



# Color Preference Modulated by Physiological Arousal

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## INTRODUCTION

### Study Design

- A between groups design was implemented to assess differences in color preference between individuals who were physiologically aroused and control subjects

### Background

- Arousal has been implicated as having an influence on various facets of human emotion and higher level processing since the 1800s
- James-Lange Theory of Emotion: emotions are feelings that occur as a result of physiological changes in response to stimuli from the outside world<sup>1, 2</sup>.
- Schachter-Singer's Two-Factor Theory of Emotion: emotions are a result of physiology, but they are also a function of cognitive factors. Emotions are a misattribution of arousal<sup>3</sup>.
- Arousal has been linked to appraisal of relationships<sup>4</sup>, slapstick comedy<sup>5</sup>, and music<sup>6</sup>
- Studies looking at the effects of color on arousal have shown that saturated, low intensity, and red light are the most arousing<sup>7</sup>
- Properties of Color:** Luminance (intensity of light), Saturation (concentration of a given color), and Hue (wavelength of light emitted)
- Physiological Arousal:** increase in heart rate and skin conductance from baseline levels, as achieved by jumping jacks
- Color Preference:** Rating of pleasantness on a 1-7 Likert scale

### Limitations of Extant Research

- The influence of arousal on color preference has been relatively ignored in the previous literature.

### Purpose

- This study investigated whether a state of physiological arousal could alter individuals' preferences for various properties of color

## HYPOTHESES

We hypothesized that individuals in the experimental group, for whom physiological arousal had been induced, would show significant differences from the control group in their preference for different hues, and/or levels of saturation and luminance. Additionally, we predicted that blue hues and low intensity colors would receive high ratings, while high intensity colors and the yellow hue would receive lower ratings overall, based on past research.

## PARTICIPANTS

- Participants were 20 college students
  - Age range=19 to 24 years old;  $M=21.4$  years;  $SD=1.10$  years
  - 11 females, 9 males
  - Excluded based on Par-Q, and Ishihara plates

## METHOD

### Measures:

- Physical Activity Readiness Questionnaire (Par-Q):** The official readiness questionnaire in Canada, now used worldwide.
- Ishihara Color Plates:** Determine if an individual lacks sensitivity to colors (color blindness test)
- Positive and Negative Affect Scale (PANAS):** mood questionnaire that utilizes ranks positive moods (happy, determined, etc.) and negative moods (hostile, scared, etc.) on a scale of 1-7, giving scores for positive affect, negative affect, and valence.
- Color Preference (CP):** questionnaire that ranks the pleasantness of color on a scale from 1-7, where 1 is extremely unpleasant, and 7 is extremely pleasant
- Heart Rate (HR):** Biopac Pro was used to gather data. Electrodes were placed on non dominant wrist, and contralateral ankle. Ground was placed on dominant side ankle. Sampling rate of 100 Hz.
- Galvanic Skin Response (GSR):** Biopac Pro was used to gather data. Electrodes were placed on pointer finger and middle finger. Sampling rate of 100 Hz.

### Color Preference Outcomes:

- Colors were each shown for 2 seconds, followed by a screen telling the participant to rate the color for 3 seconds
- 6 Hues, 3 levels of saturation, and 3 levels of luminance were used, resulting in 54 colors
- Preference for each level of hue, saturation, and luminance were determined by averaging the rated pleasantness of all colors in that category (e.g., average of all high saturation colors)

**Procedure:** Participants first filled out the consent form, and completed the Par-Q and Ishihara Plates task to verify eligibility. HR and GSR were measured for 3 minute baseline. Experimental groups completed 100 jumping jack, and CP task was completed with continued HR and GSR measures. PANAS from was completed, and then subjects were debriefed.

## RESULTS

### Descriptive Statistics:

- Experimental Group Preference**
  - Saturation (High, Medium, Low)  $M = 4.28, 4.21, 3.62$
  - Luminance (High, Medium, Low)  $M = 4.11, 4.13, 3.88$
  - Hue (Blue, Cyan, Green, Magenta, Red, Yellow)  $M = 4.9, 5.2, 4.1, 3.8, 3.9, 2.3$
- Control Group Preference**
  - Saturation (High, Medium, Low)  $M = 4.41, 4.41, 4.05$
  - Luminance (High, Medium, Low)  $M = 4.08, 4.32, 4.47$
  - Hue (Blue, Cyan, Green, Magenta, Red, Yellow)  $M = 5.1, 5.2, 4.5, 3.9, 4.5, 2.6$

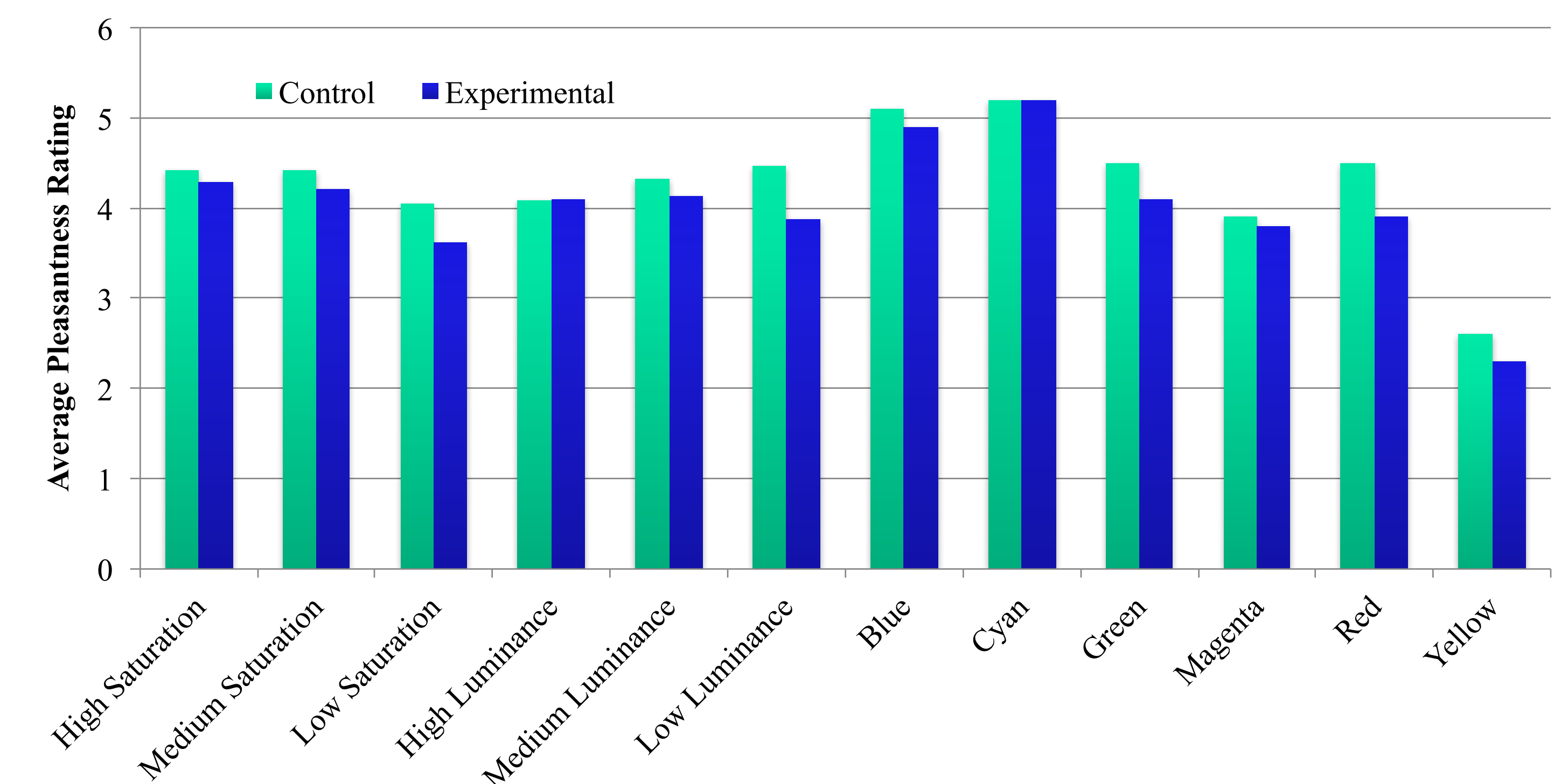
### MANOVA (Hotelling's $T^2$ ):

- Preference for different hues, levels of saturation, or levels of luminance did not differ between the experimental and control groups ( $F_{(10, 9)} = 1.30, p = .350$ ).
- Some trends between groups neared significance (i.e., low luminance), but small sample prevented significant findings

### Repeated Measures ANOVA:

- Control group showed no significant differences, however significant differences were found within the experimental condition ( $F_{(5, 90)} = 4.02, p = .002$ )
- Tukey post hoc tests failed to show where the significant differences are within the experimental group

## AVERAGE COLOR PREFERENCE



## SUMMARY & CONCLUSIONS

- Consistent with the existing literature, results showed yellow to be the least preferred hue, blue/cyan to be the most preferred, and low intensity preferred to high intensity
- Interestingly, the control group consistently rated almost every level of hue, saturation, and luminance higher than the control group
- The findings show that individuals that are physiologically aroused show a preference for different characteristics of colors, however the differences with the physiologically aroused individuals are not significantly different than a control group
- Overall our hypothesis was not supported, although there are trends in the predicted direction, and lack of significance is likely due to small sample size
- Results could be confounded by a lack of standardization in arousal, and an overall decrease in arousal throughout the task in the experimental group. Additionally, some participants felt that the stimuli were presented too quickly, and they didn't have time to give accurate ratings.
- Further research should attempt to make task more realistic. Rarely do we encounter only one color and appraise preference for it. One possible solution would be to present two colors at once and force a choice between the two.

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