

Color hue and mood:

The effect of variation of red hues  
on positive and negative mood states

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Abstract

The present study investigated three gradations of red hues; “cold,” “neutral,” and “warm”, and their effects on participants’ positive and negative mood states. Volunteer participants for the study were 30 college students (15 female, 15 male) from a northeastern university. In a between-subjects design, all participants were asked to look at a “neutral” black and white photograph, focusing on the red hue of the border which surrounded the photo. They were then asked to fill out a questionnaire assessing mood states. A t-test was used to explore the differences in positive and negative mood states and emotional intensity between males and females. Additionally, three ANOVAs were performed to examine the effect of the three levels of the independent variable; “cold,” “neutral,” and “warm” hues of red, on positive mood, negative mood, and overall mood state or emotional intensity. Results showed that the male participants reported more emotional intensity to red hues than the female participants. Also, there was a significant difference in negative mood state between participants who were exposed to “cold,” “neutral,” and “warm” hues of red in addition to a significant difference in emotional intensity between participants who viewed the “cold,” “neutral,” and “warm” hues of red.

In childhood, people learn that certain colors carry specific associations. Accordingly, people learn to associate certain emotions or moods with specific colors through simple observation of everyday life (Gardano, 1986). Hence, colors are seen to have relations to certain patterns of reaction or

combinations of feelings. Significant evidence has been found specifically involving the color red. Red has often been thought to indicate feelings of danger, love, rage, and excitement. Additionally, people associate red with certain objects such as fire, blood, and hearts (Schachtel, 1943).

The wide variation of emotional responses elicited by the color red indicates that it is an “ambivalent” color. This is a characteristic not shared by all colors (Schachtel, 1943). Red has been known to evoke negative feelings such as anxiety, anger, and annoyance (Crane, 1980). It has also been known to evoke positive feelings such as happiness and excitement (Levy, 1984). Thus, people tend to respond to the color red in different manners based on the influences and stimuli which act on them externally and which effect them internally. When human color vision is processed, several different colors merge together to form an impression on a person’s mind through associations made with the surrounding world (Shen, Yuan, Hsu, & Chen, 1999). The strength of the colors which comprise an image is enforced by past and present experiences

acting on that person and his/her perception.

However, it is also noted that when a particular hue of a color evokes strong emotions in a person, as in a picture, there is little time for that person to deliberate what overall sensation is achieved by that color. The mind does not seem to consider what the overall impression of the color is, whether negative or positive. Thus, inner and outer stimuli counteract each other and cancel each other out (Schachtel, 1943); in this case, inner stimuli represent what a person learns to associate a color with over the years, and outer stimuli represent what other colors, pictures, or external factors affect the overall perception of the color. The more an individual projects his/her experiences onto a hue of a color, the stronger the elements of reaction toward that hue will be (Schachtel, 1943).

In art and in studies utilizing the Rorschach ink blots, smudges of red often indicate blood or fire. For example, some children with minimal brain dysfunction primarily choose the color red to paint graphic, nightmarish pictures (Gonick-Barris, 1980). At a young age, the color red is seen in connection with aspects of life grotesque and horror-filled because the children associate the hue with some element in life to which they have been exposed. In turn, as people grow, they draw on these associations without consciously or actively thinking. Due to such subconscious actions, people may feel pleasure or displeasure from such a high impact color as the color red, even though general feelings toward a certain hue of the color are not particularly strong (Schachtel, 1943).

Additionally, some associations people make with a color are connected

in peoples' memories as being related to cultural factors such as rituals and ceremonies. Various native tribes have been found to react only to the color red, thus indicating the strong effect association plays on the human mind (Schachtel, 1943). In the past, these tribes found the color red so striking that they chose to use it as the primary color in art work and other forms to which tribesmen were largely exposed.

Furthermore, religious monuments such as the Sphinx feature red as a predominant color due to ancient Egyptians' belief that presence of the color red would allow for the deceased's fertility and prosperity in the afterlife (Gardano, 1986). In the medieval period, red could only be worn by royalty, judges, and executioners to symbolize these individuals' power over life and death. This suggests that perception and use of color varies based on influence

and upbringing. However, all cultures share similar emotions and have their own words to convey such emotions. Therefore, the perception of color stretches, at least to some degree, across cultural boundaries.

Perception is important when perceiving a color. Most people consider the color red to be stimulating to the eye (Wexner, 1954). When a person is placed in front of a painting, in most cases that person will be drawn to a striking color such as red before all other colors are noticed (Schachtel, 1943). It has a propensity to detract attention away from the rest of a painting and distract the viewer from gazing at all other colors because it provides high levels of stimulation to the eye (Schachtel, 1943). In related findings, as found by Kwallek, Lewis, Lin-Hsiao, and Woodson (1996), participants reported that a red office interior tends to

be more distracting than traditional office interior colors such as white. However, participants made fewer proof-reading errors in offices painted rich-hued colors high in saturation (such as red and orange) than in offices painted shallow-hued colors low in saturation (such as beige and white). This indicated that the intensity of a person's arousal to a certain hue and the stimulation in the environment where the hue is viewed is connected to the level of a color's saturation.

As found by Kwallek, et al. (1996), there is increased arousal to certain colors in connection to the stretch of those colors' wavelengths. Red has the longest wavelength of any color, followed by orange, yellow, green, blue, and purple (Kwallek, et al., 1996). Wavelength also pertains to the general sensation of "warmth" evoked by certain colors. Red is typically described as a

“warm” color. This is also due to the level of saturation of the color. Highly saturated colors such as red or orange are preferred more often than low saturated colors such as grey or beige (Kwallek & Lewis, 1990; Kwallek et al., 1996). Thus, people tend to choose the high arousal color red when they wish to feel a high level of comfort or desire to be in a playful, light mood. Conversely, people tend to choose low arousal colors such as the color blue when they desire to be in a serious mood (Kwallek, et. al., 1996). This indicates that a person feels either comfort or discomfort through exposure to different colors.

As examined by Wexner (1954) in a study on colors and their subsequent mood tones, some colors go with certain moods more than other colors. For example, red is most frequently depicted as full of hostility, inspirational, and protective, whereas purple is most

frequently depicted as distinguished. In addition, blue is most frequently described as calm, safe, and soft, whereas black is most frequently described as commanding and depressed. The frequency of responses to colors and their links to particular moods described in this study points to the notion that colors and their associations to moods are largely agreed upon among persons. These past findings are carried over to this study.

The purpose of the present study was to assess three separate hues of the color red and determine if the three levels of saturation (“cold”, “neutral”, and “warm”) have a positive or negative effect upon one’s mood. The color red was chosen for the general ambivalence it has been considered to stir in peoples’ emotions. Although a wealth of literature has been written on the color red, there are few studies which examine the color

and its effects on mood in any depth. The state of mood that participants reported was categorized into two levels assessing positive and negative mood that determined whether and how strongly the color affected the way the participants felt at the moment. It is hypothesized that participants will produce the highest scores of positive mood after being exposed to the “warmest” hue of red. Furthermore, it is hypothesized that participants will produce the highest scores of negative mood after being exposed to the “coldest” hue of red. In this case, it is considered that the “neutral” hue of red will produce the most evenly tempered results of mood.

#### Method

##### *Participants*

A total of 30 students from a northeastern university were randomly selected to participate in this study, of

which 15 were male and 15 were female. All participation was voluntary and each participant was informed of the nature of the study at the conclusion of the experiment with a debriefing statement and given an opportunity to ask questions. The majority of participants (76.7%) described themselves as European-American (Caucasian), 13.3% reported their ethnic background as “other,” and 10% as Latin-American. The majority (46.7%) were sophomore college students, while 43.3% were first year students, 6.7% were juniors, and 3.3% were seniors. Additionally, the majority of participants (73.3%) described themselves as having experienced a Christian religious upbringing, 13.3% reported having experienced “no preference” to any religion, 10% reported having experienced a Jewish upbringing, and 3.3% reported “other.” Participants

ranged from 18 to 22 years old. The mean age of participants was 18.8 years.

### ***Measures***

The Profile of Mood States (POMS) (McNair, Lorr, & Droppleman, 1981) measure was used to assess the mood of the participants. The 65-item questionnaire is comprised of words and statements pertaining to 6 mood factors: tension-anxiety, depression-dejection, anger-hostility, vigor-activity, fatigue-inertia, and confusion-bewilderment. The POMS questionnaire was designed to give equal weight to all six of these factors. Sample words and statements range from “friendly” to “shaky” to “uncertain about things” to “ready to fight” to “energetic.” Participants indicated the degree to which each word or statement described how they were feeling in a Likert Scale format: 0 = not at all; 1 = a little; 2 = moderately; 3 = quite a bit; 4 = extremely. Scores were

summed based on total negative attitude score and total positive attitude score to produce separate scores for each mood state. In addition, the total positive attitude score and total negative attitude score were summed to produce a total emotional intensity score. Test-retest reliabilities ranged from 0.65 to 0.74, evidencing concurrent, construct, and predictive validity (Kwallek, et al., 1996).

A Demographic Questionnaire Form was used to obtain various information such as age, year in college, sex, ethnicity, religious affiliation, parental relationship status, ideal lighting situation, and favorite color.

### ***Procedure***

Three hues of red were shown to participants. The three hues consisted of a “cold” hue (“Brick Red”), a “neutral” hue (“Bordeaux Red”), and a “warm” hue (“Guardsman Red”). Colors were

chosen from the Daler-Rowney Canford Papers and Card brand (70 lbs. 140 gm.; 20 x 30.5). All three hues were shown as borders against the same neutral black and white photograph. The photograph was of a box of “ALL” detergent sitting next to a glass of water and a water bottle. The camera angle was slanted from below.

The photograph was chosen based on the results of a pilot test of 10 participants in a psychology research methods class. The participants in the pilot test were asked to look at four different black and white photographs: a carousel horse, a port-a-potty behind a fence, a decrepit graveyard, and the photograph of the “ALL” detergent and glass of water. The participants were then asked to indicate, in Likert Scale format, which photograph seemed the most neutral. Seventy percent of the

participants reported the photograph chosen to be the most neutral of the four.

This was a between-subjects design with each participant receiving one level of the independent variable: hue of red. Participants were tested in groups that ranged from 1 person to 4 people in well-lit dormitory rooms with white walls. To achieve the highest level of participant comfort, tests were conducted in each individual’s personal room. Participants were asked to read and fill out an informed consent form. Subsequently, participants were asked to close their eyes, take a deep breath, relax, and clear their minds. They were then introduced to the POMS measure in order to be familiarized with the basic format. They were read the following instructions:

Look at what I am showing you intently, the picture and the *border* which surrounds it. Fill out the questionnaire to indicate *how you are*

*feeling right now. Work swiftly, going by first instinct as much as possible. (Italicized words stressed)*

Participants were then shown the black and white photograph with one hue of red (“cool,” “neutral,” “warm”) bordering the photograph and asked to complete the POMS questionnaire according to the aforementioned instructions. At the completion of this task, participants were asked to fill out the Demographic Information Form and then debriefed.

### Results

In order to assess the participants’ general attraction toward the color red, descriptive statistics were used to summarize participants’ favorite colors and to indicate participants’ preference to high and low arousal colors. Red and yellow were the most frequently indicated high-arousal colors and blue, green, and purple were the most

frequently indicated low-arousal colors. Only 6.7% of participants favored the color red, whereas most participants (40%) favored the color blue, 16.7% favored the colors green, purple, or an “other” color respectively, and only 3.3% favored the color yellow.

Descriptive statistics were also used to assess participants’ ideal lighting environment, a light, dim, or dark room. Most of the participants (63.3%) reported a preference for dim rooms, whereas 26.7% preferred bright rooms, and 10% preferred dark rooms.

The POMS questionnaire presented 65 items, 16 of which were specific to positive mood state and 49 of which were specific to negative mood state. The possible range of scores detailing positive responses was 0 to 68. The data in the study ranged from 2 to 51 ( $M = 23.2$ ,  $SD = 13.58$ ). The possible range of scores detailing negative responses was

0 to 192. The data in the study ranged from 2 to 112 ( $M = 45.5$ ,  $SD = 32.19$ ). The possible range of scores detailing overall POMS score ranged from 0 to 260. The data in the study ranged from 12 to 121 ( $M = 70.5$ ,  $SD = 31.58$ ).

An independent samples t-test was conducted to analyze for relationships between males and females and the scores obtained on the POMS test analyzing the degree of emotional intensity, a combination of positive and negative mood states, achieved by looking at the various hues of red. Results show a significant relationship between overall mood score of emotional intensity and sex ( $p = .03$ ), with males tending to report higher levels of emotional response ( $M = 82.53$ ,  $SD = 27.92$ ) than females ( $M = 58.47$ ,  $SD = 31.23$ ).

In addition, three Analyses of Variance (ANOVAs) were performed to

examine the effect of three levels of the independent variable, “cold,” “neutral,” and “warm” hues of red, on the POMS measure scores determining positive and negative mood states as well as the overall mood state indicating level of emotional intensity. There was no significant difference in positive mood state between participants who viewed “cold,” “neutral,” and “warm” hues of red ( $p = .21$ ). However, there was a significant difference in negative mood state between participants who were exposed to “cold,” “neutral,” and “warm” hues of red ( $F(2,27) = 3.37$ ,  $p = .014$ ). A Tukey’s HSD post hoc analysis indicated that the “cold” hue ( $M = 26.5$ ,  $SD = 30.69$ ) was significantly lower in reports of negative mood state than the “warm” hue ( $M = 60.4$ ,  $SD = 32.61$ ) of red. There was a significant difference in overall POMS score measuring emotional intensity between people who

viewed “cold,” “neutral,” and “warm” hues of red ( $F(2,27) = 5.01, p = .014$ ). A Tukey’s HSD post hoc found that, when looking at the overall POMS score, the “cold” hue ( $M = 47.9, SD = 32.31$ ) was significantly lower in reports of emotional intensity than the “neutral” ( $M = 78.9, SD = 18.89$ ) or “warm” ( $M = 84.7, SD = 30.69$ ) hues of red.

#### Discussion

This study demonstrates that specific hues of red do have some effect on an individual’s sense of mood. However, the findings contrast from the hypothesis, since the “warm” hue of red does not elicit a high positive response to mood as was originally considered. Rather, the “warm” hue elicits more negative responses to mood. This finding may be due to the negative associations the “warm” hue confers, where the majority of participants consider it hostile and adverse (Wexner, 1954)

rather than amorous and fiery as hypothesized. It is possible that most participants view the “warm” hue akin to the color of blood, thinking of its violent connotations such as war and fighting, rather than its more peaceful connotations such as love and the heart.

The findings in this study also indicate that men show more of a response to red in emotional intensity than women, which may suggest that red brings up more poignant associations to that particular sex. Although the men in this study do not show significant amounts of negative response to the hues of red, the researcher of this study has observed from working in a day care center that young boys seem to have more violent tendencies and interests than females. They often immerse themselves in playing with more overtly violent toys than females, such as toy soldiers, and build and defend forts

constructed from blocks. Many of the characters to which they are exposed in television programs and other media forms act out in anger. And given the color of blood, acting out in anger is most often associated with the color red. This is allied with the popular notion that one “sees red” when angry (Crane, 1980). Perhaps men look at the color red and perceive it to signify proudness or protectiveness, characteristics which Wexner (1954) found to describe red. Boys must associate red with aspects of life that contain emotional potency.

Other reasons for the high levels of reported negative mood can be attributed to the participants’ general attitudes the day in which they participated in the study, although it is not entirely clear why this would be true of males more than females. If a person had a disagreeable day, his or her emotions could have carried over into the study,

especially because the items on the POMS questionnaire deal with present feelings. In addition, it has been noted that the POMS tends to reveal more about negative emotion than positive emotion (Levy, 1984). Therefore, it is possible that this particular factor would contribute to the findings. Furthermore, there are certain assessments asked on the POMS, such as “Fatigued” and “On Edge,” both of which are constant states for many college students. Therefore, that information could sway the data in favor of higher negative mood responses. The breathing exercise may not have completely counteracted both of these factors.

In addition, many participants vocalized complaints regarding the number of questions asked by the POMS questionnaire (65 items). That factor could have automatically placed participants in a negative mood state,

especially when considering the complexity of tasks students must face from day to day.

A good deal of negative mood can also be attributed to participants' preference for low-intensity colors unlike the high-intensity color red. Recall that most of the participants reported a greater preference to low arousal colors such as blue, green, and purple, rather than to high arousal colors such as red, yellow, and orange.

“Warm” and “neutral” hues of red were found to evoke more response in emotional intensity. This might suggest that participants more easily associated the “neutral” and “warm” hues of red to aspects of their lives, thus affecting their emotions. The “warm” and “neutral” hues were richer in color and saturation. Thus, it is possible that participants could relate the hues to more poignant features in the world, such as the

variations of red found in the fiery sun or the deep red blood pumping through a person's heart. These two hues are introduced to people at a young age with magic markers and shades of crayons more often than the “cold” hue.

Therefore, the associations people make with the “warm” and “neutral” hues are probably more striking and lasting than the associations made with the “cold” hue.

This information may prove useful in advertising when companies wish to catch consumers' eyes. Advertisers will want to choose the most ideal hue of red (likely a “neutral” or “warm” hue) in order to capture consumers' attention, while at the same time avoiding placing consumers in negative mood states and detracting their attention from what is being advertised. Therefore, further studies may wish to explore the effect of hues of red (“warm” hues) evoking

negative mood state when placed against high arousal colors evoking positive mood state. It is possible that the high arousal colors will counterbalance the negative emotions the “warm” hue of red seems to conjure.

Future research may also benefit by looking at high levels of arousal produced by high-saturated hues of red and their correlation with levels of anxiety and depression. With a projector, researchers could flash objects displaying various hues of red on a wall and note how strongly the participants react to each hue by cuing participants to indicate the first words which come into their minds. If the “neutral” and “warm” hues of red were able to elicit a considerable response with participants in the current study through the possible associations the participants made with the hues, it might be interesting to assess how great these associations affect

peoples’ levels of anxiety and depression. This is especially intriguing since this study found that the “warm” hue elicited significant negative mood states.

However, the research performed on gradations of hues and their affect on human emotions has only been touched on with this research. There is need for much more research into the effects of long-term exposure to hues of red on emotion and mood states. Information garnered will be valuable not only to therapists, interior designers, and advertisers, but to the general public whose work potential and general well-being is more often than not affected by the spectrum of colors which surround them.

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