



User Color Preferences In Daily Use Products

Günlük Kullanım Ürünlerinde Kullanıcı Renk Tercihleri

Asst. Prof. Dr. Bülent ÜNAL

Atılım University, School of Fine Arts, Design and Architecture, Industrial Design, Ankara/Turkey
ORCID: 0000-0003-1721-7903

ABSTRACT

Color plays an important role in creating a certain factor of preference and it is identified as an important design tool for many products, as consumers will often choose to buy a product when it is presented in preferred colors or color schemes. In this study it was decided to investigate the effect of the color as a design element for preference in daily use products and which color has the potential to be preferred more than others. In addition, it was aimed to analyze the effect of gender on color preferences and on the factors that influence color preferences. As a result of the study, it was reported that red and gray colors were preferred more than green and blue colors; and a significant difference between gender groups in their color choices were found. Considering the gender differences, it was seen that there is a relationship between the mentioned factors and genders. The study suggests that offering a choice of product colors to consumers may be advantageous in the field of products for daily use as it has a potential to provide an attractive method to convey messages about product features and influence consumer choice decisions that affect their purchase.

Key words: Color preference, product design, daily use products, gender difference.

ÖZET

Renk, belirli bir tercih faktörünün yaratılmasında önemli bir rol oynamaktadır. Tüketiciler, bir ürünü tercih edilen renklerde veya renk şemalarında sunulduğu zaman satın almayı tercih edeceği için, birçok ürün için renk önemli bir tasarım aracı olarak tanımlanmaktadır. Bu çalışmada rengin günlük kullanım ürünlerinde bir tasarım öğesi olarak tercihe etkisinin ve hangi rengin diğerlerinden daha fazla tercih edilme potansiyeline sahip olduğunun araştırılmasına karar verilmiştir. Ayrıca cinsiyetin renk tercihleri üzerindeki etkisinin ve renk tercihlerini etkileyen faktörlerin incelenmesi amaçlanmıştır. Çalışma sonucunda kırmızı ve gri renklerin yeşil ve mavi renklerden daha fazla tercih edildiği; renk seçimlerinde cinsiyet grupları arasında anlamlı bir farklılık olduğu ortaya çıkmaktadır. Cinsiyet farklılıkları göz önüne alındığında, bahsedilen faktörler ile cinsiyetler arasında bir ilişki olduğu da görülmektedir. Çalışma, ürün özellikleri hakkında mesajlar iletmek ve satın almayı etkileyen tüketici seçim kararlarını etkilemek için çekici bir yöntem sağlama potansiyeline sahip olduğundan, tüketicilere ürün renkleri seçeneği sunmanın günlük kullanım ürünleri alanında avantajlı olabileceğini öne sürmektedir.

Anahtar Kelimeler: Renk tercihi, ürün tasarımı, günlük kullanım ürünleri, cinsiyet farklılığı.

1. INTRODUCTION

Color is one of the design elements that we use in almost every aspect of our daily lives, that evoke different emotions in us. It is an important tool in terms of color harmony and preference even when writing, shopping, describing how we feel, but perhaps we approach it without realizing it. However, it is actually the design element that we always decide and choose, that is, we prefer. People have relatively strong preferences about liking certain colors and color combinations much more than others; and this is accepted as one of the most fascinating aspects of the perception of colors (Palmer & Schloss, 2016: 354). Since this acceptance has existed for a very long time, color preferences have been studied by many researchers in various fields as it is an integral part of many design processes (e.g. Guilford & Smith, 1959; Birren, 1973; Holmes & Buchanan, 1984; Granger, 1955; Palmer & Schloss, 2010; Schloss, Strauss & Palmer, 2013).

In a general aspect color preference indicates whether a color / color combination is preferred by a group of viewers (Ou, Luo, Woodcock & Wright, 2004). Thus, it is measured by evaluative dimension of people which can be described by pleasantness and unpleasantness. People have different color preferences for different context. For instance, in their research on indoor space atmosphere, Van der Voordt, Bakker, & De Boon (2017) examined color preferences in different

types of spaces. They reported that white was the most frequently preferred color. They also found that females preferred significantly more color in their environment than males and younger persons preferred more colors around them than older ones (pp.9). Westland and Jin Shin (2015) explored personal color preference and preference of color for personal care product design. They reported that in personal, the most preferred color was blue and the least preferred color was yellow; and also the preference for colder colors over warmer colors was much more pronounced in the male group. In addition, it was stated that for personal care products females chose warmer colors (red and orange) and males chose colder colors (green and purple) (pp.53). Yu, et.al. (2018) also explored whether consumers' personal color preferences influence their product color choices. The results were broadly consistent with other published studies in that blue is a color with a high preference rate and yellow is a color with a low preference rate. Their study found that personal color preferences influence intended product-color decisions. They also reported that most products strongly preferred in red were associated with heat, while most products strongly preferred in blue were associated with cleanliness and/or health.

As can be seen from some of the results of the mentioned scientific studies, color preference may be affected by differences in age, gender, culture or geographic area. Ellis & Ficek (2001) mentioned that males are significantly more likely than females to prefer variations on the color of blue; while females were more likely to choose pink and purple. According to Bonnardel et.al, (2018) males' preferences limited to blues and greens, whereas females showed an additional liking for pinks and purples. Additionally, males showed higher preference ranking for brown and beige colors while females showed for pink color. In other study, Cohen (2013) found the same findings that men were more likely to prefer blue, while women were more likely to prefer purple, pink and red. Similar results were generally obtained in studies with child samples. Mohebbi (2014) reported that a significant difference exists between boys' and girls' tendencies towards four colors including blue, green, pink and black. Boys mostly preferred blue color, while girls mostly preferred pink color. In addition to the results of the studies mentioned, there are many studies in the literature on the effects of gender and other demographic factors on color preferences. Ou, Luo, Woodcock & Wright (2004) highlighted as a result of their study that color preference is one of the factors that affect observers' judgments on color harmony, whereby the judgements on color preference are dominated by subjective criteria such as personal taste and the effect of cultural difference (pp.389).

Racey, Franklin & Bird (2018) approached the reasons affecting color preferences from a different perspective and examined how the color preference process works in the brain. Their experimental work shows that brain activity is modulated by color preference, even when such preferences are irrelevant to the ongoing task when participants are busy. They also suggested that color preferences automatically affect our processing of the visual world; color preferences are registered by the brain, automatically suggesting that color preference may be a common aspect of visual processing of scenes. This data actually confirms that the previously mentioned color preferences are influenced by colors that are normally liked and registered as favorite colors in the brain.

Since color plays an important role in creating a certain factor of preference and responses to colors are variable, it was decided to further investigate color preferences for products that are widely used in our daily lives. A sufficient number of literature does not focus on product color preferences and there is no clear idea about the colors preferred in relation to the gender factor in case of product design. In order that, the existing research was designed to answer the following questions:

1. Which colors are the most and least preferred for a daily used product?
2. Does gender influence color preferences of daily use products?
3. Which factors may have influenced these color preferences?
4. Does the factors affecting the preference of color differ according to gender?

The hypotheses formed by the research questions mentioned above are given below:

H1: Color is an important factor in the preference of daily use products.

H2: Gender plays a significant role in the color preferences of daily use products.

H3: The factors affecting the color preferences of daily use products differ according to gender.

2. METHOD OF THE EXPERIMENT

2.1. Sample Group

The research was applied to a total of 140 people at Atılım University. Participants were selected by stratified quota sampling based on their design background and gender.

Since gender was a variable in this study, the number of male and female participants was kept equal, with 140 participants each (70 females, 70 males). The age of the sample group varies in between 19-74 and the mean age of the sample group is 35,9 (min. age 19, max. age 74: See Table 1).

Table 1. Participants on the basis of gender and age mean.

Gender	Number	Age Mean	Std. Deviation
Female	70	37,1429	11,61494
Male	70	34,6000	14,66772
Total	140	35,8714	13,24362

It was anticipated that presenting a participant group without a design background will prevent a biased or knowledgeable approach to the subject focused in the research, which is likely to be provided by a designer's eye. In addition, it is thought that the design background is important in terms of providing information to product designers, especially from the user's point of view. For this reason, people who have a relationship with design, such as being a student or lecturer at the Faculty of Fine Art, Design and Architecture, were excluded from the study.

2.2. Setting Description

The experiment was carried out in the "Virtual Reality Laboratory" located in Atılım University, Faculty of Fine Arts, Design and Architecture. This laboratory space provides an isolated space where there is no obvious interaction between interior and exterior. This is one of the important reasons why it was chosen as the experimental environment.

There is only artificial light illumination in the laboratory space. Because natural light does not enter the space, it was not required to apply natural light control. However, there are two transom ventilation windows on one side of the laboratory space (rear façade) to be used for ventilation. These windows face the indoor corridor and the light of the corridor was kept off during the experiment for providing controlled environment; so that when artificial lighting is turned on or off, it does not affect the amount of light in the experimental environment (See Figure 1).

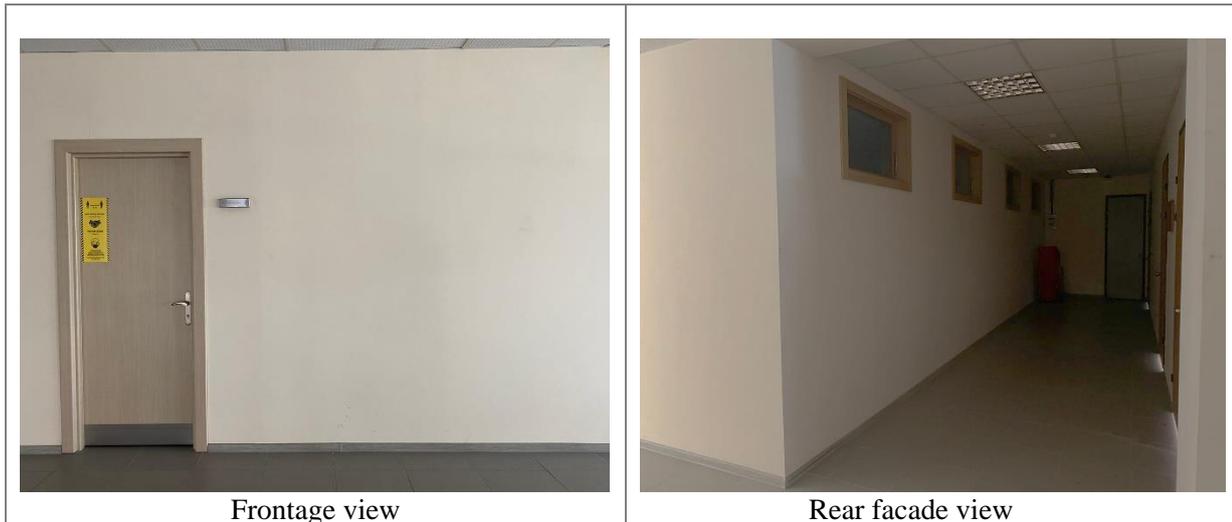


Figure 1. Views showing the experiment environment from frontage and rear facade.

The illuminance level in the space was measured with the Minolta Illuminometer T-10 and the illuminance level was fixed at 219 lux. There is a suspended ceiling in the experimental environment and six surfaces of the grids forming the ceiling arrangement are used as artificial lighting sources in this environment and covered by diffused surfaces. Philips Master TLD-18W/840 fluorescent lamps are used in each grid to illuminate the experimental environment. The seating arrangement was arranged to provide the best control over possible screening reflections on the computer screen (see Figure 2). Until the end of the experiment (140 people in total), the angle of the computer screen was not changed in order not to change the visible color perception of the participants and to keep it constant.

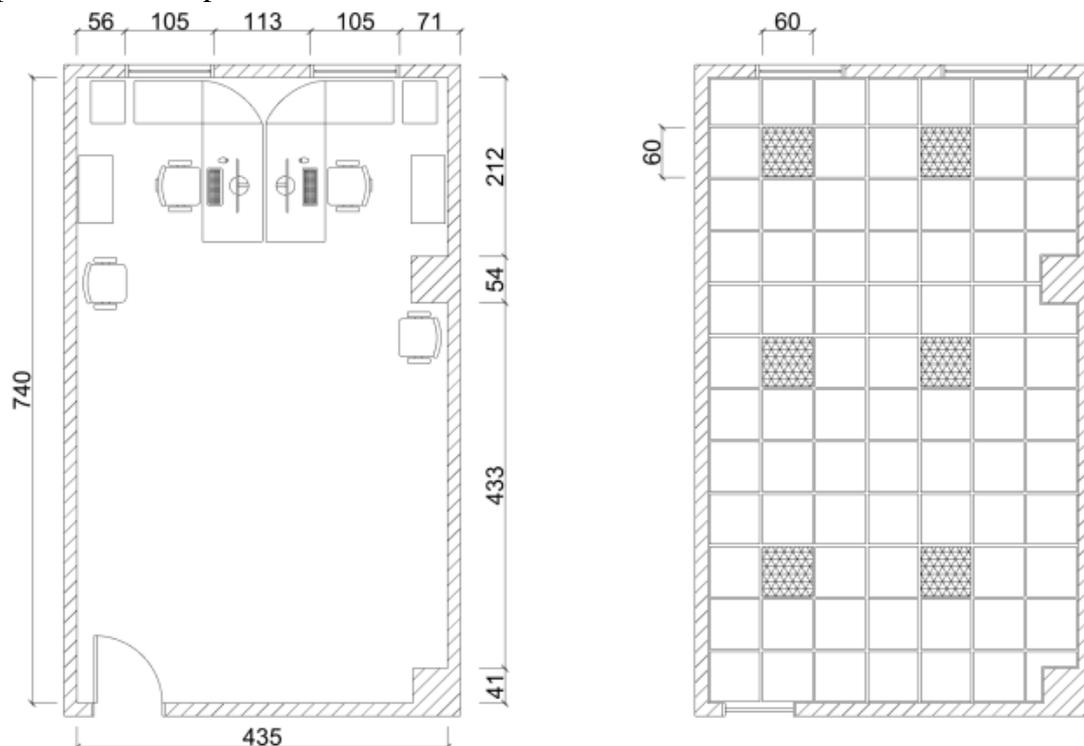


Figure 2. Views showing the floor plan and reflected ceiling plan of the experiment environment.

2.3. Procedures

2.3.1. Selecting the Product

In this study, the effect of the color as a design element for preference in daily use products and the potentials of colors to be preferred more than others were investigated. For this reason, the coffee machine, which is especially popular today, has more than one model in almost every house, and has a high marketing value, has been chosen as a product.

2.3.2. Specifying the Colors

Within the scope of this experiment, the participants were shown a model of a coffee machine on the computer screen. Computer monitors use the RGB color model as a method of managing colors. Therefore, a computer monitor can allow a wide variety of RGB colors. Additive Color Synthesis – RGB Color Model – is used in the determination and selection of colors in this study. Since the same color can be perceived differently on different computer screens depending on the monitor characteristics-different monitors may display RGB differently (Güneş & Olguntürk, 2020), the screen on which the coffee machine is modeled and color is applied was also used in the experiment process.

Primary additive colors that are red, green and blue and an achromatic color that is gray as a control tool for hue deficiency were chosen in the experiment. In the study, in order to measure the effect of hue, the saturation (S value) and brightness (B value) values were kept the same in chromatic colors. Thus, the potential variables which may affect the perception and preference were controlled (see Table 2). At the same time, while R, G, B values were determined, hue values other than the studied one were determined as 0 and the possible effects of different color values were eliminated. Therefore, the pure values of the chromatic colors were studied.

Table 2. Specified colors for the experiment.

Colors	RGB Values	HSB Values
RED	R: 255 G: 0 B: 0 Pure Red	H: 359 S: 100 B: 100
GREEN	R: 0 G: 255 B: 0 Pure Green	H: 120 S: 100 B: 100
BLUE	R: 0 G: 0 B: 255 Pure Blue	H: 240 S: 100 B: 100
GRAY	R: 128 G: 128 B: 128	H: 0 S: 0 B: 20

2.3.3. Modeling of the Products

A free ready-made model from the Archmodels (evermotion.org), appliances collection was selected for the coffee machine model (kitchen accessory 49 AM51 Archmodels). Visuals were prepared by making arrangements on the material, light, color and scene adjustments on the selected model in the Keyshot program. While preparing the images, attention was paid to the use of angles where the product could express itself as well as possible and the details could be seen (see Table 3).

Table 3. Colored products modeled for the experiment.

Red Model	Green Model	Blue Model	Gray Model
			

2.3.4. Interview Design

A pilot study was conducted to test the product models planned to be used in the research and the reliability of the results to people visiting the campus and working in the campus within the scope of preference and promotion days at Atılım University. For this reason, preliminary data was collected with the pilot study, and the arrangements were tested for the experiment. Data obtained from the pilot study were not included in the study's findings.

The main experiment was conducted in two phases;

In the first phase, subjects were asked to fill in a brief questionnaire about their gender and age. In addition, the subjects were asked if they had any eye or vision deficiencies. Subjects who have any vision deficiencies were asked to take the experiment with their correction equipment such as contact lenses or eyeglasses.

In the second phase the participant was seated in front of the computer individually and was shown four coffee machine model with different colors. S/he was asked first to pick which colored coffee machine s/he would prefer and second to write the reason for preference. No time limit was stipulated.

3. FINDINGS

Since this study basically was aimed to investigate the preferred colors and the factors that cause these colors to be preferred; in the findings section, firstly, the percentages of preference of the colors and the effect of gender were stated quantitatively and in the second section, the factors affecting the preferences of the participants were stated qualitatively.

Color Preference

To analyze the data, Statistical Package for the Social Sciences (SPSS) was used. Through the analyzing process, Independent Samples t-Test and frequency tables were used.

In the first stage of the analyses, frequency values were examined in order to look at the preference rates of the colors tested in the study, regardless of gender. According to the data obtained, as can be seen in the Table 4 and Figure 3, it is seen that red and gray colors were preferred more than green and blue colors. While the red color was preferred by 44.3% of the participants, the gray color was preferred by 40%, the green color by 7.1% and the blue color by 8.6% of the participants.

Table 4. Frequency for the color preference.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Red	62	44,3	44,3	44,3
Gray	56	40,0	40,0	84,3
Green	10	7,1	7,1	91,4
Blue	12	8,6	8,6	100,0
Total	140	100,0	100,0	

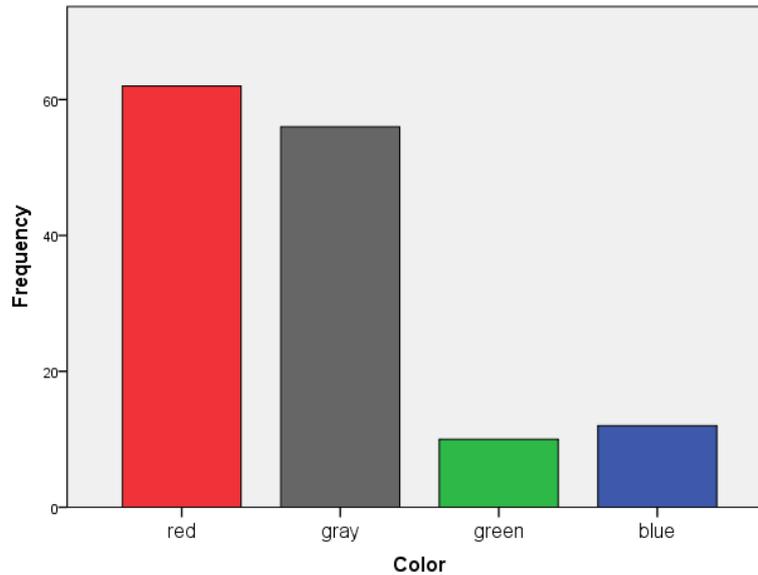


Figure 3. The distribution of preference of the colors in respect to participant numbers.

To determine the effect of gender on preference of color, Independent Sample t-Test was conducted. The test pointed out that there is a significant difference between gender groups in their color choices ($F=3.326$, $df=138$, $p=.000$). Thus, gender has influence on color preference of daily used products. According to the frequency table taken to see the distribution, most of the female participants preferred the color red and never preferred the color blue while most of the male participants preferred gray color (see Table 5, Figure 4). This results confirms the second hypothesis of the study, “gender plays a significant role in the color preferences of daily use products”.

Table 5. Frequency for the color preference in accordance with gender.

		Color				Total
		Red	Gray	Green	Blue	
Gender	Female	46	18	6	0	70
	Male	16	38	4	12	70
Total		62	56	10	12	140

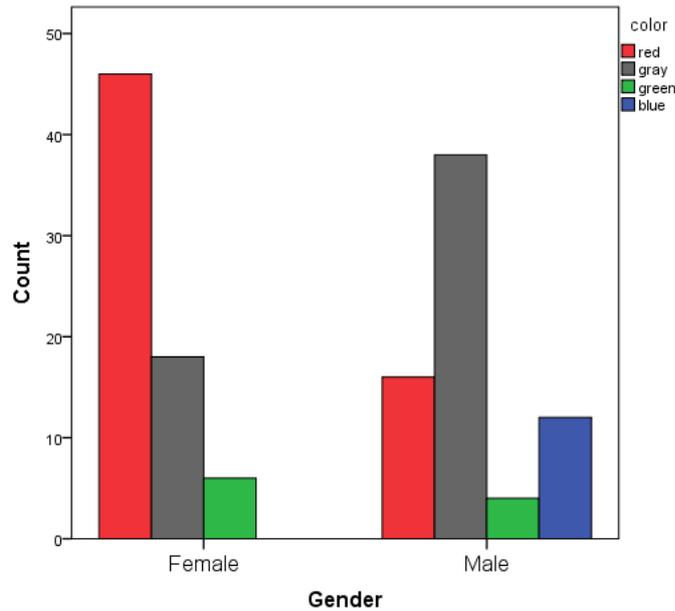


Figure 4. The distribution of preference of the colors in respect to gender.

Factors Affecting the Color Preferences

In the second phase of the experiment, samples were asked to write the reason for their color preferences. When the reasons stated by 140 participants were examined, it was seen that basically four main reasons affect their color preferences.

First of all, the fact that the chosen color is bright and attractive was shown as one of the reasons for preference. This factor was stated by those who chose red and green. It is noteworthy that some of these samples also stated that as long as the color is striking, it is expected that the product will be preferable.

Secondly, it is seen that liking the color independently of a product is effective in color preference. While many participants stated the reason for their preference, they made the following comments:

"I normally like the gray color very much, I think it is a color that goes well with everything."

"Red is my favorite color."

Thirdly, the place in which the product is located appears to be an important dimension. Since the participants stated that they will place the coffee machine in the kitchen, they focused on the colors of the products in the kitchen and even the colors of the kitchen cabinets. Their harmony with that place and the products in that place has been a factor affecting the color choice. The notes of some of the participants who stated this reason are given below as direct quotations:

"My other countertop hand tools in the kitchen are red in color, such as a teapot, toaster. I think this machine will be in harmony with them."

"Since my kitchen cabinets are white, I mostly prefer everything in red, because they appear in the foreground."

Finally, the form and design of the selected product emerges as a factor affecting the color preference. Since the design approach, lines, form and shape of the product in question creates the character of that product, color become an important design element in terms of being compatible with the character of the product. The best quotes describing this factor are given below.

"This coffee machine suits this color (gray)."

"Because this machine is large, colors other than gray make it stand out."

Considering the gender distribution of the four factors that emerged for the color preferences mentioned above, it was seen that there is a relationship between the mentioned factors and genders. Female participants especially focused on the third factor, the relationship and harmony of the color with the space and the products in the space. The fact that women spend more time in the kitchen, especially than men, makes it important for them that the space is harmonious and appealing to the eye. At the same time, women who mostly prefer the color red stated the first factor that expresses the bright and flashy red color as the reason. This indicates that flashy products are more preferable for women than for men.

Male participants, on the other hand, focused on the fourth factor, the harmony of the color and the character of the product. In addition to the fourth factor, the fact that men prefer the product with the color they like in their daily use is also seen with the results of the study. As a result of the study, while male participants pay attention to details specific to the product (such as the form and design of the product), female participants pay attention to more general details (such as the place-product relationship). This results confirms the third hypothesis of the study, “the factors affecting the color preferences of daily use products differ according to gender”.

All results reported in the findings section are confirms the first hypotheses of color as being an important factor in the preference of daily use products. The fact that each participant has a certain reason for preferring a color according to herself/himself causes color to being as an element that is considered and affects the decision mechanism.

4. CONCLUSION

Color plays an important role in creating a certain factor of preference and responses to colors are variable. Color preference is measured by evaluative dimension of people which can be described by pleasantness and unpleasantness. Thus, people have different color preferences for different context. Color is identified as an important marketing tool for many products, as consumers will often choose to buy a product when it is presented in preferred colors or color schemes (Yu, et.al., 2018). For this reason, in this study it was decided to investigate the effect of the color as a design element for preference in daily use products and which color has the potential to be preferred more than others. As a daily used product the coffee machine, which is especially popular today and has a high marketing value, has been chosen as a product.

Within the scope of this study, the participants were shown the coffee machine on the computer screen with primary additive colors which were red, green, blue and gray for as a control tool for hue deficiency. The participants were shown four coffee machine model with different colors. They were asked to pick which colored coffee machine s/he would prefer and were asked to write the reason for preference. It was seen that red and gray colors were preferred more than green and blue colors.

The statistical analyses showed that while red and gray colors were preferred by most of the participants, green and blue colors were preferred by least of the participants. Additionally, the test pointed out that there is a significant difference between gender groups in their color choices. Thus, gender has influence on color preference of daily used products. According to the frequencies, most of the female participants preferred the color red and never preferred the color blue while most of the male participants preferred gray color. These results support the findings obtained from the literature (Westland & Jin Shin, 2015; Cohen, 2013). From this, it can have reported that regardless of the product chosen, there is a potential for differences in color choices and preferences of men and women, and the trends are generally in the same direction as the findings obtained from the literature.

In this study, it was also aimed to investigate the factors affecting the color preferences of the participants for daily use products. For this reason, after the participants made their color preferences, they stated the reasons for their preferences. When the data obtained from 140

participants were analyzed, it was seen that four important factors stand out as the reason for preference. The first of these was that the color is bright and interesting; the second was the colors that are liked in normal life, regardless of any product; the third was the place where the color choice will be made and the harmony and relationship with the products in that place, and finally, the harmony of the design character of the product and the color.

Considering the gender differences, it was seen that there is a relationship between the mentioned factors and genders. Female participants especially focused on the third factor and first factor. The fact that they spend more time in the kitchen makes the harmony of space and product more important for them. On the other hand, male participants were focused on the second and fourth factors.

The study suggests that offering a choice of product colors to consumers may be advantageous in the field of products for daily use. Because a product's visual elements and packaging design provide an attractive method to convey messages about product features, they potentially influence consumer choice decisions that affect their purchase. These visual elements influence consumers' choice of products in any product category, and colors are often considered an important component in this selection process. For this reason, the findings obtained in this study should be seen as an example for studies within this scope. It shows that color preference is important, at least for some products. Identifying in which product category color choice is critical, on which products color choice has little effect, and understanding the factors that influence these choices should be the focus of future work in this area.

REFERENCES

- Birren, F. (1973). "Color Preference as a Clue to Personality", *Art Psychotherapy*, 1(1): 13-16. Doi: 10.1016/0090-9092(73)90005-7
- Bonnardel, V., Beniwal, S., Dubey, N., Pande, M. & Bimler, D. (2018). "Gender Difference In Color Preference Across Cultures: An Archetypal Pattern Modulated By A Female Cultural Stereotype", *Color Research and Application*, 43: 209-223. Doi: 10.1002/col.22188
- Cohen, P. N. (2013). "Children's Gender and Parents' Color Preferences", *Archives of Sexual Behavior*, 42(3): 393-97. Doi: 10.1007/s10508-012-9951-5.
- Ellis, L. & Ficek, C. (2001). "Color Preferences According to Gender and Sexual Orientation", *Personality and Individual Differences*, 31(8): 1375-1379. Doi: 10.1016/S0191-8869(00)00231-2
- Evermotion, https://evermotion.org/shop/show_product/kitchen-accessory-49-am51-archmodels/5097
- Granger, G. W. (1955). "An Experimental Study of Color Harmony", *The Journal of General Psychology*, 52: 21-35.
- Guilford, J. P. & Smith, P. C. (1959). "A System of Color-Preferences", *The American Journal of Psychology*, 72(4): 487-502. Doi: 10.2307/1419491
- Güneş, E. & Olguntürk, N. (2020). "Color-Emotion Associations in Interiors", *Color Research and Application*, 45(1): 129-141. Doi: 10.1002/col.22443
- Holmes, C. B. & Buchanan, J. A. (1984). "Color Preference as a Function of the Object Described", *Bulletin of the Psychonomic Society*, 22(5): 423-425.
- Mohebbi, M. (2014). "Investigating The Gender-Based Color Preference in Children", *Procedia Social and Behavioral Sciences*, 112: 827-831. Doi: 10.1016/j.sbspro.2014.01.1238
- Ou, L.C., Luo, M. R., Woodcock, A. & Wright, A. (2004). "A Study of Color Emotion and Color Preference. Part III: Color Preference Modeling", *Color Research and Application*, 29(5): 381-389. Doi: 10.1002/col.20047

Racey, C., Franklin, A. & Bird, C. M. (2018). "The Processing of Color Preference in the Brain". Available On-line: file:///C:/Users/Au/Downloads/The_processing_of_color_preference_in_the_brain.pdf
Doi: 10.1101/361006

Schloss, K. B., Strauss, E. D. & Palmer, S. E. (2013). "Object Color Preferences", *Color Research and Application*, 38(6): 393-411. Doi: 10.1002/col.21756

Palmer, S. E. & Schloss, K. B. (2010). "An Ecological Valence Theory Of Human Color Preference", *PNAS Proceedings of the National Academy of Sciences of the United States of America*, 107, 8877– 8882. Doi: 10.1073/pnas.0906172107

Palmer, S. E. & Schloss, K. B. (2016). "Color Preference" (Ed M. Luo), *Encyclopedia of Color Science and Technology*, pp.354-360, Springer, New York.
Doi:10.1007/978-3-642-27851-8_70-13

Van der Voordt, T., Bakker, I., & De Boon, J. (2017). "Color Preferences for Four Different Types of Spaces", *Facilities*, 35(3/4): 155-169. Doi: <http://dx.doi.org/10.1108/F-06-2015-0043>

Westland, S. & Jin Shin, M. (2015). "The Relationship Between Consumer Color Preferences and Product-Color Choices", *Journal of the International Color Association*, 14: 47-56.

Yu, L., Westland, S., Li, Z., Pan, Q., Jin Shin, M. & Won, S. (2018). "The Role of Individual Color Preferences in Consumer Purchase Decisions", *Color Research and Application*, 43(2): 258-267. Doi: 10.1002/col.22180