Proposed three-dimensional designs for the color wheel to help blind persons understan and matching colors of their clothes

Camellia Mousa M. Elzean,
Lecturer of Textile and Clothing, Textile and Clothing Department, Faculty of Women for Arts, Science, and Education, Ain shams University, Cairo, Egypt.

Enas M. Abd Al-Fatah Sakr,
Lecturer of Textile and Clothing, Textile and Clothing Department, Faculty of Women for Arts, Science, and Education, Ain shams University, Cairo, Egypt.

Abstract:

The most obvious thing about blind persons is that they feel it all with their hands; something flat means nothing to them. After a questionnaire sheet that 70 blind girls replied about difficulties faced them when matching the color of their clothes. The answer was for the first time 100% of them need help particularly in color matching, and 90% of them are care about good appearance and color matching. They may get some help to find out what this color is, but they need to learn about the color wheel and color scheme details to mix and match the colors of their clothes without help. Five different 3D color wheels were designed for this purpose using cardboard and glossy paper. All data were written in Braille on self-adhesive transparent paper. The effectiveness of these 3D color wheels has been confirmed by providing blind girls with different colored clothing pieces and they were able to put together matching outfits based on their new knowledge about colors. The Objectives of this study has been; to study how blind persons choose their clothes (as design and colors). And what is their knowledge about colors through a questionnaire sheet, answered by number of blind girls. Also it was intended to provide a design of five different 3D color wheels. All data on those 3D color wheels were written in Braille. Then those 3D color wheels to be used to describe the colors and their tints, value (tones) and shades for the blind students and how to construct color scheme in harmony. The study has resulted in the raising the blind girl's self-confidence because they would be able to mix and match their clothes colors by themselves.

1-Introduction

As Helen Keeler said "There is no better way to thank God for your sight than by giving a helping hand to someone in the dark."

Globally, at least 2.2 billion people have vision impairment or blindness. The International Classification of Diseases (ICD) 11 (2018) classifies vision impairment into two groups, distance and near presenting vision impairment. Blindness – as one of the Distance vision impairment, presenting visual acuity worse than 3/60 (https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment, n.d.). And this is the target group of the research, Blind persons who are unable to see colors completely. (http://www.inclusive-, n.d.)

In general: line, color, texture and design all influence how garments look, beside that fashion experts see that mixing and matching colors is more than half the fun of fashion for blind persons they recognize line, texture and design through the sense of touch but color remains the challenge. (Olsen, 2006) (Liddell, 1977)

The basic tool for combining colors is the color wheel. And as it shown in figure (1) it is an abstract illustrative organization of color hues around a circle.

Figure (1) : color wheel

As shown in figure (2) the basic or primary colors are red, yellow, and blue. Each is a pure color. No

other colors can be combined to make any of these. All other colors can be made from the three primary colors. Red and yellow make orange; green is yellow and blue; and violet is red and

blue. These are called secondary colors. While Intermediate colors can make by combining a primary and a secondary color. (Basic Color Theory, 2020)
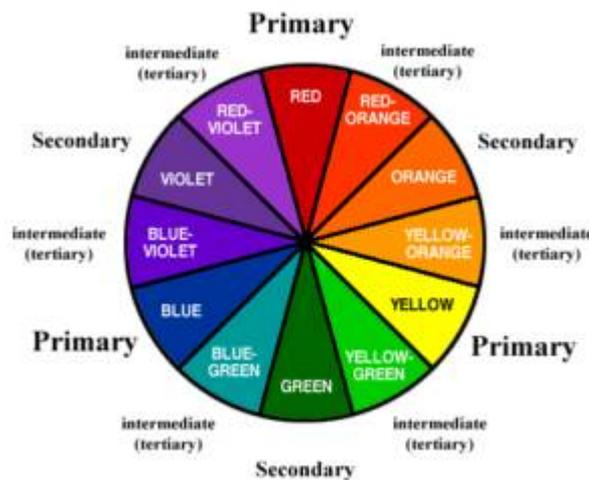

Figure (2): primary, secondary, and intermediate colors in color wheel

Color schemes are logical combinations of colors on the color wheel, and used to create style and appeal. Monochromatic is an example of a harmonious color scheme using any hue, tone tint or shade of only one color. Another example as

seen in figures (3), complementary colors which are opposite each other on the color wheel, and when put side by side, makes each other look brighter. (How to create color palettes, 2013)
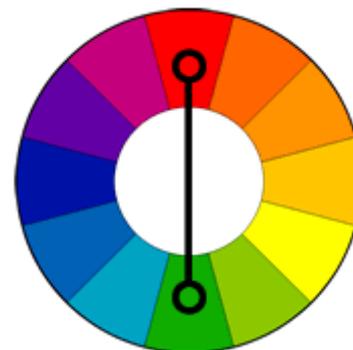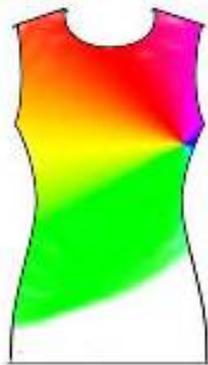

Figure (3) : harmonious color scheme (complementary colors)

Analogous colors are another example for harmonious color scheme which are colors on the wheel next to each another. (How to create color

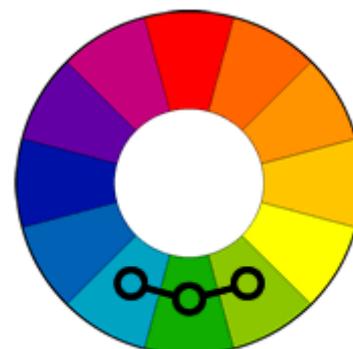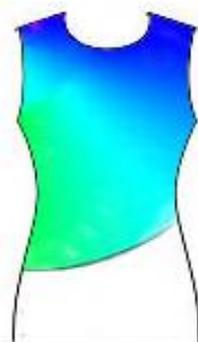palettes, 2013) Blue and green for example, as shown in figure (4)

Figure (4): harmonious color scheme (analogous colors)

White, black, and gray are neutral. White added to | pure color makes tints. Black added, makes

shades. Gray added, makes tones. (Wolfrom, 1992)

The color wheel as shown in figure (5) can be divided into warm and cool colors. (How to create color palettes, 2013) The colors on the color wheel on either side of the red are called warm colors.
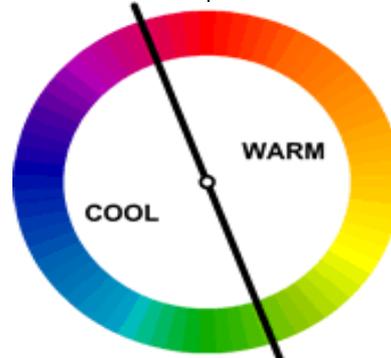
(Liddell, 1977)They are cheerful and bright. (Basic Color Theory, 2020)The cool colors are the greens and blues, and their variations. (Shevell, 2003)The words Cool, Calm are used to describe these colors (Garau, May1993)

Figure (5) : cool and warm colors in color wheel

To begin to talk about colors with a blind person you should never be afraid to take about colors, think of color as information, Attach Emotions and Feelings to Color. Then clarify why some colors together look fine, some do not. (https://www.nbp.org/ic/nbp/programs/gep/crayons/crayons-color.html,, n.d.)

It is useful to mention that there are many computer programs that provide color detection, matching results for both color and patterns of clothes for blind persons, but many of them consist of a camera connected to a computer with a audio feedback. (S.Yuan, 2011) How can a blind person found this easy for his daily clothing shopping? The blind should have color knowledge like the normal vision person. (Shruti B., 2015) (X. Yang, S.Yuan, and y. Tian, 2014) (Sushma. B, Pushpa Mala. S, Latha. B, K Ezhilarasan, 2015) (Y. Tian, 2010) (TK Harshini, 2015)

1-2 Objectives

- In this research, we study how blind persons choose their clothes (as design and colors). And what is their knowledge about colors through a questionnaire sheet, answered by number of blind girls.
- Designing five different 3D color wheels. All data on those 3D color wheels were written in Braille.
- Using those 3D color wheels to describe the colors and their tints, value (tones) and shades for the blind students and how to construct color scheme in harmony.
- Raising the blind girl's self-confidence because they would be able to mix and match their clothes colors by themselves.

1.3 Methodology

Experimental study and survey method

1.4 Delimitation

The study was carried out on a random sample of girls from Al-Nour & Al-Amal School for Blinds in Cairo Governorate, between the ages of 13 – 18 years, 54 of them born blind and the other 16 girls lost sight after a period of birth. There were 70 blind girls overall. The educational level was both middle and high school. And they were able to read Braille way.

2. Materials and Method

2-1 Questionnaire sheet

The Questionnaire sheet [see appendix (1)] used to identify the difficulties faced by blind girls during matching of their clothes and their daily use thereafter.

The Questionnaire sheet contains five questions, the answers will clarify how blind girls recognize the design and colors of clothes, how they match their clothes colors and whether they care about colors despite being unable to see them, the questionnaire sheet also includes how they can purchase their clothes on their own without help and whether there is help from whom.

2-2 Three- dimensional color wheel designs

Five different three- dimensional color wheels were designed using cardboard and glossy paper.
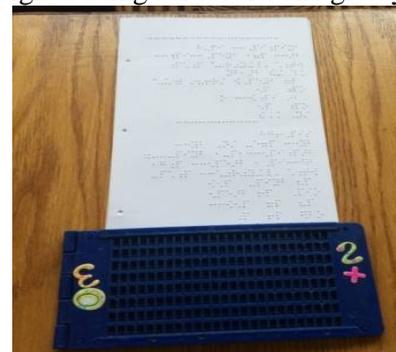

Figure (6)Braille slate and stylus

All the data were written in Braille. All Braille

alphabets were written on self-adhesive transparent paper with Braille slate and stylus as shown in figure (6).

- Design NO. 1 (figure 7) used to describe the
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main colors in the color wheel and used the double head red used arrow to describe complementary and analogues color scheme.

Figure (7)   Design No 1: basic color wheel

Figure (8): Design No. 2 (Tint, Tone, and Shade in color wheel)

- Design NO.2 (figure 8) used to describe the tone, tint and shade for each color in the color wheel.

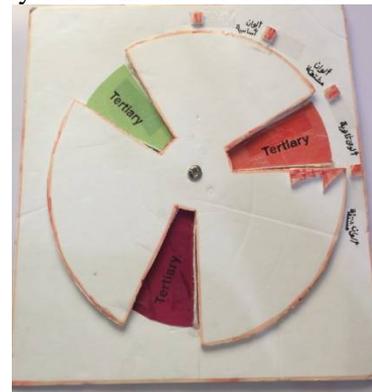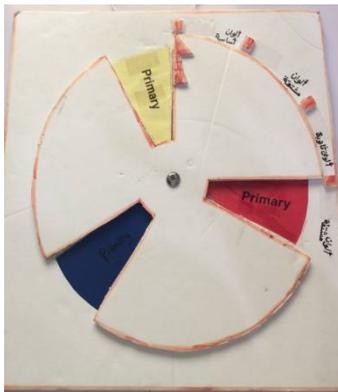- Design NO.3 (figure 9) used to describe primary, secondary, tertiary colors in the color wheel.

Figure (9): Design No.3(primary , secondary, tertiary colors in color wheel)

- Design NO.4 (figure 10) used to describe complementary and Monochromatic color scheme.

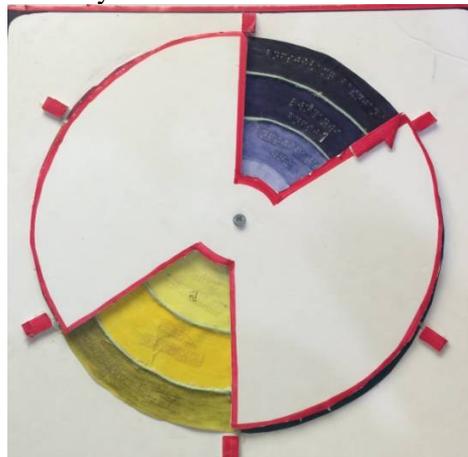- Design NO. 5 (figure 11) used to describe warm and cool colors in the color wheel.

Figure (10): Design No.4 (monochromatic &complementary color scheme)

Figure (11): Design No.5 (warm and cool colors)

In design No. 3 &4 used small arrow and rectangle as guide. Once they touch, this means that the

wheel is set to the position written in Braille next to the rectangle. In four practical lectures the

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Color wheel and color scheme were explained to the blind girls. Lecture every week for a month, keeping in mind that blind girls have participated by their opinions in implementing these three-dimensional color wheels. and the colors was connected with objects and substances in their world that always deal with such as green trees, yellow sun rays, red fire and blue sea.

2-3 Evaluating the efficiency of the three-dimensional color wheels

The efficiency of the suggested three- dimensional color wheels to raise the knowledge of blind girls about colors were evaluated by showing them a number of different pieces of clothes as shown in figures from 12 to 25, these pieces attached with label that contains information about the color and fabric written in Braille. Then they were asked to match these clothes without any help.

Figure (12) Black Trouser	Figure (13) beige Trouser	Figure (14) white Trouser
Figure (15) blue jeans blouse with front embroidery yoke.	Figure (16) white and blue printed linen blouse	Figure (17) black, gray, off white printed chiffon blouse
igure (18) blue jeans Trouser	Figure (19) blue jeans skirt	Figure (20) yellow cotton T-shirt
Figure (21) printed blouse	Figure (22) chiffon blouse	Figure (23) orange cotton T-shirt
Figure (24) printed blouse	Figure (25) printed blouse	Figure (26) orange trouser

3. Results and Discussion

Results are classified into two main parts, **first part** includes results from the questionnaire sheet, and **second part** includes Examples of clothes matched by blind girls.

3-1Questionnaire sheet

The results of the questionnaire sheet were as following:

For the first time to choose the color of their clothes 100% of them needs help especially in color matching, 82, 8% of them were able to recognize the design by themselves, 17.2 are not and need help. The design of the piece is recognized by touch, or with the help of a person who is seeing, and in some cases from the embroidery and beads. 100% do not recognize the colors and need help. 90% of them are care about good appearance and color matching, while 10% are not. 100% of them do not buy clothes by themselves and need help.

3-2 Clothes matches

4. Conclusion

Although people with vision loss are unable to see the colors of their clothes, they are interested in getting a good look in front of people with normal vision. But sadly, particularly for the first time, they can't do it by themselves. Three- dimensional shapes of the color wheel helped them to

understand the colors and its tone, tint and shades. It also helped them to understand color schemes. And they were able to match their clothes better and without any help. It is worth noting that individual differences existed between them. Some of them were able to match colors distinctly. Finally, in various fields we recommend more Three- dimensional shapes that help the blind persons make their daily lives easier without the need for help.

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