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تصميم اعلانات للمصابين بالقصور في تمييز الألوان في المملكة العربية السعودية

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الملخص
يهدف البحث إلى دراسة الأعمال الحالية لمصممي الجرافيك لتصميم الإعلانات التي تناسب الأشخاص المصابون بالقصور في تمييز الألوان في المملكة العربية السعودية. ولقد تم جمع بيانات هذا البحث باستخدام استطلاع رأي عبر الإنترنت والذي تم توزيعه باستخدام نماذج Google. حيث شارك في البحث عدد 48 من مصممي الجرافيك في المملكة العربية السعودية. ولقد أشارت النتائج إلى وجود نقص في تصميم الإعلانات التي تناسب الأشخاص المصابون بالقصور في تمييز الألوان في المملكة العربية السعودية. حيث جائت أهم نتائج الدراسة بعدد من التوصيات الخاصة بتصميمات الرسوم المرئية التي تناسب الأشخاص المصابون بالقصور في تمييز الألوان.

الكلمات المفتاحية: تصميم اعلانات، تمييز الألوان، المملكة العربية السعودية.

Designing Advertisements for Color Vision Deficiency in Saudi Arabia

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ABSTRACT
The purpose of this research is to study the current practices of Graphic Designers for designing advertisements for people with color vision deficiency in Saudi Arabia. The data for this research were collected using an online structured survey which was distributed using Google Forms. The research participants were 48 of Graphic Designers in Saudi Arabia. The results indicated that there is a lack of advertisements design for people with color vision deficiency in Saudi Arabia. The major findings of the study is having recommendations on visual graphic designs for people with color vision deficiency.

Keywords: ad design, color discrimination, Kingdom of Saudi Arabia.

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1.0 Introduction

Color vision deficiency, or as phrased in other instances as 'color blindness', conveys a combination of conditions that impede the process of color perception. Most commonly, the red-green color deficiencies. Individuals with such deficiency experience a difficulty in differentiating between different shades of the following colors: red, yellow and green (Color Blindness, 2017). Therefore, it is considered one of the commonest disorders of vision and can be divided into congenital and acquired forms. Affected individuals with color vision deficiency have trouble distinguishing between some shades of red, yellow, and green. Color vision deficiency people often don't see the advertisements as we see it, they can't recognize the colors as normal people do.

As a designer, we don't design for normal people only, we design for all types of people. Considering people with color vision deficiency in advertising might benefit both the designer and the advertiser. This research will study the aspects of designing for people with color vision deficiency and will set rules to help the designers to follow a well-documented guidelines when designing for color vision deficiency audience.

1.1 Aim

- To study the current practices of considering color vision deficiency by the graphic designers in Saudi Arabia.

1.2 Objectives

- To specify the extent to which graphic designers in Saudi Arabia considers people with color vision deficiency in their designs;
- To determine the type of color vision deficiency test used by graphic designers in Saudi Arabia;
- To propose a set of guidelines for the designers when designing for people with color vision deficiency;

2.0 Literature review

2.1 The Importance of Colors in Advertising

Basing his argument on theories of associative learning, Kumar (2017) attempted to establish a correlation between color and emotion. Using secondary data, he designed a diagnostic study that aimed to examine the psychology behind the impact of color on consumer's buying behavior. The experiment investigates some characteristics of color such as hue, valu, and saturation. In this sense, the role of color was examined in terms of product packaging, influencing brand image, and how marketers use color to portray their brand to the customers and ensure it fits their personality and taste.

On the other hand, Harris (2018) attempted to answer the question of whether the color scheme used in advertisements impacted the audience's potential to purchase the product through a quantitative study. For the sample, a number of commercials were selected which implemented regular color schemes that are neither too blatant

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nor mundane or unnoticeable. The media pieces were identical in every aspect except the on-screen props which followed different schemes; specifically an analogous scheme, a triadic scheme, and a complementary scheme. The main purpose of such media pieces was for it to be further elaborated through recruiting other research participants to be shown the commercials and surveyed about their purchasing potential.

According to Terkan, (2014) Advertising is a way of facilitating communication. In terms of nature, it can be insightful and persuasive; using mass or modern media to convince consumers to buy goods and services. Moreover, Seher, (2012) mentioned that advertising is one of the most powerful methods used to inspire customers not only for the trail but to buy it over and over.

Also, Purves et. al. (2001) explained that brightness of colors has different impacts on human minds and in return they respond accordingly. Thus showing the fact that colors mostly changes the human responsive behavior. Furthermore, As mentioned by Seher et. al, (2012) When designing a new product, it should be taken into account that it is intended for end consumers or customers so that it is tailored to suit their needs and desires. In addition, Colors associated with a particular advertisement or brand will play important roles for the brand itself and thus increases the brand's identification (Gorn et. al., 1997). Colors play a vital role in the way we set our minds to an advertisement. While again Anna (2002) supporting the importance of colors said that the thought that colors are less important properties, seems doubtful.

2.2 Color Vision Deficiency

"Congenital color vision deficiency is one of the commonest inherited disorders of vision: its prevalence may be as high as 8% in males and 0.5% in females. Those with color vision deficiency are at a distinct disadvantage when performing certain visual tasks" (Simunovic, 2010). In addition "Instead of being a constant level of disability, color vision deficiencies tend to vary with types of lighting. Colors are most discernable in bright light and may tend to fade or become indistinguishable when light is dimmed." (Kaufman, 2001)

However, according to Simunovic, (2010) that until now there is no treatment for color vision deficiency. However, tinted lenses where suggested. It may offer a method of enabling those with color vision deficiency to make spectral discriminations that would normally elude them, clinical trials of such lenses have been largely disappointing. Moreover, Simunovic, (2010) mentioned that normal vision of human color is trichromatic, meaning any color can be reproduced by a mixture of three judiciously selected primary colors. The physiological substrate of color vision is the cone photoreceptor, of which there are three classes: blue, green, and red cones.

There are different types of color vision deficiency as follows:

1- Anomalous trichromacy

"Anomalous trichromacy is the mildest form of color vision deficiency. Like those with normal color vision, the anomalous trichromat requires three primary colors to match any other color." (Simunovic, 2010).

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2- Protanomaly (which affects the red cones)
3- Deuteranomaly (which affects the green cones)
4- Tritanomaly (which affects the blue cones). " (Simunovic, 2010)
"The cones contain three types of pigments, red, green and blue.6,7 The reflected light absorbed by three types of cones is transmitted as signals through the optic nerves to the brain. Color vision is a perception which happens in the brain.8-10 Any defects at one or more of the three cone types will defect the color perception process." (IŞIK, 2018)
As Wagner, (2013) mentioned, deficiencies in color may be due to injury, disease, or even certain medications.

2.3 Color Vision Deficiency Testing Tools

There are "Several different Color Vision Deficiency testing methods and apparatuses exist. The most common ones include pseudoisochromatic plates, such as the Ishihara and Hardy-Rand-Rittler (HRR) tests, and disc arrangement tests, such as the Farnsworth-Munsell 100 and Farnsworth D-15 (D15) hue discrimination tests."
(Annadanam, et. al. 2017)

According to Annadanam, et. al. (2017) Full Ishihara color test: uses numbers arranged as dots of varying size, hue, and saturation color.
The HRR test: was developed later in 1955 to determine the extent and form of the defect in color. This test requires color shapes on a gray dotted background to be identified. Moreover, "These tests are currently used as an initial analysis of patients' color vision loss due to congenital defects, retinal diseases, or acquired color deficiencies.4 Both of these pseudo isochromatic test booklets are inexpensive, durable, and readily available for use in the offices of eye care professionals." (Annadanam, et.al. 2017)

According to IŞIK (2018) in an early diagnosis of color vision defects the Ishihara test plates have proven successful. This commonly used color vision test was initially intended to identify those who suffered from congenital color blind-ness red-green aspect, but it may also be useful to reveal acquired color vision defects. On the other hand "The Ishihara test which has almost a century background does not fit today's technology and has many drawbacks." (IŞIK, 2018). Furthermore, in Ishihara test there is a risk that the output printer cannot achieve the same required level of sharpness and clarity at all the time. Also the introduction of direct sunlight or the use of electric light may produce some discrepancy in the results, and many more drawbacks.
"Color blindness is a variable trait, including individuals with just slight color vision deficiency to those rare individuals with a complete lack of color perception"
As stated by Keene (2015), about seventy-five percent of those with color impairment are green deficiency and the rest are red deficiency. Furthermore, red-green color deficiency is highly related to sex with a noticeable dominance of males. However,

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there are some tools that could be used to accommodate those with color deficiency such as using Adobe Photoshop or FIJI. These programs allow the adjustment of hues to be substituted with colors to be viewed by both the color sighted and the color impaired. In addition, web-based programs are also utilized to red-green images into two colored images to be viewed clearly by individuals with challenges related to color perception.

2.4 Solutions for Color Vision Deficiency Designs

"Designers must have deep understanding of people for whom design and people should understand the design process" (Chammas, et. al, 2015)
According to A. Chammas et. al. (2015) Users should be involved in the project creation process; user interaction is a valuable source of usage context awareness and can be used to explore solutions. The essence and extent of the involvement will depend on the type of project concerned

"In the present generation, the mobile phone is a device that is used by most common people. Developing software using the existing infrastructure available in smart phones would be a boon to color blind people." (Navada, et. al. 2017)
Navada, et. al. (2017) proposed a software application with the aim of designing and implementing a tool which can:
1. "Acquire images of a sign board in the color-blind person's sight area.
2. Identify the background and text color.
3. Detect the edges of the characters on the sign board and further convert it to a high-contrast image using thresholding.
4. Recognize the characters using a feature extraction algorithm.
5. Identify the background and character color.
6. Text the information extracted from the sign board to the user via GSM."

Moreover, according to Elrefaei, (2018) the use of simulators for color blindness reveals how images can appear to users with a variety of blindness conditions. People use color-blind simulators to check for color blind visibility in their artwork, pictures, documents, and web pages. Some simulators are offered as a software program offline, as an online web page or as a mobile application.

2.5 Guidelines for Color Vision Deficiency Design

"The golden rule of map design states that one should carefully consider both a map's purpose and its audience"
According to Hobbins (2020), maps designed to the public predominately fail to accommodate the presence of individuals with color impairments and color vision deficiency (CVD). As a result, Hobbins was able to examine the portion of the population with CVD and develop color alternatives to be used in maps that would facilitate their vision process. In addition, the study's result contributed to the development of certain tools that could be incorporated while selecting the suitable colors during the process of map design.

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"Visual design, in terms of text style and color interplaying with a background color or the degree of visual complexity displayed on a web page can either enhance or degrade screen readability, thus increasing extraneous cognitive load and interfering with learning retention" (Mayer, 2014; Sweller, 1994)

Considering designing with text for people with Color Vision Deficiency, Lynch and Horton, (2008); Hall and Hannah, (2004); Duebel, (2003); Murch, (1987) recommended the following:

1. Use dark color for text
2. Black text on a white background

On the other hand, Murch, (1987) said:

1. Use white text on a black background
2. Black text on green background
3. Blue text on a white background

As mentioned by Harper, (2009) minimize visual complexity by reducing amount of text and graphics. Moreover, Jack, et. al, (2000) recommended Sans Serif font in designing for color vision deficiency.

On the other hand, considering backgrounds in the Advertisement design for people with color vision deficiency, Duebel, (2003) said use neutral colors (grays or pastels) for backgrounds, and avoid blue-orange, red-green, violet-yellow color combinations for text and background. However, Lynch and Horton, (2008) said avoid overuse of primary colors. In addition, as for backgrounds for color vision deficiency, Duebel (2003) suggests using less saturated, neutral colors for important details, such as grays and pastels for backgrounds with higher brightness values. Natural tones provide subtle degrees of complementarity and contrast, and are recommended when choosing color schemes as a color palette.

Moreover, according to Lynch and Horton, (2008) in using white space, the suggested 5% white space; content. However, Coursaris and Kripintris, (2012) suggested 50% white space: content.

Richardson, et. al. (2014) recommendations for Instructional and Web Designers for color vision deficiency to Improve Readability To maximize contrast between font and background, text should be represented with dark colors (Deubel, 2003). The font used should be without Serif, as it was associated with increased readability (Jacko et al., 2000). Higher brightness and increased contrasting luminance. In addition, In web design Lynch and Horton, (2008) recommend a white background with black text for maximum contrast due to its high saturation in addition to avoiding overuse of primary colors. Using Cascading style sheets permit a standard format to be easily maintained across multiple web pages, allows for consistency of text and background. Moreover, Duebel, (2003) also recommends against blue-orange, red-green, and violet-yellow combinations of text and/or backgrounds. Since text should be represented in dark colors, background colors thus serve as organizational structures via their ability to allow text to contrast, or stand out, relative to their background.

However, Kaufman, (2001) mentioned that many of the respondents indicated an understanding of the use of colors in advertising, but stated that such techniques were

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inefficient. They were expecting advertisers to use typical color choices to make certain items or words stand out.

3.0 Methodology

In order to achieve the research aim, the secondary data were collected from the literature review. While, the primary data were collected from a closed ended questions survey. The survey was distributed and analyzed using Google forms. The survey consists of 12 questions and considers the following aspects: 1) the challenges facing graphic designer when designing for color vision deficiency people, 2) the guidelines followed by graphic designers in Saudi Arabia when designing advertisements for color vision deficiency audience.The research participants are 48 graphic designers in Saudi Arabia.

4.0 Results

The following is a comprehensive presentation illustrated in tables and charts, in terms of:

1- I'm designer working as:

Table (1) and Chart No. (1) Illustrate the distribution of the research sample according to a variable **(I'm designer working as).**

Table (1) Distribution of the research sample according to a variable (I'm designer working as)

I'm designer working as	Number	Percentage
Freelancer	25	52.1%
In house design office	7	14.6%
Design agency	16	33.3%
Sum	48	100%

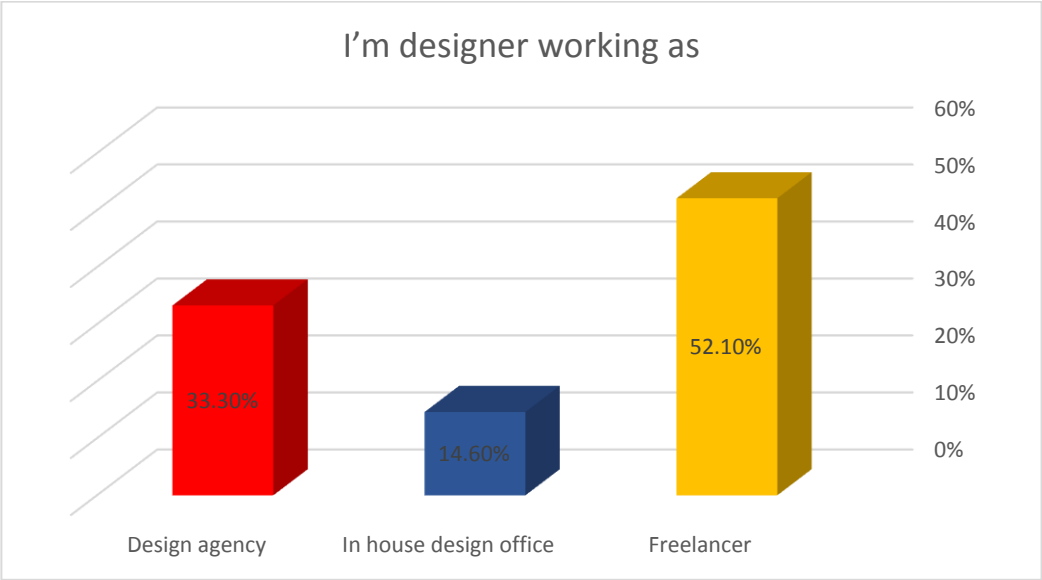

Chart (1) shows the distribution of the research sample according to a variable (I'm designer working as)

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Evidenced by table (1) and chart (1) that 25 members of the research sample **(Freelancer)** of 52.1%, while 16 of the research sample **(Design agency)** of 33.3%, and 7 members of the research sample **(In house design office)** of 14.6%.

2- Age:

Table (2) and chart No. (2) illustrate the distribution of the research sample according to a variable (Age).

Table (2) Distribution of the research sample according to a variable (Age)

Age	Number	Percentage
Between 20 - 29	**32**	**66.7%**
Between 30 - 39	**10**	**20.8%**
Between 40 - 49	**6**	**12.5%**
Sum	**48**	**100%**

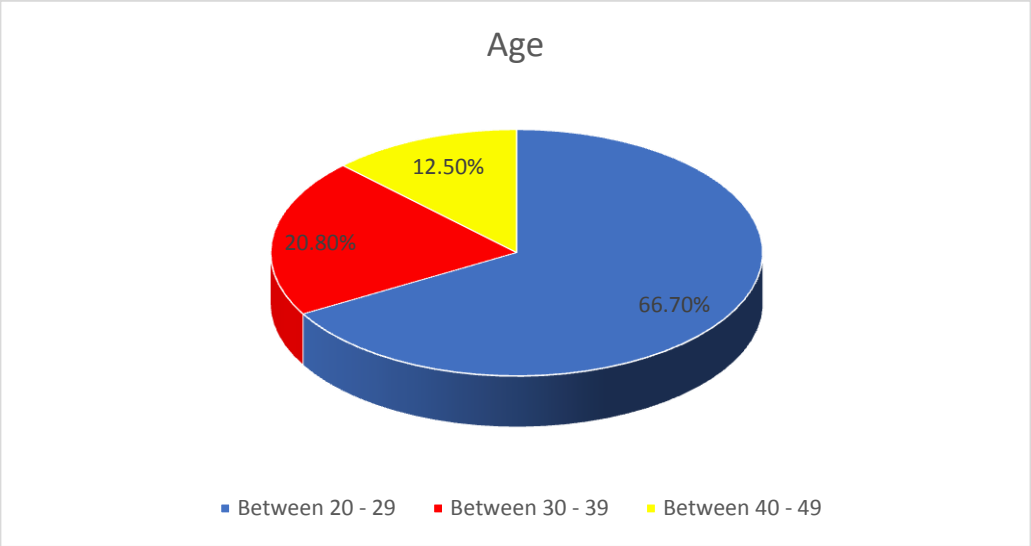

Chart (2) shows the distribution of the research sample according to a variable (Age)

Evidenced by table (2) and chart (2) that 32 members of the research sample between 20-29 in the percentage of 66.7% While 10 of the research sample individuals were between 30 - 39 in the percentage of 20.8% , and 6 of the research sample, between 40 - 49, in the percentage of 12.5%.

3- Color is the most important element in visual graphic advertisements:

Table (3) and chart No. (3) illustrate the distribution of the research sample according to **(Color is the most important element in visual graphic advertisements)**

Table (3) Distribution of research sample individuals according to a variable (Color is the most important element in visual graphic advertisements)

Color is the most important element in visual graphic advertisements	Number	Percentage
Strongly agree	**19**	**39.6%**

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Agree	**17**	**35.4%**
Neutral	**12**	**25%**
Disagree	**0**	**0%**
Strongly disagree	**0**	**0%**
Sum	**48**	**100%**

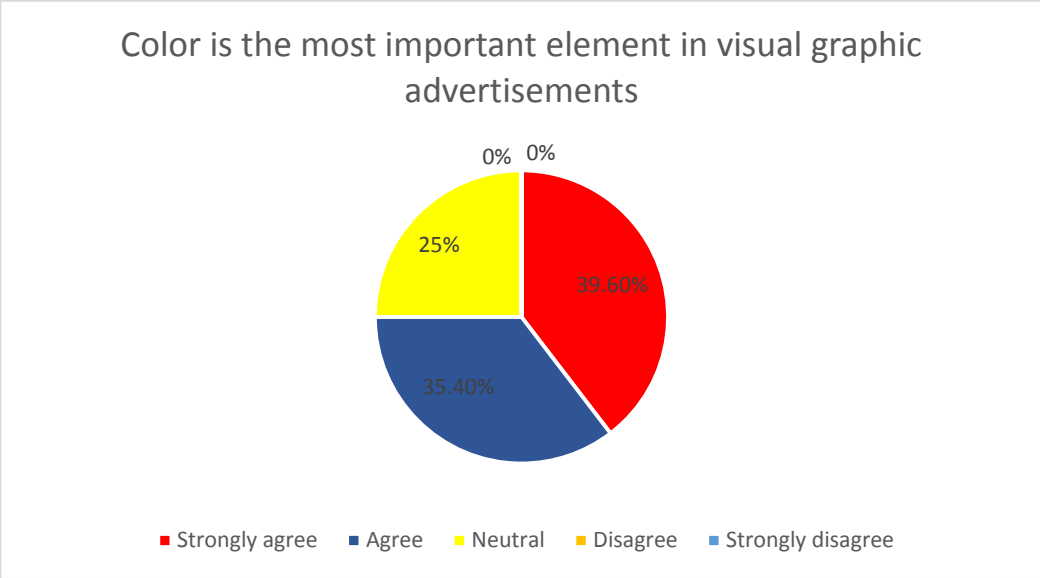

Chart (3) shows the distribution of the research sample according to a variable (Color is the most important element in visual graphic advertisements)

Evidenced by table (3) and chart (3) that 19 members of the research sample are sample **(strongly agree)** in the percentage of 35.4%, and 12 of the research **(Neutral),** in the percentage of 25%.

4- How often do you design for people with color vision deficiency:

Table (4) and chart No. (4) illustrate the distribution of the research sample according to **(how often you design for people with color vision deficiency)**

Table (4) Distribution of research sample individuals according to a variable (How often do you design for people with color vision deficiency)

How often do you design for people with color vision deficiency	Number	Percentage
Always	**9**	**%18.8**
Sometimes	**7**	**%14.6**
Rarely	**8**	**16.7%**
Never	**21**	**43.8%**
I don't know	**3**	**6.3%**
Sum	**48**	**100%**

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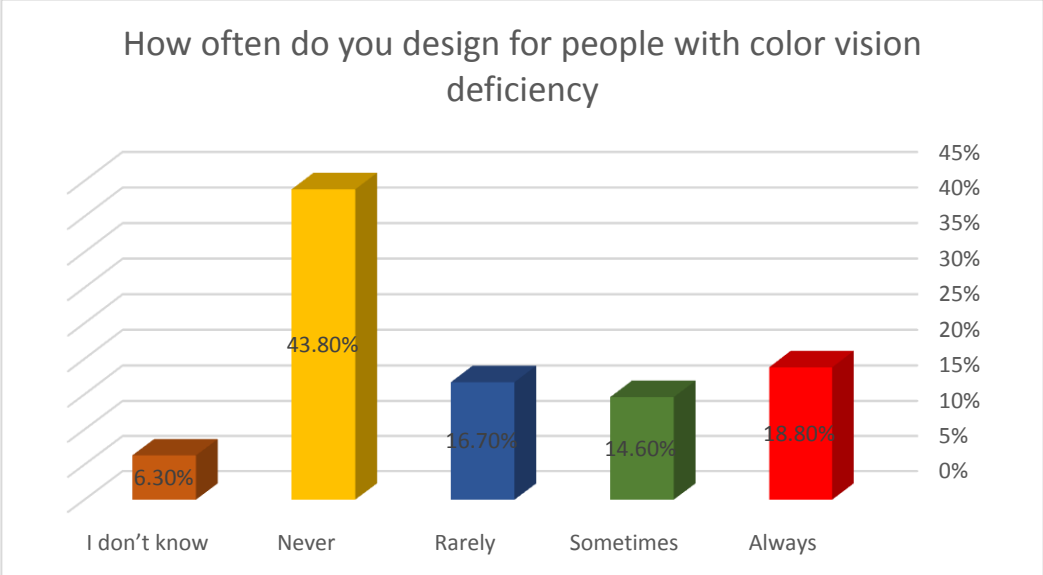

Chart (4) shows the distribution of the research sample according to a variable (How often do you design for people with color vision deficiency)

Evidenced by table (4) and the chart (4) that 21 members of the research sample **(Never)** in the percentage of 43.8%, while 9 of research sample **(Always)** in the percentage of 18.8%, and 8 of research sample **(Rarely)** in the percentage of 16.7%, and 7 of the research sample **(sometimes)** in the percentage of 14.6%, and 3 of the research sample **(I don't know)**, in the percentage of 6.3%.

5- Which type of color vision deficiency have you designed for :

Table (5) and chart No. (5) illustrate the distribution of the research sample according to **(which type of color vision deficiency have you designed for)**

Table (5) Distribution of research sample individuals according to a variable (which type of color vision deficiency have you designed for)

Which type of color vision deficiency have you designed for	Number	Percentage
Deuteranopia	4	8.3%
Protanopia	8	16.7%
Tritanopia	5	10.4%
None	31	64.6%
Sum	48	100%

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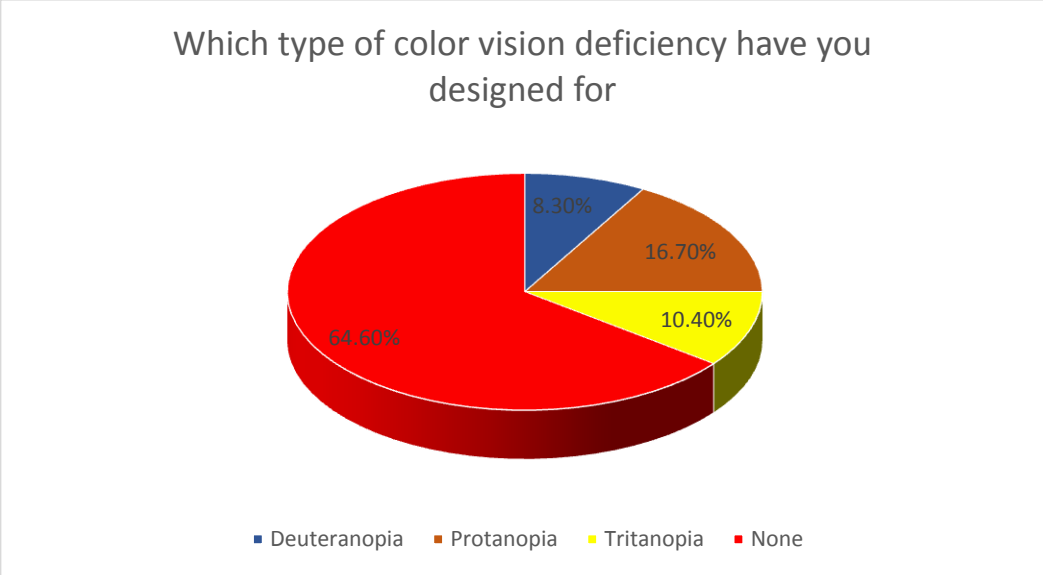

Chart (5) shows the distribution of the research sample according to a variable (which type of color vision deficiency have you designed for)

Evidenced by table (5) and chart (5) that 31 of the research sample **(None)** in the percentage of 64.6%, while 8 of the research sample **(Protanopia)** in the percentage of 16.7%, and 5 of the research sample **(Tritanopia)** in the percentage of 10.4%, and 4 of the research sample **(Deuteranopia)** in the percentage of 8.3%.

6- How exactly do you know the client's type of color vision deficiency :

Table (6) and chart No. (6) illustrate the distribution of the research sample according to **(How exactly do you know the client's type of color vision deficiency).**

Table (6) Distribution of research sample individuals according to a variable (How exactly do you know the client's type of color vision deficiency)

How exactly do you know the client's type of color vision deficiency	Number	Percentage
They tell me	10	20.8%
I test them	6	12.5%
We do experiments	11	22.9%
I don't know	21	43.8%
Sum	48	100%

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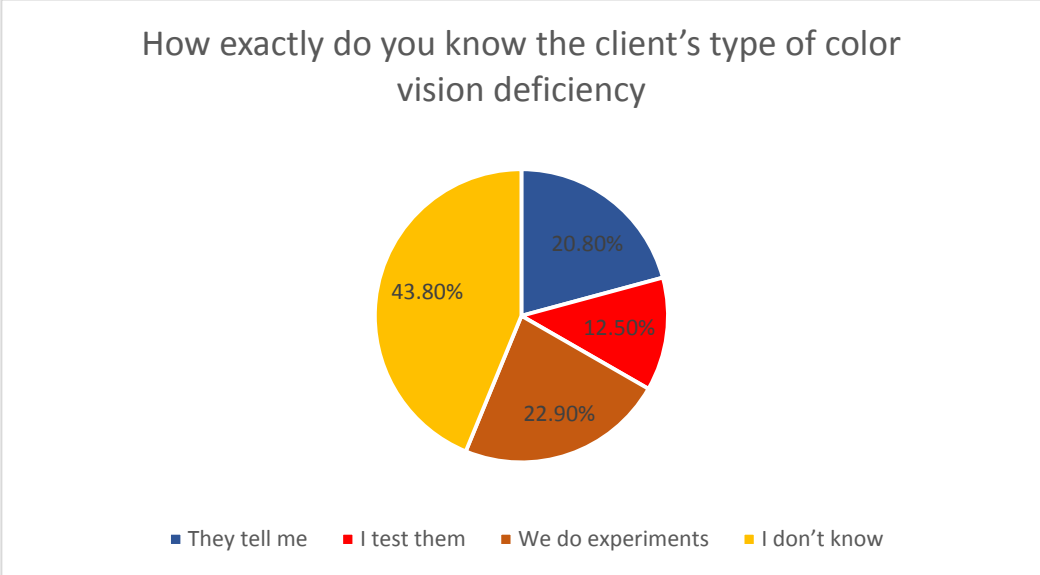

Chart (6) shows the distribution of the research sample according to a variable (How exactly do you know the client's type of color vision deficiency)

Evidenced by table (6) and the chart (6) that 21 members of the research sample **(I don't know)** in the percentage of 43.8%, while 11 of the research sample **(We do experiments)** in the percentage of 22.9%, and 10 of the research sample **(They tell me**) in the percentage of 20.8%, and 6 from the research sample **(I test them)** in the percentage of 12.5%.

7- From where did you get information about color vision deficiency :

Table (7) and chart No. (7) illustrate the distribution of the research sample according to (From where did you get information about color vision deficiency)

Table (7) Distribution of research sample individuals according to a variable (From where did you get information about color vision deficiency)

From where did you get information about color vision deficiency	Number	Percentage
Google	30	62.5%
Books	5	10.4%
Friends and colleagues	8	16.7%
College	3	6.3%
First time hearing of it	2	4.2%
Sum	48	100%

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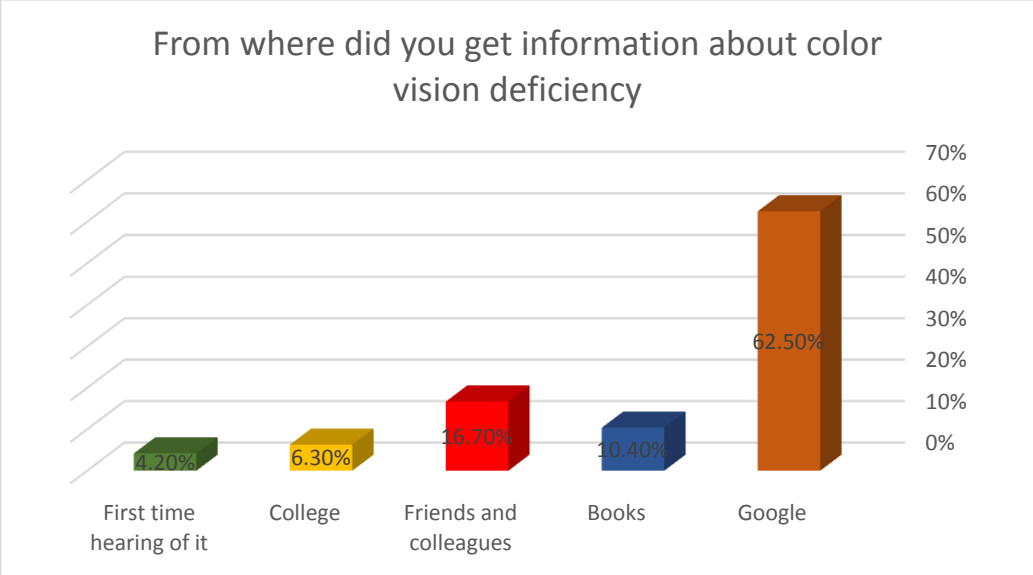

Chart (7) shows the distribution of the research sample according to a variable (From where did you get information about color vision deficiency)

Evidenced by table (7) and the chart (7) that 30 members of the research sample are **(Google)** in the percentage of 62.5%, while 8 members of the research sample are **(Friends and colleagues)** in the percentage of 16.7%, and 5 members of the research sample **(Books)** in the percentage of 10.4%, and 3 members of the research sample **(College)** in the percentage of 6.3, and 2 of the research sample, in the percentage of 4.2%.

8- When you design an advertisement for color vision deficiency people do you test your work on :

Table (8) Distribution of the research sample according to a variable (When you design an advertisement for color vision deficiency people do you test your work on)

When you design an advertisement for color vision deficiency people do you test your work on	Number	Percentage
Always	14	29.2%
Sometimes	10	20.8%
Rarely	4	8.3%
Never	7	14.6%
I don't know	13	27.1%
Sum	48	100%

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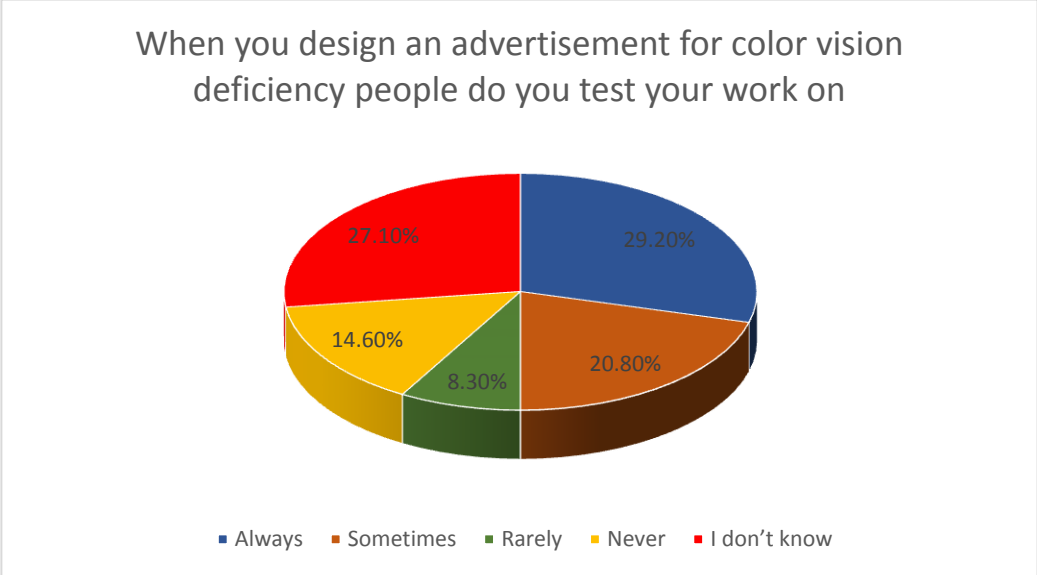

Chart (8) shows the distribution of the research sample according to a variable (When you design an advertisement for color vision deficiency people do you test your work on)

Evidenced by table (8) and the chart (8) that 14 members of the research sample are **(Always)** in the percentage of 29.2%, while 13 members of the research sample are **(I don't know)** in the percentage of 27.1%, and 10 members of the research sample **(Sometimes)** in the percentage of 20.8%, and 7 members of the research sample **(Never)** in the percentage of 14.6%, and 4 of the research sample (Rarely) in the percentage of 8.3%.

9- Target audience with color vision deficiency should be considered by the designers :

Table (9) Distribution of the research sample according to a variable (Target audience with color vision deficiency should be considered by the designers)

Target audience with color vision deficiency should be considered by the designers	Number	Percentage
Strongly agree	21	43.8%
Agree	15	31.3%
Neutral	7	14.6%
Disagree	3	6.3%
Strongly disagree	2	4.2%
Sum	48	100%

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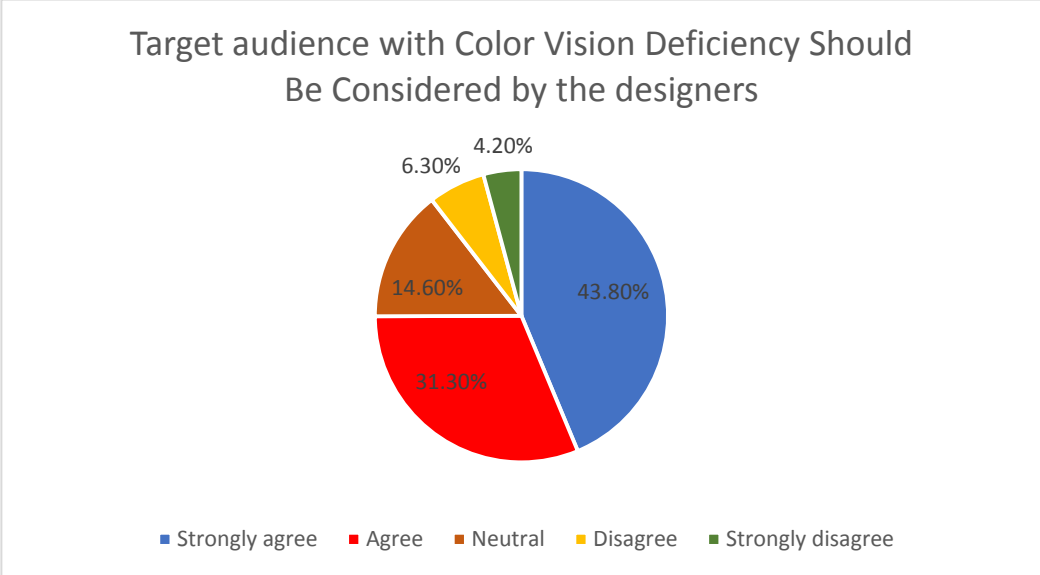

Chart (9) shows the distribution of the research sample according to a variable (Target audience with color vision deficiency should be considered by the designers)

Evidenced by table (9) and the chart (9) that 21 members of the research sample are **(Strongly agree)** in the percentage of 43.8%، while 15 members of the research sample are **(Agree)** in the percentage of 31.3%, and 7 members of the research sample **(Neutral)** in the percentage of 14.6%، and 3 members of the research sample **(Disagree)** in the percentage of 6.3%, and 2 of the research sample **(Strongly disagree)** in the percentage of 4.2%.

10- Which test do you rely on when testing your advertisements on color vision deficiency people :

Table (10) Distribution of the research sample according to a variable (Which test do you rely on when testing your advertisements on color vision deficiency people)

Which test do you rely on when testing your advertisements on color vision deficiency people	Number	Percentage
Ishihara test	9	18.8%
Hrr test	8	16.7%
None	31	64.6%
Sum	48	100%

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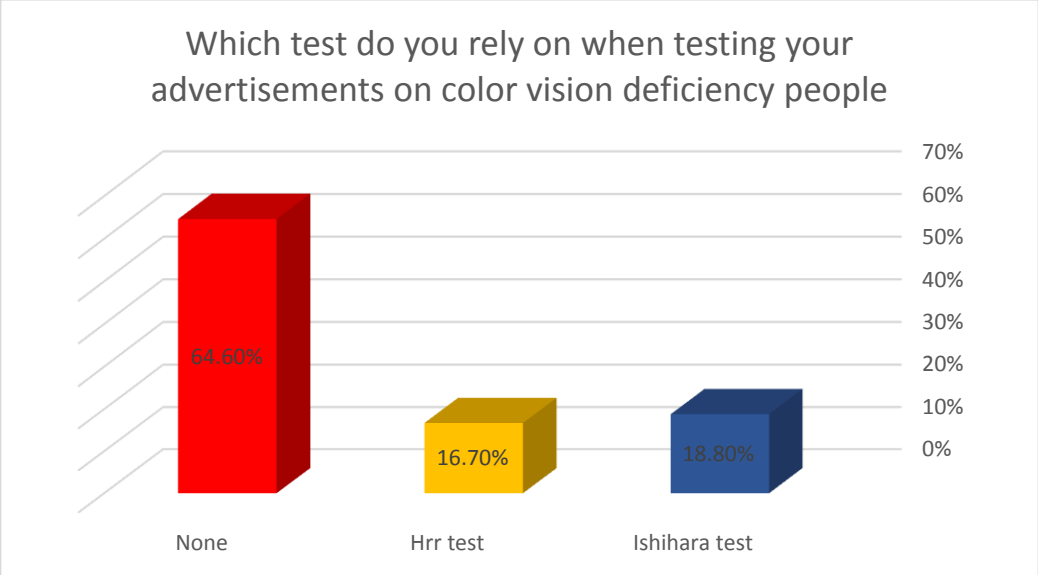

Chart (10) shows the distribution of the research sample according to a variable (Which test do you rely on when testing your advertisements on color vision deficiency people)

Evidenced by table (10) and the chart (10) that 31 members of the research sample are **(None)** in the percentage of 64.6%، while 9 members of the research sample are **(Ishihara test)** in the percentage of 18.8%, and 8 members of the research sample **(Hrr test)** in the percentage of 16.7%.

11- How do you know that your message is reached through your design :

Table (11) Distribution of the research sample according to a variable (How do you know that your message is reached through your design)

How do you know that your message is reached through your design	Number	Percentage
Test it on my client	18	37.5%
I just send it on the due date	4	8.3%
I ask questions to make sure	23	47.9%
Nothing	3	6.3%
Sum	48	100%

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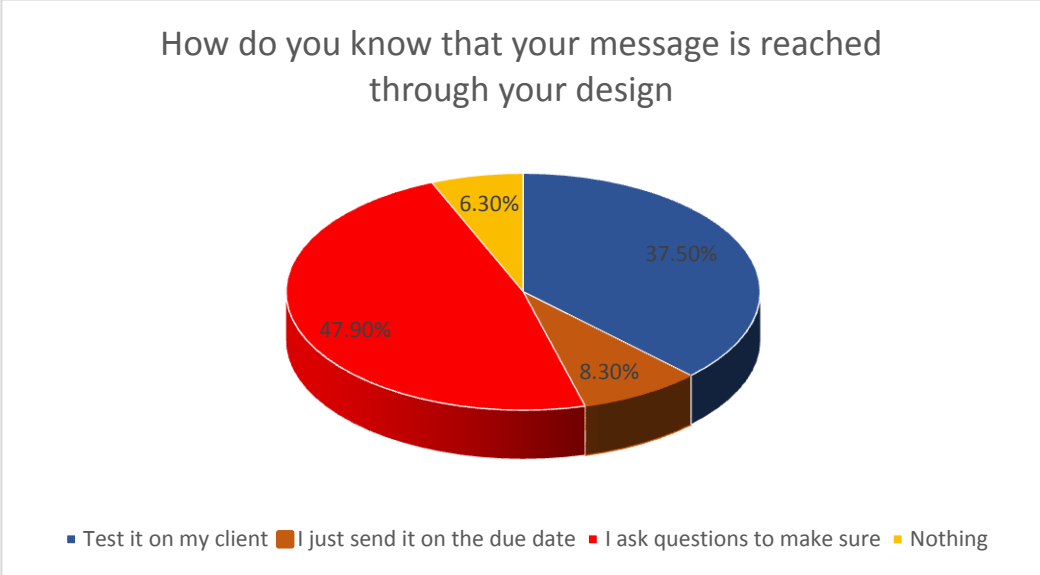

Chart (11) shows the distribution of the research sample according to a variable (How do you know that your message is reached through your design)

Evidenced by table (11) and the chart (11) that 23 members of the research sample are **(I ask questions to make sur)** in the percentage of 47.9%، while 18 members of the research sample are **(Test it on my client)** in the percentage of 37.5%, and 4 members of the research sample **(I just send it on the due date)** in the percentage of 8.3%، and 3 members of the research sample **(Nothing)** in the percentage of 6.3%.

12- What challenges did you face when designing for color vision deficiency :

Table (12) Distribution of the research sample according to a variable (What challenges did you face when designing for color vision deficiency)

What challenges did you face when designing for color vision deficiency	Number	Percentage
Costs more money	7	14.6%
Requires more time	10	20.8%
Needs more information and guidelines	31	64.6%
Sum	48	100%

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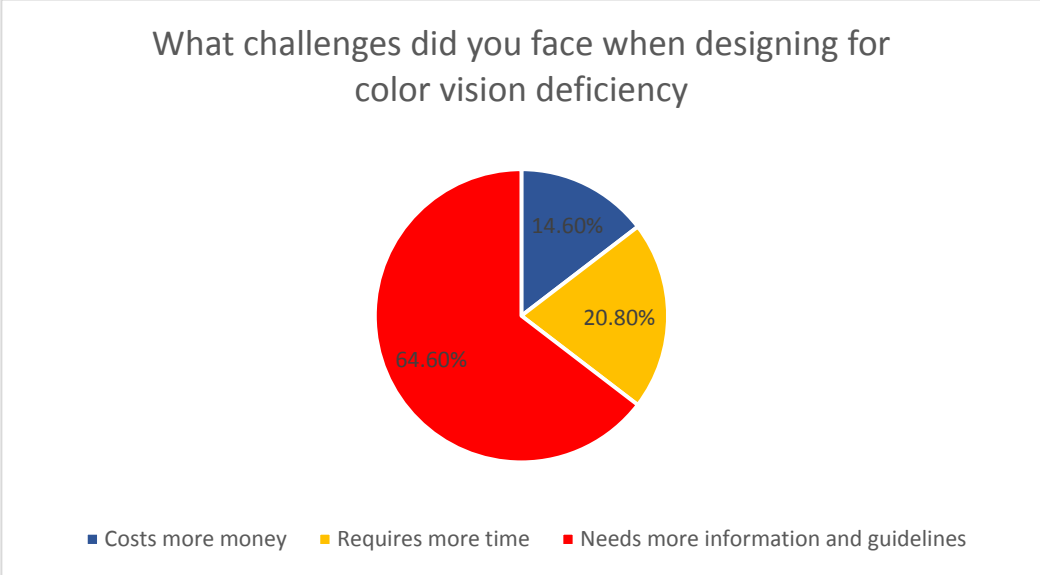

Chart (12) shows the distribution of the research sample according to a variable (What challenges did you face when designing for color vision deficiency)

Evidenced by table (12) and the chart (12) that 31 members of the research sample are **(Needs more information and guidelines)** in the percentage of 64.6%، while 10 members of the research sample are **(Requires more time)** in the percentage of 20.8%, and 7 members of the research sample **(Costs more money)** in the percentage of 14.6% .

5.0 Discussion

Colors are the most important element in visual graphic design advertisement. The present study aims to understand the current status of considering color vision deficiency by designers in Saudi Arabia. As mentioned by Kaufman (2001) color vision deficits tend to differ with the types of illumination, rather than being a persistent form of impairment. Under bright light, colors are most discernible, and can appear to fade or become invisible when light is dim. The findings of the study confirmed that the designers strongly agree that colors are the most important element is visual graphic advertisements. This was supported by Gorn et. al. (1997) as he mentioned that colors play vital role in the way we set our mind to an advertisement.

Considering the end users requirements lead to a successful design as mentioned by Seher et. al. (2012) when designing a new product or an advertisement, end consumers or customers should be taken into account so that the design is tailored to suit their needs and desires. In addition, according to Chammas et. al. (2015) users should be involved in the project creation process; user interaction is a valuable source of usage context awareness and can be used to explore solutions. The researcher supports the fact that all designers should be aware of their target audience's needs and wants in order to achieve the goal. In addition, every designer

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should read and have questions to ask their client in order to know more about their type of color vision deficiency, not just taking information from google. Also, regarding determine the client's type of color vision deficiency, the results showed that the graphic designers don't know what is the type of their client color deficiency.

Moreover, according to IŞIK (2018) in an early diagnosis of color vision defects the Ishihara test plates have proven successful. This commonly used color vision test was initially intended to identify those who suffered from congenital color blind-ness red-green aspect, but it may also be useful to reveal acquired color vision defects. While the present study findings indicated that there are no tests used by graphic designers in order to know their client's type of color vision deficiency. Though the graphic designers must try and examine their designs for people with color vision deficiency. The findings indicated that the graphic designers always try and test their work on color vision deficiency people. On the other hand, As motioned by Kaufman, (2001) the respondents were expecting advertisers to use typical color choices to make certain items or words stand out.

In addition to testing, some of the existing solutions that enhance the design for people with Color Vision Deficiency, are the stimulators. Elrefaei, (2018) mentioned that the use of simulators for color blindness reveals how images can appear to users with a variety of blindness conditions. People use color-blind simulators to check for color blind visibility in their artwork, pictures, documents, and web pages. Some simulators are offered as a software program offline, as an online web page or as a mo-bile application. In addition, IŞIK (2018) said that the introduction of direct sunlight or the use of electric light may produce some discrepancy in the results, and many more drawbacks. The researcher point of view, is that the designers must lookout for their client's conditions and consider it in each step of the design process.

On the other hand, the major challenge that faces graphic designers when designing for color vision deficiency is the need for more information and guidelines. The research has indicated that there are visual design recommendations for people with color vision deficiency which was supported by the literature review as followed:

Considering designing with text for people with Color Vision Deficiency, Lynch and Horton, (2008); Hall and Hannah, (2004); Duebel, (2003); Murch, (1987) recommended the following:

1. Use dark color for text
2. Black text on a white background

On the other hand, Murch, (1987) said:

4. Use white text on a black background
5. Black text on green background
6. Blue text on a white background

On the other hand, considering backgrounds in the Advertisement design for people with color vision deficiency, Duebel, (2003) said use neutral colors (grays or pastels) for backgrounds, and avoid blue-orange, red-green, violet-yellow color combinations for text and background. However, Lynch and Horton, (2008) said avoid overuse of primary colors. In addition, as for backgrounds for color vision deficiency, Duebel

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(2003) suggests using less saturated, neutral colors for important details, such as grays and pastels for backgrounds with higher brightness values. Natural tones provide subtle degrees of complementarity and contrast, and are recommended when choosing color schemes as a color palette.
However, the research finds that the designers are not familiar with these recommendations to take it in consideration.

6.0 Conclusion and Recommendations

Considering the requirements of people with color vision deficiency is important for both the advertiser and the consumers. This study indicated that there is lack of knowledge and information about designing advertisements for people color vision deficiency and this was supported by the literature review.
The study fulfilled the three objectives by studying the current practices of designing for people with color deficiency in Saudi Arabia. Furthermore, the findings of the study indicated that the graphic designers are not aware of the guidelines. However, having guidelines set for the designers to follow will improve designing advertisements for normal and color deficiency people. Finally, the study recommends that every designer should know about this deficiency, and should study it as well. Well-documented guidelines set to inform and spread the knowledge, so that the designers be aware and understand all types of color vision deficiency.

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