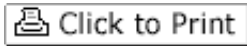




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Design: Spatial Color

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Does yellow make people happy, or does it evoke aggression? Is blue really calming? Do restaurants designed with red encourage guests to linger and eat more?

Color plays a vital role in the world in which we live. Color can sway thinking, change actions, and cause reactions. It can irritate or soothe our eyes, raise blood pressure or suppress our appetite. As one of the three fundamental design grammar cornerstones—along with light and form—color is both rich and complex. It is a phenomenon so core that we are hard pressed to find life examples untouched by it. Knowing this truth, Joseph Albers imparted the wisdom in Lois Swirloff's book *Dimensional Color*: "No color is perceived as what it actually is physically. Without special devices we never see color singly, or by itself, as we may hear single tones, but only in relationship to the many factors, which influence our vision, which transfer the optical (physiological) susceptibility into a psychological effect (perception)."

While these truths are espoused by most color theorists, architects and designers have little direct working knowledge on the spatial interaction of light, color, and form. It is from this lack of knowledge that the idea for a live lab color experiment, *Spatial Color*, was born. An empirical experiment to test human behavior in a specific function contextualized as a cocktail party, *Spatial Color* was constructed to test color beliefs that commonly are quoted and mechanically employed by everyone. Unlike the scientist who isolates individual aspects and evaluates them empirically, the designer is faced with intimately connected and complex interactions, where the whole is greater than the sum of each part.

The Experiment

Spatial Color, therefore, was conceived to examine three sets of popular preconceptions commonly attributed to red, blue, and yellow, within a real life setting:

- Red inspires people to eat more. Time stands still.
- Blue is calming. Time lengthens.
- Yellow evokes happiness…and aggression.

Three identical volumes were built and bathed in the specified hues. These rooms were used for an hour-

long cocktail party at the Architectural Digest Home Design Show in New York City, in March 2006, to conduct a series of controlled and observational tests. Each room—18 ft. by 20 ft. by 10 ft. tall—contained a bar with 12 stools and four computers on pedestals. Each room and its furnishings were white and the room was immersed, using colored light, with one of the colors. Pantone, Benjamin Moore, Sherwin-Williams, and DuPont were asked to identify and submit the most popular colors specified for entertainment, dining, and relaxation from across the United States. A single red, blue, and yellow common to all companies were selected as the control and matched with LED lights. Actual pigment colors were painted on small walls which formed a baffle to the entrance outside of each volume and were used for original color reference.

The following assumptions were formulated for the experiment:

1. There is a connection between the physiological and the emotional response to color.
2. There is a correlation between the emotional response and human behavior.
3. Physical and emotional response to color impacts behavior.
4. The quantity of food and beverage consumption would increase depending on color influence.
5. There would be a correlation between sound level related to color influence.
6. A majority would be attracted to one colored environment over others.
7. The color of the environment would affect behavior specifically in the context of a party function.

To test the assumptions the following tests were administered:

- **Physiological:** An empirically controlled experiment was conducted with the use of heart rate monitoring wrist bands. This test was most scientific and had the sole purpose of measuring heart rate to determine physiological response when people are fully exposed to red, blue and yellow.
- **Emotional 1:** An objective and nationally standardized test which is used by the medical profession called the Profile of Mood States (POMS) survey was administered during the heart rate monitoring.
- **Emotional 2:** A subjective, "by association" test, devised as an Emotional Association Response (EAR) survey, was administered during the party.
- **Behavioral:** This included tabulation of four objectives: food and beverage consumption; ambient sound recording; initial color attraction response (choice of room entered based on color attraction); and party interaction and observation of human behavior when people are performing a specific function.

The Results

The experiments provided many interesting, relevant, and nuanced findings. For instance, in filling out the Emotional Association Survey, the majority of participants reported that while in the red room, they felt thirsty and hungry, which was not the primary comment in yellow. However, when analyzing the data for food and beverage consumption, in actual fact, people consumed twice as much in the yellow room.

The Emotional Association Survey seemed to confirm the initial assumption that blue was calming and caused time to lengthen. The word calm was associated significantly more with the blue room than with the red and yellow rooms. The survey, in this instance, was supported by the behavioral observations. The blue room was by far the most sedate with remarkably little body movement and with people lingering much longer when compared with the other rooms.

A number of scientific studies have reported that lower heart rates were observed under blue light and higher values under red (Fehrman, 1986; Gerard, 1957), which presumably support the hypothesis that blue is calming. Surprisingly, when measurements for the three rooms were compared, heart rate readings did not change with the room color. The inconsistent results may be explained by the possibility that the presence of other people in a social context somehow neutralizes or changes the effect of color on heart rate. Further investigation is needed to test that assumption.

One unexpected observation was how people clustered differently in the various rooms. In the blue room people seemed to ring the perimeter, while in the red and yellow rooms people clustered in groups in the middle. This raised the suggestion that blue may be more conducive to asocial activities, which would have significant implications for the designer and make blue a color more conducive to environments intended for calm and individual activities.

The presumption that yellow evokes both happiness and aggression was neither supported nor refuted under observation. Subjects in the yellow room were the most physically active and animated group. The frequently changing body positions, active circulation around the room, and verbal activity with loud talking and laughing within smaller groups would suggest higher levels of stimulation. This behavioral pattern was consistent with the verbal associations with being active, playful, and energetic, and seemed to confirm that yellow supports social activities and may be appropriate for environments of social functions.

The initial hypothesis that red inspires people to eat more and causes time to stand still was not confirmed. The findings suggest that yellow, not red, stimulates the appetite. Not only did yellow seem to stimulate appetite, but almost the same number of people entered both the yellow and red room and twice as many entered the yellow room first when compared to the blue room. This would seem to challenge the common belief that red is the most appropriate color for stimulating the appetite.

The Conclusions

The experiments confirm that designers must cultivate a rigorous process for critical observation at the onset of a project. Important throughout the design decision-making process, this knowledge may be of greatest benefit during the programming and information gathering phase.

The conventional "Programming Questionnaires" filled in by user groups are often based on their aspirations, memory, or learned knowledge rather than intrinsic need. When actively observed, actual behavior most likely differs from that reported in a survey. In other words, if you want to know how people behave don't ask them; observe them (a fact long established by William H. Whyte, who focused on observing behavior patterns in urban design). Other findings of interest can be summarized as follows:

- Self-report surveys most probably provide inaccurate and incomplete information regarding human behavior.

- The POMS and EAR are self-report surveys, which do not take into account culturally inherited knowledge and which may be the primary reason for the inconsistency between the reports and the behavior observed.
- People primarily are attracted to enter a yellow environment over Blue by a ratio of 2-to-1.
- People will enter a yellow environment first but leave more quickly, while once in a blue environment they tend to stay much longer.
- Red and yellow create dynamic environments of movement and social interaction, while blue creates a space of calm and stillness with little social interaction
- Color affects physical activity. People will gesture, fidget, and circulate around a yellow or red room, while in a blue room they remain still and sedate.
- Vernacular or culturally learned use of color explored in this experiment stemmed from cultural inheritance and not from empirical experimentation.
- Singularity of a laboratory environment restricts the complexity of context in a way that limits real life application.
- Lack of change in heart rate seems to support the conclusion that social context has a greater impact on color response than has been assumed.

The scientific world provides a way of understanding color that is not entirely comprehensive. Other measurements are needed to fully understand color and its impact on behavior. This research was a unique learning experience that sought to better understand the impact of color on environment and human behavior specifically from a design viewpoint. For this, a select group of experts were brought together by The Collective. The project team included: *Shashi Caan, architect/interior designer, The Collective, project lead;

*Gin Guie Ebnesajjad, color scientist, DuPont Solid Surfaces;

*Bonny Wilson, interior designer/psychological consultant, NBBJ;

*Maria Paula Villamil, architect/technologist;

Val Jones, M.D., researcher;

Paul Gregory, lighting/color expert, Focus Lighting;

David Bianciardi, technology artist, A/V Controls;

(*individuals responsible for all data analysis).

The physical installation and venue were made possible by Troy Durst, vice president, show manger at

Merchandise Mart Properties, Inc., the Architectural Digest Home Design Show, and Structure Tone. The party and research were supported by IIDA and ASID.

Shashi Caan, Contract's 2004 Designer of the Year, is principal of The Shashi Caan Collective in New York.

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