Aesthetic - Elegant and Showy	2	3	4	0	3
Aesthetic - Impressive	3	3	2	0	4
Aesthetic - Unique	0	1	4	0	7
Psychological - Feeling of Spaciousness	3	1	2	0	6
Psychological - Warmth	0	4	4	0	4
Psychological - Sense of Security	0	2	2	0	8
Psychological - Comfort	0	0	0	0	12
Health - Physical Refreshment due to Air Quality	1	0	3	0	8
Health - Mental Relaxation	4	3	0	0	5
Health - Spacious Effect	3	3	4	0	2
Health - Reduction of Blood Pressure and Stress due to Indoor Air Quality	3	0	2	0	7
Tactile - Smooth and Thin	2	0	0	0	10
Tactile - Smooth and Thick	3	0	2	0	7
Tactile - Thorny and Rough	4	1	4	0	3
Tactile - Succulent Leaves	2	4	1	0	5
Tactile - Rough and Thin	1	3	1	0	7
Figure 6					
Criteria	Very Important	Important	Neutral	Unimportant	Very Unimportant
Aesthetic - Natural Appearance	2	1	1	0	8
Aesthetic - Elegant and Showy	0	1	2	0	9
Aesthetic - Impressive	2	4	0	0	6
Aesthetic - Unique	3	0	4	0	5
Psychological - Feeling of Spaciousness	1	3	3	0	5
Psychological - Warmth	1	4	3	0	4
Psychological - Sense of Security	2	2	2	0	6
Psychological - Comfort	0	3	4	0	5
Health - Physical Refreshment due to Air Quality	2	3	4	0	3
Health - Mental Relaxation	3	1	4	0	4
Health - Spacious Effect	1	3	0	0	8
Health - Reduction of Blood Pressure and Stress due to Indoor Air Quality	4	2	1	0	5
Tactile - Smooth and Thin	4	2	4	0	2
Tactile - Smooth and Thick	0	1	1	0	10
Tactile - Thorny and Rough	3	2	3	0	4
Tactile - Succulent Leaves	1	1	0	0	10
Tactile - Rough and Thin	4	2	3	0	3

Figure 3 illustrates the distribution of evaluations provided by experts based on the established criteria. Each row represents a criterion, to which the 12 experts have assigned scores, resulting in a total of 12. The horizontal axis represents the quantity of scores assigned to each criterion.

The vertical axis presents ten distinct criteria. Colors signify the levels of scoring. High (Green): The highest rating. Medium (Blue and Orange shades): Moderate assessments. Less red and pink shades: assessments at lower levels. Equivalent (Light Blue): Denotes impartial evaluations.

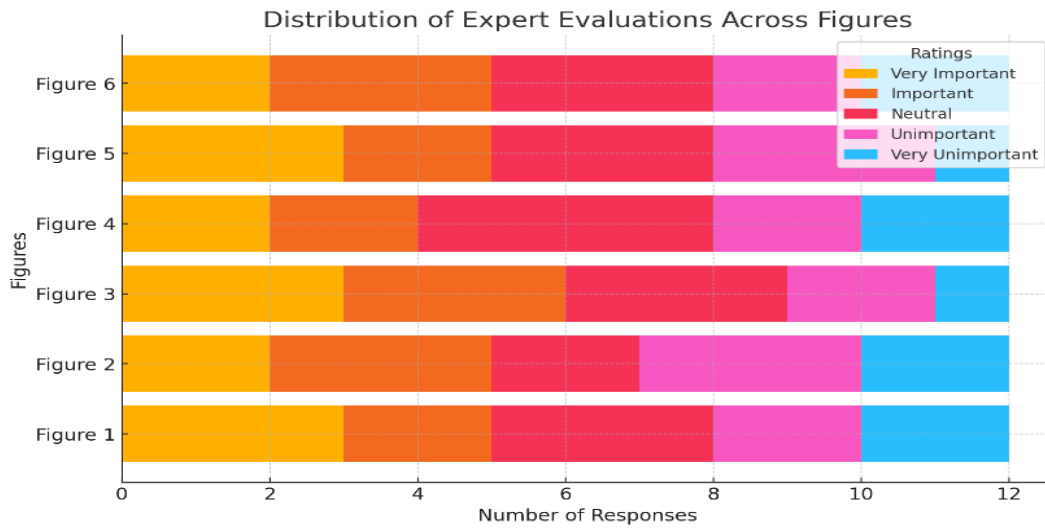


Figure 2. Distribution of expert evaluations across criteria.

Vertical lines represent clusters of analogous criteria. The closer the connection between two criteria, the more similar their evaluations become. As the height of the connection increases, the disparity between the groups expands. People perceived criteria associated with very high levels as distinct from one another. The aesthetic criteria, such as natural appearance, classiness, and stylishness, appear to be more closely clustered. This suggests that experts assess these categories in a comparable manner. Experts collectively categorize psychological criteria like perception of spaciousness, feeling of warmth, and safety, but they also exhibit some relationships with health criteria. This suggests a correlation between perceptual comfort and health outcomes. Health and tactile criteria often show up in separate groups, which suggests that experts evaluate these areas separately.

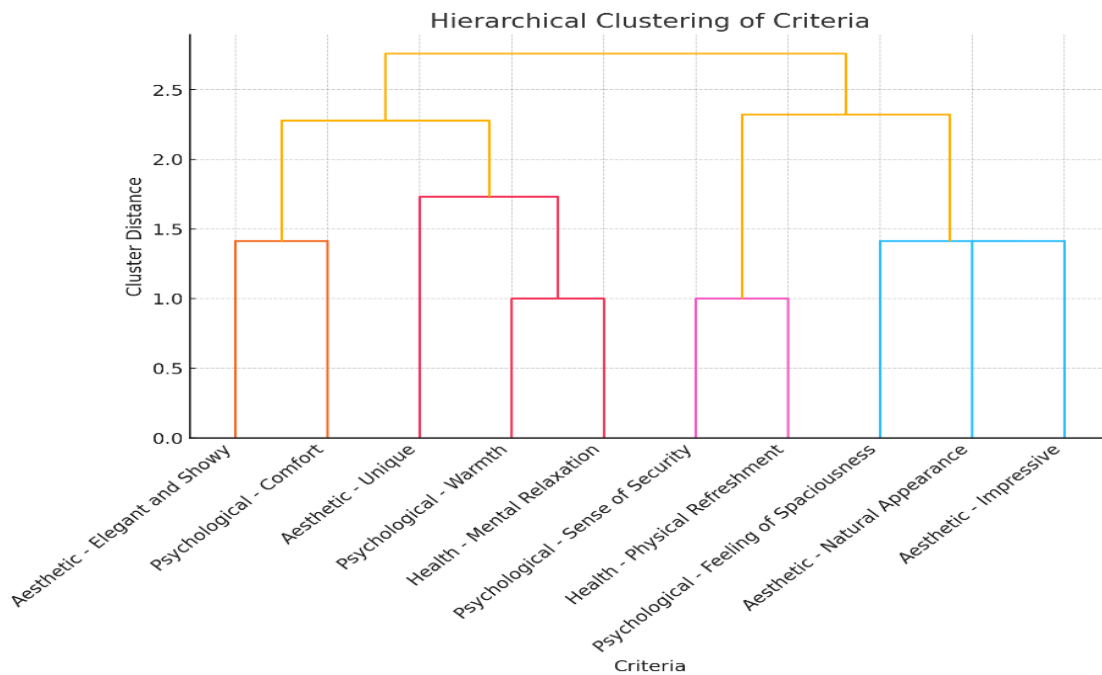


Figure 3. Hierarchical Clustering of criteria.

CONCLUSIONS

- Expert evaluations reveal distinct dimensions of understanding space and plant integrity. Designs that attain higher scores demonstrate a balanced distribution of aesthetic, psychological, and health criteria. This research offers significant insights for designers and interior planners (Aşur et al. 2021; Öztürk Birim & Ankaya; 2020; Yazici & Ünsal, 2019; Gülgün et al., 2008). Holistic consideration of aesthetic, psychological, and tactile factors can positively influence spatial perception. Plants significantly contribute to both aesthetic and functional aspects of interior and exterior design. The leaf form, color, texture, and growth form of plants significantly influence the visual perception of a space. Plants characterized by broad leaves and vibrant colors contribute to a dynamic and lively atmosphere, whereas those with thin, elongated leaves promote a sense of simplicity and elegance. Additionally, the flowering cycles of plants, seasonal color variations, and their interactions with light contribute to the aesthetic value of a space, thereby enhancing perceived visual depth. Plants provide environmental benefits by enhancing air quality, regulating temperature, and offering acoustic control. Leaf surfaces enhance oxygen concentrations by removing airborne toxins, whereas extensive green spaces function as temperature regulators, mitigating the urban heat island effect. Dense foliage enhances acoustic comfort by absorbing noise. This, in turn, contributes to a healthier indoor environment, especially in functional spaces like offices, hospitals, and educational areas. The positive and negative effects of plants are linked, so choosing the right plants can help with both aesthetics and environmental sustainability. Incorporating plant characteristics into design processes enhances user experience, leading to the creation of more balanced and healthy environments that improve spatial quality. Plants significantly influence spatial perception in both aesthetic and functional dimensions. Flowering plants and cactus species have different effects on how we see and understand space because of the way they look and how they are built (Yazici & Temizel, 2020; Yazici & Aşur, 2021; Yazici & Gülgün, 2019; Gülgün et al., 2014; Ankaya et al., 2017). Flowering plants enhance spaces through their diverse colors, seasonal variations, and distinct flowering periods. Species with brightly colored flowers enhance the environment, contributing to a friendly, inviting, and energetic atmosphere. Their flowering cycle contributes to a perception of seasonal variation within the space.
- Cactaceae Family: Their design is predominantly minimalist and modern, providing aesthetic value through their sculptural shape and texture. Thornless species convey an elegant and balanced aesthetic through their soft forms, whereas thorny species produce a pronounced and distinctive visual effect. The richness of green tones and the varied textures of the stem structure provide an aesthetic enhancement, particularly in minimalist and simple spatial designs. Flowering plants evoke emotional responses through their colors. Red and orange tones are associated with energy and vitality. Blue and purple tones are associated with peace and serenity. The transient quality of flowers imparts a romantic and nostalgic significance to the environment, serving as a reminder of nature's cyclical patterns. Cactus plants provide a more stable and static form of energy. Their symmetrical structure and distinctive form features enhance the perception of balance, simplicity, and calmness. Additionally, these plants symbolize endurance and can psychologically reinforce strength and determination. Flowering plants possess a significant ability to enhance environmental air quality. Large leaf surfaces facilitate ecological functions, including air humidification and toxin filtration. Pollen production may present a risk of allergic reactions in certain individuals. Cactus plants exhibit adaptations to arid and hot environments through their ability to retain water, which renders them low-maintenance species. Recognizing that thorny species may pose a physical hazard in certain environments is crucial. While they are less effective at sound absorption compared to plants with dense foliage, they can maintain an optimal moisture balance in confined areas. Flowering plants and cacti serve distinct aesthetic and functional purposes. Flowering plants contribute to vibrant and dynamic environments through their diverse colors and visuals, whereas cactus plants offer a minimalist, contemporary, and robust aesthetic appeal. However, depending on the purpose, both plant species can be used together to improve spatial perception and make the environment more useful and pleasant for people.

Description. The author received the Ethics Committee's permission for the study from the Social and Human Sciences Ethics Committee of Yozgat Bozok University.

REFERENCES

1. Aşur F, Sevimli Deniz S, Yazıcı K, (2020). Visual Preferences Assessment of Landscape Character Types Using Data Mining Methods Apriori Algorithm the Case of Altınsaç and Inkoy Van Turkey. *J. Agr. Sci. Tech.*, 22(1), 247–260;
2. Ankaya F, Gülgün B, Türkyılmaz B, (2017). An Investigation of Determination Of environmental Awareness Level A Casestudy İn The City of Izmir. *Ege Ziraat Fakültesi Dergisi*, 54(4), 419–427;
3. Han KT, Ruan LW, (2019). Effects of indoor plants on self-reported perceptions: a systemic review *Sustainability*, 11 (16), 4506;
4. Gülgün B, Güney MA, Aktaş E, Yazıcı K, (2014). Role of Landscape Architect in Interdisciplinary Planing of Sustainable Cities. *Journal of Environmental Protection and Ecology*, 15(4), 1877–1880;
5. Gülgün B, Önder S, Aktaş E, Ankaya F, (2008). Responses Of University Students Related to Environmental Problems A Case Study of Ege University Izmir Turkey. *J. Int. Environmental Application & Science*, 3(4), 234–246;
6. Jumeno D, Matsumoto H, (2013). The effects of the number of indoor foliage plants on productivity. stress and attention. *Proceedings of CLIMA. Prague. Czech Republic* 8(1).1–9. Montacchinia E, Tedesco S, Rondinonea T, (2017). Indoor Environment Quality (User Comfort. Health and Behaviour). *Energy Procedia* 122 (2017) 289–294;
7. Kaplan R, (1973). Some psychological benefits of gardening. *Environ. Behavior*, 5(2): 145-162. Kaplan, R. ve Kaplan, S., 1989. *The experience of nature: A psychological perspective*. Cambridge University Press. New York;
8. Raanaas R, Evensen K, Rich D, Sjoström G, Patil G, (2011). Benefits of indoor plants on attention capacity in an office setting. *Journal of Environmental Psychology*, 31, 99-105;
9. Park SH, Mattson RH, (2008). Effects of flowering and foliage plants in hospital rooms on patients recovering from abdominal surgery *HortTechnology*. 18 (2008). pp. 563-568;
10. Öztürk Birim Ş, Ankaya F, (2020). Analysis And Evaluation of The Sustainable Protection and Controlled Usage Environments with The Support of Gis Using T-Test Case Study of Cesme Izmir Turkey. *International Journal of Ecosystems and Ecology Science (IJEES)*, 10(3), 551–561;
11. Sezen I, Aytatlı B, Ağrılı R, Patan E, (2017). İç mekân tasarımında bitki kullanımının birey ve mekân üzerine etkileri. *ATA Planlama ve Tasarım Dergisi*, 1(1), 25-34;
12. Urrestarazu LP, Kaltsidi MP, Nektarios PA, Markakis G, Loges V, Perini K, Cañero RF, (2021). Particularities of having plants at home during the confinement due to the COVID-19 pandemic. *Urban Forestry & Urban Greening*, 59, 126919;
13. Ulrich RS, (1981). Natural versus scenes: Some psychophysiological effects. *Environ. Behavior*. 13: 523-556;
14. Ulrich RS, (1991). Psychophysiological indicators of leisure. pp. 73-89. In: B.L. Driver. P.J. Brown, and G. L. Peterson (eds.). *Benefits of leisure*. Venture Publishing Inc. State College. Pa.;
15. Ulrich RS, Parsons R, (1992). Influences of passive experiences with plants on individual well-being and health. pp. 93-105. In: D. Relf (ed.). *The role of horticulture in human well-being and social development*. Timber Press. Portland. Ore;
16. Ulrich RS, Simons RF, (1986). Recovery from stress during exposure to everyday outdoor environments. *17th Annu. Conf. Environ. Design. Res.*, 115-122;
17. Yazıcı K, Aşur F, (2021). Assessment of Landscape Types and Aesthetic Qualities by Visual Preferences Tokat Turkey. *The Journal of Environmental Protection and Ecology*, 22(1), 340–349;
18. Yazıcı K, Temizel S, (2020). Kentsel Peyzaj Tasarımlarında Aydınlatma Donatı Elemanlarının Kullanımı *Yozgat Spor Vadisi Örneği*. *ISPEC Journal of Agricultural Sciences*, 4(4), 952–971;
19. Yazıcı K, Gülgün B, (2019). The Visual Quality Effect of Historical Building Gardens on Urban Texture in The Sustainable Landscape. *Fresenius Environmental Bulletin*, 5(2), 3756–3767;
20. Yazıcı K, Ünsal T, (2019). Kentsel Yaşam Kalitesi Açısından Süs Bitkilerinin Önemi Tokat Merkez- Yeşilirmak Örneği. *Ziraat Mühendisliği Dergisi*, (367), 66–76;