Journal of International Architectural Sciences
JIArcS, 2025, 2 (2): 94-113
Research Article
https://mimarlikbilimleri.com/ojs/index.php/architecturalsciences
E-mail: architecturalsciences@gmail.com
e-ISSN: 3062-1399

Design Strategies for Color Use in Residential Interiors

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Abstract

This study aims to propose color design strategies by examining the relationship between color preferences, user psychology, and spatial perception in residential interiors. Colors were evaluated holistically, not only by their basic types (hue) but also by their value (lightness/darkness) and saturation. The analyses reveal that warm colors are suitable for social interaction and dining spaces, while cool colors should be preferred in resting, sleeping, and working spaces. The research findings indicate that the same color type can elicit different psychological and physiological responses at different value and saturation levels, and that color effects vary significantly depending on the space's function, user profile, and contextual factors. Based on these findings, the study provides practical color strategies to optimize the user experience for different residential spaces (living rooms, bedrooms, workspaces, etc.).

Keywords: *Space color, Residence, Color effect, Color components.*

Konut Mekânlarında Renk Kullanımına Yönelik Tasarım Stratejileri

Öz

Bu çalışma, konut iç mekânlarında renk tercihleri ile kullanıcı psikolojisi ve mekânsal algı arasındaki ilişkiyi inceleyerek, renk tasarım stratejileri önermeyi amaçlamaktadır. Çalışmada, renkler yalnızca temel türleriyle (hue) değil, değer (açıklık/koyuluk) ve doymuşluk bileşenleriyle birlikte ele alınarak bütüncül bir şekilde değerlendirilmiştir. Yapılan analizler, sıcak renklerin sosyal etkileşim ve yeme-içme mekânları için uygun olduğunu, soğuk renklerin ise dinlenme, uyuma ve çalışma alanlarında tercih edilmesi gerektiğini ortaya koymaktadır. Araştırma bulguları, aynı renk türünün farklı değer ve doymuşluk düzeylerinde farklı psikolojik ve fizyolojik tepkilere yol açabildiğini, renk etkilerinin mekânın işlevi, kullanıcı profili ve bağlamsal faktörlere göre önemli ölçüde değişkenlik gösterdiğine işaret etmektedir. Çalışmanın sonucunda, bu bulgulardan hareketle, farklı konut mekânları (oturma odası, yatak odası, çalışma alanı vb.) için kullanıcı deneyimini optimize etmeye yönelik pratik renk stratejileri için uygulanabilir bir kılavuz sunulmaktadır.

Anahtar kelimeler: *Mekan rengi, Konut, Renk etkisi, Renk bileşenleri.*

Citation: Duyan, F. (2025). Design strategies for color use in residential interiors. *Journal of International Architectural Sciences*. 2 (2): 94-113.

DOI: https://doi.org/10.5281/zenodo.18068467

Received: *September 17, 2025* – ***Accepted:*** *December 07, 2025*

1. Introduction

Residential space is not merely a physical structure, it is a multidimensional collective of spaces that fulfills an individual's fundamental needs for security, privacy, and belonging while encompassing all functions of daily life. As the setting where people spend more than half of their lives, the residential environment hosts a wide array of activities, and its multifaceted design directly shapes both individual experience and behavioral and emotional processes. Consequently, residential interiors, with areas designated for sleeping, dining, socializing, reading, watching television/movies, studying, and increasingly, working, respond to diverse needs through design components such as form, color, texture, and lighting. The holistic composition of these components creates not only perceptual but also psychological and physiological effects on the user. Within this holistic framework, color, in particular, stands out as one of the most fundamental design elements that determines the perception of a space, guides user attitudes and behaviors, and shapes the identity of a residence. Mahnke (1996) defined color as a phenomenon 'created by light and an energy form that affects bodily functions and directs mental and emotional processes,' emphasizing its influence on the nervous system and hormonal activities. In this context, the colors used in interior spaces are not merely an aesthetic element but a powerful tool that directs users' physiological responses, moods, and spatial perception. The color of a space can create a stimulating effect by increasing heart rate, a relaxing effect by slowing it down, or at times, a cheerful effect, while also mediating the perception of the space as gloomy, peaceful, spacious, or bright.

The effects of color in a space extend beyond its physiological and emotional dimensions, directly relating to its functional context. The purpose of a space is a decisive factor in color selection. While more neutral and calming colors are suitable for study areas that require intense attention and mental focus, vibrant and stimulating colors are prominent in spaces for socializing, dining, or entertainment. In relaxation and sleeping areas, serene colors that provide peace and tranquility are prioritized, while circulation areas utilize color schemes that guide movement and increase dynamism. This context demonstrates that color selection is a strategic tool that shapes the user experience according to the intended use of the space.

Interior wall colors, as a design component, hold a significant place in spatial perception due to the large surface area they cover. As noted by Hutchings et al. (2012), walls are a design component of interiors through their colors. Walls have been the backdrop of human life since humanity began living in caves (Ulusoy et al., 2020). They provide a background for the objects within the space, playing a role in highlighting them or making them recede. In this context, color studies for interior spaces are largely based on wall colors.

On the other hand, color preferences vary from person to person, from culture to culture, and according to geographical conditions and spatial context. For example, an individual who likes purple may use this color in their clothing choices but may not show the same inclination when choosing a car or interior color. Studies conducted independently of context have shown that blue tones are generally preferred, and the main reason for this is that the sky, seas, and clean water sources are blue (Palmer & Schloss, 2010). However, the colors used in living spaces vary depending on the function of the space, the color-texture characteristics of furniture and fixtures, and the psychological impact of the space on the user. Therefore, color selection in residential interiors should be considered as a holistic design decision that supports the function of the space and guides the user experience.

1.1. Theoretical Framework of Color

To understand the effects and perception of color in architecture, it is first necessary to grasp color science. The subject of color is a broad and profound scientific field, extending beyond simple adjectives like red, blue, or purple used to identify an object or surface. The word "renk" in Turkish is derived from the Persian word "reng." The Greek word "chroma" means color, and the term "chromatic" refers to having a color other than black, white, and gray. To perceive, define, or use color, one must understand its various properties. Scientifically, colors are addressed in two forms: light colors and surface colors. Color is a property of light, and the specific color is determined by the light's

wavelength. The visible spectrum, or colored radiation, constitutes the region between 360-780 nm of the electromagnetic spectrum (Figure 1).

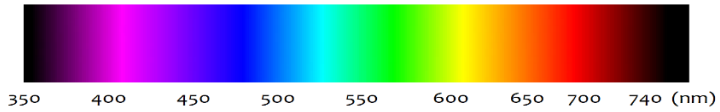


Figure 1. Visible spectrum of radiation and wavelengths of colors (Created by the Author)

Color, an intermediary that surrounds our visual world and helps us distinguish, define, and even form emotional connections with objects or surfaces, consists of light stimuli that originate from a light source, strike surfaces/objects, and are reflected to our eyes, stimulating our brain through the visual system (Figure 2). The contrasts between colors in our environment also help us define and evaluate our surroundings. A bird's ability to spot a red berry among green plants and survive stems from the perception created by this color contrast (Mahnke, 1996). Similarly, the widespread use of yellow for taxis in many parts of the world is due to this color being in the area to which the visual system is most sensitive, making it more visible than other objects and allowing users to notice it from a distance.

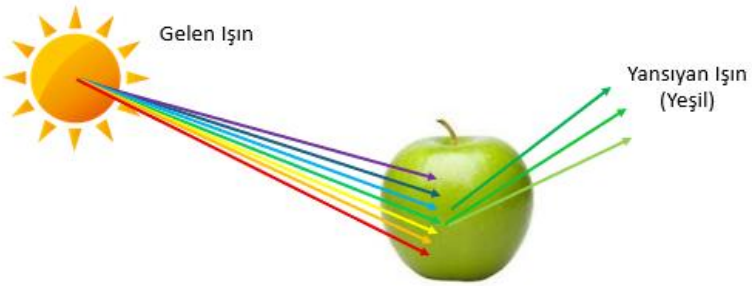


Figure 2. Reflection of light from a surface (Created by the Author)

Color perception is a complex process that influences how we interpret and experience our environment, and its foundation is shaped by both scientific and artistic approaches. The first systematic studies on color began with Isaac Newton's separation of white light with a prism, which established color as a physical reality. The "Young-Helmholtz Three-Color Theory," developed by Thomas Young and Hermann von Helmholtz, proposed that three types of cone cells in the eye (red, green, blue) are sensitive to different wavelengths (Wandell, 1995), while Ewald Hering's "Opponent-Process Theory" argued that colors are processed in opposing pairs (red-green, blue-yellow) (Hering, 1878). In addition to these scientific approaches, concepts such as hue, value (lightness/darkness), and saturation were first brought together in Philipp Otto Runge's Farbenkugel (Color Sphere) model (Gage, 1999). Subsequently, the Munsell Color System developed by Albert H. Munsell (1915) and the CIE 1931 Color Space created by the International Commission on Illumination (CIE) enabled the quantitative and objective definition of colors (Fairchild, 2013). All these developments demonstrate that color is not merely a visual element in spatial design but a physiological and psychological tool based on scientific principles.

1.2. Color Compenents

To comprehend color more effectively, it is insufficient to define it merely with basic designations like red, yellow, or blue. Color can be understood more comprehensively when examined beyond these simple classifications, by considering its different components. For this reason, the systematic explanation of the color phenomenon becomes apparent in systems like the Munsell Color System (Munsell, 1915).

The chromatic properties of both light and surface colors are defined by three components that can vary independently of each other: hue, value (lightness/darkness), and saturation. Hue specifies a color's fundamental identity, such as its name, like red, yellow, or green. Value indicates how light or dark a color is. This component also expresses the amount of black or white within a color. In the Munsell system, value is defined by a ten-step gray scale between black (0) and white (10). For example, increasing the value of red turns it into a lighter shade, or pink. Saturation, on the other hand, expresses a color's purity or intensity. This determines how vivid or how dull a color appears. A color

with low saturation contains more gray and looks duller, while a high-saturation color looks more vivid and pure. In the Munsell system, saturation increases as one moves away from the gray axis on a hue page. For example, increasing the saturation of a red turns it into a brighter and more intense red (Figure 3).

Colors are defined by color ordering systems. In these systems, similar colors are placed next to each other, and color changes or perceptual steps are arranged in a sequential manner. Colors defined in a specific order are matched with particular coordinates in space and transformed into a three-dimensional system called a "color solid" (Figure 3). The Munsell Color System, one of the surface color systems, was created based on the decimal system in accordance with equal perceptual steps. In this system, defined by hue, value, and saturation components, each hue is shown with its different values and saturations on a single page (Figure 4). In the Munsell color system, on any hue page, as one moves away from the value bar extending from black to white, the proportion of gray in the color decreases, and the purity, or saturation, of the color increases. In the red hue (Munsell 7R) page in Figure 4, it can be seen that as one moves from low to high saturation, the red color becomes purer, i.e., its saturation increases. If the proportion of white within a specific hue and saturation is increased, the color will lighten; in other words, its value will increase. For example, the dark red of a red hue, maroon, will evolve toward pink (Figure 4).

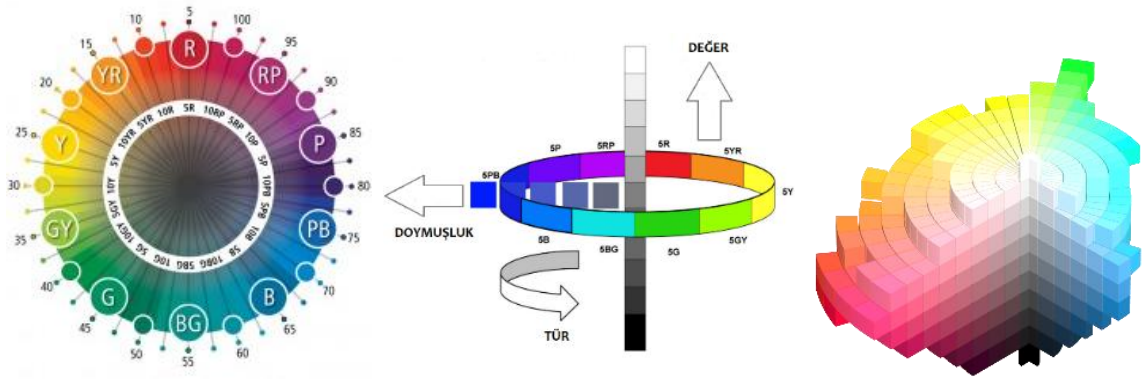


Figure 3. Munsell Color System (Munsell Color, 2025)

Most fundamental color terms are based on hue or refer to it (e.g., red, orange, yellow), but some describe lightness (e.g., pink is a light red, brown is a dark yellow or orange) or color saturation (e.g., gray, light blue) (Jonauskaite & Mohr, 2025). However, a single hue is defined across a very broad color scale with different values and saturations.

Considering the explanations above, defining color only in terms of hue—such as red or yellow—is a very superficial approach, given that the human visual system can distinguish up to 2.5 million color sensations (Pointer & Attidrige, 1998; Linhares et al., 2008). In this context, the relationship established in the context of hue, value, and saturation, rather than just hue, will play an effective role in understanding color's effect on humans and the studies to be conducted in color design within a specific systematic framework.

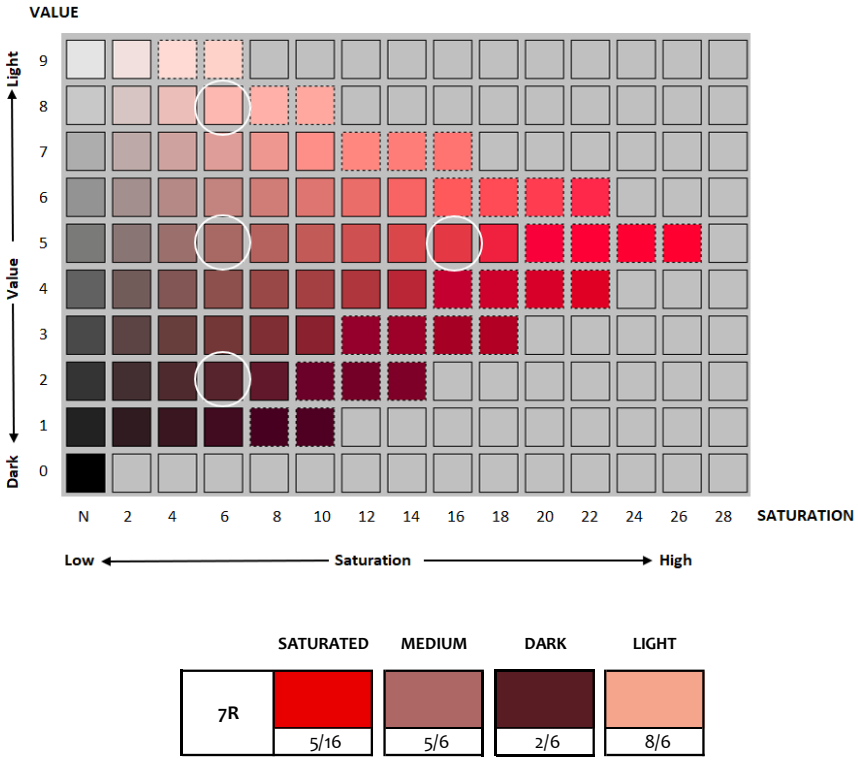


Figure 4. Colors of the red type (Munsell 7R) with different values and saturations (Created by the Author)

1.3. Use of Color in Interiors and Residential Spaces

Interior colors are one of the most fundamental elements shaping the spatial experience. Colors not only affect visual perception but also influence individuals' psychological states, physiological reactions, and behaviors within a space (Mahnke, 1996; Kaya & Epps, 2004). Therefore, in interior design, color emerges as a powerful design parameter that must be evaluated in conjunction with its functional, physiological, and psychological dimensions. The literature, particularly studies on color preferences in residential spaces, indicates that colors have a direct effect on individuals' quality of life and perception of spatial comfort (Yıldırım et al., 2011; Jonauskaite & Mohr, 2025). Consequently, examining the psychological associations created by different color in interiors and their contribution to user experience is significant from both a theoretical and an applied perspective.

A color's hue is defined by its wavelength in the light spectrum. Colors with short wavelengths are associated with "cool" colors. The shortest wavelength color is violet (360-400 nm), followed by blue (400-480 nm) and green (520-565 nm). The longest wavelength is red (625-740 nm), followed by orange (590-625 nm) and yellow (565-590 nm), which are associated with "warm" colors (Nakasian, 1964; Crowley, 1993; Yıldırım et al., 2011). Cool colors (blue, green) generally have calming, peaceful effects, while warm colors (red, orange, yellow) have stimulating, energizing effects. These general psychological effects are consistently observed in studies on interior color perception (Valdez & Mehrabian, 1994; Nelson et al., 1984). Research on color use in spaces indicates that colors with short wavelengths are predominantly preferred by users. This preference suggests a general relationship between mood and wavelength in spatial perception (Valdez & Mehrabian, 1994). Experimental research suggests that, in parallel with the relaxing effect of the natural environment, such as the blue sky and vast green vegetation, cool colors with short/medium wavelengths like blue and green have a calming effect and make an interior space appear more peaceful (Yıldırım et al., 2011; Ulusoy et al., 2020; Jonauskaite & Mohr, 2025). Depending on its value and saturation components, the color blue can, in some cases, also create a melancholic and somber effect, making the space feel dull, static, and boring (Manav, 2015).

A great deal of evidence in the literature shows that colors have strong effects on individuals' emotional states (Jonauskaite & Mohr, 2025; Valdez & Mehrabian, 1994; Mahnke, 1996; Kaya & Epps, 2004). Levy's (1984) study demonstrated a systematic relationship between color and emotion, finding

that warm colors, especially red, activate more active emotions like "anger," and yellow, "sadness," while cool colors evoke feelings of "calmness" in blue tones and "serenity" in purple tones. Jonauskaite & Mohr's (2025) comprehensive literature review systematically presents common inferences about the color-emotion relationship. According to their review, yellow, green, green-blue, blue, and pink colors, as well as white, light/bright, and saturated colors, are more frequently associated with positive connotations, whereas brown, gray, black, and dark colors tend to create more negative associations. Furthermore, red, yellow, and saturated colors in general are linked to high arousal levels, while blue, green, white, and gray are associated with low arousal.

Red is the most debated color in the literature, with both positive and negative connotations. While it is attributed with positive effects such as increasing blood pressure, and being stimulating, powerful, passionate, and appetite-inducing, it can also trigger negative emotions like aggression, hyperactivity, and anger (Kaya & Epps, 2004). Research by Küller et al. (2009) in rooms painted with saturated red found that red increased brain activation and heart rate. In contrast, pink, a low-saturation and high-value tone of red, creates a different effect with its calming and happiness-inducing properties. Indeed, Schauss's (1979) study in a prison setting reported that pink wards reduced aggression and aggressive behavior among inmates.

Many studies on color show that green is most associated with nature (Sakarya & Canpolat, 2015; Kaya & Epps, 2004). The renewal and freshness of nature express this color's association with concepts such as peace, harmony, relaxation, freshness, silence, contentment, happiness, and hope in a space (Ulusoy et al., 2020). While green gives positive results in creating a serene environment, its intensive use can create laziness and sluggishness (Manav, 2015).

In interior design, the effect of color has been examined by classifying it primarily based on hue in many studies. However, this approach may be insufficient to fully explain color's perceptual and psychological effects, as the same hue can create entirely different experiences and contrasting effects at different value and saturation levels (Elliot, 2015). For instance, a high-saturation red can have a stimulating and aggressive effect, while a low-saturation, high-value red (e.g., pastel pink) can be calming. Therefore, considering the hue, value, and saturation components together is of critical importance for understanding color's effect.

Kaya & Crosby (2006) investigated color preferences in residential buildings and found that preferences were shaped more by value and saturation than by hue. The study showed that low-saturation and light colors provided a low arousal level, but this did not always align with a calming home atmosphere, indicating a complex interaction. Al-Ayashi et al. (2016) stated that users perceived all high-saturation colors as "vibrant," regardless of whether they were warm or cool. The same study reported that high-saturation yellow and red tones were found to be disturbing and unsuitable for work environments. The findings of Valdez & Mehrabian (1994) support this view. These results suggest that the primary determinant of color effect is not hue but rather saturation and lightness.

Some studies have shown that gender differences also play a decisive role in color preferences. Duyan & Ünver's (2018) study on living room color preferences found that female participants preferred warm colors (red, orange, yellow), while male participants leaned toward medium and high-value tones of cool colors (especially blue and blue-violet). Similarly, in their studies on dormitory buildings, Costa et al. (2018) found that women preferred purple hues more intensely compared to men, while men showed a more pronounced inclination toward blue hues. However, the literature on such gender-based differences is limited.

The relationship between the color of a space and its function is one of the key elements that guide user experience in interior design. Colors are not merely emotional, meaningful, or perceptual, they are also functional tools that support the intended use of the space and guide user behavior (Kwallek, Lewis & Robbins, 1997; Manav, 2007). For example, the preference for cool hues like blue and green in work areas is associated with increased focus and productivity, while the use of warm hues like red and orange in social areas promotes vibrancy and interaction. Similarly, it has been reported that light and neutral colors used in healthcare spaces create a calming atmosphere by reducing stress levels (Dalke et al., 2004; Aydoğdu, 2024). Kaya & Crosby (2006) examined 18 different colors and various

building types (residences, restaurants, religious buildings, hospitals, hotels, shopping malls, educational structures, entertainment venues, official buildings, and factories) and found that color preferences were linked to emotional associations, and these associations were influenced by the knowledge individuals gained from their color experiences in the built environment. In this context, it can be stated that selecting colors that are compatible with the function of the space positively affects both the effective use of the space and the psychological and behavioral reactions of the users.

Color is a powerful tool for manipulating the perceived physical properties of a space. It is known that different hues and their use at high/low values or high/low saturation affect the perception of a space as large/small, narrow/wide, bright/dark, or focusing/distracting. Studies on the perception of room size have shown that cool hues like blue and green have a relaxing and refreshing effect by making the space appear larger (Kaya & Epps, 2004). Studies with warm colors suggest a tendency to make an interior look narrower but more active (Nelson et al., 1984; Whitfield & Wiltshire, 1990; Crowley, 1993). Freiling stated that painting all walls in warm tones creates a surrounding, unifying, and visually restrictive effect (Freiling, 1979). Gage (1999) suggested that dark colors help gather attention and make boundaries perceptually more defined. The literature also emphasizes that dark colors make the ceiling appear lower (Evans & McCoy, 1998). Specifically, dark and warm colors (e.g., dark red, brown) can make surfaces stand out, making the space feel narrower, lower, and more intimate (Mahnke, 1996). In general, some studies have stated that light and cool colors (e.g., light blue, lavender) push surfaces back, making the space appear wider and higher and increasing the sense of spaciousness (Gage, 1999; Savavibool & Moorapun, 2017). High-saturation (vivid) colors reinforce the feeling of narrowness and intensity in spatial perception, while low-saturation and high-value colors create a more expansive, calm, and refreshing feeling, thereby having a soothing effect (Küller et al., 2009).

Research focusing on residential spaces shows clear differences in color preferences according to different room functions. A study on residential interiors examined the color suitability of living rooms and bedrooms and concluded that the use of a color changes according to the function of a room (Slatter & Whitfield, 1977). In Manav's (2007) study, participants preferred pink (high-value red) for bedrooms, light blue for living rooms, and light yellow for dining areas. Similarly, Torres et al.'s (2020) research in a nursing home revealed that warm colors (yellow, orange, red) were preferred in social living areas, while cool colors (blue, purple, green) were preferred in bedrooms. In a study on spatial color preference, participants associated cool colors and blue with residences, hotels, and hospitals, and warm colors and red with entertainment buildings like restaurants, theaters, and shopping malls. The study also found that purple was the least preferred color for residential building types, whereas blue (due to its calming associations like peace and relaxation) or red (due to participants' prior experiences with brick colors) emerged as the most preferred colors (Kaya & Crosby, 2006).

A study by Costa et al. (2018) revealed that blue and green were the most preferred colors in dormitory rooms. Ulusoy (2024), in a color study on geometric wall surfaces in bedrooms, determined that the most preferred colors were purple, followed by brown and blue. This shows that color preference can vary depending on the context (e.g., shape). Another study by Ulusoy et al. (2020) emphasized that the color green creates positive emotions in interiors, referencing 'home,' 'peace,' and 'joy of life.' The results of the same study suggest that purple should be used more carefully in residential spaces (Ulusoy et al., 2020). In their study on living room colors, Yıldırım et al. (2011) described warm color schemes as "high arousal," "exciting," and "stimulating," while cool colors tended to be associated with "not very exciting," and were also described as "spacious" and "relaxing." Generally, the literature assumes that cool and achromatic colors evoke more calm and peaceful feelings (Yıldırım et al., 2011).

Interior colors are influenced by many contexts, including individual preferences, function, gender, cultural background, and spatial perception. However, studies conducted specifically on the dimension of spatial function indicate the existence of some objective tendencies in the evaluation and preference of colors. As a powerful design parameter that directly affects users' psychological and physiological comfort, color emerges as a fundamental element in residential spaces that supports functional differences, defines the identity of the space, shapes its atmosphere, and guides its use. The conscious and strategic use of color enriches the spatial experience while supporting the functionality

and success of architectural design. This study aims to provide a comprehensive theoretical framework for color use in residential spaces, conduct a systematic analysis of the studies in the literature, and develop design strategies for color use in residences in light of the findings. The goal is to create a comprehensive resource, both academic and practice-oriented, that will provide guidance in color selection within the context of different usage areas and functions in residences.

2. Method and Method

This study adopts a qualitative approach to analyze color knowledge from a theoretical foundation, conducting a systematic literature review on its use in residential spaces. The methodology is structured in two phases.

In the first phase, national and international studies in color theory, color psychology, and spatial design were reviewed to define the psychological and physiological effects of each color for residential use. This phase identified fundamental colors used in interior spaces and correlated them with their functional applications in a residential context.

The second phase involved analyzing the effects of colors on user experience (e.g., stimulating, relaxing, calming) and matching them with appropriate application areas within residential spaces. The data gathered from the literature review were categorized using the Munsell Color System as a reference, including chromatic primary colors (red, yellow, green, blue, purple), intermediate colors (orange, yellow-green, blue-green, blue-purple, and red-purple), and achromatic colors (white, gray, black). The psychological and physiological effects of each color were systematically organized into a tabular format, providing a framework that highlights the functional roles of colors in a residential context.

3. Findings and Discussion

A literature review on residential interiors examined numerous studies and conducted comprehensive evaluations of colors in terms of their functional, affective, and component-based properties. Accordingly, the relationship between color and function is seen as a particularly important factor in interior design. While the spatial arrangement of residences is often shaped by individual or family preferences, existing studies show that color perception reveals not only subjective differences but also certain objective tendencies.

3.1. Evaluation of Colors in Residential Spaces

Studies on the effects of interior colors on users show that warm colors have stimulating, activating effects (Figure 5), while cool colors have calming, relaxing effects (Jonauskaite & Mohr, 2025). Many studies indicate that red, at medium to high saturation, is stimulating, and yellow and orange are slightly stimulating but also cheerful (Silters et al., 2023; Jonauskate & Mohr, 2025).



Figure 5. Interiors using warm colors; Left and right (Hygee & Home, 2025), middle (Stylishspaceglobe, 2025)

In the literature, it is reported that the effects of red, the most stimulating of the warm colors (especially its saturated tones), can be both positive and negative (Jonauskaite & Mohr, 2025).

Specifically, red is suggested to negatively impact activities requiring fine psychomotor coordination and cognitive performance (Elliot, 2015; Yıldırım et al., 2011; James & Domingos, 1953; Nakashian, 1964). A study in primary school classrooms found that red wall color distracted students and led to hyperactivity (Duyan & Ünver, 2022). Similarly, research by Küller and colleagues in rooms painted red showed that this color increased brain activity (Küller et al., 2009). However, red's metabolism-accelerating and stimulating effect is positively evaluated as an appetite stimulant, which is why it is frequently recommended for use in dining spaces like restaurants and cafeterias (Elliot, 2015). The effects of pink, a high-value (light) tone of red, and maroon, a dark tone, differ from that of saturated red. In the literature, pink is associated with positive emotions (Jonauskaite & Mohr, 2025), while dark red, similar to other dark colors, creates a focusing and space-constricting effect (Gage, 1999; Duyan & Işık, 2024).

Yellow and orange are reported in many studies to have a high potential for arousal as warm colors (Jonauskaite & Mohr, 2025). Yellow, the color of the sun, is generally associated with happiness and energy, and stands out for its positive effects on individuals (Boyatzis & Varghese, 1994). Due to yellow's warmth and its association with the sun, it is noted that it can make users perceive a space as warmer than it is. Additionally, some research has shown that yellow has a supportive effect on mental activity (Duyan & Ünver, 2022). Orange, formed by the combination of long-wavelength red and yellow, is evaluated as a color associated with dynamism, energy, joy, and creativity (Figure 5). However, it is also emphasized that high saturation and intensive use of orange can cause restlessness (Manav, 2015).

In light of these findings, it can be said that medium and saturated colors of red and other warm colors are suitable for use in residential interiors, particularly in spaces where socialization and dining are prominent, such as living rooms and dining rooms. In contrast, limiting the use of red in spaces where focus and tranquility are important, such as study, relaxation, or sleeping areas, will provide a more balanced design approach. When warm hues are examined based on their value and saturation components, it is reported that light colors of red (pink) have a calming effect (Schauss, 1979). Therefore, warm colors with high value and low saturation may be appropriate for use in bedrooms, relaxation, and study areas. Figure 6 shows the different effects created by the use of light, medium/saturated, and dark tones of red in a bedroom.



Figure 6. Light, saturated and dark shades of red (Created by the Author)

In contrast to warm colors, cool colors such as purple, blue, and green have been shown to have 'relaxing' and 'calming' effects in numerous studies (James & Domingos, 1953; Nakashian, 1964). Blue, in particular, has been highlighted in various studies for its association with improved mood and a sense of tranquility (Rosenstein, 1985; Stone, 2003). Manav's (2007) research also indicated that participants gravitated more toward cool blue colors in living rooms. Similarly, a laboratory study by Küller et al. (2009) revealed that blue rooms had a calming effect on users, reducing their heart rate. It is generally accepted in the literature that while warm colors create a more dynamic atmosphere in a space, cool colors shape spatial perception in a more static, peaceful, and positively associated manner with low arousal levels (Jonauskaite & Mohr, 2025).

The relaxing, calming, and refreshing effects of the blue, blue-green, and green color palette form the primary rationale for their preference in residential interiors, especially in bedrooms, relaxation rooms,

and study rooms (Figure 7). Green's association with happiness is another strong reason supporting its use in all other spaces of the home (Ulusoy, 2020).

Purple, classified within the cool color group, exhibits properties partially similar to other short-wavelength colors in terms of spatial perception and psychological effects (Figure 7). This color, which ranges across a wide spectrum from red-purple to blue-purple, also offers a variety of color options due to its rich saturation scale. Influenced by its red and blue pigments, purple can evoke feelings of calmness and joy, but also sadness and fatigue. Findings in the literature suggest that purple encourages creative thinking (Levy, 1984; Kaya & Epps, 2004). However, despite studies showing a significant relationship between this color and empowering and motivating emotions, users generally avoid using purple in residences (Ulusoy et al., 2020; Jonauskaite & Mohr, 2025).



Figure 7. Examples of interiors in cold colors (Left (Decoholic, 2025), center (Defrente Para Omar, 2025), right (Haus und Gartentrend, 2025))

Formed by the combination of two colors at the beginning and end of the light spectrum, red-purple has been associated with positive emotions such as happiness, love, and serenity, as well as partially with depressive connotations (Kaya & Epps, 2004). A study in primary school classrooms found that red-purple wall color calmed students and helped them focus (Duyan & Ünver, 2022). Furthermore, the lighter tones of this color fall into the pink range, reinforcing its calming potential (Schauss, 1979). Based on these findings, it can be suggested that red-purple may yield positive results, especially in spaces designated for rest, work, and sleep.

Achromatic colors refer to the neutral color group that lacks hue and includes different tones of black, white, and gray. These colors, which range from white to black, are defined solely by the value variable because they lack saturation (Figure 8). Consequently, in spaces designed with a purely achromatic palette, other design elements such as form, texture, and light-shadow contrast take precedence over the psychological or perceptual effects of color (Yıldırım et al., 2011). Nevertheless, it is acknowledged in the literature that achromatic colors have certain emotional connotations. For example, the study by Wilms & Oberfeld (2018) showed that achromatic colors caused a brief slowing of heart rate, a condition linked to a low arousal level. This finding suggests that the intensive use of achromatic colors might create a feeling of stagnation and sluggishness in a space. Other studies indicate that gray is typically associated with low arousal and negative emotions (e.g., lifelessness, melancholy), black with high arousal but negative connotations (e.g., power, authority, fear), and white with high arousal and mostly positive connotations (e.g., purity, spaciousness, emptiness) (Jonauskaite & Mohr, 2025).



Figure 8. Achromatic color schemes in the space. On the left, white (Freepik, 2025), in the middle, gray (Haus und Gartentrends, 2025), on the right, black (Hgyee & Home, 2025)

Black, a color that absorbs the majority of all incoming light, is generally associated with death, and thus linked to sadness, depression, fear, anger, mourning, and tragic events, as well as darkness and night (Kaya & Epps, 2004). Positively, it is associated with concepts of power, elegance, and richness. Dark gray and low-saturation colors are similarly regarded and can reflect similar characteristics. From both a design and a lighting technology perspective, black is not highly suitable for use in residences.

Gray, which spans a scale from light to dark, is primarily associated with emotions and concepts such as sluggishness, sadness, depression, fatigue, loneliness, and bad/rainy weather. In an experiment by Adams & Osgood (1973), red was found to be the most active color for a sample group, while black and gray were the most passive. However, in terms of value, gray is also associated with "independence, separation, loneliness, and self-criticism" from white (light) to black (dark) (Chiazzari, 1998; Kaya & Epps, 2004). Gray colors are known for their neutral nature and can serve as an excellent background to highlight other colors (Enwin et al., 2023).

White, the complete opposite of black and a symbol of light and brightness, is associated with innocence, peace, hope, purity, silence, and cleanliness. In general, it is linked to positive, low-arousal emotions (Hemphill, 1996; Jonauskaite & Mohr, 2025). As a color that reflects all incoming light, white tends to make a space appear larger and more spacious. In a study by Kwallek et al. (1997), participants found a white office unsettling and made more errors. This finding suggests that white may not be suitable for use in spaces like workspaces or bedrooms, as very bright rooms can be distracting.

In Northern geographies, particularly in Scandinavian countries, there is a strong preference for light colors—most notably white—in interior spaces (Figure 9). The primary functional reason for this preference is the high light-reflectance property of light colors. This feature maximizes interior light levels even during the long winter months when daylight is extremely limited, thereby enhancing spatial perception and promoting positive psychological effects. These geographical and climatic necessities have evolved into an aesthetic principle, playing a fundamental role in the emergence of the Scandinavian Design Style. Within this style, white and other light colors dominate large surfaces, while darker tones are applied sparingly and strategically to generate contrast. Natural materials such as wood, wool weaves, and furry textiles are frequently used to add warmth, tactility, and an organic naturalness to the space (Figure 9). Consequently, the prevalence of white and light color use in these regions should be considered a functional and highly adaptive response to geographical and climatic conditions.



Figure 9. Scandinavian style interior (Lavi Tasarım, 2025)

The explanations and scientific findings presented above demonstrate that a more comprehensive and valid approach to defining colors involves considering them in the context of their components, particularly value and saturation, rather than solely through basic hue categories like red or green. Indeed, various studies have shown that colors with the same hue but different value and saturation levels have significantly different cognitive and emotional effects (Elliot, 2015; Palmer & Schloss, 2010). This finding suggests that a reductionist, hue-focused approach is insufficient in color research, whereas multidimensional and holistic analyses yield more reliable results. Therefore, to gain a deep understanding of the psychological and physiological effects of colors, a systematic research framework that considers hue, value, and saturation components together needs to be developed, as saturation and value are critical factors that directly shape a color's psychological and physiological impact (Elliot, 2015).

Saturation refers to a color's distance from the gray scale. In this context, high saturation means the color is more prominent, eye-catching, and produces strong psychological effects, while low-saturation colors become more neutral as they approach gray, and their perceptual effects weaken. However, most studies in the literature focus on hue and do not adequately consider the saturation parameter (Elliot, 2015). Yet, in architectural and interior design, the level of saturation is a critical variable that directly determines the psychological atmosphere of a space and the user experience. High-saturation colors increase emotional responses through their stimulating effects, while low-saturation colors tend to create a calm and neutral environment. Furthermore, this effect is directly related not only to the color itself but also to the size of the surface on which it is used. High-saturation colors on large surfaces create a more intense stimulating effect, whereas this effect is relatively limited on small surfaces. However, the use of highly saturated colors on large surfaces can lead to some disadvantages in terms of lighting technology. The colored reflection of light striking a colored surface can cause color shifts on adjacent surfaces, which both distorts spatial color perception and negatively affects visual comfort and lighting efficiency (Ünver, 1985; Kwallek et al., 1997; Al-Ayash et al., 2016). Therefore, in effective spatial design, the level of saturation and the size of the surface area must be balanced appropriately with the design purpose, in addition to the hue. In this context, the limited use of high-saturation colors is suitable for residential spaces.

A color's value (lightness/darkness) has a decisive effect on spatial perception. Low-value (dark) colors give a space a heavier and narrower character while also creating a focusing effect. In this context, although the preference for dark tones in work and rest areas is considered appropriate due to their focusing effect, they are not recommended by standards for lighting efficiency and visual comfort (TS EN 12464-1:2021). High-value (light) colors increase the light reflection ratio, raising the overall light level in the space, which helps support visual comfort and contributes to the perception of the space as more spacious and large. While some studies show that light colors have more relaxing effects, their

use can still vary depending on the function (Aydoğdu, 2024; Köseoğlu & Çelikkayalar, 2016). Figure 10 shows the high and low-value interior applications of blue.



Figure 10. High (left) and low (center) use of blue hue (Munsell 10B) (Left, (House & Garden Magazine UK, 2025), medium (Mobilya günlüğü, 2025), right (Michele Clamp Art, 2025)

The combined use of different colors with similar and high values creates visual unity and a balanced atmosphere in an interior. The left side of Figure 11 shows high-value (light-toned, V:9) colors from the Munsell Color System, while the right side presents an application of these colors to a living space. The use of light colors with different hues not only gives the space a harmonious and peaceful character but also supports a spatial perception that is wider, simpler, brighter, and more tranquil.

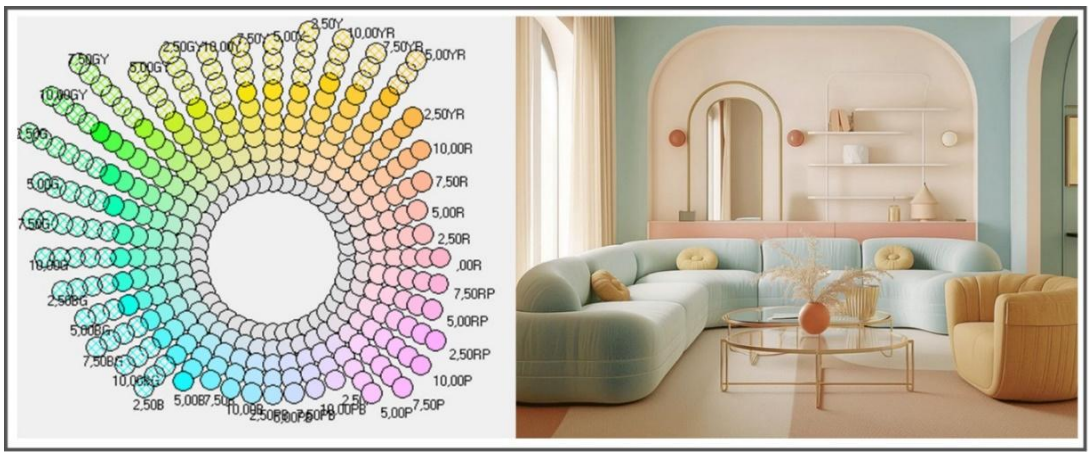


Figure 11. On the left, high value (light, V:9) Munsell colors (Wallkill Color Services, n.d.), on the right, a living space made of high value colors (Chloé, 2025)

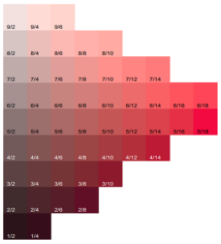
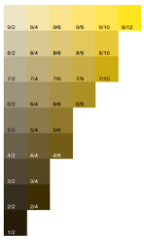
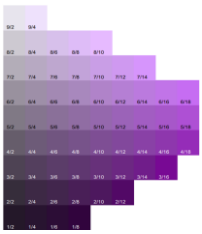
In spatial design, color selection can be viewed as a multidimensional process that requires the simultaneous evaluation of color's hue, saturation, and value components, along with a space's function, lighting conditions, and visual performance criteria. As emphasized in the literature, such a multidimensional approach can help balance the psychological effects of colors with physical conditions such as spatial perception, visual comfort, and energy efficiency (Küller et al., 2009; Manav, 2007; Elliot, 2015). This allows for higher-quality interior designs where color decisions improve user experience, enhance a space's functionality, and align with sustainability criteria.

3.2. Systematic Analysis of Colors Used in Residential Spaces

Literature findings on the colour-space-impact relationship are also applicable to residential interiors. Colour preferences in homes exhibit significant diversity based on both the function of the space and the user profile. The results of colour psychology studies can be utilised to construct an analytical framework for residential spaces.

Studies in the literature have predominantly concentrated on red and blue, while other primary colours such as yellow, green, and purple, as well as intermediate tones, have been investigated to a more limited extent. To address this gap, this study employs the Munsell Colour System to create systematic tables categorising colour use in residential spaces. The spatial effects and recommended applications of primary chromatic colours (Table 1), intermediate chromatic colours (Table 2), and achromatic colours (Table 3) are summarised based on compiled literature findings. Each selected fundamental colour is treated inclusively, encompassing its nearby hues.

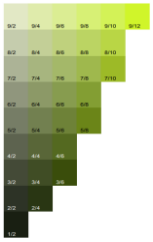
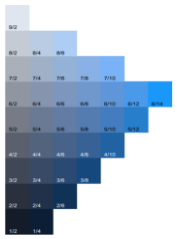
Table 1. Uses of Achromatic Primary Colors in Residential Spaces (Michele Clamp Art-Munsell, 2025)

CROMATİC PRIMARY COLOS	PROPERTIES of COLOR	COLOR EFFECT	RESIDENTAL USE AREAS
5R RED 	Energy, passion, stimulation, activity (Kaya & Epps, 2006; Valdez & Mehrabian, 1994; Küller et al., 2017)	Saturated colors are stimulating, energizing, exciting, appetite-increasing, but can also trigger anger and aggression. (Kaya & Epps, 2004; Küller et al., 2009; Jonauskaite & Mohr, 2025).	Medium/light colors of red are suitable for living and dining rooms. Highly saturated colors can be stimulating, so they should be used in smaller spaces. Lighter colors (like pink) are more suitable for bedrooms and children's rooms.
5Y YELLOW 	Liveliness, joy, optimism, attention-grabbing, happiness, and mind-stimulating (Boyatzis & Varghese, 1994). Low-value and saturated colors are associated with earth tones.	Light colors brighten spaces, while saturated colors have a vibrant, warm, uplifting, and mentally active effect. Saturated colors can be tiring with prolonged use. (Duyan & Ünver, 2022; Jonauskaite & Mohr, 2025).	Its high-value, low-saturated colors, also called beige, can be used in almost all residential spaces due to their calming effect. Medium-saturated colors can be used in living spaces.
5G GREEN 	Balance, naturalness, peace, trust, happiness (Ulusoy et al., 2020).	It has a relaxing, calming, pleasurable, and refreshing effect, reminiscent of nature. It has a positive, low-stimulation effect. (Ulusoy, 2020; Elliot, 2015; Jonauskaite & Mohr, 2025).	Colors of different values and saturations of green can be used in the living room, study and bedroom.
5B BLUE 	Calmness, serenity, confidence, coolness/coldness (Kaya & Epps, 2004; Yıldırım et al., 2011; Valdez & Mehrabian, 1994; Nelson et al., 1984)	Blue colors, which have short wavelengths, have a calming effect. They make the space look spacious and roomy (Valdez & Mehrabian, 1974; Yıldırım et al., 2011)	Different colors of blue can be used in bedrooms and study rooms for both calming and relaxing purposes.
5P MOR 	Nobility, creativity, mysticism, dramatic effect (Adıgüzel & Kolancı, 2017)	Purple, a short-wavelength blend of blue and red, has a relaxing, calming, and creative effect (Jonauskaite & Mohr, 2025; Levy, 1984). It adds depth and a sophisticated atmosphere to a space, creating emotional intensity.	Limited use in bedrooms and recreational areas may be appropriate. (Ulusoy, 2024). Studies generally discourage the use of purple in residential settings. (Kaya & Crosby, 2006; Ulusoy et al., 2020).

Intermediate colors are positioned between primary colors on the color wheel and embody the characteristics of the two primary colors that compose them. For this reason, the effects of intermediate colors within a space create a unique experience by carrying the perceptual and influential properties of their neighboring warm and cool color groups. For example, yellow-green tones carry the warm and stimulating qualities of yellow while also including the effects of green, which are associated with nature and balance. Similarly, red-purple tones can integrate the dynamism and

stimulation of red with the sense of tranquility and depth of purple. This dual character allows intermediate colors to create more flexible, multi-layered, and context-sensitive effects on spatial perception. The majority of color research in the literature has focused on primary colors (Elliot, 2015), while the effects of intermediate colors on spatial perception and user attitudes have been studied less frequently. Table 2 evaluates the effects of intermediate colors and their use in residential spaces.

Table 2. Use of achromatic intermediate colors in residential spaces (Michele Clamp Art, 2025)

CROMATİC SECONDARY COLOS	PROPERTIES of COLOR	COLOR EFFECT	RESIDENTAL USE AREAS
5YR ORANGE 	Orange, a mixture of red and yellow, reflects the dynamism and stimulation of red and the warmth and liveliness of yellow.	It's a stimulating color with a medium-high wavelength. It has an uplifting effect, but heavy use can cause restlessness (Manav, 2007). It's not widely preferred by users and isn't considered suitable for work environments. (Kwallek et al., 1997).	Medium light value and medium/saturated colors can be used in dining rooms and living rooms.
5GY GREEN-YELLOW 	Warmth and stimulation of yellow + Balance and naturalness of green	Green-yellow, also known as warm green, contains both warm and cool colors. It has a euphoric effect (Ulusoy et al., 2020). It reflects the color of nature and is peaceful and soothing.	It can be used in living and dining rooms. Higher-value, lower-saturated colors can be used in bedrooms.
5BG BLUE-GREEN 	Coolness and serenity of blue + balance and peace, contentment and joy of green (Jonauskaite & Mohr, 2025)	It reminds one of clear seas and leaves a calming, peaceful and relaxing effect.	High value, low/medium colors can be used in studies, children's/master bedrooms.
5PB PURPLE-BLUE 	The depth and mysticism of purple + The serenity of blue, the color of the sky	Calming, peaceful, relaxing, dark tones can evoke gloom.	High value, low colors can be used in bedrooms, children's/baby rooms, High value, low/medium saturated tones can be used in living and sitting areas.
5RP RED-PURPLE 	The liveliness and stimulation of red + the creativity, serenity and nobility of purple (Adıgüzel&Kolancı)	It is a focusing, calming color. It provides balance because it contains both cold and warm colors. (Duyan & Ünver, 2022).	Its high-value, low/medium saturated colors can be used in parents' and children's rooms. They are also suitable for study and recreation rooms.

Neutral or achromatic colors (black, white, and gray) play a functional role in interior design, particularly in residential rooms, from both an aesthetic and a psychological perspective. The literature notes that white makes a space feel more spacious, bright, and hygienic, and is therefore widely preferred, especially in small-scale residential rooms (Manav, 2007). Gray tones contribute to a balanced and calm atmosphere, giving a space a timeless and neutral identity, although their intensive use can lead to a cold and monotonous perception (Kwallek et al., 1997). Black, as a powerful element of contrast, provides depth and emphasis, but excessive use can make a space feel constricting and oppressive (Dalke et al., 2004). In this context, the use of different values of neutral colors in residential rooms, when combined in a balanced way with other colors, can positively affect both spatial comfort and user perception.

Table 3. Use of White, Black and Gray Colors in Residential Spaces

	ACROMATİC PRIMARY COLOS	PROPERTIES of COLOR	COLOR EFFECT	RESIDENTAL USE AREAS
WHITE		Freshness, cleanliness, clarity, purity, neutrality, positively calming	It makes the space look spacious and increases the brightness. (Hemphill, 1996; Jonauskaite & Mohr, 2025)	It can be used in all areas of the home. Excessive use can have a stimulating effect, but it's best used in a specific setting with compatible materials.
GREY		Balance, neutrality, serenity, dullness, melancholy, formality. Negative low arousal	Gray has many values, from light to dark. It is a neutral color and is often associated with negative emotions. (Jonauskaite & Mohr, 2025).	Gray can sometimes create a good background on walls, providing a backdrop for furniture within the space. Therefore, it's a popular choice for living rooms.
BLACK		Power, seriousness, sophistication, fear, negative strong arousal	It evokes darkness, unrest, and is depressive (Hemphill, 1996) Jonauskaite & Mohr, 2025). It leaves a dramatic effect on the space.	It is not suitable for use in residential spaces where space is limited. Optionally, it can be used in small living and working spaces.

4. Conclusion and Recommendations

This study aimed to analyze the effects of color use in residential interiors on user psychology, physiology, and spatial perception from a multidimensional perspective, considering color components (hue, value, saturation) and spatial function. The primary contribution of this research is its demonstration of the necessity to examine color effects relationally with value and saturation components, rather than solely based on hue, and its integration of this three-way interaction into a systematic framework.

The evaluations revealed that, in addition to the relationship between color and emotion, color use in a space exhibits certain consistent patterns in the literature. The study's findings indicate that warm colors (red, orange, yellow) are suitable for spaces requiring social interaction and energy. Specifically, red's appetite-stimulating effect supports its use in dining areas, while yellow tones' cheerful and energizing properties support their use in social spaces (Elliot, 2015; Jonauskaite & Mohr, 2025). In contrast, cool colors like blue and green stand out for their calming and peaceful effects, making them more frequently preferred in rest, sleep, and work areas (Kaya & Epps, 2004). However, this study goes a step further by indicating that this generalization is not absolute. For example, as noted by Jonauskaite & Mohr (2025), a high-saturation red can create aggressive effects in workspaces, whereas a low-saturation of the same color, like pink, exhibits calming properties, clearly demonstrating the importance of components. This finding supports the idea that value and saturation can be more decisive in evaluating color effects than hue (Valdez & Mehrabian, 1994). The component-based evaluations align with the established view in the literature that low-saturation and high-value (light) colors make spaces appear more spacious and expansive (Küller et al., 2009; Yıldırım et al., 2011). Conversely, high-saturation colors are said to have negative effects, particularly in work, rest, and sleep areas (Al-Ayashi et al., 2016; Kaya & Crosby, 2006; Valdez & Mehrabian, 1994).

In conclusion, this study has developed a holistic and systematic color guide that encompasses color design criteria specific to residential spaces. Colors, which play a fundamental role in the perception of a space, stand out as decisive physical qualities that should be addressed within the context of the figure-ground relationship. Accordingly, the choice of which hue or which component (value/saturation) of that hue to use on walls should be planned to align with the desired elements of the space. The systematic guide, created as a reference, aims to provide applicable strategies based on scientific research, transforming color selection from a purely subjective preference into a conscious design process that optimizes a space's functional performance and user experience. Future research that empirically validates these findings and comparatively examines color perception in different cultural contexts will provide significant contributions to the literature.

Acknowledgments and Information Note

The article complies with national and international research and publication ethics. Ethics Committee approval was not required for the study.

Author Contribution and Conflict of Interest Disclosure Information

The article was written by a single author. There is a conflict of interest with the Person(s) named.

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