Psychological Survey of Color Perceptions for Indian Users

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Abstract –This research paper presents the result of a psychological survey of colors for Indian users. The major goal of this survey is to find out the emotions evoked after observing particular colors. It also, investigates about most favorite colors of the Indian users. Color is a major factor impacting user's decision when selecting products amongst given variety of goods and services. Every user's perception and response to a certain color is different. Some users are attracted by a specific color, while others may not. This presents a challenge to the product designer while selecting a suitable color for product or its user interface, one is designing. In this survey, the user has been presented with 11 emotions associated with 11 colors as suggested by an interesting article from 99designs.com.The users were asked to select the emotion that each color evokes, based on their experience and understanding. Furthermore, the user had been asked to select his/her maximum three favorite colors out of these 11 colors. The user survey is aimed at wider range of age groups as (13-22 years), (23-59 years) and 60+ years. This survey involves both male and female users and a total of 225 valid responses were received. A deviation in the users' emotional perception has been observed for the four colors viz. Orange, Blue, Brown, and Grey. Moreover, the top three favorite colors selected by the Indian users were Black, Blue and White respectively. The results of this survey will guide the product designers as well as user interface designers in selection of appropriate colors when designing products, mobile apps or user interfaces. This survey will help product designers to influence the user's buying decisions and maximization of the product sale.

I. INTRODUCTION

Color is a powerful communication element, which can be used to signal action, influence mood, and even influence physiological reactions [6]. It has been seen that some colors are related to increased blood pressure, metabolism, and eyestrain. Color affects human feelings along with one's memories. A color therapy technique, also known as chromotherapy, is a prominent alternative medicine method. It involves a use of selected colors to treat different kinds of diseases [2]. One area where the color psychology is put into effect, is in the fields of marketing as well as design. Color plays a major influence on the customer's selection of a product. Brands and companies utilize colors for their brand logos as a trick to allure the customers. This happens when the colors associated to the logos tend to resonate with the personality of the customers; they get attracted to the company's products.

Color psychology can be defined as a study of how colors affect behaviors and perceptions of users or customers [10] and the theme of this survey was to understand the Indian users' perception about colors and to identify their favorite colors. As a result, this survey was named as "Psychological Survey of Color Perceptions". Humans' perceptions of colors differ from person to person. How a person perceives and responses to a certain color, is very subjective. Multiple factors play a role in determining color perception and these factors include age, gender and culture [2]. Another important factor would be an intimate relation or connection with a specific color. For example, let us consider a person who as a child had a favorite cartoon character who was red in color, then it is very likely that whenever he is in a situation where he has to choose a product or service based on his favored color, his inclination will be towards the red color [5].

Although, due to universal human experiences, there is a chance of guessing how customers might react to certain common colors, but not all of them. Customers relate the color green to nature, as a result of being witness to the growth of plants and trees. For the color blue, it has been related to the emotion of calmness and trust, as this gets evoked when people view elements of nature like sky and water [5]. But, there are many other colors that need to be understood along with emotions they invoke. There have been a few global studies conducted to understand the color psychology of the users, but there isn't any study conducted specifically for the Indian users. This has been a real motivation behind conducting this user study.

II. LITERATURE REVIEW

We encountered few research papers and blog or magazine articles during literature review related to color psychology, favored colors and other user studies. These research papers and articles are discussed widely in this section.

The first study titled 'Color Assignment', is basically a website showcasing a research project having a goal of discovering the cultural differences based on the color preferences, associations and internet activities. This user survey has questions inquiring about emotions related with color representations [13]. The main aim of this study was to provide color combinations and favored colors to facilitate designers in making better color choices when designing products or applications. This research provided the colors that evoked certain emotions and qualities. Moreover, it also

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informed about the most and the favored colors by genders, as well as age groups. This study has helped in understanding the process of creation of the user survey and information about the emotions and the colors.

Second article is focused on the topic 'Color, Psychology and Design' published on UX Planet. The article explains about the differences in the preference of colors according to the gender [3]. It has highlighted that selection of a certain color is dependent upon what emotion, the designer desires to portray with that product or service design. Further, it has explained what impact the colors -Blue, Black, Red, Pink and Green, has on that design. This article has provided insights on the impact of these colors, which has further helped in selecting of certain colors for the survey.

Another article about 'Colors and Emotions' published at 99Designs.com, has explained about how colors and emotions are linked to each other. It has illustrated the effects of warm colors, cool colors, monochrome colors as well as happy colors on the human psychology and emotions evoked after viewing them [12]. The colors and the emotions selected for this research work were chosen from this article.

Next research paper titled 'A Note on Adults' Color-Emotion Associations' was targeted on understanding the color-emotion associations of 20 men and women using a questionnaire that included questions about preferred color, color of the their clothes, their emotional response to colors and reasons for the same [14]. This study assisted in realizing the emotional responses of men and women for different colors.

The last research paper 'Color Psychology in Marketing' explained the literature that connected the color psychology to the marketing of products to determine that colors are significant contributors in marketing. It touched many points that had impact on them due to colors. The various points related with colors were health, culture, emotions, gender and branding [15]. This study provided a theoretical understanding about how colors impacted marketing of products and has been taken into consideration during this user study.

III.   RESEARCH METHODOLOGY

This section has a discussion on vital process of research methodology, which includes various stages such as selection of colors, design of user survey and response of participant users.

1.   Selection of Colors:
The colors are categorized as basic colors, warm colors, cool colors, monochrome colors and/or happy colors [12].In order to identify favorite colors and the user emotions evoked, 11 colors were selected to be included in the survey form. These 11 colors were Red, Orange, Yellow, Green, Blue, Purple, Pink, Brown, Black, White and Grey. According to

the article on 99designs, these 11 colors are the most popular and liked by everyone [12]. As a result, these specific 11 colors were chosen. These selected colors also have enough representation of all color types.

2.   Design of User Survey:
The survey form created was decided to include a total of three sections. These sections include a section each on personal details, colors and related emotions, and favorite colors. The first section has asked personal details about user such as, email id, gender and age group. The age groups have ranges such as 13-22 years, 23-59 years and 60+ years.

For the second section, the images of the 11 colors are included. For every image, a dropdown menu is provided showcasing a list of 11 emotions. The major objective behind creating this section was to understand what emotions were invoked among the users after viewing the colors displayed. In the last section, we wanted to find out the favorite colors of the Indian users. This was done by providing the images of each of the 11 colors. All the images were titled with the names of the respective colors. The user was asked to choose his/her maximum of three favorite colors.

3.   Participant Users:
The user survey has been created for Indian users, representing huge Indian population. The targeted users are divided into three major groups as per their ages. These groups are:

User Group 1 (13-22 years): This specific age group was targeted towards the teenagers and bachelors. The age group limits of 13 & 22 are selected as the minimum age for teenagers is 13 years and average age of marriage for Indians is about 23 years [17]. The users in this age group have a specific understanding of colors and emotions.

User Group 2 (23-59 years): This specific age group was selected as it depicts huge adult population. Also, the average minimum age for marriage in India is 23 and the retirement age is 60 [18]. This is the reason for selection of these age limits for this group.

User Group 3 (60+ years): This age group represented senior citizens over the age of 60 years.

Our target was to receive responses from over 200 Indian users, including about 70 female users. This survey was prepared with Google Forms and forwarded to targeted users through shareable link of the user survey through a popular mobile messenger app -WhatsApp. The survey was forwarded to about 300 Indian users. Only 226 users responded actively to the survey form. The response of one user was discarded and not considered for further analysis due to lack of seriousness in his survey response. A distribution of valid user responses to the user survey is depicted in Table 1 below:

Group No.	Age Group (in years)	No. of Users		Total Valid Users
		Male	Female	
1	13-22	87	75	162
2	23-59	47	14	061
3	60+	02	00	002

Table 1: Distribution of valid user responses in the survey, among user groups

IV.   USER SURVEY

A user survey was created using Google forms in order to collect data from the Indian Users. This survey consisted of three sections as discussed ahead:

First Section:
The user survey started with instructions about entry of mandatory personal information. This personal information included username, his / here mail address, the gender and age group as seen in Fig. 1.The gender entry was made more inclusive with Lesbian, Gay, Bisexual, Transgender and Queer (LGBTQ) option. The three options for age groups were 13-22 years, 23-59 years and 60+ years of age as discussed in section 3.

Fig. 1. Screenshot of personal information in user survey

Second Section:
This section of the user survey presented 11 colors, which are selected as discussed in section III. These colors included Red, Orange, Yellow, Green, Blue, Purple, Pink, Brown, Black, White and Grey. These colors were presented in a rectangle along with name of the color as seen in Fig. 2.Just below the color rectangle, a dropdown menu was provided. This menu listed 11 emotions which included Fear, Calmness, Happiness, Excitement, Romance, Trust, Purity, Mystery, Maturity, Anger and Stability. The colors and related dropdown menu for emotions, were provided as

shown in the Fig. 3. User was required to select the emotion that is evoked looking at the color presented.

Fig. 2. Screenshot showcasing the colors and related dropdown menu

Fig. 3. Screenshot from the survey showcasing the list of 11 emotions included in the dropdown menu

Third Section:
Third and the final section of the survey again presented same 11 colors to the users as depicted in Fig. 4. Each user was asked to choose a maximum of three favorite colors among these 11 colors.

Fig. 4. Screenshot for selection of three favorite colors

V. RESULTS AND DISCUSSION

A total of 225 valid user responses have been received. Out of these responses, 39.1%users were females. For the age groups, 72% of the responses received are from the age group of 13-22 years, 27.1% from the age group of 23-59 years and 0.9% from the 60+ age group.

The results of the second section about emotions evoked for colors, are presented here. An emotion is noted, only if at least 45 users (20 % of total 225 users) have voted for an emotion for a particular color.
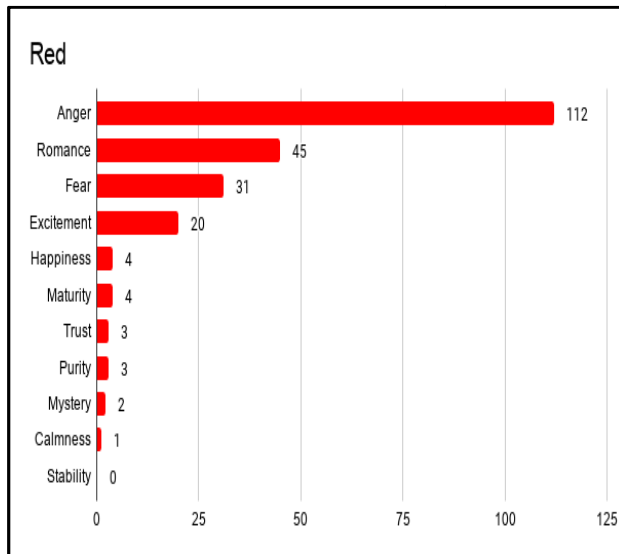

Fig. 5. Bar graph showing the emotions selected by the users the color -Red

According to the user responses depicted in Fig. 5, Red color has been voted to evoke the emotion Anger (about 50%) and next, Romance (about 20 %).
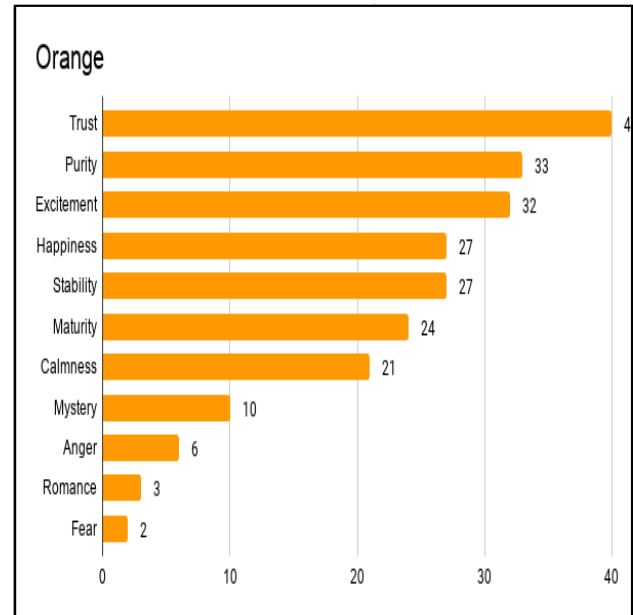

Fig. 6. Bar graph showing the emotions selected by the users the color Orange

The color - Orange, according to responses shown in Fig. 6, evokes the emotion of Trust (about 32%).
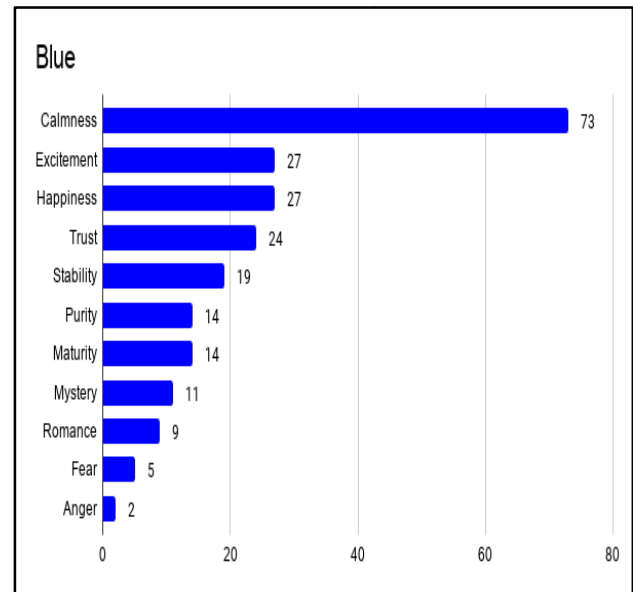

Fig. 7. Bar graph showing the emotions selected by the users the color - Blue

For the color Blue shown in Fig. 7, the responses show that it evokes the emotion of Calmness (about 32 %).
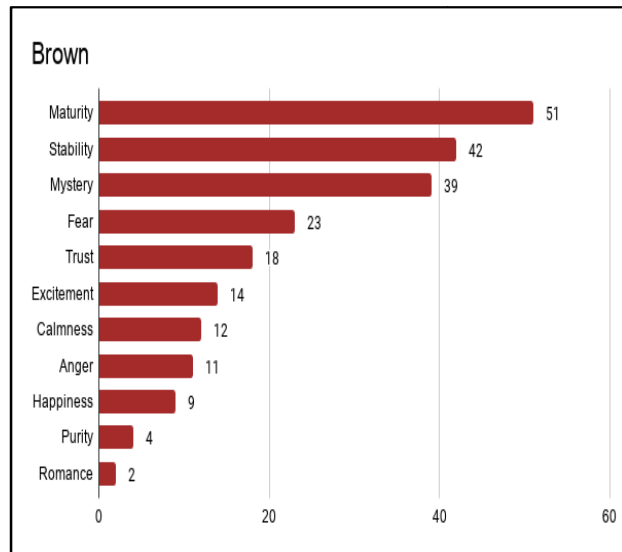
Fig. 8. Bar graph showing the emotions selected by the users the color - Brown

For the color – Brown shown in Fig. 7, emotion of Maturity has been voted the most with 23 %.

Similarly, several emotions are also evoked for remaining seven colors as well. The responses received are compared with these expected emotions in Table 2.

Selected Colors	Expected Emotions	Obtained Emotions
Red	Anger	Anger
Orange	Excitement	Trust
Yellow	Happiness	Happiness
Green	Calmness	Calmness
Blue	Trust	Calmness
Purple	Mystery	Mystery
Pink	Romance	Romance
Brown	Stability	Maturity
Black	Fear	Fear
White	Purity	Purity
Grey	Maturity	Mystery

Table 2: Table showcasing the comparison of the expected emotions and the obtained emotions during user survey

A deviation in the expected emotions in comparison with obtained emotions is observed in the colors - Orange, Blue, Brown and Grey as highlighted in Table 2.

A deviation in the emotion associated with a color - Orange has been seen from excitement to trust. This can be due to the reason that orange color has a significant use in depicting various religious aspects of the Indian culture. It is often resonated with Hinduism where in the gods are often shown wearing Orange clothes [19]. Due to this use, Indian people tend to feel an emotion of trust when they view the color - Orange.

A deviation in the expected and the obtained emotions for the color - Blue can be interpreted to the fact that the Blue color comes into the category of cool colors. There are many emotions that are evoked after observing the color Blue like trust, calmness, spirituality, and security [12]. It was expected that the emotion of trust will be evoked for blue color, but Indian people associated calmness with Blue. This could be due to the fact that the color of the sky and the ocean, which are the main elements of the nature, are blue in color. People tend to feel relax and calm when they look at the sky and the ocean [11]. As a result, the emotion of calmness has been associated to color Blue by the Indian users.

Another deviation in people's association has been observed for the color - brown. It was expected that people will choose the emotion of stability, whereas the results show that Indian people have associated the emotion of maturity with the color brown. This could be because the brown color is generally preferred by adult and older people; more specifically older men when it comes to their clothing and accessories [4]. As a result, brown color has been associated with maturity.
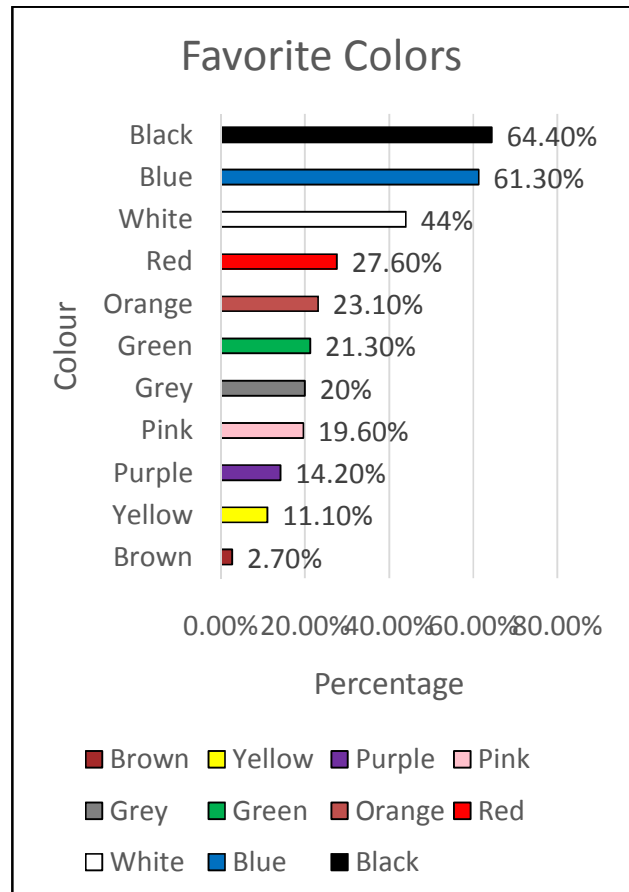

Fig. 9. Bar graph showing the favorite colors of Indian users obtained during user survey

Lastly, a deviation has also been observed in Indian people's association of the color - Grey. The emotion with which people had associated grey color was mystery, as opposed to the expected emotion of maturity. This could be a result of the use of color grey often done to showcase a dark, mysterious vibe in movies and television shows, wherein the logos and the titles of the movies are represented with grey.

In this user survey, the third section focus on choosing favorite colors of Indian people. Related results are presented in the graph shown in Fig. 9.

According to responses received to the user survey, Black, Blue and White have been selected as the most favorite colors. Black color has been selected by 145 users out of 225 users i.e.64.44%. Blue has been selected by 138 usersi.e.61.33%, whereas White has been selected by 99 users- 44.00 % users.

The color - Black emerged to be the most favorite color by the Indian users. This is due to the fact that Black is an elegant color, which reflects luxuriousness and seriousness in terms of formality [7]. As a result, many brands use the Black color in their logos and products. Also, the color - Black is very versatile in terms of clothing and it can be combined with any other color. Being a neutral color, Black is used in UI of websites or mobile apps in the form of text color and themes in the recent times which users love to use [16]. Thus, Black is the most favorite color of the Indian People.

Followed by Black, the color - Blue turned up to be the second-most favored color of the Indian users. This is because it is a universally liked and very easy to pick color due to its calming effect on the eyes [8]. Moreover, when it comes to clothing like t-shirts and jeans, Blue is such a type of color that tends to look good on each and every individual irrespective of the gender. Also, Blue is the most popularly used color in the user interfaces and icon of the IT applications like Facebook, PayPal and Twitter as it a very comforting color to users and makes them feel at ease when using the apps[1].

The third-most favored color selected by the users, came out to be the White. As White color oozes the image of cleanliness and purity [9], it is favored by a lot of people. Also, being a monochromatic color, White gives a very minimalist aesthetic and stylish look when used with the user interfaces websites, and mobile apps as well as clothing, making it a common choice in terms of favored color.

VI. CONCLUSION AND FUTURE WORK

The aim of the research paper was to determine the favored colors of the Indian users and the emotional association of these users to the selected major colors. After receiving 225 valid responses to the user survey, the results showcased that *the colors - Black, Blue and White were the most preferred colors of the Indian users*. For the emotional association section, it was found that there were deviations in Indian users' association to invoked emotions for four colors viz. Blue, Orange, Brown and Grey.

In future, the results of this user survey with Indian users, will be mainly used as reference, while designing the products, user interfaces and / or mobile apps targeting specifically the Indian Users. This research work will provide an idea to the designers about colors that are liked and preferred by the Indian people, while selecting the color schemes for the IT products and even, other applications. It may also help product designers or developers to influence the user's buying decisions and maximization of the product sale.

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