Development of products aimed for the tactile perception of children with visual disabilities

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Abstract: Fashion is not just about visual appeal, it can provide sensory experiences that help to stimulate other senses such as tactile, acquired through the touch of fabrics, olfactory essences applied to products, and auditory, employing sound devices on objects, toys, clothing and accessories. This article seeks to discuss the implementation of the Feelipa Color Code color system in children's changing room, contributing to the stimulation and tactile perception of children with visual impairments through the development of t-shirt prototypes. The dimension that the fashion products market presents in Brazil is high, but the number of garments with inclusive aspects available is still not satisfactory, especially when it comes to visually impaired children. For such questions, an applied, qualitative and exploratory research was developed, where the technical procedures used are bibliographic and action research, since there was interaction with users of the piece. Thus, it is proposed, in a logical and strategic way, the planning and elaboration of a tool that actually includes and facilitates the lives of children with visual impairments, offering information and elements that will help in their independence and daily life.

Keywords: inclusive fashion, visual impairment, color system.

1. Introduction

The Brazilian Institute of Geography and Statistics (IBGE) pointed out in the 2010 census that there were in Brazil around 45.6 million people with at least some type of disability (visual, hearing, motor and mental), which represents 23.9% of the population, with visual being the most frequent, reaching 35.8 million. For each group of 100 Brazilian children from 0 to 14 years of age 7.5% have some disability, and among them 5.3% is the visual impairment. In the Northeast, there are a total of 2,192,455 children and adults, about 4.1% of the local population (INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA, 2010).

Vision is one of the informational senses of data necessary to understanding certain aspects of clothing items, it is responsible for identifying the color and the correct side of the pieces. Visually impaired people cannot always use this sensitive instrument normally used to dress, buy, choose, which becomes a complex and difficult task in their daily lives (BARBOSA & ALBUQUERQUE, 2010).

The lack of products with accessible technologies or devices with customized information is still limited, which largely reduces the autonomy of this audience with regard to interaction with fashion and clothing, making them largely dependent on the participation of third parties to perform simple tasks such as choosing which clothes to wear (SCHNEIDER et al. 2017). One of the difficulties present in the interaction between the visually impaired and the clothing concerns the recognition of colors, particularly by those who are blind from birth, as they encounter great natural difficulties in understanding color-related concepts (SENA, 2009).

The fashion industry makes few instruction manual data available that contain explanations regarding color identification, maintenance and product conservation for people who cannot see. The tactile experience through clothing can help include the disabled in society, as necessary information present in products through support methods is of paramount importance for social inclusion.

In the children's fashion market, some brands have been developing playful garments, which helps and brings the possibility of learning for children, contributing to the visual, tactile, olfactory and auditory development (PEREIRA; ANDRADE, 2013). This tactile experience in clothing can also include visually impaired children such as parents and society, who come to know through clothing the importance of the role of social inclusion.

Given the above, this article seeks to discuss, in a reasoned way and in an inclusive perspective, the implementation of the Feelipa Color Code color system on t-shirts, in order to contribute to the tactile perception

and identification of colors by visually impaired children, focusing on their needs, offering information and elements that can help in their independence and daily life.

2. Literature review

2.1. Visual impairment and inclusive fashion

Inclusive fashion seeks to cover the various types of bodies that the industry generally doesn't contemplate, it is about a focus directed at increasingly specific markets, in which product creation projects are developed for consumers with some type of disability or reduced mobility (AULER, 2012).

Visually impaired people don't present change their physical structure when it comes to clothing, however, the perception, as well as the identification and autonomy in the act of dressing, must be taken into account in the aesthetic, practical and perceptive aspects of clothing, especially when it comes to children's clothing (BONONI, 2016).

Visual impairment can be classified as mild, moderate, severe or profound. It reaches a group of people with low vision or people with low vision, or the total absence of visual response. The individual can be born with a disability (congenital) or acquire due to an accident or illness, which is partial/temporary, reduced or irreversible (LIMA et al., 2013).

The person with visual impairment doesn't "compensate" with his other senses due to lack of vision, their remaining senses are more acute/developed, because they resort to these senses more often, making listening, touch and smell more trained than people who don't have visual impairment (ULBRICHT et al., 2011).

The visually impaired find many difficulties when shopping, because making the recognition of pieces, combining colors, models and identifying product information are difficult tasks to be practiced when there is no tactile or auditory experience about size, color or type of fabric to facilitate both in choice and in use of product (OLIVEIRA; CINELLI, 2017).

One of the forms of communication that can be inserted in clothing and facilitates in the time of purchase is braille. It was invented by Louis Braille in 1825, it is a tactile reading and writing system for the blind, that is, the reading with the hands that was used based on a military code in order to facilitate night communication. It consists of 64 symbols by means of six points positioned in various positions along three columns, in addition to having 63 signs (CANEJO, 2005).

The braille label on clothing helps in identifying, through tact, sizes, colors, types of fabric and other aspects that can help remove communication barriers. Touch is responsible for various sensations such as heat, cold, pressure and pain that are captured by existing receptors in the epidermis (SENA, 2009). Regarding children who are born blind or lose their sight in early childhood, braille is essential, as it helps and contributes to the daily needs of children, in the identification of objects and tasks, making them more independent, its frequent use will help more opportunities in adulthood, besides being one of the methods of teaching and reading quite consistent.

2.2. Visual impairment and the relation with trendy colors

In fashion, one of the first requirements and choice at the time of purchase by the consumer is the color, so when creating a collection, one of the decisions to be made by the designer is in relation to the color chart, with this choice being determined by factors such as trend, climate and season (SENA, 2009 apud JONES, 2005).

According to Farina (2006), color is an element that can interfere in the mood of each individual differently, your choice may be associated with experiences, desires and affinities. Color is a characteristic of fashion and is closely linked to lifestyles and groups in society, which proves, for example, the preference for dark tones in times of crisis, protests or mourning (TURATTI, 2011).

Color is widely used in our language, it helps to reveal and identify instruments, maps, graphs and other visual elements. For the visually impaired, color is an extremely important aspect of communication, however, in the products currently developed, there are still no frequently used techniques, such as braille code, which helps to facilitate color recognition for the visually impaired, a need that becomes important as a form of inclusion (ANCZUROWSKI, 1987 apud OLIVEIRA et al., 2017).

Daltonism, which affects the correct perception of colors and causes confusion, is a congenital anomaly and occurs due to the absence or insufficiency of cones in the retina that are responsible for the perception of colors (NEIVA, 2008). According to IBGE (INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA, 2010), in Brazil there are about 6.2 million people with visual impairment, which affects 10% of the world population, where 98% of those affected are male. The carriers have their impaired visualization and have difficulties in identifying the primary colors, which impairs the visualization of the rest of the light spectrum (QUADROS apud FERREIRA, 2012).

Daltonism is also known as "color blindness", an anomaly that hinders some daily activities, including with regard to fashion, where some visualized colors have no relation to the actual color of the products, which can cause embarrassment for not being able to correctly identify the colors of the clothes, dressing and shopping (QUADROS; SCOPEL; VIEIRA, 2017).

The color code was developed to assist the visually impaired through the simple association of universal geometric shapes, presented in high relief and that can be applied in various types of materials, including fabrics, where its main characteristics are easy memorization and
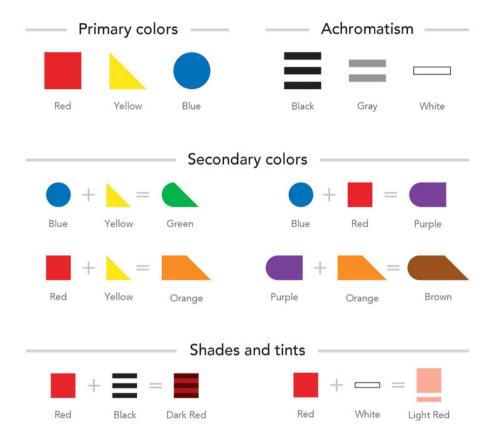
Figure 1. Code criated by Filipa Nogueira Pires. Source: Feelipa – Color Code (2019).

effortless recognition of shapes, allowing better tactile recognition, thereby increasing the autonomy of people with visual impairments (OLIVEIRA; CINELLI, 2017).

The operation of the code was very simple, where the geometric shapes square, triangle and circle are associated with the primary colors red, yellow and blue (Figure 1). With regard to secondary colors such as green, orange and purple, these are inserted in the new geometric shapes, which together with the primary shapes provide a basis for a new formation. And the colors black, gray and white are represented by lines thick enough for tactile recognition, making the code a simple, logical and intuitive system (OLIVEIRA; CINELLI, 2017).

3. Researrh methodology

As for the nature of the research, it is classified as applied, since it was motivated by the need to produce knowledge to apply its results, in order to contribute for practical purposes, aiming to solve problems found in reality, involving local truths and interests (BARROS; LEHFELD, 2000). The approach to the problem is considered as a qualitative research, due to the concern to analyze and interpret more in-depth aspects, aiming to evaluate the product's efficiency with the child, observing the user's experience and its evolution regarding the knowledge and interpretation of colors and tactile sensitivity (MINAYO, 2011).

The methodology used is exploratory in nature as it aims to formulate questions or problems with three purposes, among them conviviality of the researchers with family and child, getting closer to the problems that may occur in the course of product development, making it possible to develop solutions and alternatives (LAKATOS; MARCONI, 2010).

As for the technical procedures used, the research started with bibliographic research, made from materials already prepared, which served as a basis for the development of t-shirts (GIL, 2009). While the t-shirts were produced and tested, the technical procedure used was an action research, carried out in association with the resolution of a collective problem, where researchers and participants in the investigated situation were cooperatively involved (THIOLLENT, 2009).

In order for the research objective to be achieved, 4 stages were adapted from the design methodologies of Lobach (2001) and Baxter (2011) . Initially, a theoretical foundation was made, analyzing inclusive fashion, visual impairment and their relationship with colors in fashion, obtaining greater familiarity with the researched theme. The

second stage covered the elaboration and construction of the prototype, in the third stage usability tests were carried out with a visually impaired child and finally, an evaluation of the product and analysis of the results achieved. Thus, the intention of the research is to present a contribution from the color system in clothing for visually impaired children.

4. Results and discussion

The main concern during the elaboration and construction of the prototype was to make parts with functional and ergonomic characteristics, which provide freedom of movement, comfort and well-being to the user. Some t-shirts with geometric shapes and primary colors were made using the Feelipa Color Code color system.

In the process of building the prototypes, the difficulties and discoveries that happened were in relation to the size of both the piece and the objects, because it was possible to verify that to build clothing, accessories or any other children's item requires a lot of patience, delicacy and care, being meticulous work and, because of their small size, make work slower.

For the development, the modeling, cuts and then the paintings and applications of the prints were made. The materials used were: 100% CO mesh, 100% PES felt, threads, velcro, scissors and paint. After modeling the piece was cut and before closing it was placed the pocket, and then it was scratched and applied the outline of the pattern with the puff paint, to give the 3D effect, ending with the seam.

In the elaboration and construction of the prototypes, some t-shirts were made (Figure 2) that have the same functionality, but different aesthetics, one was developed with geometric shapes and colors, aimed at children aged between 3 and 5 years, another with pencil, geometric shapes and colors for children aged between 6 and 9 years old. Although the two pieces were made, at the time of the research it was only possible to perform the usability test with a 9 years old child, being tested the piece containing the pencils, geometric shapes and primary colors, as shown in Figure 2.

In order to confirm the effectiveness of the t-shirt, usability tests were carried out and the concepts of interactivity and child development were applied using a pocket, where pencils and objects can be kept. Design assists in the development of perception and interpretation through sensory exploration, in addition to contributing to movements, arousing the child's curiosity, and developing their tactile sensitivity better. The pencils were decorated with the geometric shapes associated with the primary colors as suggested by the code, making identification simple, interactive, dynamic and easy to memorize.

The carry out the product usability test, all those involved were invited to participate in the research as volunteers and completed the Informed Consent Form (ICF) authorizing the dissemination of the test results and photographic records in scientific publications.

In the test realized, it was possible to observe the independence and autonomy of the participant in carrying out the interactive activities proposed by the piece. The use of tactile textures and the use of colors linked to pencils were devices considered satisfactory and accepted by the child (Figure 3). The practice and the continuous use of the piece can be an auxiliary resource in the construction and inclusion of the child in society, contributing to the development of color perception and interpretation, facilitating the school routine, since the child will be able to color drawings and

Figure 2. Prototypes. Source: Elaborated by the authors (2018).

Figure 3. Usability test with 8 year old child. Source: Elaborated by the authors (2018).

choose the shades proposed by the teacher or the ones he wishes for his school activities.

The tactile perception regarding the Feelipa Color Code was confirmed in the test, the identification of the geometric shapes assimilating them into the primary colors was well memorized by the child, in addition to the interactive act of opening, and directing the pencils to the felt board on the t-shirts were dynamic activities and easy to handle.

A fundamental point that cannot be overlooked was the importance of family participation, their involvement, knowledge, ability with the child, and above all, the desire to provide more opportunities for knowledge, autonomy, freedom and inclusion helped in the tests.

5. Final considerations

The purpose of the article was contributed to the discussion on inclusive fashion by presenting reports on the relationship of users with the proposed product. The intention is to generate discussions on the subject, contributing not only to the academic environment, but also to the social life of those involved and visually impaired children.

Through the use of the Feelipa Color Code color system in clothing, it was possible the interaction between the child and the clothing, helping her to know and identify not only colors but also geometric shapes, focusing on their needs, what they think and feel, offering information and elements that can contribute to their independence and daily life.

When developing and testing prototypes, it was possible to identify aspects related to the needs of children, with regard to difficulties in the use of clothes, how they imagine and see objects and the world around them. As a result, it is expected that the proposal developed meets the needs of users with the lowest possible cost and that the idea can be widely reproduced.

The construction of prototypes, prints, and geometric shapes were handmade, but can be done on a large scale and industrially, if the proposal is patented. With the usability test, it was possible to verify the efficiency with regard to the identification of colors and shapes, meeting the needs of children through clothing, making the t-shirt useful and attractive, and the child feeling motivated to use it.

The interaction with the piece allows the child to learn in a fun and productive way, thus developing their potential, preparing them for adult life. The use of games through clothing with blind and low vision children is a vehicle for the development of their abilities (BONONI, 2016).

The playful clothing proposal is expected to provide tactile experiences for visually impaired children and that can contribute to the discussion on inclusive fashion through the reports presented on the relation of the participant with the developed piece.

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