AN ABSTRACT OF THE THESIS OF

Sara E. Hefling for the Master of Science

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Title: An Examination of the Effect of Exposure to Color on State Anxiety Levels

Abstract approved: Cooper B Holmes

This study examined the effect of room color on state anxiety levels. Participants were 120 undergraduate students from a midsize Kansas university. The participants were given the State-Trait Anxiety Inventory - State scale (STAI-S), were given ten minutes of intensive exposure to one of four colors (red, blue, green or yellow), and were then given the STAI-S again. Results indicated no significant differences between the pre- and post-test scores by color or by gender, which did not support the proposed hypotheses. The results also did not support the findings from previous research.

AN EXAMINATION OF THE EFFECT OF EXPOSURE TO COLOR ON STATE ANXIETY LEVELS

A Thesis

Presented to

the Department of Psychology and Special Education

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In Partial Fulfillment

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Master of Science

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by

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CHAPTER 1

INTRODUCTION

Color is all around us. Colors surround people every day and in many ways, but what is really known about the impact that colors have? The impact color has on individuals could provide useful information; however, very little research has been conducted in this area. The studies that have been done have mostly examined color preference, but have left the area of colors' effect on anxiety virtually untouched. The purpose of this study is to examine the effects of color exposure on state anxiety levels.

Color may play a significant role in everyday life. However, not much is known about the specific effects of its role. To gain a better perspective of the role of color, it will be necessary to examine how color is described, color preferences, the effects that colors have on individuals, and color's association with anxiety.

Description of Colors

The way in which individuals describe a color is related to their perception of that color. The perception of the color also plays a role in the effect that color has on the individual. Various colors have been described in different ways, such as "red as happy and blue as both serene and dignified" (Jacobs & Suess, 1975, p. 207). Red has also been described as "disagreeable, exciting, upsetting, and imposing" and green was described as "agreeable and quieting" (Jacobs & Suess, 1975, p. 207).

Hemphill (1996) found that yellow was reported to be positive and seen as bright, like the sun and "green was associated with the environment: forests, trees, and nature" (p. 278). Red was seen as positive "because it was a 'strong positive colour' and a 'warm colour' " (p. 280). Jacobs and Hustmyer (1974)

reported that red has also been "described as more stimulating, awakening, and attention-drawing" (p. 763). Hemphill (1996) also found that blue received a large number of positive responses and was often identified as a favorite color. This may have occurred because blue was often associated with the ocean or sky and seen as limitless, calm, or serene (Hemphill, 1996).

Color Preference

Color preference also plays a role in how individuals describe and perceive colors, just as how an individual describes and perceives colors plays a role in color preference. Reeves, Edmonds, and Transou (1978) reported that an "increasing number of studies have shown that blue is the most preferred color worldwide" (p. 857). Silver and Ferrante (1995) pointed out that research has shown that color preferences differ across cultures. However, it was also indicated that "blue has been the predominant choice in the United States" (p. 920). While it is important to note that there are cultural differences in color preferences, this study will be focusing on American samples and, thus, American preferences.

Differences in color preference have been found between men and women (Silver & Ferrante, 1995). Spiegel and Keith-Spiegel (1971) indicate that more extraverts than introverts and more men than women prefer warm colors. However, Seefeldt (1979) reports that there has been little published research about women's color preferences. In a study exploring color preferences and sex differences, Seefeldt (1979) found that "no significant differences between the sexes was found on either the rating or ranking of green" (p. 897). The study goes on to report that women preferred yellow significantly more so than men. Spiegel and Keith-Spiegel (1971) found

that when compared to men, "females preferred brighter colors, more highly saturated colors, liked green less, and preferred violet more" (p. 320).

Effect of Colors

Color is not only associated with a verbal description or a preference, but it can also be associated with a physiological or emotional effect as well. The results of semantic, physiological, and inventory studies indicate that red is arousing, blue is not arousing, and there is disagreement about the level of arousal associated with yellow and green (Reeves, et. al., 1978). In an examination of the "effects of continuous viewing of colored fields upon psychophysiological functions," there was "significantly less physiological arousal under blue than red or white illumination" (Spiegel & Keith-Spiegel, 1971, p. 318). Hemphill (1996) indicated that "red has been associated with aggression and excitation, green has been associated with withdrawal, and black has been associated with anxiety" (p. 277). In a study reported by Jacobs and Suess (1975), the lighting in a classroom was changed in order to see the effect on color perception. When the lighting was changed, "red and yellow were described as 'most unpleasant' and green and blue as 'most pleasant'" (p. 207). Contrasting evidence presented by Kwallek, Lewis, and Robbins (1988) indicated that during a reading task, blue in the background induced adverse stress while red did not induce adverse stress.

Hemphill (1996) found that for both men and women, bright colors (white, pink, red, yellow, blue, purple, and green) got more positive responses; dark colors (brown, black, and gray) got more negative responses. He also found that women tended to respond in a more positive manner to bright colors and more negatively to dark colors. The same study also reported that men responded slightly more positively to dark colors than women did. Hemphill

(1996) also found that, examining both men and women, green received a large number of positive responses, as did red and yellow.

Association with Anxiety

Individuals have many verbal associations they make with color, but color can also have an effect on physiological arousal and mood, specifically anxiety. In a study investigating the relationship between color and state anxiety, Reeves, et. al. (1978) found that the results of their study and "those of 'preference' studies suggest that blue consistently influences emotion" (p. 857). However, further examination is needed to establish the qualitative (i.e., positive or negative) responses to blue (Reeves, et. al., 1978).

Jacobs and Suess (1975) reported that there was a differential effect between red and blue when a number of physiological measures were recorded. "Red was more arousing than green when GSR [galvanic skin response] was the dependent variable" (p. 207). In a study examining the effects of color on anxiety state, Jacobs and Suess (1975) found that the "relatively high anxiety associated with red and the relatively low anxiety associated with green are consistent with observations that red was described as disagreeable while green was described as agreeable and calming" (pp. 208-209). In the above study, blue and green were associated with relatively low state anxiety (A-state) values. Jacobs and Suess (1975) also found red to arouse more anxiety than blue or green, which was consistent with previous studies using GSR effects. In a similar study, Reeves, et. al. (1978) found that individuals with high trait anxiety (A-trait) "were significantly more anxious while viewing blue, red and green than were the low A-trait" (p. 856).

In a study investigating anxiety and color saturation, Ireland, Warren,

and Herringer (1992) found that tests "indicated that the high-anxiety group preferred less saturated shades...than did low-anxiety subjects" (p. 546). The researchers postulated that the "high-anxious individuals may have preferred more pastel shades... because these are less arousing in a physiological sense" (p. 546). When examining the effects of continuous viewing of colored fields, it was found that "subjects with higher manifest anxiety scores were significantly more activated and disturbed by red illumination, but were more relaxed and calmed by blue illumination than were subjects with low manifest anxiety" (Spiegel & Keith-Spiegel, 1971, p. 318). Profusek and Rainey (1987) were examining the effects of Baker-Miller pink and red on anxiety and found that "state anxiety scores were significantly higher for subjects in the red room" than "those in the Baker-Miller pink room" (p. 941).

Kwallek, et. al. (1988) examined the effects of office color on mood and productivity. Results indicated that mean anxiety scores for participants remaining "in the red room was higher than for the other groups, the mean depression score for the subjects who remained in the blue room was higher than for any other group" (p. 127). The authors stated "that red may be associated with anxiety and that blue may be associated with depression" (Kwallek, et. al., 1988, p. 127). More information about how color affects anxiety could be of use in regard to improved choices of environmental colors of different settings. By determining the effects that a specific color may have on anxiety levels, environments could be made more conducive to learning, working, living, and communicating in general.

Summary

The verbal description of color and color preference plays a role in how individuals perceive color. Different colors have different connotations that go

along with them. Many of these colors also have physiological or emotional effects that are associated with them. Women and men tend to exhibit differences in color preference and appear to be effected by different colors in different ways. The colors red, blue, green, and yellow appear to have the strongest physiological and emotional effects on people. These colors also have an effect on an individual's level of anxiety. It is the effect that color can have on anxiety and which colors have the most effect on anxiety that was of particular interest in this study. To gain a better understanding of the effects color may have on anxiety, this study examined the effect intensive color exposure had on the level of state anxiety. The effect that was expected was that certain colors would increase the level of anxiety while other colors would have no effect on or reduce the level of anxiety.

Hypotheses

Based on the findings from previous studies, the present study examined the following hypotheses:

Hypothesis 1: Red and yellow will be more state anxiety arousing than blue and green.

Hypothesis 2: Blue and green will reduce the state anxiety level.

Hypothesis 3: Women, as compared to men, will show the largest increase in anxiety when exposed to red or yellow.

CHAPTER 2

METHOD

Participants

A voluntary sample of 120 students at a Midwestern university was used in this experiment. Students were enrolled in either Introductory Psychology or Developmental Psychology. The students signed up for and participated in the experiment as partial fulfillment of the research requirements for the two classes. The participants ranged in age from 18 to 49 years old and from freshman to senior standing, with over half of the students being classified as freshman or sophomore. Both women and men participated, with 81 of the total number of subjects being women and 39 being men.

The group exposed to blue consisted of 36 (22 women, 14 men) participants. Of these, 12 were freshmen, 14 were sophomores, 5 were juniors, and 5 were seniors. The mean age was 20.50 (SD = 2.81).

The group exposed to red consisted of 27 (17 women, 10 men) participants. Of these, 13 were freshmen, 9 were sophomores, 4 were juniors, and one was a senior. The mean age was 19.93 (SD = 2.59).

The group exposed to green consisted of 29 (23 women, 4 men) participants. Of these, 16 were freshmen, 6 were sophomores, 5 were juniors, and 2 were seniors. The mean age was 22.03 (SD = 6.62).

The group exposed to yellow consisted of 28 (19 women, 9 men) participants. Of these, 15 were freshmen, 8 were sophomores, 4 were juniors, and one was a senior. The mean age was 23.28 (SD = 9.09).

Design

The present study used a 2 (Sex: men or women) X 4 (Color: red, yellow, green, or blue) factorial design. The between subjects independent

variables were sex and the color to which the participant was exposed. The between subjects dependent variable was the individual's gain score, or the difference between the pre- and post- test score.

Instrumentation

For the purposes of this study, the state anxiety scale (S-Anxiety) of the State-Trait Anxiety Inventory (STAI) (Form Y) (Spielberger, Gorsuch, Luschene, Vagg, & Jacobs, 1983) was used. The inventory is well-respected and widely used in the field of psychology as a measure of state and trait anxiety levels. State anxiety exists at a particular moment in time, at a certain level of intensity, and can be considered transitory. Trait anxiety (T-Anxiety) is related to differences in anxiety proneness that are relatively stable over time. The state anxiety scale is made up of 20 statements that assess an individuals' level of anxiety at that particular moment. The statements are rated on a four point Likert type scale ranging from "not at all" to "very much so." The scale is scored by hand by adding up the weighted scores for the 20 statements on the scale. The minimum score for the scale is 20, indicating low state-anxiety, and the maximum score is 80, indicating high state-anxiety. The State-Trait Anxiety Inventory (Form Y) manual reported good Alpha reliability coefficients, based on the normative sample, ranging from .86-.95 for the state anxiety portion of the inventory.

Procedure

The sign-up sheets for the experiment were set up so that a maximum of 5 participants could be run at the same time. Prior to arrival, the groups of participants were randomly assigned to be exposed to one of the four colors by drawing the colors out of a bag. Prior to the arrival of the participants, the end

wall and two-thirds of each side wall were covered with either red, yellow, blue, or green fabric, as assigned by the random draw. The participants were then brought into the room and asked to sit in the five chairs at a table facing the colored end wall. The researcher stood between the participants and the colored end wall to pass out the forms and give directions. In doing this, the researcher was directing the participants attention away from the colored wall. The participants were given an informed consent document (see Appendix A) was presented to each participant prior to the start of the experiment. The document informed them of the nature of the experiment and that they had the right to withdraw from the experiment at any time without fear of penalty or loss of research points. Along with the written informed consent, the researcher also verbally explained the nature of the experiment and the items included on the informed consent document. After completing the informed consent document, the researcher continued to stand between the participants and the end wall and a set of standardized instructions was read (see Appendix B). Each participant was then given the state anxiety scale to complete as a pre-test. Once the scales were completed, further standardized instructions were given regarding what would take place next. The researcher moved from between the participants and the end wall and the participants were then given fuller exposure to the color for 10 minutes. While the color had been present throughout the session and the participants had seen it, at this point the researcher was not between the color and the participants and was no longer the focus of the participants' attention.

During the 10 minutes of exposure, to act as a time filler, a paper and pencil personality inventory was administered. At the end of the 10 minutes, the inventories were collected, the researcher moved back to being the focus of the

participants attention, a set of standardized instructions was presented, and the state anxiety scale of the STAI was administered again as a post-test. Once the participants had completed the inventory, they were asked to complete a brief demographics sheet (see Appendix C). Once that was completed, a short debriefing was held to ensure the well-being of the participants.

CHAPTER 3

RESULTS

Participants were administered the State-Trait Anxiety Inventory - State (STAI-S) scale. They were then exposed to either blue, red, green, or yellow. Following the exposure time, the participants were again administered the STAI-S. The results were analyzed using the Microcase statistical software, where appropriate ANOVA's were conducted using the gain scores, or the difference between the pre- and post-test scores. The alpha level was set at .05.

Effects on State Anxiety Level

A 2 x 4 Factorial Analysis of Variance was run using the gain STAI scores (see Table 1). The main effect of color was found to be statistically significant, F (3,1) = 4.227, p = 0.007. Further analysis of this finding was conducted. The results from the Tukey HSD test indicated that group 1 (Blue) and group 4 (Yellow) were significantly different, with a confidence interval of (10.48, 1.46). The main effect of sex was not found to be statistically significant, F (3,1) = 0.187, p = 0.667. The interaction between color and sex was also not found to be statistically significant, F (3) = 0.685, p = 0.563. For the means and standard deviations of the gain scores, see Table 2.

Hypothesis 1. The hypothesis stated that red and yellow would be more state anxiety arousing than the other two colors. The results indicated that red did not produce any significant changes in state anxiety, but that yellow did significantly reduce state anxiety, when compared with blue. Thus, the proposed hypothesis was not supported.

Hypothesis 2. The hypothesis stated that blue and green would reduce the state anxiety level. The results showed that neither blue nor green

Table 1

Summary of Factorial Analysis of Variance of Gain Score as a Function of Color (Blue, Red, Green, Yellow) and Sex

Source	df	SS	MS	F
Color	3	604.738	201.579	4.227*
Sex	1	8.901	8.901	0.187
Color x Sex	3	98.022	32.674	0.563
Error	112	5341.202	47.689	

*$p < .05$

Table 2

Summary of Means and Standard Deviations of State-Trait Anxiety Inventory Gain Scores by Color and Sex

	Blue	Red	Green	Yellow	Total
Women					
Mean	2.227	-0.941	-2.783	-4.000	-1.321
SD	5.706	4.723	5.567	6.037	5.962
n	22	17	23	19	81
Men					
Mean	0.929	1.500	0.500	-4.778	-0.308
SD	6.120	7.337	10.710	13.283	9.168
n	14	10	6	9	39
Total					
Mean	1.722	-0.037	-2.103	-4.250	-0.992
SD	5.819	5.814	6.831	8.758	7.139
n	36	27	29	28	120

significantly reduced the level of state anxiety. Therefore, the proposed hypothesis was not supported.

Hypothesis 3. The hypothesis stated that women, as compared to men, would show the largest increase in anxiety when exposed to red or yellow. The results indicated no statistically significant differences between sexes for any color, including red and yellow, and that, overall, yellow, when compared with blue, significantly reduced state anxiety. Thus, the proposed hypothesis was not supported.

CHAPTER 4

DISCUSSION

Findings and Related Literature

Hypothesis 1. Hypothesis 1 stated that red and yellow would be more state anxiety arousing than either of the other two colors. The results indicated that red produced no significant increase in state anxiety and yellow, when compared to blue, significantly reduced state anxiety. In looking at the results of the red group, the findings seem to contradict what has been presented in previous research. Jacobs and Suess (1975) reported that red has been described as "disagreeable, exciting, upsetting, and imposing" (p. 207). Red has also been found to be physiologically arousing (Jacobs & Suess, 1975; Reeves, et. al., 1978; Spiegel & Keith-Spiegel, 1971). Hemphill (1996) reported that "red has been associated with aggression and excitation" (p. 277). Jacobs and Suess (1975) also found that red was associated with a relatively high state anxiety level. Based on the above mentioned research, it could be concluded that the individuals in the group that was exposed to red should have reported an increase in the score for the state anxiety level. However, in a study reported by Kwallek, et. al. (1988), it was found that, during a reading task, a red background did not cause any adverse stress. While this study was not designed to be a reading task, there was quite a bit of reading involved on the part of the participants. Because the red did, essentially, provide a background for the participants, it is possible that that fact could account for the results from the red group.

In looking at the results of the yellow group, a significant reduction in state anxiety was found, when compared to blue. In regard to previous research, findings have been inconsistent. Hemphill (1996) reported that

yellow was described as positive and bright. While yellow has been described as unpleasant (Jacobs & Suess, 1975), Reeves, et. al. (1978) reported that there is disagreement about the arousal level associated with yellow. In light of previous research, the findings from this study may be explained, in part, by the fact that yellow is described as a positive color and, therefore, may reduce state anxiety levels.

Hypothesis 2. Hypothesis 2 stated that blue and green would reduce the state anxiety level. The results indicated no statistically significant reduction in state anxiety for either blue or green. These findings contradict the findings presented in previous research. Jacobs and Suess (1975) reported that blue was described as serene, thus leading to the conclusion that blue would have a calming effect and, thus, reduce state anxiety levels. Reeves, et. al. (1978) reported that blue was not arousing, based on the results of semantic, physiological, and inventory studies. Jacobs and Suess (1975), in a study examining the effects of color on anxiety state, found that blue was associated with relatively low state anxiety scores. However, Kwallek, et. al. (1988) reported that, during a reading task, blue in the background created adverse stress. In this study, the participants were surrounded by blue, effectively creating a blue background. In order to fill out the anxiety questionnaires and the filler activity during the exposure time, the participants were required to read. While this study was not designed to be a reading task per se, there was a good deal of reading involved and this could have affected the results from the blue group.

Jacobs and Suess (1975) reported that green had been described as "agreeable and quieting" (p. 207). Hemphill (1996) reported that green was associated with nature. Reeves, et. al. (1978) reported that there is

disagreement about the arousal level associated with green. However, Jacobs and Suess (1975) did report that, when looking at state anxiety levels, green was associated with relatively low anxiety. In light of these earlier findings, a reduction in state anxiety levels would have been expected from the groups exposed to blue and green.

Hypothesis 3. Hypothesis 3 stated that women, as compared to men, would show the largest increase in anxiety when exposed to red or yellow. No significant differences between sexes was found for any color in this study, including red and yellow. Differences in color preference have been found between men and women (Silver & Ferrante, 1995). Spiegel and Keith-Spiegel (1971) indicate that more extraverts than introverts and more men than women prefer warm colors. In a study exploring color preferences and sex differences, Seefeldt (1979) reported that women preferred yellow significantly more so than men. Hemphill (1996) also found that, examining both men and women, green received a large number of positive responses, as did red and yellow. While previous research reports that differences between women and men have been found in regard to color preference, no specific research has shown whether this difference carries over into the area of the effect on anxiety. While yellow may be preferred more by women and red and yellow may receive more positive responses from men and women, research has also indicated that red and yellow are more arousing colors. If these colors tend to be more arousing, it could also be possible that they would increase anxiety levels.

Conclusions and Future Directions

When studying state anxiety levels, there can be any number of outside influences on the levels. While this study was examining the effect of exposure

to color, the results would indicate that there were some other factors involved in the final analysis.

One of the first factors that may have had an effect on the results was the way in which this study was set up. The instructions to the participants, the administration of the questionnaires, and the room set up was consistent for all testing times. However, the physical set up of the room could be improved. In order to give the room a more natural feel, further studies should consider painting the room instead of using fabric. It would also be beneficial to run the participants individually and have them take the pre-test in a separate room, before being exposed in any way to the color being tested. Additionally, other individual factors, such as color preference and amount of attention paid to the color of the room, could also have had an effect on the results.

Another factor that may have influenced the results is the pool of participants. If more equality of overall numbers in each color group and number of women and men in each group were achieved, it is possible that the results would be slightly different, and perhaps be more complementary to the findings of previous research. Along with more equality, if the same group of participants were exposed to all four colors, it could give a clearer picture about which colors have the most influence on state anxiety levels. However, were this to be done, it could create a problem of familiarity with the testing instrument.

A final factor that may have influenced the results is the colors that were used. In looking at the research, other colors, such as purple, pink, black, and gray, could also affect state anxiety levels (Hemphill, 1996). Thus, looking at colors other than the ones used in this study could provide a more complete analysis of which colors cause increases or decreases in state anxiety levels.

Another aspect of the color that is used that must also be considered is the saturation level of the colors. Brighter colors may have more of an effect on state anxiety than pastels, or vice versa. This is another aspect of color to keep in mind as having an effect on the amount of change produced in state anxiety levels.

Since, in general, the results from this study and previous research have produced mixed results, this area of study is an important one to continue. This area of research has the potential to provide information that can be used not only in psychology, but in a number of other fields as well. This area of research is also one that has not been very well researched in the last 15 years or more. Updating the information could be useful as it is possible that people's perception of colors and the effect that colors have on individuals may have changed in the past 15 years.

Further studies looking at the association between color and state anxiety could be useful to the field of psychology in a number of ways. First, it could provide another way to help individuals who suffer from anxiety disorders find ways to manage the anxiety, as well as reducing the anxiety. For this to occur, studies would need to be conducted with anxious populations in order to determine what colors have the most anxiety reducing effect. In the future, it might be possible for an anxious individual to use color in his or her home or work place to help reduce overall feelings of anxiety. These same principals could also be applied to individuals who have problems with only occasional anxiety or those individuals who suffer from other disorders that are exacerbated by anxiety.

Further studies could also be useful in other areas of psychology, such as art therapy and industrial/organizational psychology. In both of these

specific areas, the information gained from further research could be used as an auxiliary means of helping an individual or organization to discover other methods of dealing with a problem.

Another field in which future research in the area of color and anxiety could be useful is that of interior decorating. Decorators have long used specific colors to try to create a mood or feeling in a room. With further research in this area, decorators could use the information gained to make more helpful choices as to colors that would be calming and those that would be exciting. Additionally, individuals who work with hospitals, schools, and prisons could also use the information gained from this area of research. In all three of these settings, helping to make people feel less anxious and having a calm environment are important in order for individuals to function at a higher, more productive level. By being familiar with colors that tend to be calming to people, rooms, hallways, and cells could be painted to help foster a calmer, more pleasing environment. It should be noted that further research dealing with the populations involved with each of those areas may be necessary in order to get an accurate and complete picture of the population involved.

Colors surround people every day. In a society that is increasingly trying to find ways to get away and relax, further work on the effect exposure to color has on state anxiety levels could provide some useful information. Based on the results of the current study compared to previous findings, further research does need to be conducted to help establish a clearer picture of which colors consistently affect state anxiety and how colors affect state anxiety. With further research, it may be possible to create and provide a relaxing environment without having to leave home.

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Appendix A

Consent Form

INFORMED CONSENT DOCUMENT

The Division of Psychology and Special Education at Emporia State University supports the practice of protection for human subjects participating in research and related activities. The following information is provided so that you can decide whether you wish to participate in the present study. You should be aware that even if you agree to participate, you are free to withdraw at any time, and that if you do withdraw from the study, you will not be subjected to reprimand or any other form of reproach.

You will be asked to fill out an inventory, be exposed to a color, and then asked to fill out another inventory. This should take approximately 30 minutes. There is a chance that you may experience some slight anxiety during this procedure.

"I have read the above statement and have been fully advised of the procedures to be used in this project. I have been given sufficient opportunity to ask any questions I had concerning the procedures and possible risks involved. I understand the potential risks involved and I assume them voluntarily. I likewise understand that I can withdraw from the study at any time without being subjected to reproach."

_____ _____

Subject Date

Appendix B

Verbatim Instructions to Participants

Instructions to Participants

I would like to thank you for coming today and participating in this experiment. To begin, I have an Informed Consent Documents for you to read over and sign. (Pass out forms.) This documents informs you that if you agree to participate, you are free to withdraw at any time. If you do so, you will not be subjected to reprimand or any other form of reproach. You will be asked to fill out a questionnaire, be exposed to color, and then asked to fill out another questionnaire. There is a possibility that you may experience some slight anxiety during this procedure. Do you have any questions? (Pause.) Please read over the document silently and sign it. (Collect signed forms when everyone is done.) I would now like you to fill out the first questionnaire. All responses given on the questionnaires will be kept confidential. (Pass out STAI.) Please fill out only the side that has been highlighted on. Please fill in you name, the date, your age, and gender. (Pause.) Please read the directions silently as I read them aloud. (Read directions from STAI-S). Please complete the questionnaire now. (Collect completed STAIs when everyone is done.) For the next ten minutes I would like you to work on this form. (Show the filler activity personality questionnaire.) When you finish the first side, go on to the other side. Please be sure to read the directions at the top of each side carefully as they are slightly different. Also, please provide your gender and age where indicated at the top of the page. I will tell you when the ten minutes is up. If you do not complete the questionnaire that is fine; if you finish the questionnaire before the ten minutes is up, please sit quietly until the time is up. (Pass out the form.) You may begin. (Start timing for ten minutes.) Time is up. (Collect questionnaires.) I would now like you to complete the final questionnaire. Please fill out only the side that has been highlighted on. (Pass

out STAI.) Please fill in your name, the date, your age, and gender. (Pause.) Please read the directions silently as I read them aloud. (Read directions from STAI-S.) Please complete the questionnaire now. (Collect completed STAIs when everyone has finished.) Finally, I would like you to fill out this demographics sheet. (Pass out demographics sheet. Collect completed demographics sheet when everyone is finished.) The experiment that you have just participated in is looking at the effect of color on state anxiety levels. All information received here will be kept confidential in that you names will not be used and the scores will not be associated with your names, only a number. If you are feeling any uncomfortable levels of stress or anxiety and would like further assistance, please let me know. Again, I would like to thank you for your cooperation and participation today. Finally, I would ask that you not discuss this research until I have finished running my experiment. (Hand out research slips.)

Appendix C

Demographics Sheet

DEMOGRAPHICS INFORMATION

Age: _____ Gender: M F

Year in School: Freshman Sophomore Junior Senior

What is your favorite color? _____

Are you color blind? Y N

Appendix D

Raw Data for the Color Red

Raw Scores for the Red Group - Women and Men

Women

Pre-Test	Post-Test
22	21
30	31
22	25
33	32
35	33
32	26
30	20
34	37
37	42
29	21
37	45
38	40
21	20
28	22
42	38
20	20
35	36

Men

Pre-Test	Post-Test
33	22
34	32
38	54
30	27
37	37
32	29
29	36
47	48
45	48
37	44

Appendix E

Raw Data for the Color Yellow

Raw Scores for the Yellow Group - Women and Men

Women

Pre-Test	Post-Test
37	36
30	27
28	26
31	22
45	38
29	34
35	38
36	32
25	26
35	32
55	45
32	26
32	26
35	21
64	45
31	27
29	28
30	31
34	37

Men

Pre-Test	Post-Test
49	30
28	30
34	29
33	37
23	21
60	39
59	77
52	31
32	33

Appendix F

Raw Data for the Color Blue

Raw Scores for the Blue Group - Women and Men

Women

Pre-Test	Post-Test
27	26
37	42
42	43
33	21
26	29
26	32
21	21
57	75
48	51
32	32
22	30
31	26
27	30
46	45
23	22
41	42
40	40
33	36
25	28
39	40
24	35
71	74

Men

Pre-Test	Post-Test
50	57
29	30
22	25
33	46
33	37
35	32
30	29
20	20
23	23
24	20
58	68
31	26
40	30
24	22

Appendix G

Raw Data for the Color Green

Raw Scores for the Green Group - Women and Men

Women

Pre-Test	Post-Test
42	40
40	40
36	37
34	21
40	30
34	32
47	42
29	29
26	21
28	26
20	20
47	63
26	20
38	33
33	31
35	31
33	35
34	26
37	36
37	36
32	30
30	24
29	20

Men

Pre-Test	Post-Test
35	44
32	29
40	22
20	26
34	32
33	44

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Sara E. Hefling
Signature of Author

August 31, 2001
Date

An Examination of the Effect of Exposure to Color on State Anxiety Levels
Title of Thesis

Signature of Graduate Office Staff Member

September 4, 2001
Date Received