The Effects of Color on Visual Short-Term Memory

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Johnson, TaeLynn; Burk, Zachary; Larson, Kassandra; and Ellsworth, Annalisa, "The Effects of Color on Visual Short-Term Memory" (2011). All Student Publications. 127.
https://scholarsarchive.byu.edu/studentpub/127

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INTRODUCTION

This experiment examined the effects of the color of images on the short-term memory of participants. We hypothesized that naturally colored images and unnaturally colored images had differing effects on short-term memory not affected by gender and favorite colors.

Background

Chromatic cues as well as observations of shape, form, position, and movement of objects are important to recognize and make sense of the world (Vernon & Lloyd-Jones, 2003). Vernon & Lloyd-Jones, who found colored objects were identified in less time than black and white objects (2003), it has been shown that elderly Alzheimer’s patients find it easier to navigate their environments and identify objects when color is used to improve their short-term memory which also improves their functional abilities (Cerrin, Keller, Stoner, 2003). Furthermore, color assists recognition of the context of environments even if the image is somewhat blurry (Caetanhos & Henderson, 2007). Natural color coding improves our ability to recognize objects more quickly (Vernon & Lloyd-Jones, 2007). What is not well known is how natural and unnatural colors affect visual short-term memory recall.

Hypothesis

- Research Question: How does object coloration affect a person’s visual short-term memory of observed items?
- Primary Hypothesis: The control group would be able to recall and record more images present in the collage the experimental group.
- Secondary Hypotheses: Gender and reported favorite color would have no significant effect on memory.

Operational Definitions:
- Memory: Number of items remembered and reported
- Natural coloration: Commonly-recognized coloration, or coloration usually found in nature
- Unnatural coloration: Altered and uncommon coloration, or coloration not found in nature

METHOD

Subjects Design
- Group A (Control): viewed Collage A
- Group B (Experiment): viewed Collage B
- Independent variable: Which collage was viewed

Participants
- Convenience (Internet) Sample
- Female: 42
- Male: 38

Administration
- Qualtrics (www.qualtrics.com)

Measures
- Primary Measure: The number of images remembered by each participant group in a collage
- Secondary Measure: The number of times and types of items that were correctly remembered.

Procedure
- Participants were directed to Qualtrics where the online survey was hosted. Participants read and agreed to an online consent form.
- Participants were randomized into either Group A or Group B.
- Participants selected one of links on SONA Systems, classifying them into either Group A or Group B. Each link routed to Qualtrics where the online survey was hosted. Participants read and agreed to an online consent form.
- Participants were directed to view a collage for 90 seconds.
- Participants were asked to view a collage for 30 seconds with the intent to remember the items viewed in a collage.
- Participants were asked to recall 90 seconds of the items they remembered from the collage they viewed in open-box provided for them.
- Participants were then asked to answer demographic questions, including age range, gender, major in college, colorblindness, and favorite color.
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Analysis
- All data were analyzed using SPSS 16.

RESULTS

Overall Results
- We hypothesized that color would influence participants’ ability to recall colored images. There was a significant difference in the number of items each team remembered.
- Participants who viewed the commonly colored collage recalled a greater number of items than participants who viewed the strangely colored collage.

Analysis of Primary Hypothesis
- We hypothesized the control group (Group A) would be able to recall more images from memory than the experimental group (Group B).
- ANOVA revealed a significant difference between groups, \( F = 11.946, p < .001 \). This indicated that Group A was able to recall more images than Group B, as we predicted.
- Using this information we were able to reject the null hypothesis and infer that object color influenced participant memory.

Analysis of Secondary Hypotheses
- Gender was not an overall determinant in the number of items remembered, nor was it a determinant within groups as shown by univariate analysis that an overall gender effect was \( p = .198 \). Gender effects within each group yielded 301. This effect was insignificant at the p ≤ .05 level.

DISCUSSION

General Discussion
- The fact that naturally colored images were remembered more frequently than unnaturally colored images suggests that object color significantly affects visual short-term memory and item recall.
- In order for our mind to efficiently and accurately store data, visual information needs to be presented in a way that can be readily recognized. We suspected that unnatural coloration would require more cognitive power and negatively affect a person’s ability to identify and memorize the items in the collage. These results compliment previous findings, which suggest that color plays an important role in object identification and recall.

Limitations
- Possible limitations to our study that should be addressed. Our collage included several images designed to be noticeable in everyday life (e.g. stop sign and traffic cone). It is possible that the functional nature of these items affected participants’ ability to remember them.
- Also of note is the fact that several of the included items are recognizable in other colors. For example, an apple can be identified as having red, yellow, or green skin. Whether this decreased the contrast between each collage is unknown.

Future Directions
- Using color properly to enhance memory will benefit businesses related to advertising, the educational field relating to textbook and learning graphics, the health industry relating to cognitive and improvement or healthy environments.
- This knowledge will enable the above industries to provide more effective advertisements, learning graphics, and healthy environments and improve quality of life for people of all ages.