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DETERMINATION OF COLOR HUE PREFERENCES ON GENERATING HARMONY IN THE CASE OF INTERIOR ARCHITECTURE STUDENTS

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Abstract
Color is one of the most important elements of design. The aim of this study is the determination of interior architecture students' preferences of color usage in their designs and of the level of persistence in their preferences for different harmonies. The survey has been conducted with 500 students from "Interior Architecture" and "Interior Architecture and Environmental Design" undergraduate programs in Turkey and TRNC. In this study, for which survey was used as the data gathering method, the questions consist of three parts. In the first part of the survey, the students were asked for their demographic information and the favorite colors they prefer for their daily personal belongings. In the second part, the students were given seven criteria, which are likely to influence their color preferences in design and were requested to prioritize them. In the third part, an eight-sliced color chart was given and they were asked for choosing colors to create monochromatic, dyad, multi-color and complementary color harmonies in design. As a result of the study, it has been observed that, along with the designer identity, several factors such as the function of design and dimensions of space, user age and gender profile, psychological effects of colors that mainly affect the color preferences of students. In addition to this, it has been determined that, Interior Architecture students usually prefer to use their favorite colors in generating harmony for their interior designs and tend to maintain their preferences for different harmonies.
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Key Words: *Interior Architecture; Color Preference; Design; Harmony; Color*

1. Introduction

Colors are used for stimulating a mood or emotion [1]. Dynamism or the monotone character of the emotion which is desired to be created can be provided with conscious color preferences. Design atmospheres with high visual aesthetics can be created by using different tones of one color hue or multiple color hues together. In order to create the targeted effect, the harmony between the colors should be built correctly. The concept of harmony can be defined as the accord and balance between at least two different colors. When the colors are brought together, they interact with each other and visual aesthetic is achieved [2]. Using different types of colors together can create relaxing effects in the design, also striking and stimulant effects can be achieved. This variety can be created by using various harmony types within the design.

2. Harmony Types

While diversifying color harmonies, color positioning on the color circle is based on. Depending on the closeness or distantness, and warmth and coolness of colors, as well as the number of color hues are used in the harmony, it is possible to make harmony classifications. Combinations created by bringing multiple colors together can be named as *dyad* for two colors, *triad* for three colors, *tetrad* for four colors and *hexad* for six colors [3].

2.1. Monochromatic Harmony

This is the harmony type that created by using different values and saturation of a single color hue on the color circle together. This is one of the easiest and risk free methods to apply among harmony types. A relaxing and calm effect can be created with this harmony type [4]. The monotone effect of the harmony can be broken by emphasizing the differences between the values and saturation of the colors.

2.2. Analogous Harmony

This is the harmony type where a color on the color circle is used together with its adjacent colors on the circle. Even if the color hue is different, the color transitions will be close; therefore this harmony application is one of the easiest ones like monochromatic harmony. It is possible to create nice looking color combinations with this harmony type [5].

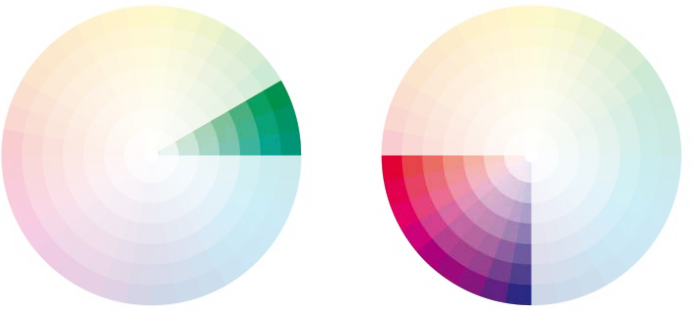


Fig. 1. (a) Monochromatic Harmony; (b) Analogous Harmony

2.3. Complementary Harmony

This is the harmony type where the opposite colors on the color circle are used together. Since the colors are complement of each other due to their attributes, they strengthen each other when brought together. Created visual effects can be controlled by adjusting the size, value and saturation of the colors. This is one of the harmony methods usually used for creating stimulating effects [6].

2.3.1. Double Complementary Harmony

This is the harmony type where two component color pairs on the color circle are used together. In terms of number of colors, this harmony type is in the tetrad group, but its difference from the tetriadic harmony is that there isn't equal distance between different color pairs. Considering that using complement colors is challenging already, using two complement color pairs is a more challenging harmony method to apply.

2.3.2. Split Complementary Harmony

This is the harmony type where a color on the color circle is used with two color types which are adjacent and equal distance to that complement color.



Fig. 2. (a) Complementary Harmony; (b) Double Complementary Harmony; (c) Split Complementary Harmony

2.4. Triadic Harmony

This is the harmony type where three different color types with equal distance to each other on the color circle are used together. It is created by using three primary or three secondary colors together simultaneously [7]. Since the number of types is increased and there isn't any opposition between the colors, this is one of the difficult harmony method to apply.

2.5. Tetriadic Harmony

This is the harmony type where two different complement color pairs with equal distance to each other on the color circle are used together.

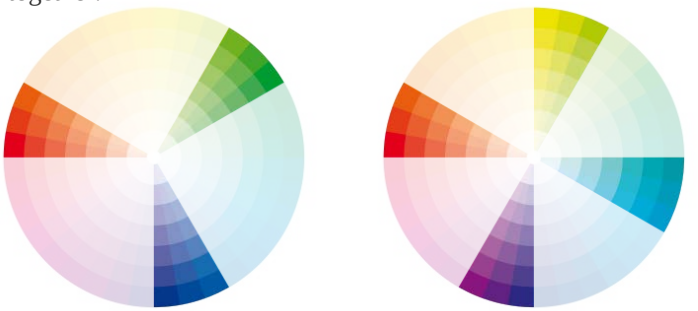


Fig. 3. (a) Triadic Harmony; (b) Tetriadic Harmony

3. Research Method

Within the scope of the study a survey involving 500 students studying in the "Interior Architecture" and "Interior Architecture & Environmental Design" graduate programs in Turkey and Turkish Republic of Northern Cyprus was conducted. Survey questions are divided into three sections.

In the first section, students were asked about the university- department they study at, academic periods, genders, their favorite colors used in the personal belongings they use in their daily lives. A total of 8 colors were presented, where 3 primary colors were *Red*, *Yellow* and *Blue*; 3 secondary colors were *Green*, *Orange* and *Purple*; and 2 achromatic colors were *Black* and *White*, and they were asked to make a selection. Also, in order to allow them make additions to the colors given, the "other" option was added.

In the second section, seven different criteria that may affect the color preferences in design were given and they were asked to sort these criteria based on the degree of importance to them. While sorting, they weren't allowed to list multiple criteria with same level of importance. Besides, in order to allow them make additions to the criteria given, the "other" option was added. Criteria given in this section are listed as below;

- Your designer identity (Your favorite color)
- Psychological effects of colors
- Age and gender profile of users
- Conditioned reflexes
- Architectural trends
- Function of the design / space
- Dimensions of the design / space

In the third section, a color circle divided into eight pieces was given. They were asked to make selections from the regions of the circle depending on the scenarios where they will apply to the design with monochromatic, dyad, multi-color and complementary color harmonies. Color circle used in this section is as below:



Fig. 4. Color circle with eight pieces

4. Findings and Comments

A total of 500 students, of whom 375 were female and 125 were male, were participated in this survey. 330 of these students continue their education at the "Interior Architecture" and 170 of them continue their education at the "Interior Architecture and Environmental Design" departments (See Fig.5).

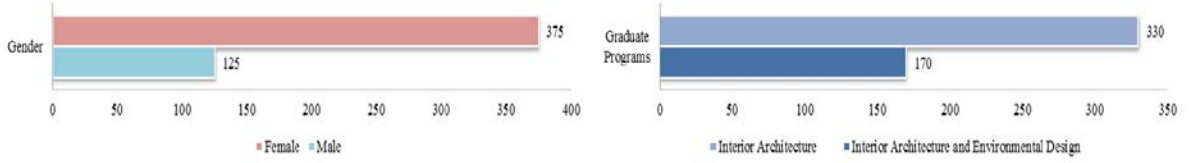


Fig. 5. Distribution of students participated in the survey based on their gender and graduate programs

For the question asking the favorite color they prefer in the personal belongings which they use in their daily lives, *Black* was chosen by 198 students (39.6%) and determined as the most preferred favorite color. *Blue* was chosen by 79, *White* was chosen by 43 and *Red* was chosen by 31 students, constituting the majority of preferred favorite colors. Favorite color distribution of female and male students participated in the survey is given in Fig. 6.

Answers given to the "Other" option in the question have demonstrated that students might prefer using different colors as their favorite color too. It has been observed that the answers given consisted of achromatic color *Grey* and secondary colors. Most preferred color in the "Other" option was *Grey* with 20 preferences. It was followed by *Brown* - chosen by 14, *Pink* - chosen by 10 and *Maroon* - chosen by 8 making the majority of choices in the "Other" option. These colors were also followed by *Navy Blue*, *Turquoise*, *Cream*, *Golden*, *Earth*, *Saxe*, *Plum*, *Marsala*, *Tobacco*, *Fuchsia*, *Emerald*, *Lilac*, *Mustard* and *Beige*, respectively.

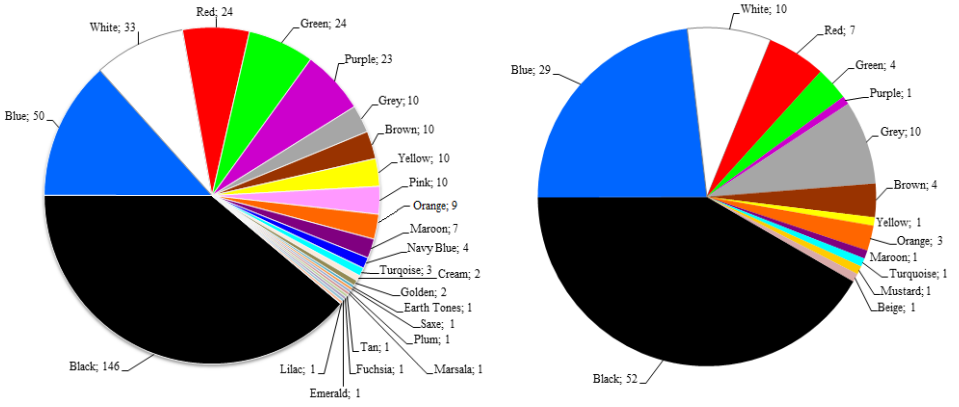


Fig. 6. Distrubition the favourite color preferences of female and male participants

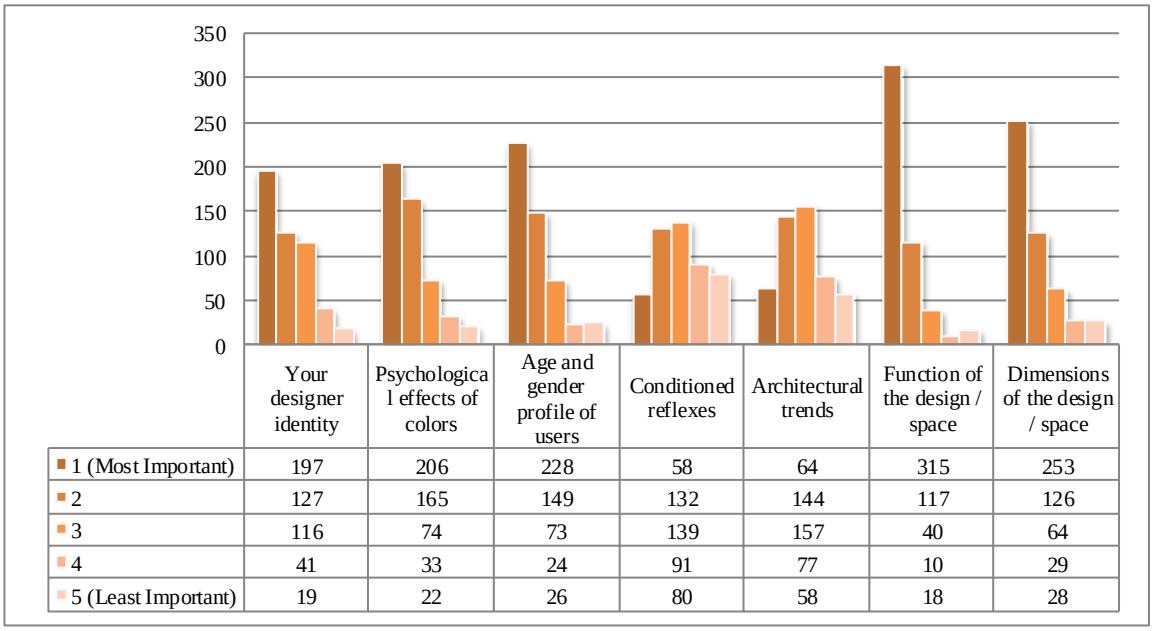
When the level of importance to the criteria affecting participants' color preferences in the design was observed, it was seen that the criteria were mostly ranked as *1 (Most Important)* below respectively;

- Function of the design / space (%63)
- Dimensions of the design / space (%50,6)
- Age and gender profile of users (%45,6)
- Psychological effects of colors (%41,2)
- Your designer identity (your favorite color) (%39,4)

On the other hand, two criteria were mostly rated as 5 (Least Important) are as below.

- Conditioned reflexes (%16)
- Architectural trends (%11,6)

Rating distribution of each criteria rated between 1 and 5 are given in Fig.7.



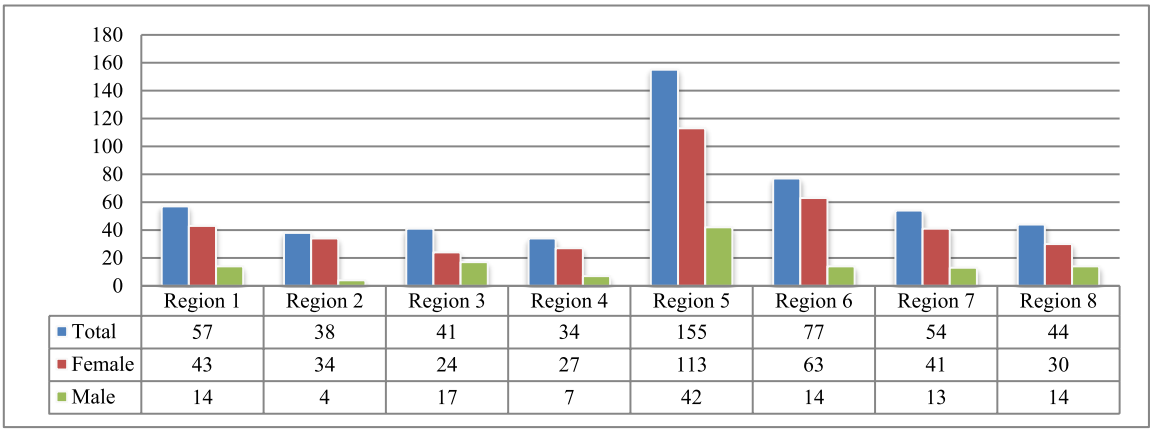
	Your designer identity	Psychological effects of colors	Age and gender profile of users	Conditioned reflexes	Architectural trends	Function of the design / space	Dimensions of the design / space
1 (Most Important)	197	206	228	58	64	315	253
2	127	165	149	132	144	117	126
3	116	74	73	139	157	40	64
4	41	33	24	91	77	10	29
5 (Least Important)	19	22	26	80	58	18	28

Fig. 7. Distribution of participants based on the ratings of design criteria

In the first question of the third section, where color preferences in different harmonies were determined, students were asked to make color selections for the monochromatic harmony. When observed with regards to the number of students, the 5th region in the circle has been the most preferred area in the monochromatic harmony by a total of 155 students (31%), of whom 112 were female (30.13%) and 42 were male (33.6%). 4th region in the circle has been the least preferred area in the monochromatic harmony by a total of 34 students (6.8%), of whom 27 were female (7.20%) and 7 were male (5.6%).

When observed in terms of gender, most preferred ones stayed the same, whereas the results of least preferred ones have varied. Among female participants, 3rd region was the least preferred region in monochromatic harmony by 24 female (6.4%); whereas 2nd region was the least preferred region in monochromatic harmony by 4 male (3.2%). In this section, it was observed that the most preferred region in total for monochromatic harmony contained cool colors, whereas the least preferred region mainly included warm colors.

Distribution of color preferences of the participants in the monochromatic harmony are given in total and based on gender in Fig. 8. Most and least preferred regions by the participants within the monochromatic harmony in total are given in Fig. 9.



	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8
Total	57	38	41	34	155	77	54	44
Female	43	34	24	27	113	63	41	30
Male	14	4	17	7	42	14	13	14

Fig. 8. Distribution of participants based on their color preferences in monochromatic harmony



Fig. 9. For monochromatic harmony; (a) most preferred region in total; (b) least preferred region in total

In the second question of the third section, the students were asked to make color selection for the dyad color harmony. When observed with regards to the number of students, the 4th & 5th regions in the circle have been the most preferred areas in the dyad color harmony by a total of 49 students (9.8%), of whom 38 were female (10.13%) and 11 were male (8.8%). 3rd & 6th regions and 3rd & 8th regions in the circle have been the least preferred areas in the dyad color harmony by a total of 7 students (1.4%), of whom 6 were female (1.6%) and 1 was male (0.8%). In this section, it has been observed that the most preferred region in total for the dyad color harmony included “cool-close colors”.



Fig. 10. For dyad color harmony; (a) most preffered region pair in total; (b)-(c) least preffered region pair in total

In the third question of the third section, the students were asked to make color selection for multi-color harmony. When observed with regards to the number of students, the 5th & 6th & 7th regions in the circle have been the most preferred regions for being used together in the multi-color harmony by a total of 37 students (7.4%), of whom 25 were female (6.67%) and 12 were male (9.6%). 1st & 2nd & 7th regions and 3rd & 4th & 8th regions in the circle have been the least preferred area in the multi-color harmony by a total of 2 students (0.4%), of whom 1 was female (0.26%) and 1 was male (0.8%). When observed in terms of gender, there wasn't any difference in the results of most and least preferred results. In the most preferred region triad in this section, cool-close colors were preferred along with Blue as the main color. In the least preferred region triads, it was observed that “warm-close colors & cool secondary color” and “cool-close colors & warm-primary color” combinations were preferred.



Fig. 11. For multi-color harmony; (a) most preffered region triad in total; (b)-(c) least preffered region triad in total

In the forth question of the third section, the students were asked to make color selection for the complementary color harmony. When observed with regards to the number of students, the 4th & 8th regions in the circle have been the most preferred areas for being used together in the complementary color harmony by a total of 80 students (16%), of whom 61 were female (16.26%) and 19 were male (15.2%). 3rd & 7th regions in the circle have been the most preferred area in the complementary color harmony by a total of 43 students (8.6%), of whom 32 were female (8.5%) and 11 were male (8.8%). When observed in terms of gender, female students' preferences were equal (61 female - 16.26%) in 1st & 5th regions in the most preferred results, and there wasn't any change observed in the least preferred results. Most preferred region pair for the complementary color harmony in this section were “warm-primary color & cool-secondary color” regions. In the preferences of female students, “cool-primary color & warm-secondary colors” were preferred in the same ratio. In the least preferred region pair , it was observed that “warm-secondary color & cool-secondary color” region pairs were preffered.



Fig. 12. For complementary color harmony; (a) most preffered complement region pair in total; (b) most preffered complement region pair in female participants; (c) least preffered complement region pair in total

When the color preferences of the students participating in the survey in harmony types were observed in general, it was observed that a total of 367 students (73.4%), of whom 273 were female (72.8%) and 94 were male (75.2%) maintained their color preferences at least in 3 different harmony types. Numeric distribution of harmony types where the color preferences were maintained is as below:

- A total of **106 students**, of whom 81 were female and 25 were male, maintained their preferences in monochromatic, dyad color, multi-color and complementary color harmonies,
- A total of **173 students**, of whom 124 were female and 49 were male, maintained their preferences in monochromatic, dyad color and multi-color harmonies,
- A total of **16 students**, of whom 12 were female and 4 were male, maintained their preferences in monochromatic, dyad color and complementary color harmonies,
- A total of **17 students**, of whom 14 were female and 3 were male, maintained their preferences in monochromatic, multi-color and complementary color harmonies,
- A total of **55 students**, of whom 42 were female and 13 were male, maintained their preferences in dyad color, multi-color and complementary color harmonies.

Total 239 students involving 186 female and 53 male students stated a color other than *Black*, *White* and *Grey* as their favorite color. It has been observed that a total of 179 students (74.89%), of whom 141 were female (75.8%) and 38 were male (71.69%), among the students who chose a chromatic color as their favorite color preferred their favorite colors at least in one harmony type. A total of 60 students (25.1%), of whom 45 were female (24.19%) and 15 were male (28.3%) did not choose to use their favorite colors in any harmony type.

5. Conclusion

As a result of the study, it has been observed that Interior Architecture students preferred to use Blue and its tones for harmony applications in the design. Since the most preferred chromatic color among the favorite color selections was Blue, it has been concluded that the favorite color was preferred primarily for creating harmony. In color selections in single, dyad, multi-color and complementary color harmonies, *Blue* included regions were chosen mainly; therefore it is possible to say that students had the tendency to maintain their color preferences for different harmonies too. This determination stands out when the characteristics and relations of regions that preferred for harmony applications have been examined. The most preferred region for monochromatic harmony includes cool colors. The regions that include cool-close colors were mostly preferred in dyad color harmony. Similarly, the regions that include cool-close colors were mostly preferred for multi-color harmony. When all these findings have been evaluated it has been determined that cool colors were mostly preferred for all harmony applications and close colors were preferred when the quantity of color hue increases.

It has been concluded that students preferred very close color harmony types in the color selections among dyad and multi-color harmonies, therefore they tend towards less risky and clam harmony types. However, in addition to their designer identities, variables such as function of the design and dimensions of the space, user age and gender profile and psychological effects of colors have been the criteria affecting the color preferences of students.

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