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The Impact of Color and Texture on Wayfinding in Healthcare Building Circulation Areas

Sağlık Yapılarının Sirkülasyon Alanlarında Renk ve Doku Kullanımının Yön Bulmaya Etkisi

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ABSTRACT

People's ability to perceive space is a consequence of their perception bonding with their surroundings, which allows them to communicate with space. Individuals see the physical components of the environment first, and then their behavior is shaped by their perceptions. People use the physical components of spaces as a point of reference when they are wayfinding in the circulation areas that link the spaces. In this context, users become stressed and lose time when navigating the circulation areas of large, complex buildings, which discourages them from using the space. The purpose of this study is to identify the colors and textures that influence how well people navigate around the circulation areas of healthcare facilities. The digital environment was used to model the Konya City Hospital's circulation area, which was identified as the sample area. A route was made, and the animation and three-dimensional visuals were produced based on the variables. Memorability and orientation decision levels were assessed in the context of wayfinding using the survey technique. As a result of the survey conducted on a total of 399 people, it was analyzed that people remembered the orange color and wood-textured surface coverings and requested orientation.

Keywords: Spatial perception, Color and texture, Health structures, Circulation, Wayfinding.

ÖZ

Kişilerdeki mekânsal algı, algının insan ile çevresi arasında bir bağ kurarak mekânla iletişime geçmesi sonucu oluşmaktadır. Kişiler, mekân içerisinde bulunan fiziksel ögeleri öncelikle algılar, sonrasında algıladığı nitelikte davranışlarını şekillendirir. Mekânları birbirine bağlayan sirkülasyon alanlarındaki yön bulma sürecinde de kişiler, mekân içerisinde bulunan fiziksel ögelerden referans alarak yön bulma davranışlarını sergiler. Bu bağlamda, karmaşık fonksiyonlu ve büyük ölçekli yapıların sirkülasyon alanlarındaki ulaşım güçlüğü, kullanıcılarda stres ve zaman kaybı oluşturarak kişileri mekâna karşı isteksizleştirir. Bu çalışmada, sağlık yapılarının sirkülasyon alanlarında, kişilerin yön bulma performansına etki eden renk ve dokuların ortaya konması amaçlanmıştır. Materyal olarak belirlenen Konya Şehir Hastanesi'nin sirkülasyon alanı dijital ortamda aslına uygun olarak modellenerek bir rota oluşturulmuş, ele alınan değişkenlere göre animasyonu ve üç boyutlu görselleri oluşturulmuştur. Anket tekniği kullanılarak yön bulma kapsamında hatırlanabilirlik ve yönelme kararı düzeyi ölçümlenmiş ve analizleri yapılmıştır. Toplam 399 kişiye yapılan anket sonucu kişilerin turuncu rengi ve ahşap dokulu yüzey kaplamalarını hatırladığı ve yönelim isteğinde bulunduğu analiz edilmiştir.

Anahtar Kelimeler: Mekânsal algı, Renk ve doku, Sağlık yapıları, Sirkülasyon, Yön bulma.

Introduction

Individuals' wayfinding behavior is directly impacted by circulation areas that connect spaces. Wayfinding is the impact of one's physical surroundings on one's ability to navigate different types of environments and get from one place to another (Fewings, 2001). People's perception of space is the first step in the wayfinding process. Since their primary means of perception are their senses, the user navigates the space primarily through their senses (Aksoy et al, 2020). In this context, it is important to design circulation areas that connect large-scale spaces in a perceptible way, especially in terms of readability.

Particularly in the circulation areas of intricately designed, large-scale structures, the wayfinding process is challenging. Hospitals, the very establishments that address people's health issues after they are born and provide solutions, are among the most considerable examples of this (Yurtgün & Demirkan Türel, 2023).

Hospitals perform a complex function due to their research, treatment and rehabilitation programs for various diseases. Patients visiting these structures due to a variety of illnesses, and healthcare workers functioning at a fast-paced experience stress and waste of time when they are unable to find their way through the circulation areas. Users' direction-finding problem is generally experienced in circulation areas that connect spaces to each other.

Because they perform more functions than other structures of comparable size, health structures are the most complex organizations (Holst, 2015). Hospitals are defined by the World Health Organization as establishments with beds that offer medical services that fall under the categories of observation, diagnosis, treatment, rehabilitation, and where patients receive either long-term or short-term care (Eceoğlu, 2010). Due to technological developments, evolution of medical treatment and differentiation of diseases, healthcare structures have shown morphological changes throughout history.

With the outbreak of diseases and the continental wars in Europe and America after the 1850s, hospital buildings began to use the pavilion system, in which patient beds were arranged along a long corridor. The mono-block system was adopted in the 1900s as a result of the advancement of building technology and due to the pavilion system covering very large areas (Aydın, 2009). In the wake of medical and technological advancements, health campuses—which integrate general and branch hospital operations—are now built to accommodate a multitude of requirements (Ayan, 2019).

Health campuses, which are implemented in many cities in our country as city hospitals, are large-scale structures spread over large areas, aiming to meet all kinds of needs of the users. When we look at the spatial formation of city hospitals, we see blocks with wide circulation areas around the main mass. There are emergency services, operating rooms, intensive care units and technical units within the central mass. The blocks attached to the central mass with corridors serve as branch hospitals. There are polyclinics and units providing inpatient services here (Noraslı, 2022). Since the circulation areas of fully equipped large buildings such as city hospitals are dense and the corridors are long, correct design solutions should be a reference to people's wayfinding behavior.

Hospitals are separated into numerous small cellular areas. Users find it challenging to navigate the circulation areas of these kinds of spaces (Güç et al., 2013). As public spaces with the highest user circulation during the day, hospitals, which people frequent and race against time to regain their health, have a negative association with social consciousness. Accordingly, establishing settings that facilitate good interactions between patients and hospital areas contributes to the shift in consciousness (Aksoy et al, 2020; Özgen, 2018). One of the most important issues that are difficult for users in hospitals is the decision-making processes of patients' behavior in finding their way in circulation areas.

Spatial perception stimulation is revealed by drawing distinctions at the circulation areas' landmarks and highlighting them with elements of spatial design. The ability to perceive the location with these elements aids in memory retention and improves wayfinding performance. Physical elements such as color and texture relate to how one perceives space and determines direction (Yurttaş, 2019). Therefore, by directly influencing how the space is perceived, the use of color and texture elements in circulation areas influences wayfinding behavior (Hidayetoğlu, 2010). In this context, the color and texture factors used in the circulation areas of hospitals, which are examples of complex functional structures, can provide the correct orientation of people or cause incorrect orientations.

The Konya City Hospital's circulation area served as the study's sample area. The goal is to find out how wayfinding behavior is affected by the use of color and texture elements in circulation areas. In this instance, digital environments were used to create three-dimensional drawings of the sample area, upon which animations and other visuals were produced. Users were moved along a predetermined path through the hospital's circulation areas using color and texture variables that were created based on the literature. The subjects were given visuals as part of a wayfinding exercise using the survey technique, and their memorability and orientation decision levels were analyzed and evaluated. The analysis shows that materials with a wood texture and the color orange have a positive impact on people's orientation decisions and memorability.

Spatial Perception and Wayfinding in Circulation Areas

According to Von Meiss (2013), space is an internally filled void that is bounded by spatial elements that partially isolate individuals from their surroundings. Every location has a unique structure all its own. With all of its features, space offers users messages. People interpret this message and apply it to their behavior and successfully complete the space's wayfinding process as a result. In this regard, the realization of wayfinding behavior depends on people's perception of the space.

The circulation areas that link spaces are where the wayfinding process, which involves the perception of space, takes place. The space occupied by components connecting different building volumes, such as ramps, stairs and corridors, is known as the circulation area (Hasol, 2019). The perceptibility of circulation areas determines how well users perform when wayfinding (Haq & Zimring, 2003). For circulation areas to have high visibility and promote participation in the events they host, they must be designed in easily understood forms (Herztberger, 2008).

People will always use wayfinding as a fundamental behavior to get from one place to another. They may experience stress and time loss if they are unable to perform this fundamental behavior. Using and organizing sensory cues from the outside world is known as wayfinding (Lynch, 1960). The phases of decision-making, decision-execution, and information processing comprise the wayfinding process (Arthur & Passini, 1992). These stages develop depending on people's cognitive perception of space.

People need to be able to perceive their surroundings before they can find their way. People's finding their way around depend on how they perceive space. The space can be used more effectively by users as they see it. As such, prior to wayfinding, people's spatial perception is relevant. The process of organizing sensory data to give objects or events around us meaning is called perception. Individuals interpret the stimuli and give them meaning at the end of this process (Siegel, 2006; Smith, 2002). People's interpretation of the environment by making sense of it reveals their interaction with the space based on perception.

The idea of spatial perception is revealed by the way that perception interacts with space by creating a connection between people and their surroundings. A person's formation of spatial perception is linked to their memory of a location through their experiences there. The idea of movement informs how this experience evolves and changes (Uysal, 2009). Through the

creation of various images, the human mind converts the physical characteristics of space into behavior during the process of spatial perception. These brain-formed images also have the power to influence how people behave (Golledge, 1999). In this context, there is an important context between people's reading and perception of the space and the qualified design of the space.

To ensure that people can move between spaces, circulation areas need to be designed in a way that is easily noticeable. This is especially important for large and complex functional structures. Patients may feel anxious while navigating through healthcare building corridors and healthcare personnel are often working at a fast pace. Therefore, it is important to have spatial elements in circulation areas that make wayfinding easier, improve memorability and accessibility, and increase efficiency.

Color and Texture in Healthcare Buildings

Hospital travelers experience anxiety when they can't see the end of the corridor or are unsure of where to exit (Karaçar & Fidan, 2022). There must be hierarchy-based, well-defined circulation spaces in every sizable hospital building. People are given cues in the wayfinding process by placing prominent design elements in areas where they will ask for directions (Carpman & Grant, 2016). Spatial elements like color, texture and pictograms that are decided upon during the design stage will help users' wayfinding behavior. In this context, the qualitative and perceptual connotations of the colors used in hospitals are important.

Color is defined as the image that results from the sensations that the eye experiences when light strikes an object and reflects, ultimately reaching the brain (Güller, 2007). In human psychology, warm colors are those that arouse feelings of coziness and vitality. Typically, the colors red, orange, and yellow belong to this group. Features in warm, vibrant colors are vivacious, provocative and ostentatious. Colors that convey a sense of calmness or coolness are known as cool ones. These hues are typically blue, purple, and green. Calm colors lower body temperature and promote relaxation (Güngör, 2019).

Since the long wavelengths of warm colors are generally high in vibration, they are the colors that hit the retina of the human eye first when viewed directly. Because warm colors have a dynamic effect, they appear to be closer than other colors. Cool colors generally fall on the retina of the eye later than other colors, thus creating a more receding and stagnant effect. Due to these slow effects and their backward appearance, they make the volume they are in appear larger and wider (Müezzinoğlu et al, 2021).

The effect of color in facilitating navigation in space increases only when it does not mix with other elements. Especially in hospital buildings, colored floors and corridors, which play a role in helping patients and hospital visitors find their way to the places they want to go, have a significant impact on the legibility of the space. Wayfinding can be facilitated if sections and corridors can be distinguished by different color coding in circulation areas (Hunter, 2010). Healing environments should be increased by protecting the physiological and psychological health of patients. It should assist in diagnosis, treatment, and rehabilitation actions. It should provide information by supporting orientation in the space, and visually improve working conditions by defining special spaces. Accordingly, appropriate lighting should be selected by considering the expression of colors. (Mahnke, 1996).

Sözen & Tanyeli (2014) state that texture is a surface effect element that can be perceived by touch and sight. The material's texture, structure, type, and rate of light reflection all affect how color is perceived. Texture and material are therefore assessed collectively (Özsavaş, 2016). There is an integration rather than an accumulation in the relationship between the texture's parts. The connections of integration give meaning to these relationships. (Gökaydın, 2002). The appropriate application of the texture factor serves as a guide for wayfinding behavior in circulation areas, just like the color factor does.

The texture of a material reflects the traces of the place where it is located. The characteristics specific to any material, such as the fact that the materials used in the indoor environment cannot be kept the same as the materials used in the outdoor environment, constitute the identity of that space. The textures of the materials used in the space give an idea to the person in reading that space. Materials in previously seen spaces provide a match with a space we encounter later (Çelik, 2017). Identifying surfaces that have expressive value in space designs allows the designer to interpret the textural expressions of these surfaces according to their meanings and to classify them in a logical order that forms the design language (Yanarateş, 2002).

Methods

The study's goal is to find out how hospital building circulation areas' use of color and texture affects patients' wayfinding habits. It is intended to examine the colors and textures utilized in hospital buildings at the level of memorability and orientation decision after the independent variables have been established. The ground-floor and first-floor plan circulation areas of Konya City Hospital were identified as sample area in the study methodology. As demonstrated in Figure 1, the study's methodology involved the creation of animations and visuals of the area along with the route designed for the circulation. To measure memorability and orientation decision levels within the context of wayfinding, the survey technique was used to analyze the data.

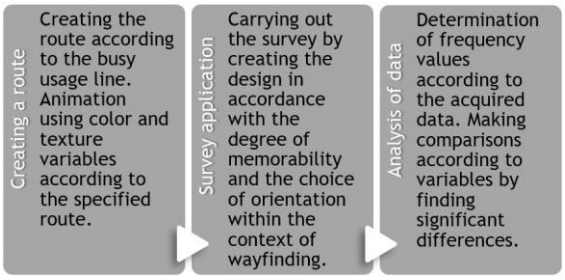

Figure 1. Methodology diagram of the study.

Experimental Environment

The ground and first-floor plan schemes of Konya City Hospital, which was employed as the sample area, were precisely modeled in three dimensions in the first stage of the method, in accordance with the prescribed method scheme. Three distinct color and texture variables were identified, per the literature review. The most popular circulation line in the sample area was identified, as shown in Figure 2, and a route was created using that information. This route served as the inspiration for a three-minute animation. On the walls, information desk, and waiting areas, three distinct color and texture variables were used to illustrate the subjects. The animation produced by assigning priority to each variable was recorded in three separate methods to guarantee equality in the order of the variables. Therefore, to guarantee equality in the variable order, the total number of subjects was divided by three.

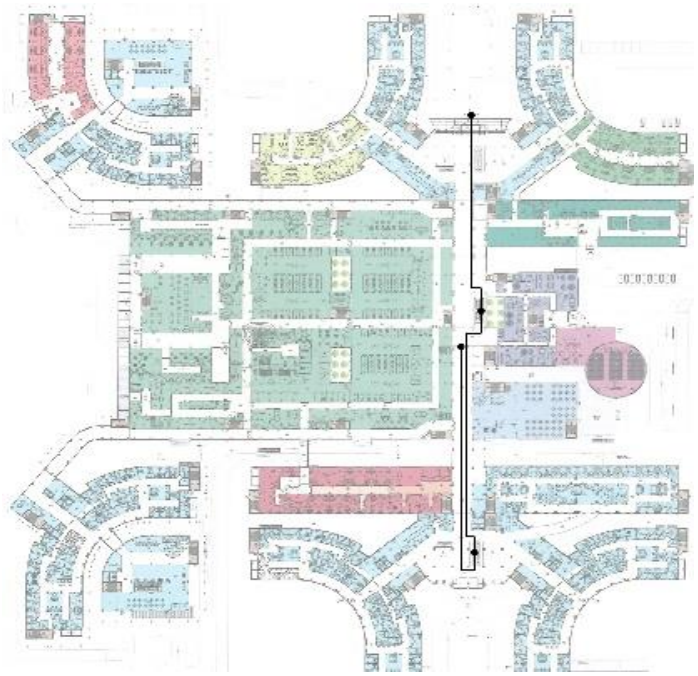

Figure 2. Route created for memorability analysis.

Survey Design

In the dependent variables selected for the survey, orange was used to represent warm, blue was chosen to represent cool, and gray was utilized to represent neutral colors. The color orange was used to represent the warm color because red increases blood pressure and should not be used in hospital buildings (Leibrock, 2000; Marberry, 1997). In texture variables, wood, ceramic and metal surface-coated materials were used. The survey study was approved by the human research ethics committee of KTO Karatay University on 14.09.2020 with the decision number of 2020/04/07. Informed consent documents were obtained from the survey participants. The survey sample was calculated as 395 people according to the population of Konya, with a margin of error of 0.05 at a reliability level of 0.95, and a survey was administered to 399 people in total.

To ascertain the subjects' wayfinding behaviors, the survey technique outlined in the second stage of the method scheme was applied in two different ways: memorability and orientation decision. The subjects watched the created animation first to gauge their level of memorability. Then, they were shown the images in Figure 3 and asked to recall the areas with orange, blue, gray, and ceramic colors as well as surface coverings made of wood, ceramic, and metal that were or were not in the animation. Regarding the color and texture variables in this case, the locations shown in images numbered 1, 2, 3, 7, 8, and 9 correspond to those that are in the animations, while the images numbered 4, 5, 6, 10, 11, and 12 correspond to those that are not.

Colors were shown to the subjects in locations 1, 2, 3, 4, 5, and 6 of the survey, which was designed to ascertain the degree of orientation decision. The locations were based on the sample area's entrance corridor and outpatient clinic consultation. In spaces 7, 8, 9, 10, 11, and 12, the subjects were presented with images with different textures. The subjects were asked, as illustrated in Figure 4, which of the space visuals with wood, ceramic, and metal surface coverings as textures and warm, cool, and neutral colors they would prefer. With the help of this application, it was possible to measure whether the orientation preferences agreed with the memorability level measurements in addition to revealing the orientation decision.

Figure 3. Space visuals used for memorability level.

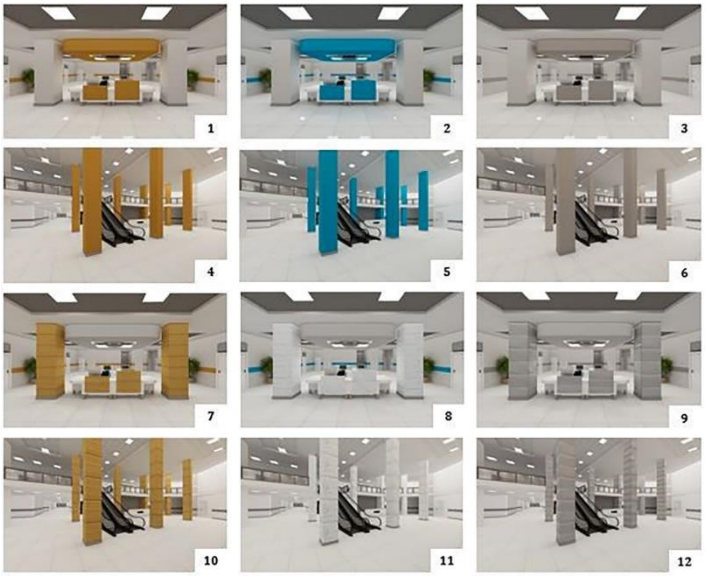

Figure 4. Space images used for orientation decision level.

The third step involved using the SPSS 18 (Statistical Package for Social Sciences) software to analyze the survey data. Chi-Square and Anova, which are used for parametric data, were used to test the data in this case, which came from a normal distribution. The analyses that showed significant differences as a result of these tests were compared using the Tukey Test. Therefore, it has been established that the color and texture elements employed in the wayfinding-related circulation areas of healthcare buildings influence people's memory of and orientation toward particular variables.

Results

Cronbach Alpha was utilized to assess the reliability of the data collected during the study's experiment. In their studies, Kim & Jin (2001), Grewal et al., (1998) reported that it can be

considered reliable when alpha reliability coefficients for all elements are above 0.60. The preliminary survey data in the study have a reliability coefficient of 0.811, and the reliability coefficient of all the data collected is 0.807. The Cronbach's Alpha coefficient in this situation is higher than the given value, which as a result, suggests that the collected data is regarded as reliable.

Table 1 displays the descriptive statistics values for the memorability analysis based on color variables. As a result, a low value denotes a positive response and a high value, a negative response. More people remembered the first, second and third positions in the animation depicted in Figure 3 than the fourth, fifth, and sixth positions that were left out of the animation. As a result, with an average value of 1.20, the warm color was the most remembered among the spaces in the animation. Following that, people remembered the neutral color with a mean value of 2.33 and the cool color with a mean value of 1.67.

Table 1. Descriptive statistical value of color variables according to memorability level.

	I am sure I saw		I think I saw		I am not sure		I think I did not see		I am sure I did not see		Average Value
	f	%	f	%	f	%	f	%	f	%	
1	297	74.8	69	17.4	16	4	9	2.3	6	1.5	1.20
2	196	49.7	83	21.1	69	17.5	33	8.4	13	3.3	1.67
3	130	32.9	90	22.8	84	21.3	55	13.9	36	9.1	2.33
4	73	18.3	70	17.6	70	17.6	62	15.6	122	30.7	3.48
5	43	11	45	11.5	79	20.2	105	26.8	120	30.6	4.10
6	104	26.3	52	13.2	64	16.2	71	18	104	26.3	3.30

The regular distribution of the data used depends on the skewness and kurtosis values being between ±3 (Shao, 2002). According to the normality analysis results of the scales used, the skewness coefficient for color =0.377 and the kurtosis coefficient =-1.314. This situation appears to have a normal distribution. ANOVA was used to compare color variables according to memorability level and determine whether there were statistically significant differences at the p<.05 level, as Table 2 illustrates. Consequently, a significant difference is observed at the level of (F=22.872; df=2; p=.00).

Table 2. Comparison of color variables according to memorability level, ANOVA Test.

Variables	Average Value	Standard Deviation	Standard error	F Value	Degrees of Freedom	p Value
	Upper Limit	Lower Limit	Upper Limit			
Warm	2.305	1.51	0.05	22.872	2	.00
Neutral	2.743	1.47	0.05			
Cool	2.742	1.47	0.05			
Total	2.60	1.50	0.03			

Table 3 presents the results of the Tukey test, which indicate a statistically significant difference between warm, cool and neutral colors. It can be observed that the memorability of neutral and cool colors is not significantly different from one another. It appears that the warm color is the variable that people remember the most in this context.

Table 4 displays the descriptive statistics values for the memorability analysis based on texture variables. As a result, a low value denotes a positive response, and a high value, a negative response. The animation in Figure 3 that ranked seventh was the one that people remembered the best. Furthermore, despite not being featured in the animation, the majority of the subjects seemed to recall placing tenth.

Table 3. Comparison of color variables according to memorability level, Tukey Test.

(X) Color (Y) Color	Average Difference (X-Y)	Standard Error	Value	95% Reliability Interval	Average Difference (X-Y)	Standard Error
	Lower Limit	Upper Limit	Lower Limit	Upper Limit	Lower Limit	Upper Limit
Warm	Neutral	-.43699(*)	.07471	.000	-.6122	-.2618
	Cool	-.43822(*)	.07480	.000	-.6136	-.2628
Neutral	Warm	.43699(*)	.07471	.000	.2618	.6122
	Cool	-.00123	.07490	1.000	-.1769	.1744
Cool	Warm	.43822(*)	.07480	.000	.2628	.6136
	Neutral	.00123	.07490	1.000	-.1744	.1769

Table 4. Descriptive statistical value of texture variables according to memorability level.

	I am sure I saw		I think I saw		I am not sure		I think I did not see		I am sure I did not see		Average Value
	f	%	f	%	f	%	f	%	f	%	
7	260	65.5	55	13.9	36	9.1	36	9.1	10	2.5	1.37
8	105	26.5	101	25.5	92	23.2	58	14.6	40	10.1	2.53
9	175	44.2	86	21.7	77	19.4	31	7.8	27	6.8	1.77
10	139	35.4	81	20.6	48	12.2	49	12.5	76	19.3	2.27
11	109	27.5	99	25	61	15.4	74	18.7	53	13.4	3.27
12	105	26.4	49	12.3	71	17.9	76	19.1	96	24.2	3.37

The regular distribution of the data used depends on the skewness and kurtosis values being between ±3 (Shao, 2002). According to the normality analysis results of the scales used, the skewness coefficient for the texture =0.530 and the kurtosis coefficient =-1.089. This situation appears to have a normal distribution. ANOVA was used to compare texture variables according to memorability level and determine whether there were statistically significant differences at the p<.05 level, as Table 5 illustrates. Consequently, a significant difference at the level of (F=26.429; df=2; p=.00) is observed.

Table 5. Comparison of texture variables according to memorability level, ANOVA Test.

Variables	Average Value	Standard Deviation	Standard error	F Value	Degrees of Freedom	p Value
	Upper Limit	Lower Limit	Upper Limit			
Ceramic	2.609	1.35	0.05	26.429	2	.00
Wood	2.143	1.42	0.05			
Metal	2.569	1.47	0.05			
Total	2.440	1.43	0.03			

When comparing wood-textured surface coating to ceramic and metal-textured surface coatings, a significant difference is observed, as indicated by the Tukey test result, which is presented in Table 6. It is observed that the memorability of textured metal and ceramic surface coatings is not significantly different from one another. Wood-textured surface coverings are the texture variable that people remember the best when comparing the memorability level of the texture variables.

Table 6. Comparison of texture variables according to memorability level, Tukey Test.

(X) Texture (Y) Texture	Average Difference (X-Y)	Standard Error	Value	95% Reliability Interval	Average Difference (X-Y)	Standard Error
	Lower Limit	Upper Limit	Lower Limit	Upper Limit	Lower Limit	Upper Limit
Ceramic	Wood	.46555(*)	.07098	.000	.2991	.6320
	Metal	.03986	.07091	.840	-.1264	.2062
Wood	Ceramic	-.46555(*)	.07098	.000	-.6320	-.2991
	Metal	-.42569(*)	.07095	.000	-.5921	-.2593
Metal	Ceramic	-.03986	.07091	.840	-.2062	.1264
	Wood	.42569(*)	.07095	.000	.2593	.5921

The orientation decision analysis employed the Chi-Square test, which is derived from a normal distribution and is utilized

for parametric data in double-choice experiments, to determine if the variables were statistically significant at the $p<.05$ level. Using the images in Figure 4, an orientation decision analysis was conducted based on color and texture variables.

As indicated in Table 7, there is a significant difference at the level of (F=165.638; df=2; p=.00) based on the orientation decision analysis of color variables. As a result, warm colors were preferred by 44.9% of the subjects, cool colors by 39.5%, and neutral colors by 15.7%. Warm colors appear to be the most in-demand color factor in this sense.

Table 7. Comparison of color variables according to orientation decision level, Chi Square Test.

Variables		No	Yes	Total	F Value	Degrees of Freedom	p Value
Warm	Number	451	347	798	165.638	2	.00
	Expected Number	540.3	257.7	798.0			
	Color %	56.5%	43.5%	100.0%			
	Orientation %	27.8%	44.9%	33.3%			
Cool	Number	493	305	798			
	Expected Number	540.3	257.7	798.0			
	Color %	61.8%	38.2%	100.0%			
	Orientation %	30.4%	39.5%	33.3%			
Neutral	Number	677	121	798			
	Expected Number	540.3	257.7	798.0			
	Color %	84.8%	15.2%	100.0%			
	Orientation %	41.8%	15.7%	33.3%			
Total	Number	1621	773	2394			
	Expected Number	1621.0	773.0	2394.0			
	Color %	67.7%	32.3%	100.0%			
	Orientation %	100.0%	100.0%	100.0%			

As indicated in Table 8, there is a significant difference at the level of (F=274.347; df=2; p=.00) based on the orientation decision analysis of the texture variables. As a result, wood-textured surface coatings were chosen by 49.9% of the subjects, ceramic-textured surface coatings by 39.1%, and metal-textured surface coatings by 11%. Wood-textured surface coverings appear to be the most popular texture variable in this regard.

Table 8. Comparison of texture variables according to orientation decision level, Chi Square Test.

Variables		No	Yes	Total	F Value	Degrees of Freedom	p Value
Wood	Number	415	383	798	274.347	2	.00
	Expected Number	542.2	255.8	798.0			
	Texture %	52.0%	48.0%	100.0%			
	Orientation %	25.5%	49.9%	33.3%			
Ceramic	Number	497	300	797			
	Expected Number	541.5	255.5	797.0			
	Texture %	62.4%	37.6%	100.0%			
	Orientation %	30.6%	39.1%	33.3%			
Metal	Number	714	84	798			
	Expected Number	542.2	255.8	798.0			
	Texture %	89.5%	10.5%	100.0%			
	Orientation %	43.9%	11.0%	33.3%			
Wood	Number	1626	767	2393			
	Expected Number	1626.0	767.0	2393.0			
	Texture %	67.9%	32.1%	100.0%			
	Orientation %	100.0%	100.0%	100.0%			

Orange, a color associated with warmth, was more likely to be remembered, according to an analysis conducted on wayfinding. Regarding memorability, there was not a significant difference between gray (a neutral color) and blue (a color associated with coolness). Furthermore, more was remembered about wood-textured surface coverings in the orientation decision analysis. There was no significant difference between the surface coatings on metal and ceramic materials. When it came to choosing their orientation, the subjects favored warm colors like orange and wood-textured surface coverings.

According to memorability and orientation decision data, warm colors used in the circulation areas of hospital buildings give a feeling of closeness as they reach the retina of people's visual senses more quickly. In this case, warm colors become more memorable. For this reason, it is also effective in orientation decisions. Although cold colors are not preferred for direction finding, they can be used in areas that ensure the continuity of circulation areas with their calming effect. Special and highlighting colors should not be used on the general surfaces of hospital buildings. Highlighting colors used in many areas can put pressure on users. Therefore, the background in the circulation areas of hospital buildings should be kept white and special colors should be preferred to emphasize focal points.

Conclusion and Recommendations

People use their perception of wayfinding to engage in navigation behaviors in circulation areas. For users to find their way around large-scale structures with complex functions, circulation areas must be readable and easily understood. Users who struggle to find their way around in these kinds of structures end up in stressful situations where they lose time and become confused. People can navigate through the descriptive design elements placed in circulation areas with ease in this setting (Holst, 2015; Canbakal Ataoğlu, 2009).

The configuration of hospitals, which are considered as complex functional structures, and the form of the circulation system affect the wayfinding behavior of the users. The central circulation system and the nodal points of the linear circulation system are critical regions where decision stages in wayfinding behavior take place, as they are the focal points that connect the spaces. In this context, nodes in complex functional structures affect people's wayfinding behavior. In addition, wrong orientation decisions taken at these points where the intensity of use is highest; It can cause stress, fatigue, loss of time and accumulation in emergency situations (Arthur & Passini, 1992; Hidayetoğlu, 2010).

Direction signs used in hospital buildings are not only an explanatory element; With intense use, it can turn into an element that creates confusion. Therefore, at critical points affecting the decision-making process in wayfinding behavior, some design elements can be used in accordance with environmental factors, and users' wayfinding performance can be increased by making differentiations with color and texture variables (Aksoy et al, 2020).

This study investigated the impact of color and texture on wayfinding in the circulation areas of healthcare buildings. Based on the considered variables, users found the orange color and wood-textured surface coverings in circulation areas to be more memorable. They relied on their orientation preferences concerning these variables. As a result, using wood-textured surface coverings and the color orange enhances user wayfinding performance in hospital circulation areas, as per the findings of this study.

Hospitals have a variety of spaces with various purposes. It should be remembered that these spaces may vary in how color

and texture are used because they each have distinct qualities of their own. For instance, because of spatial perception, while orange is a great color for wayfinding in healthcare buildings' circulation areas, it might not be the best option for operating rooms. It is advised that every unit be assessed under its own special circumstances in this regard.

Just as crucial as the characteristics of the colors and textures employed are the usage rates. The colors and textures used in this study, which fall under the category of wayfinding, are highlighted at significant locations but do not cover the entire surface of the area. Consequently, it is advised that textures and colors be applied at a specific rate and given emphasis when used in circulation areas to improve people's wayfinding performance.

When compared to one another, the memorability and orientation preference levels examined in the context of wayfinding exhibit consistency. People tend to gravitate towards this color and texture because they can remember the orange color and wood-textured surface used to a certain extent as an accentuator. On the other hand, it is advised to use only the texture with a different cleanable material, not raw wood, when applying preferred wood-textured surface coatings.

This study on hospital buildings can be expanded with different field studies by including other complex functional structures or can be compared with hospital buildings with different spatial organizations. Within the scope of this study, design elements, color and texture variables are discussed and can be enriched with studies that include different spatial and personal factors. The experimental study was conducted digitally since the sample area was a large-scale hospital structure, the high density of use, and the pandemic conditions. The experiment can be handled with a one-on-one application in a smaller scale hospital structure or other complex functional structures.

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