

Color Analysis in Tennis Sports Center Design and Its Influence on Athlete Performance

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ABSTRACT

Tennis has become an increasingly popular sport in Indonesia, driving demand for tennis sports centers that go beyond providing a court and instead offer a complete range of supporting facilities. However, many existing facilities remain limited in scope and offer little variation in court type, despite the growing number of players and athletes seeking more comprehensive training environments. Among the many design considerations for a tennis sports center, color selection is often overlooked despite its documented influence on mood, concentration, and physical performance. Poorly chosen color schemes risk disrupting athlete focus and comfort, while well-considered color choices can support motivation and recovery. This study uses a descriptive research method to examine how color psychology principles can be applied to the interior design of tennis sports centers, drawing on existing literature on color theory, sports psychology, and built examples from comparable sports facilities. The findings identify distinct functional roles for different colors: warm hues such as red, orange, and yellow are shown to suit high-intensity spaces by supporting alertness and motivation, while cool and neutral tones such as blue, green, and white are better suited to rest and recovery areas. The study offers practical color-selection guidance for interior designers working on tennis and other sports facilities, contributing to the broader goal of creating performance-supportive athletic environments.

KEYWORDS

Color psychology
Tennis
Sports center
Athlete performance
Color theory

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1. Introduction

Physical fitness is essential for carrying out daily activities, and many people have turned to sport as a way to maintain or improve their health, particularly since the COVID-19 pandemic prompted a broader shift toward physical activity as a health-protective behavior (Lee, 2022). According to the Council of Europe, sport encompasses all forms of physical activity which, through organized or casual participation, aim to express or improve physical fitness and mental well-being, form social relationships, or obtain results in competition at all levels. Beyond its health benefits, sport also carries social value: people form new communities and socialize with others who share similar interests, and they gather both to compete and to watch others compete. What was once regarded purely as a hobby or leisure activity is now often treated as a profession, a shift that has driven considerable growth in sports center design. A sports center is a facility equipped to support physical training, competition, spectating, and community gathering, and many now include supplementary amenities such as spas, cafés, lounges, and pro shops as facilities compete to offer more complete and engaging sporting experiences.

Tennis is one sport that has grown increasingly popular in recent years. Numerous tennis communities and clubs have emerged, offering training programs for players at various levels. However, many existing tennis facilities remain inadequate, typically offering little more than a court with few or no supporting amenities such as locker rooms, changing rooms, showers, or designated waiting areas. Some facilities operate with only a single court, forcing players to wait their turn—a limitation that can disrupt visitor comfort and potentially affect the performance of athletes in training. Court type diversity is a further limitation: the three main tennis court surfaces are hard court, clay court, and grass court, yet in the Jabodetabek area of Indonesia, hard courts are reportedly the dominant type available, despite the fact

that competitive athletes are generally expected to be proficient across all surface types. Indonesian tennis athletes have voiced concern over this limited variety and expressed hope for more diverse facilities in the future.

Today, visitors come to sports centers not only to exercise but also to socialize, join sporting communities, spend recreational time with friends or family, and enjoy the range of amenities on offer. This shift in how people use sports facilities creates an opportunity to adapt and reconsider design approaches that remain relevant over time. Among the many considerations in designing a tennis sports center, color selection is one that carries particular weight: color has a documented influence on both the space itself and the people who occupy it (Hou et al., 2024). Well-chosen colors can produce positive effects on users, such as increasing motivation and energy among athletes in training or competition, while poorly chosen colors can produce the opposite effect—disrupting concentration and negatively affecting both comfort and performance. That said, the strength of these color effects on competitive outcomes specifically remains contested in the sports science literature (Goldschmied et al., 2023), which is a distinction this study returns to in the Results and Discussion. For this reason, color selection in tennis sports center design must be considered carefully and aligned with the specific activities the space is intended to support.

2. Method

This study employs a descriptive qualitative research method, an approach used to examine the characteristics of a phenomenon as it naturally occurs rather than to test relationships between variables (Sugiyono, 2018). This is consistent with the study's aim: to characterize how color functions within tennis sports center interiors, not to measure or compare variables experimentally. A descriptive design is appropriate here because it allows the existing body of knowledge on color and its application in sport-related spaces to be organized and interpreted systematically, rather than treated as isolated facts (Villamin et al., 2025).

Data for this study were drawn from two complementary sources. The first is a literature review covering the conceptual foundations of sport, sports center facilities, tennis as a discipline, and the physiological and psychological dimensions of color, which together establish the theoretical basis for interpreting color's role in athletic environments. The second is a precedent study of built examples—sports centers, fitness facilities, and wellness spaces documented in architectural and design publications—used to examine how specific colors are applied in practice and what functional or atmospheric roles they serve within comparable facility types. Precedent study is a well-established method in architectural and interior design research, allowing design decisions embedded in existing built works to be extracted and interpreted as a form of design knowledge in their own right, separate from what published literature alone can offer (Groat & Wang, 2013; Yaseen et al., 2022).

These two data sources are read against each other throughout the Results and Discussion: each color's documented psychological associations are paired with observed examples of how that color has been applied in real sports and wellness interiors, allowing the study to move from general color theory toward specific, design-relevant guidance for tennis sports center interiors.

3. Result and Discussion

Color functions as a form of nonverbal communication: it can establish identity, signal information, and shape mood, behavior, and perceived atmosphere (Elliot, 2019). Certain colors can influence blood pressure, metabolic rate, and visual fatigue, and color choice has been shown to affect user performance both positively and negatively—an effect increasingly documented in sports facility research specifically, where innovative venue coloring has been linked to athletes' perceived emotional value and overall facility satisfaction (Hou et al. 2024). Colors on the red side of the spectrum (red, orange, yellow) are generally categorized as warm colors, associated with sensations ranging from warmth and comfort to anger and hostility. Colors on the blue side (blue, purple, green) are categorized as cool colors, generally associated with calm but occasionally with sadness or isolation. Physiological evidence supports this broad distinction: exposure to red environments has been shown to produce measurably higher skin conductance—an indicator of physiological arousal—compared to blue environments (Weijs et al., 2023). Bright, saturated colors are generally associated with increased heart rate and respiration, which is why they are typically used in high-intensity spaces such as cardio or gym rooms, while neutral or pastel tones are more commonly used in rest or waiting areas to support calm and recovery. Natural elements such as

plants and wood accents also contribute a sense of relaxation and warmth, and are commonly used as accents or decorative features within a room.

Wall, ceiling, floor, and furniture color selection significantly shapes the overall atmosphere of a sports facility. The following section outlines nine colors and their documented effects on athlete psychology and performance, together with their design applications within a tennis sports center.

3.1. Red

Red is one of the most visually prominent colors in the spectrum after yellow, which is why it is frequently used as a warning signal to capture attention. Red is also associated with strength, energy, and spirit, and is believed to stimulate the body and mind toward increased circulation. In sport, red has been associated with a performance advantage: reviews of uniform-color research have repeatedly linked red to perceptions of dominance and aggression, and to faster perceived movement speed among opponents (Mentzel et al., 2019). That said, this evidence should be read with some caution—a comprehensive critical review of 33 studies on uniform color and sport performance concluded that the overall evidence for red producing a genuine competitive advantage remains weak, even though perception-based effects (how red-wearing athletes are *judged* by others) are more consistently supported than actual performance outcomes (Goldschmied et al., 2023). Red can be applied in high-intensity spaces such as cardio rooms, gyms, or training areas, and in player locker rooms to sustain motivation. It can also serve as an accent on walls or columns to mark or define specific zones. Pairing red with neutral tones helps maintain balance and motivate athletes without inducing excessive aggression.



Fig. 1. Laver Cup Team World Room.
Source: lavercup.com



Fig. 2. Hafnia-Hallen Sports Center.
Source: dezeen.com

3.2. Orange

Orange is a combination of red and yellow, often described as bright, cheerful, and energizing. Many sports teams use orange in uniforms, mascots, and branding for its associations with excitement and enthusiasm. Orange is visually prominent yet perceived as approachable, and is frequently used in signage for its attention-drawing quality. Longer-wavelength colors such as orange and red are associated with heightened arousal (Weijs et al. 2023; Elliot 2019). Orange can therefore be applied in play areas, lobbies, or locker rooms to stimulate energy and draw visitor attention, though its intensity can become overwhelming and disruptive to concentration when overused—pairing it with neutral tones is advisable.



Fig. 3. Fontys Sports College
(Source: dezeen.com.)



Fig. 4. F51 Folkestone Skatepark
Source: archdaily.com

3.3. Yellow

Yellow is bright, intense, and highly visible, sharing red and orange's capacity to attract attention and its common use as a hazard or warning signal. Overused, however, yellow can cause visual fatigue and disorientation due to the high volume of light it reflects. Yellow is associated with happiness, enthusiasm, and energy, but its intensity can also read as aggressive or confrontational when overapplied, potentially causing discomfort and irritation (Elliot 2019). For this reason, yellow is typically paired with other colors to balance and moderate its intensity. It can be used as an accent in spectator stands, reception areas, corridors, or as a visual boundary between zones.



Fig. 5. Moulin Junior High School.
(Source: archdaily.com.)



Fig. 6. Symantec Fitness Center.
(Source: interiordesign.net.)

3.4. Blue

Blue conveys calm, security, and order, and is widely associated with trust and stability. In sport, teams or individuals associated with blue are often perceived as honest, calm, and sincere; because blue reads as unthreatening and conventional, athletes surrounded by blue may appear less aggressive than those surrounded by red. Blue exposure has been linked to measurable reductions in stress-related heart rate variability compared to more stimulating colors (Oh et al., 2021), consistent with its frequent use in rest areas and lounges. Blue is also well suited to spaces designated for cooling down or stretching after intense activity. As a cool color, blue can occasionally read as cold or distancing, producing feelings of sadness or isolation if overused—pairing it with warmer or brighter tones, or adding wood elements, can offset this and create a warmer, more welcoming atmosphere.



Fig. 7. Well Group Office.
(Source: officesnapshots.com.)



Fig. 8. Cambrionix Office.
(Source: spacio.co.uk.)

3.5. Green

Green carries a strong association with nature, evoking grass, trees, and forest, and is often described as harmonious, refreshing, and calming; in several cultures it is also associated with luck. Green is linked to positive effects on mood, relationships, and physical health, and is believed to relax the body and reduce stress, which is one reason designers frequently incorporate it into public spaces. This is supported by direct experimental evidence: cyclists who exercised while viewing green natural video footage reported lower total mood disturbance and lower perceived exertion than those

viewing the same footage rendered in gray or red, with red specifically associated with increased anger (Akers et al., 2012)—a finding commonly referred to as the "green exercise effect." In sport, green is associated with an athlete's desire to win and with cheerfulness, and surrounding environments featuring green—plants, trees, or natural views—have been linked to increased creativity. Green can be applied across lobbies, lounges, corridors, or as an accent throughout a facility.



Fig. 9. Neumatt Sports Center.
Source: archdaily.com.



Fig. 10. De Koog Sports Center.
Source: archello.com.

3.6. Pink

Pink is a softer, less intense variant of red, associated with love, affection, understanding, and gentleness. Some sports teams have reportedly painted opposing teams' locker rooms pink in an attempt to keep opponents passive and low-energy—most notably at the University of Iowa's Kinnick Stadium—based on the premise that the shade known as Baker-Miller pink has a physiologically calming effect. This premise deserves a more cautious reading than the popular narrative suggests: a controlled study comparing Baker-Miller pink and red rooms found that participants in the pink room reported significantly lower state anxiety, but showed no corresponding difference in grip strength or motor precision—meaning pink's psychological calming effect did not translate into any measurable physical disadvantage for the "weakened" athlete (Gilliam, 1991). Lighter pink shades tend to produce a calming effect, while brighter, more intense shades can cause visual fatigue and discomfort. Pink suits yoga studios or rest areas where a calming atmosphere is desired, though overuse can read as immature; pairing it with neutral tones helps moderate its intensity.



Fig. 11. Yoga Center.
Source: bhibu.com



Fig. 12. Locker Room.
Source: bhibu.com.

3.7. Purple

Purple combines the primary colors blue and red. Historically associated with royalty—purple dye was once rare and costly, accessible only to nobility—it continues to symbolize nobility, luxury, wealth, power, and ambition. Purple is also associated with spirituality, mystery, and exoticism, partly

because it appears infrequently in nature. Cross-cultural research on purple's affective meaning finds it consistently associated with dignity and creativity across languages, though its precise emotional connotations vary meaningfully between cultural contexts (Uusküla et al., 2023)—a caution worth noting given the international authorship expected of Sinta-indexed submissions. Lighter purple shades are associated with cheerful, romantic energy, while darker shades can convey sadness or frustration. Some sports teams use purple in uniforms and branding for its connotations of boldness and stateliness. Purple can be applied in yoga studios or as lighting accents; because its intensity can both motivate and distract, shade selection should be matched carefully to the intended atmosphere.



Fig. 13. Yoga Studio.
Source: luxnomade.com.



Fig. 14. Fitness Center.
Source: archello.com

3.8. Black

Black is not a primary, secondary, or tertiary color and does not appear on the color wheel, as it is not technically classified as a color—it absorbs the full visible spectrum. Black is associated with power, elegance, and luxury. Athletes wearing black are often perceived as more intimidating than those wearing other colors, and players in black uniforms have been found to be judged more likely to commit penalties, as they are perceived as more aggressive—though, consistent with the broader caution already raised regarding uniform-color research (Goldschmied, Furley, and Bush 2020), this reflects a perception effect on judges and observers rather than confirmed evidence that black changes an athlete's actual competitive outcome. Black is also associated in some contexts with negative connotations such as death, and can evoke strong feelings of anger, aggression, fear, and sadness. In feng shui, black is associated with the water element and can evoke strength, calm, and mystery. Black works well in high-activity spaces such as cardio rooms and gyms; used in appropriate proportion, it produces a "grounding effect," and is therefore usually paired with brighter colors to maintain balance and prevent a space from reading as overly dark. Black can also be used as an accent to frame or define specific areas.

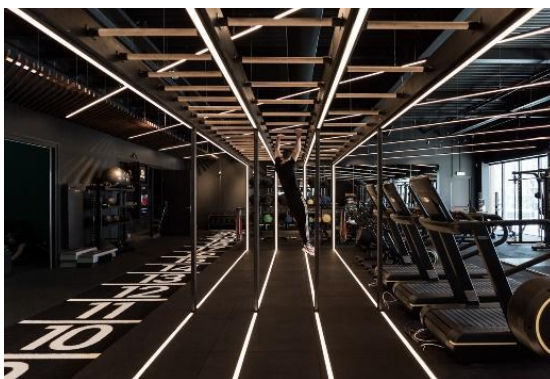


Fig. 15. Fitness Center.
Source: ijarchitecture.com



Fig. 16. Fitness Center.
Source: ijarchitecture.com

3.9. White

White is technically not a color but a shade, and its inclusion increases the perceived brightness of any color it is combined with—though many people continue to regard it as a color in everyday use. White is closely associated with purity, cleanliness, calm, simplicity, and innocence, often read as a blank slate symbolizing the new beginnings. White is commonly used to produce a fresh, clean, modern, minimalist atmosphere with a youthful quality, though it can equally read as cold, empty, rigid, bland, tedious, or isolating; in some cultures white is associated with death and mourning. Designers frequently use white to make a space feel larger and more open, and it is a common choice in hot climates for its cooling visual effect. White is best paired with other colors to avoid appearing pale or plain, and the addition of wood elements can help a predominantly white room feel warmer.



Fig. 17. Yoga Studio.

Source: buzzbuzzhome.com



Fig. 18. Wellness Studio.

Source: 561pacific.com

4. Conclusion

A sports center is a facility equipped to support athletic training, competition, recreation, and community gathering. Tennis is one sport that has grown increasingly popular in recent years, a shift that has driven corresponding development in tennis sports center design. Among the many considerations involved in designing such a facility, color selection carries particular weight: color shapes the atmosphere of a space and produces specific impressions on its users, with direct consequences for athlete performance during training or competition.

This study finds that different colors serve distinct functional roles within a tennis sports center. Warm colors—red, orange, and yellow—are associated with motivation and elevated energy, and are best suited to high-intensity spaces. Black, while not part of the warm-color spectrum, can similarly project intensity and give athletes a more assertive presence. However, this study's review of the underlying sport-psychology literature also found that the evidence connecting these colors to *actual* competitive performance is considerably weaker and more contested than popular color-psychology narratives suggest; where the evidence is strongest, it tends to describe how athletes are perceived by others rather than how their performance is measurably affected. Excessive or overly saturated use of these colors can also produce a visually overwhelming effect, contributing to visual fatigue and reduced concentration. This can be mitigated through the use of neutral or muted colors—white, blue, green, and pink—which have been more consistently associated with relaxation and calm, supporting the recovery process after intense physical activity. These cooler tones also read as visually "lighter," reducing eye strain and minimizing visual disruption for users. In addition, incorporating natural elements such as plants and wood creates a warmer atmosphere and helps balance a space's overall color composition.

Taken together, these findings suggest that color selection in tennis sports center design should not rely on any single color's assumed psychological effect in isolation, but should instead be matched deliberately to the specific function of each space—motivational intensity in training and competition areas, and calm restoration in rest and recovery areas—while remaining appropriately cautious about performance claims that current sport-psychology evidence does not yet fully support.

Reference

- Akers, A., Barton, J., Cossey, R., Gainsford, P., Griffin, M., & Micklewright, D. (2012). Visual Color Perception in Green Exercise: Positive Effects on Mood and Perceived Exertion. *Environmental Science & Technology*, 46(16), 8661–8666. <https://doi.org/10.1021/es301685g>
- Elliot, A. J. (2019). A Historically Based Review of Empirical Work on Color and Psychological Functioning: Content, Methods, and Recommendations for Future Research. *Review of General Psychology*, 23(2), 177–200. <https://doi.org/10.1037/gpr0000170>
- Gilliam, J. E. (1991). The Effects of Baker-Miller Pink on Physiological and Cognitive Behavior of Emotionally Disturbed and Regular Education Students. *Behavioral Disorders*, 17(1), 47–55.
- Goldschmied, N., Furley, P., & Bush, R. (2023). Critical review of uniform color effects in sports. *International Review of Sport and Exercise Psychology*, 16(1), 311–336. <https://doi.org/10.1080/1750984X.2020.1855668>
- Groat, L. N., & Wang, D. (2013). *Architectural Research Methods* (2nd ed.). Wiley. <https://www.wiley.com/en-us/architectural-research-methods-2nd-edition-p-9780470908556>
- Hou, Y., Gou, B., Liao, J., Zhang, Y., Huang, Q., & Sun, B. (2024). Innovative Sports Venue Colors and Consumers' Satisfaction Based on Multilevel Data: The Mediating Effect of Athletes' Perceived Emotional Value. *Buildings*, 14(11), 3674. <https://doi.org/10.3390/buildings14113674>
- Lee, K. (2022). The Interior Experience of Architecture: An Emotional Connection between Space and the Body. *Buildings*, 12(3), 326. <https://doi.org/10.3390/buildings12030326>
- Mentzel, S. V., Schücker, L., Hagemann, N., & Strauss, B. (2019). Perceiving speed—The color can matter. *Color Research & Application*, 44(6), 957–966. <https://doi.org/10.1002/col.22429>
- Oh, J., Lee, H., & Park, H. (2021). Effects on Heart Rate Variability of Stress Level Responses to the Properties of Indoor Environmental Colors: A Preliminary Study. *International Journal of Environmental Research and Public Health*, 18(17), 9136. <https://doi.org/10.3390/ijerph18179136>
- Sugiyono. (2018). *Metode penelitian kuantitatif, kualitatif, dan R&D*. Alfabeta. <https://opac.perpusnas.go.id/DetailOpac.aspx?id=1543971>
- Uusküla, M., Mohr, C., Epicoco, D., & Jonauskaitė, D. (2023). Is Purple Lost in Translation? The Affective Meaning of Purple, Violet, and Lilac Cognates in 16 Languages and 30 Populations. *Journal of Psycholinguistic Research*, 52(3), 853–868. <https://doi.org/10.1007/s10936-022-09920-5>
- Villamin, P., Lopez, V., Thapa, D. K., & Cleary, M. (2025). A Worked Example of Qualitative Descriptive Design: A Step-by-Step Guide for Novice and Early Career Researchers. *Journal of Advanced Nursing*, 81(8), 5181–5195. <https://doi.org/10.1111/jan.16481>
- Weijis, M. L., Jonauskaitė, D., Reutimann, R., Mohr, C., & Lenggenhager, B. (2023). Effects of environmental colours in virtual reality: Physiological arousal affected by lightness and hue. *Royal Society Open Science*, 10(10), 230432. <https://doi.org/10.1098/rsos.230432>
- Yaseen, A., Waqas, M., & Mukhtar, A. (2022). Precedent Study: An Approach to Learning about Design Challenges in Architectural Studio Pedagogy. *Global Educational Studies Review*, VII(1), 395–403. [https://doi.org/10.31703/gesr.2022\(VII-I\).38](https://doi.org/10.31703/gesr.2022(VII-I).38)