The Effect of Color on the Perception of a Webpage

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Abstract

Websites make up the internet which is an incredibly important space for culture and business. The impact that design choices have when creating websites, in respect to how they affect users, is a question of major importance. This study looked to see if the color of a webpage could influence a user's perception of a site. 31 participants were tested by being exposed to one website with one of four dominant colors, and were then asked to rate how well different qualities fit how they felt about the site. The results of this study were unable to show any significant results that different colors had on the ratings. This was true of all of the categories participants were asked to rate. These findings seem to suggest that the choice of a dominant color on a webpage does not significantly impact a user's reaction, which is important information for website designers.

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Websites have become a common experience in everyday life. In a 2021 study, Pew Research found that 93% of all Americans use the internet which requires interacting with websites of some form (Pew Research, 2021). Websites employ a variety of design elements, from shapes to colors to fonts. Focusing on colors it is possible to uncover a variety of effects on people who interact with them.

Effects of Color on User's Emotion

In a paper by Sik-Lanyi it is highlighted that an understanding of color theory, in particular, is very important in effective and purposeful web design that can engage users (Sik Lanyi, 2017). Color has been shown to be an especially effective tool for utilizing human psychology to create certain moods or impressions. An article by Singh found these can create

hunger, calm moods, reduce the perception of time, among many other usages, in a review of literature surrounding color psychology and marketing (Singh, 2006). Additionally, Kaya & Epps demonstrated that college students displayed consistent emotions when exposed to certain colors (Kaya & Epps, 2004). The results showed strong connections between certain colors and certain emotions, such as gray being perceived as negative and moody, and green as much more positive and relaxing. This helps create a case that there are strong connections between specific colors and certain emotional perceptions, foundational to the research question of this study.

Additional Variables on the Effect of Color

The effects of color on a person can vary depending on their cultural background as well. Cyr and their fellow researchers (Cyr et al., 2010) were able to demonstrate this by asking how color treatments on websites affected participants of different cultures in different categories including user trust, satisfaction, and e-loyalty. This study was conducted by having participants do a variety of tests; including eye-tracking, a survey, and interviews. The results of this study showed that that website color is a significant determinant for website trust and satisfaction, with there being some noted differences in results across different cultural groups. This shows how color can influence behavior and perception, but that there can be external factors that influence perception going in, which could be an otherwise unforeseen variable going into this study. In another set of complementary studies, Bonnardel and their colleagues researched how the color of websites impact the favor of their users (Bonnardel et al., 2011). In the first study, participants were given access to 23 different versions of the same homepage in a different color and were asked to indicate their favor of each page on a 1 to 7 scale. The second study used only 3 versions of that webpage and had participants do a number of tasks on those web pages and then

surveyed them on their experience. Results showed that participants did not appreciate a page without color, and most liked pages with blue as the dominant color. These results provide some context to how participants may react to colors presented in this study. This provides an example of how color may affect users response to a webpage on a basis of approval or disapproval rather than just what emotions they experience.

Purpose of the Present Study

With research showing that strong correlations can be made between emotion and color (Kaya & Epps, 2004) and color and favorability (Bonnardel et al., 2011), colors should have a significant effect on how the users of a website interact with and perceive elements of websites. Because of these findings, it is hypothesized that the specific dominant color of a website will significantly change user perception of that website in one of several different qualities related to emotions.

Methods

This test uses a randomized post-test design in order to investigate the impact of the dominant color of a webpage on a participant's perception of that same webpage. Each randomized test provides the participant with a link to 1 of four color variations of the same webpage. The perceptions of the participants were measured with a self-report survey.

Participants

In this study, data was collected from MTurk participants (N=xx). Participants were paid $0.15 for completing the survey. Participation in this study was made public, but was limited to those from the US who had an HIT approval rate of 95% and at least 50 successful completions.

Setting limitations like this on the participants have been previously shown to improve the quality of responses (Paolacci & Chandler, 2014).

Materials

Demographics survey

A four question survey was given to participants at the beginning of this study. They were asked about their age, gender, level of education, and daily internet usage (in hours).

Conditions

Participants were randomly given a link to one of four different variations of the same webpage. This webpage is a single webpage with filler text and non-usable links, and was coded in html with css from w3 School (W3.CSS, 2021). Each page is identical in structure, with a navigation bar, header, body, and footer. The variation comes in the singular color of the website used (besides white), which is one of the three aforementioned . Examples of these pages can be seen in Appendix A.

Post-Test Survey

A five question survey was given to participants in order to measure their perception of the webpage they viewed. They were given a series of questions asking them to rate the webpage on five descriptive qualities (professionality, excitement, relaxedness, organization, and power) on a five point scale from strongly disagree to strongly agree. These questions are available in Appendix B.

Procedure

After being accepted through MTurk, participants first received the informed consent form. After accepting, they then took the demographics survey. They were then randomly assigned one of the eight webpage variations, and were then asked to complete the post-test survey. Finally, participants were given instructions on how to receive compensation.

Results

The data analysis was conducted on the relation of the webpage color as an independent variable in relation to sever dependent variables, being different categorical qualities for perception. This study utilized IBM's SPSS software in order to analyze the data and generate tables. Participants were asked to rank how accurately they thought the provided categories described the webpage they were assigned, on a 5 point scale from strongly agree to strongly disagree. In the data the former is a 5, down to the latter which is a 1.

Professionality

A Kruskal-Wallis Test was conducted on participants' ratings of professionality to test for differences among the levels of page color. This test indicated a non-significant result for page color, $H\,(3) = 0.23$, $p = 0.97$; $\eta^2 = -0.10$. Participants in all groups performed at the same level. See Table 1 for all Means and Standard Deviations.

Excitement

A Kruskal-Wallis Test was conducted on participants' ratings of excitement to test for differences among the levels of page color. This test indicated a non-significant result for page

color, H (3) = 1.88, p = 0.59 ; η^2 = -0.04 . Participants in all groups performed at the same level. See Table 1 for all Means and Standard Deviations.

Relaxedness

A Kruskal-Wallis Test was conducted on participants' ratings of relaxedness to test for differences among the levels of page color. This test indicated a non-significant result for page color, H (3) = 0.42, p = 0.94 ; η^2 = -0.10 . Participants in all groups performed at the same level. See Table 1 for all Means and Standard Deviations.

Organization

A Kruskal-Wallis Test was conducted on participants' ratings of organization to test for differences among the levels of page color. This test indicated a non-significant result for page color, H (3) = 1.12, p = 0.77 ; η^2 = -0.07 . Participants in all groups performed at the same level. See Table 1 for all Means and Standard Deviations.

Power

A Kruskal-Wallis Test was conducted on participants' ratings of power to test for differences among the levels of page color. This test indicated a non-significant result for page color, H (3) = 2.11, p = 0.55 ; η^2 = -0.03 . Participants in all groups performed at the same level. See Table 1 for all Means and Standard Deviations.

Table 1

Means and Standard Deviations

Page Color	Professionality	Excitement	Relaxedness	Organization	Power

Blue	Mean	3.63	3.13	3.38	3.75	3.00
	N	8	8	8	8	8
	Std. Deviation	1.506	1.458	1.302	1.389	1.309
Green	Mean	4.00	2.86	3.29	3.86	3.14
	N	7	7	7	7	7
	Std. Deviation	.577	1.215	.951	.900	1.464
Grey	Mean	3.88	3.00	3.63	3.63	3.25
	N	8	8	8	8	8
	Std. Deviation	.641	1.309	1.302	.916	1.282
Red	Mean	3.63	3.63	3.50	4.13	3.88
	N	8	8	8	8	8
	Std. Deviation	1.188	1.061	1.195	.835	1.126
Total	Mean	3.77	3.16	3.45	3.84	3.32
	N	31	31	31	31	31
	Std. Deviation	1.023	1.241	1.150	1.003	1.275

Discussion

This study was conducted in an attempt to identify any significant effect that a webpage's color might have on a participant's perception of the website. However, from the data that was collected, there were no significant results that could reject the null hypothesis. In all of the perception categories (professionality, excitement, relaxedness, organization, and power) p was between 0.55 and 0.97 and not significant. It was initially hypothesized that colors should have a significant effect on how the users perceive a website. It was expected that we could see this represented in responses to the adjective based categories that participants rated the pages on. While there was variation in responses from four different page colors, the results were not significant enough to not be directly tied to this variable.

There have been several previous studies that have investigated the effect that color can have on a user's experiences and emotions about a website. One example of this was a study by Bonnardel and some fellow researchers (Bonnardel et al., 2011) who did find significant results regarding users finding certain color choices on a webpage more appealing than others. They also found that design interacted with color to produce different results. Kaya and Epps studied how different color webpages caused different emotional responses, finding that different colors correlated to different emotional responses, such as blue with relaxation and calmness and red with romance and even evil (Kaya & Epps, 2004). Our inability to find significant results goes against the findings of these and other previous studies.

This study did use good controlled examples for the independent variable. Four webpages were created specifically for the purpose of this study; these had the same simple design, with the only difference being the color of the website. There were only two on the webpage, the variable color, and white. There were several limitations on this study, many of which may have

contributed to a lack of significant results. One of these is the sample population. This study only used results from 31 participants, which is not large enough for the number of variables being tested. The use of too many conditions for the independent variable was also a limitation because of this, with four webpage colors being tested by only seven or eight participants each. With these two major limitations in mind, an improved study to test our hypothesis would either use a greatly increased number of participants or a decreased number of conditions for page color.

To conclude, while this study was unable to support the hypothesis, it touches on an area that is open for further study. With there being large amounts of prior work showing how much color can affect the users of websites, with designers using this as a fact to help develop websites geared to evoke certain reactions (Singh, 2006). That being said, the current study is unable to provide evidence for a significant effect, which goes against most of the research on this subject. Further research should be done to test the effect of color on the type of perceptions measured in this study. The implications of whether or not color matters in terms of how a website is viewed and perceived is crucial to the design of the websites that make up the internet (Singh, 2006) and so the answers to what extent different design choices matter is that it will influence how designers approach the development of websites in the future. Results showing that color is not a significant factor in user perception reduces the importance of this element of design in future websites.

References

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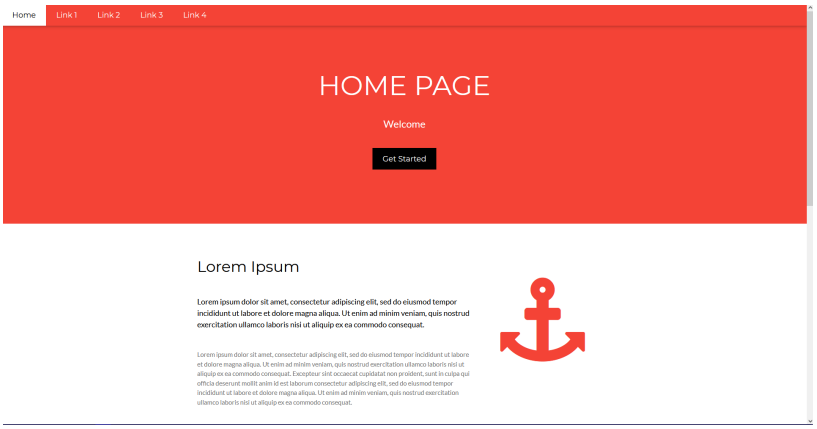
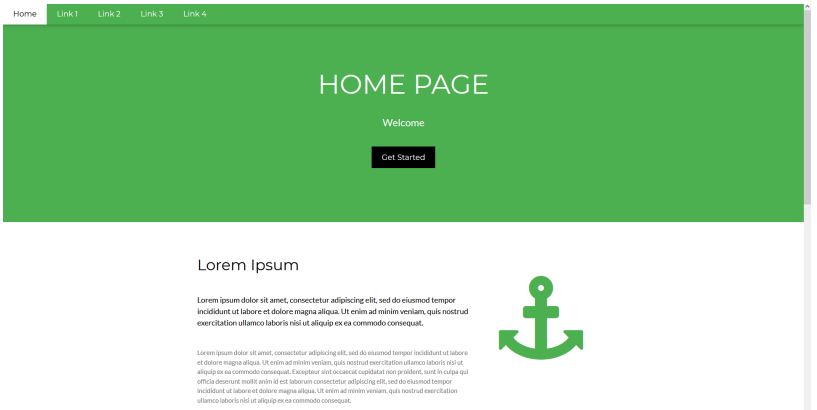
Appendix A

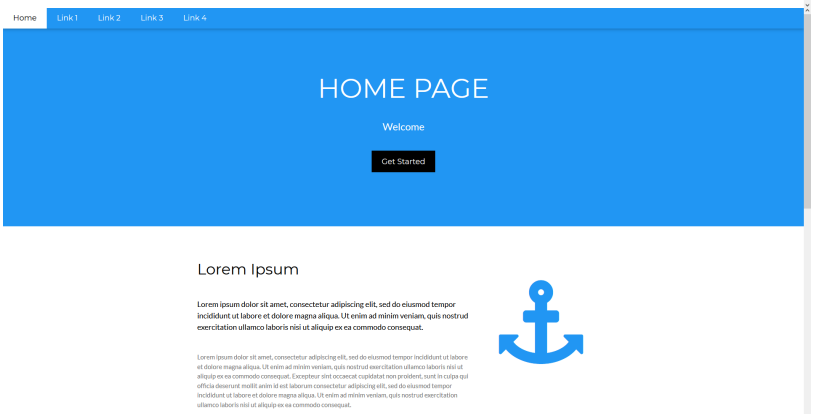
Red Page



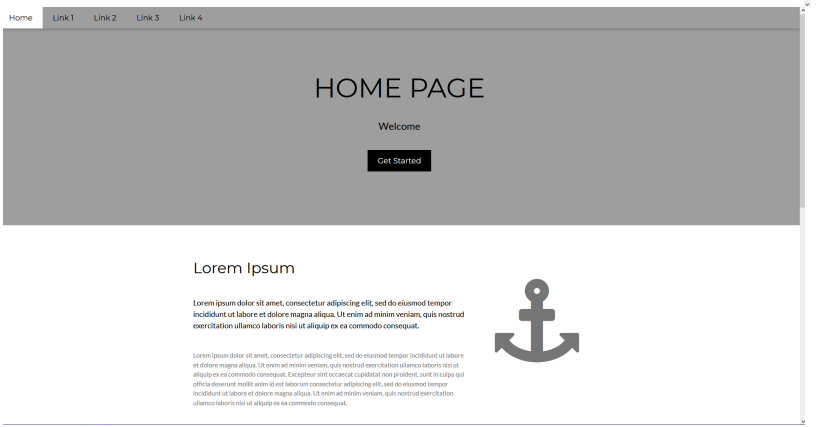
Green Page



Blue Page



Gray Page



Appendix B

Post-Test Questions

Q1: This page is professional.
- Strongly Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Strongly Agree

Q2: This page is exciting.
- Strongly Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Strongly Agree

Q3: This page is relaxing.
- Strongly Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Strongly Agree

Q4: This page is organized.
- Strongly Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Strongly Agree

Q5: This page is powerful.
- Strongly Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Strongly Agree