Tactile coloration for inclusive fashion: the role of *"See Color"* in enhancing autonomy for individuals with visual impairments

Fernanda Ribeiro[1], Claudia Schemes[1], Ítalo José de Medeiros Dantas[1]

[1] Department of Cultural Processes and Expressions, Feevale University, Novo Hamburgo, Brazil. frconsultoriaonline@gmail.com; claudias@feevale.br; italodantasdesign@hotmail.com

Corresponding author: Fernanda Ribeiro (frconsultoriaonline@gmail.com)

ABSTRACT

Color has historically played a pivotal role in design and fashion, serving as a tool for identity, communication, and aesthetic expression. However, the interplay between color and accessibility, particularly for individuals with visual impairments, remains underexplored. This study investigates how the tactile language "See Color" enables autonomy and inclusivity in fashion for individuals with acquired visual impairments. Drawing from qualitative methodologies, including ethnographic approaches and usability testing, the research proposes a tactile color chart as a practical solution for facilitating independent clothing choices. Findings indicate that tactile systems, such as "See Color", not only democratize access to personal coloration but also foster social belonging and cultural expression. By bridging the gap between aesthetics and accessibility, this research contributes to the historical narrative of color in design, highlighting its evolving role in inclusive practices. The results underscore the importance of integrating accessible design principles to broaden the scope of fashion's cultural and social impact.

KEYWORDS Fashion inclusion. Tactile coloration. Accessibility. Visual impairment. "See Color" system. Inclusive design. Autonomy.

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1. Introduction

Color plays a central role in fashion and design, functioning as a powerful tool for personal identity, communication, and aesthetic expression. From its use in everyday clothing choices to its prominence in high fashion, color influences how individuals perceive and present themselves to the world. Historically, color has carried symbolic meanings, served as an indicator of social status, and reflected cultural trends. Despite its universal significance, the relationship between color and accessibility remains largely unaddressed, particularly for individuals with visual impairments. For this group, the inability to perceive or identify color creates significant barriers to making independent and expressive choices in fashion.

Moreover, fashion has long been a platform for self-expression, offering individuals the means to communicate their identities and values. However, the experience of fashion is not universally accessible. Individuals with visual impairments often face limitations in accessing key elements of design, such as color, that are essential to clothing selection and personal styling. While technological advances have improved tactile recognition of shapes and textures in design, accessible tools for understanding and engaging with color remain scarce. This exclusion reinforces a broader issue of invisibility for people with disabilities in fashion and challenges their autonomy in daily life.

In recent years, the fashion industry has made progress in addressing diversity and inclusion by creating adaptive solutions tailored to the needs of individuals with disabilities. Initiatives such as Tommy Hilfiger’s "Tommy Adaptive" line have demonstrated how inclusive fashion can merge functionality with aesthetics, catering to a broader range of consumers. However, these advancements have primarily focused on physical adaptations, such as adjustable closures and ergonomic designs, with limited exploration of how aesthetic elements like color can be made accessible. This gap highlights the need for inclusive strategies that not only address mobility or fit but also empower individuals with visual impairments to engage with the symbolic and emotional aspects of fashion, particularly color.

Fashion serves as more than a medium for personal expression; it is also a social and cultural connector. Clothing choices often signal membership in certain groups, reflect cultural heritage, or align with current trends. For individuals with visual impairments, barriers to engaging with color restrict their ability to participate in these broader social and cultural narratives. The absence of accessible tools for color recognition further marginalizes these individuals, creating an unmet need for innovations that enable independence and inclusion in the fashion space. Addressing this need would not only improve individual autonomy but also broaden the societal understanding of inclusion in design.

Furthermore, the growing importance of accessibility in design has prompted new conversations about how inclusive principles can be applied across various industries, including fashion. While research on adaptive fashion has highlighted its role in improving functionality and comfort, there remains a significant lack of focus on the aesthetic dimensions of clothing, particularly color.

In this context, image consulting, particularly the personal color analysis method, has gained prominence as a tool for enhancing self-expression and self-esteem through the strategic use of color. This process involves identifying hues that harmonize with an individual’s skin tone, hair, and eyes to create a cohesive and flattering appearance. However, for individuals who are blind or visually impaired, this method poses unique challenges. The traditional reliance on visual assessment excludes these individuals from participating in an experience that significantly influences personal style and identity. This raises the need for adaptive approaches that enable blind individuals to access and engage with personal color analysis, ensuring that they too can enjoy its aesthetic and emotional benefits.

Therefore, we argues that the “See Color” tactile language emerges as a promising solution to bridge this gap, offering a system that allows individuals with visual impairments to identify and interact with colors through touch. By translating color into a tactile code of lines and points, “See Color” empowers users to independently engage with their personal style. In the context of image consulting, this system can transform how blind individuals perceive and select clothing, enabling them to participate actively in processes traditionally dominated by visual cues. This integration might enhances autonomy while reinforces the broader goal of inclusive fashion, ensuring that aesthetic practices like color analysis are accessible to all, regardless of visual ability.

This gap represents a missed opportunity to create solutions that are not only functional but also culturally meaningful. Tactile color systems, such as the “See Color” language, offer a promising avenue for bridging this divide by providing individuals with visual impairments the means to independently engage with color.

Therefore, this study seeks to explore the potential of the “See Color” tactile system as a tool for promoting autonomy and inclusion in fashion for individuals with acquired visual impairments. By examining how tactile color recognition can facilitate independent clothing choices, this research aims to demonstrate the broader cultural and social benefits of integrating accessibility into

aesthetic design. The objective of this paper is to highlight the importance of inclusive strategies that connect aesthetics and functionality, fostering a more equitable and participatory approach to fashion.

2. Theoretical frameworks

2.1. *Fashion and inclusion*

Fashion is a cultural and social phenomenon with profound influence on individuals and societies. Lipovetsky (2009) argues that fashion is a hallmark of modernity, shaped by individuality and transience, and reflects social transformations and personal identity. Beyond functionality, fashion embodies cultural, aesthetic, and historical dimensions, making it an essential tool for expressing societal values and individual preferences.

Fashion operates not only as an aesthetic expression but also as a marker of cultural and social belonging. Miranda (2008) describes fashion as a form of visual communication that enables individuals to construct their identities and participate in social groups. By engaging with the symbolic language of clothing, people navigate social expectations while expressing personal narratives, highlighting the dual role of fashion in integrating and distinguishing individuals within society (Piacentini & Mailer, 2004).

This dynamic relationship between fashion and identity is further illustrated by Crane (2006), who emphasizes that clothing, as one of the most visible forms of consumption, is central to the construction of social identity. Fashion choices reveal how individuals interpret cultural norms while adapting them to their unique expressions (Barnard, 2013). Crane (2006) argues that fashion acts as both a reflection of societal structures and a medium through which individuals negotiate their place within them.

Inclusive fashion builds on this understanding by seeking to extend these opportunities for expression and belonging to individuals who have historically been marginalized. Machado (2017) underscores the importance of acknowledging diverse perceptions and experiences within fashion, emphasizing that inclusion involves more than physical accessibility; it requires creating spaces for all individuals to participate in cultural and social dialogues through clothing (Busch, 2018).

As Auler and Sanches (2017) note, inclusive fashion is rooted in the recognition of diversity and aims to address the specific needs of various individuals, particularly those with disabilities. This approach involves rethinking traditional fashion norms to create designs that not only accommodate but celebrate differences (Busch, 2018). By doing so, inclusive fashion expands the possibilities for self-expression and fosters greater social integration (Busch, 2018).

The concept of inclusive fashion challenges conventional standards that often prioritize exclusivity. Pereira and Cruz (2016) highlight how traditional fashion systems have historically excluded certain body types and abilities, perpetuating a narrow ideal of beauty. Inclusive fashion, by contrast, seeks to dismantle these barriers, advocating for designs that embrace a broader spectrum of bodies and identities, thereby promoting equity and representation (Busch, 2018).

Fashion also plays a critical role in fostering a sense of social belonging. For marginalized groups, the ability to participate in fashion is tied to their recognition and acceptance within society (Joo & Wu, 2021). By creating inclusive designs, the fashion industry contributes to this process, enabling individuals to express their identities and connect with others through shared cultural symbols (Busch, 2018). This approach reaffirms that fashion is not merely a tool for personal aesthetics but a vital medium for social inclusion and dialogue (Busch, 2018; Joo & Wu, 2021).

Ultimately, inclusive fashion is more than a design philosophy; it is a commitment to equity and representation within a cultural and social framework (Busch, 2018). By recognizing the diverse needs and preferences of all individuals, inclusive fashion redefines the boundaries of the industry, ensuring that clothing serves not only as a form of personal expression but also as a means of fostering community and belonging (Busch, 2018).

2.2. *Acquired Blindness and Colors: The Path to Inclusive Fashion*

Acquired blindness refers to the loss of vision at some point in life after an individual has already experienced the world visually (Wong, 1991; Collignon et al., 2013). Almeida and Araújo (2013) emphasize that this condition is particularly traumatic as it disrupts previously established patterns of communication, mobility, work, and leisure. Adapting to this new reality often requires a painful process of identity reconstruction and reorganization of sensory and motor skills. The individual must relearn how to navigate their environment, relying on other senses such as touch and hearing, which can lead to feelings of frustration and anxiety (Wong, 1991; Almeida & Araújo, 2013 Collignon et al., 2013; Tomasello et al., 2024).

The experiences of individuals with acquired blindness vary according to the timing and manner of vision loss. Almeida and Araújo (2013) note that sudden vision loss can lead to an intense shock, followed by a gradual adaptation phase, during which emotional recovery is a challenging process. In cases of progressive blindness, the emotional impact may be less abrupt due to the psychological preparation for eventual total vision loss (Wong, 1991; Almeida & Araújo, 2013 Collignon et al.,

2013 Tomasello et al., 2024). However, the constant threat of losing vision often generates prolonged anxiety, further contributing to depersonalization processes and directly impacting self-esteem and identity as a social subject (Wong, 1991; Almeida & Araújo, 2013 Collignon et al., 2013; Tomasello et al., 2024).

In this context, Almeida and Araújo (2013) argue that individuals with blindness can utilize the vision of others as an instrument to perceive the world, enabling the formation of a renewed sense of self. Nonetheless, this process requires proper orientation, training, and lived experiences that help individuals improve their quality of life and reorganize their motor abilities (Wong, 1991; Almeida & Araújo, 2013 Collignon et al., 2013; Tomasello et al., 2024). Fashion emerges as a valuable tool in this journey, providing opportunities for autonomy and self-esteem (Alsabhi, 2024). While traditionally centered on visual aesthetics, fashion can play a central role in the adaptation process for individuals with acquired blindness by fostering a renewed relationship with clothing as a means of social reintegration and self-discovery (Alsabhi, 2024).

Bononi, Domiciano, and Menezes (2016) suggest that clothing design for visually impaired individuals should prioritize tactile experiences, as touch becomes the predominant sense in the absence of vision. They highlight the need for fashion design to adapt to this sensory reality, where tactile elements offer a new way of engaging with the world. Fabrics with varied textures, embroidery, and raised surfaces become essential tools to facilitate interaction with clothing. Similarly, Krone, Oliveira, and Rizzi (2020) stress the importance of incorporating universal design principles into the development of inclusive fashion pieces, ensuring accessibility for all individuals regardless of sensory abilities.

The relationship between fashion and acquired blindness also involves notions of both social and emotional inclusion. Oliveira et al. (2015) underline that fashion can serve as a means of reconnecting individuals with their environment and society, particularly for those who experience sudden or progressive vision loss. Clothing featuring raised patterns, Braille labels, and other sensory details not only facilitates autonomy in dressing but also acts as a medium for restoring self-esteem (Alsabhi, 2024). For individuals who have lost their vision, fashion becomes a means of expressing identity and regaining a sense of belonging to the world, which has been abruptly altered by the loss of sight (Alsabhi, 2024).

The challenge of associating blind individuals with color is further discussed by Bianchi, Ramos, and Barbosa-Lima (2016), who explore how to teach colors to individuals blind from birth. These authors view learning as a multisensory process, arguing that while colors are traditionally linked to vision, their meaning can also be understood through other sensations and social associations. They conclude that even without visual perception, knowledge of colors can be constructed through interactions with other senses and shared social experiences (Kim et al., 2021).

Bianchi, Ramos, and Barbosa-Lima (2016) also argue that the conceptualization of colors in blind individuals involves the mobilization of senses such as touch, hearing, and even smell, enabling meaningful associations that compensate for the lack of vision. Their study revealed that blind students associated colors with tactile and emotional elements, illustrating that understanding colors is not exclusively a visual process but rather a complex intellectual and social activity. This multisensory approach to teaching colors contributes to an inclusive education adapted to the needs of blind individuals.

2.3. *Personal coloring and the perspective of inclusion*

In the context of fashion, one of the most prominent contemporary areas is image consulting (Wellington and Bryson, 2001; Marks, 2021). This field focuses on guiding and informing consumers about the best choices for clothing, accessories, makeup, and other items to effectively communicate a self-image aligned with their interests, personality, professional roles, and social positioning consulting (Wellington and Bryson, 2001; Marks, 2021). Within this framework, personal color analysis stands out as a technique designed to identify and harmonize colors with an individual's skin undertone. This process directly influences self-image and self-esteem by providing a palette that enhances natural features and improves personal perception (Medeiros, 2022).

Personal color analysis, as a service, explores the impact of colors on self-esteem, revealing a strong connection between appearance and self-perception. Medeiros (2022) highlights that personal color analysis can significantly influence how individuals perceive themselves and how they are perceived in social contexts. The appropriate use of a personalized color palette can transform the way individuals view their physical characteristics, boosting confidence and elevating self-esteem. Research on the impact of colors on personal image supports these claims, showing that using harmonious colors fosters a positive self-image (Ulrich, 2019).

This perspective is further reinforced by Silveira and Soratto (2022), who discuss how fashion consulting promotes self-awareness and serves as a key tool for building self-esteem. They argue that understanding one's personal style and learning to use colors effectively not only enhances appearance but also fosters a deeper sense of self-confidence and well-being. Thus, personal color

analysis transcends aesthetics, contributing to emotional and psychological growth by helping individuals construct a more positive self-image (Silveira & Soratto, 2022).

As highlighted by Medeiros (2022), personal color analysis has proven effective in delivering the benefits outlined in theoretical reviews. Her study shows that participants who underwent in-person consultations using the expanded seasonal method reported increased self-esteem, greater use of colorful clothing, improved makeup techniques, and enhanced ability to combine colors effectively (Medeiros, 2022).

Ulrich (2019) emphasizes that the impact of colors on personal and professional image, while subjective, can be amplified through a technical color analysis that harmonizes colors with skin pigmentation. By combining this analysis with a personalized approach considering personality and environment, individuals can positively influence their self-esteem. Ulrich highlights how the proper use of colors not only enhances aesthetics but also strengthens confidence and improves social positioning in diverse contexts.

In the context of this research, it is understood that while personal color analysis is widely used as a tool to improve self-image and self-esteem, it poses challenges when applied to inclusive fashion, especially for individuals with visual impairments. The concept of harmonizing colors with skin tone, as described by Medeiros (2022), heavily relies on the visual perception of colors and the non-verbal communication they convey. For visually impaired individuals, this perception is limited or absent, creating barriers to fully benefiting from this resource. This raises the need to adapt personal color consulting to include those who cannot "See Color"s but still wish to express themselves aesthetically and enhance their self-esteem through fashion.

In this regard, inclusive fashion must be reimagined to integrate visually impaired individuals into processes such as personal color analysis, which traditionally depends on visual cues. To date, no research has been identified that connects personal color analysis with inclusive fashion concepts. However, we argues that Ulrich's (2019) technical analysis of skin pigmentation could be adapted using tactile technologies and detailed descriptions, allowing individuals to sense and understand the relationship between colors and their appearance without visual input.

Furthermore, as Lazzarin (2022) notes, self-awareness can significantly elevate self-esteem. For visually impaired individuals, image consulting could focus on other sensory aspects of fashion, such as textures, shapes, and comfort, offering alternative ways to express identity and personality without relying exclusively on vision.

2.4. *Tactile Methods for Color Identification: The ""See Color"" System*

Tactile methods for color identification have been developed to provide autonomy to visually impaired individuals in choosing clothing, services, and other products, recognizing the central role of color in design and fashion consumption. Among the available systems, solutions range from simple geometric shapes and Braille codes to more complex systems requiring the memorization of various symbols and their combinations. These systems enable colors to be interpreted through touch, offering an inclusive and sensory experience. According to Brogin et al. (2024), tactile methods allow for color recognition without visual support, bridging the gap between inclusive design and accessible fashion.

Brogin et al. (2024) identify simplicity and ease of memorization as key features of effective tactile methods (Figure 1).

For instance, the ColorADD system uses simple geometric shapes to represent different colors, while the "See Color" Tactile Color Language relies on points and lines to create an intuitive and practical code for clothing. Additionally, other approaches, such as QR codes and Braille tags, are discussed, although many users exhibit low adherence to solutions dependent on digital technology. These tactile methods collectively aim to make color identification accessible and user-friendly (Brogin et al., 2024).

Systems such as ColorADD and the "See Color" language strive to create visual codes that are easily recognizable and applicable in various settings, whether for educational, commercial, or communicational purposes (Brogin et al., 2024). The Gagne Todd system, for example, involves memorizing geometric shapes and abbreviations for colors in English, while the Constanz system requires the retention of geometric shapes and seven different types of lines (Brogin et al., 2024).

In addition to these, other methods, such as the Universal Color Code and the FOCO system, focus on expanding accessibility and universality in color recognition. ColorADD, for instance, utilizes combined geometric shapes to represent colors inclusively, especially for individuals with color blindness. Similarly, the FOCO system employs overlapping figures and colors for a more intuitive identification process. These strategies aim to create visual and tactile codes that are universally understandable, transcending linguistic and sensory barriers to foster inclusivity (Brogin et al., 2024)

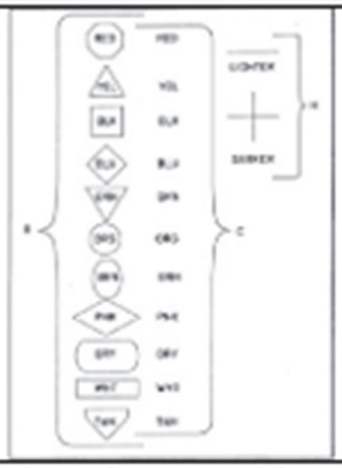
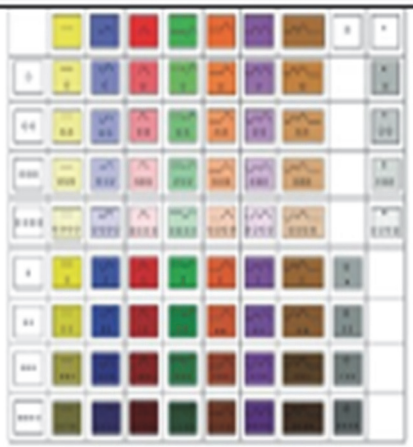
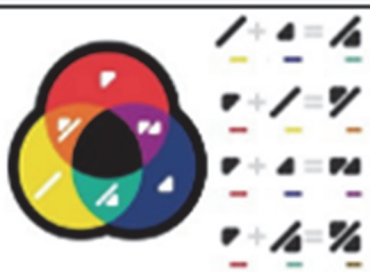
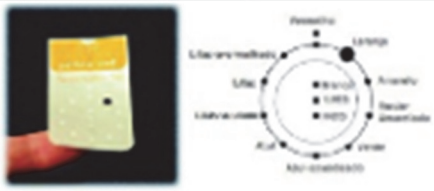
Sistema Gagne Todd (Todd, 2006)	Sistema Constanz (Monroy, 2012)	Sistema ColorADD (Santos, 2008)
		
It requires memorizing geometric shapes and color abbreviations in English.	It requires the memorization of geometric shapes as well as 7 different types of lines.	It requires the memorization of simple geometric shapes and their juxtaposition.
Código FOCO (Pires, 2011)	**Sistema Ramsamy-Iranah (Ramsamy-Iranah et al., 2015)**	**Sistema Iro-pochi (Sagawa, Okudera, Ashizawa, 2019)**
		
It requires the memorization of simple geometric shapes and their juxtaposition.	Requires memorization of all 14 symbols presented.	Requires memorizing the position of 14 points on the circle.
Linguagem tátil das cores *See Color* (Marchi, 2019)	**Universal Color Code Código Universal de Cores - CUDC (Pereira, Ferronato, 2019)**	
		
It requires memorizing the stitch and line, as well as the positions of 8 colors.	Requires understanding of two Braille cells, i.e. 12 dots.	

Fig. 1. Color recognition methods mapped by Brogin et al. (2024)

Among the methods discussed, the "See Color" system stands out as an innovative tactile language designed by Marchi (2019) specifically for visually impaired individuals (Figure 2). This system is based on the combination of points and lines inspired by Braille, allowing users to perceive colors through tactile interaction. The code features a central point indicating a reference position and a line pointing to the corresponding color, resembling a clock hand. This structure facilitates memorization and enables users to create a tactile mental map of colors, offering an accessible solution rooted in the principles of Universal Design (Marchi, 2019)

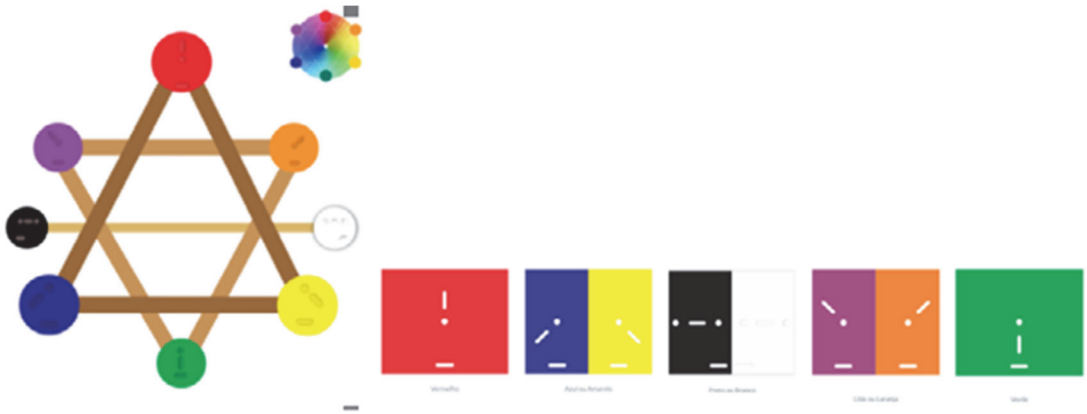


Fig. 2. Tactile Language ""See Color""

Testing of the "See Color" system with 18 participants demonstrated the simplicity of its forms and its alignment with Color Theory, making it easier to learn and remember. The small dimensions of the code (ranging from 1.6x1.6 cm to 1.8x1.8 cm) allow it to be applied to virtually any surface, making it a practical tool for identifying colors. This method supports learning about color relationships, including secondary and neutral tones, providing visually impaired individuals with a guide to understanding and choosing colors in various domains such as fashion, education, and daily life (Marchi, Brogin & Okimoto, 2022).

The effectiveness of the "See Color" system lies in its simplicity and proven functionality. According to Marchi (2019), it enables quick and accurate color identification in an average time of 18.5 seconds, with an accuracy rate of 82.86%. Its adaptability to different surfaces broadens its application in fashion, education, and everyday products, fostering greater autonomy for visually impaired users. By allowing for tactile color identification, "See Color" can democratize access to personal color analysis, enabling visually impaired individuals to participate in image consulting and style processes more independently.

Marchi (2019) highlights the potential of "See Color" for use in clothing labels and accessories, suggesting that it could also be implemented in color palettes for fashion consulting. This integration would make the color selection process more accessible and aligned with inclusive design principles. By enabling visually impaired individuals to actively participate in the discovery and use of colors, the "See Color" system opens new opportunities for inclusion within the fashion industry, fostering personalization and autonomy in the use of colors.

3. Methodology

This research is classified as applied, as it seeks to develop practical solutions for specific challenges within the context of inclusive fashion. According to Prodanov and Freitas (2009), applied research is oriented towards addressing real-world problems, producing knowledge with a direct application. The inductive method was chosen, progressing from particular observations to broader generalizations, which enables conclusions to be drawn directly from empirical evidence.

From a methodological perspective, the study is exploratory, aiming to deepen understanding of tactile color systems and their applications in promoting inclusion. Prodanov and Freitas (2009) argue that exploratory research is fundamental when the objective is to clarify concepts, investigate new approaches, or provide more information about a subject. Additionally, the research is descriptive, a methodology often employed in the social sciences to observe, analyze, and describe phenomena within their natural context.

The first phase of the research involved a bibliographic review, defined by Cervo and Bervian (1983) as a systematic process for identifying and analyzing theoretical contributions relevant to a specific subject. This stage focused on academic works related to inclusive fashion, tactile methods for color identification, and issues

faced by visually impaired individuals. The review provided the theoretical basis for developing the field research and understanding existing gaps in the literature.

Field research was conducted using a case study approach, which Yin (2015) identifies as an effective method for detailed investigation of complex phenomena in real-life contexts. This approach allowed for an in-depth exploration of the lived experiences of a single participant, enabling a nuanced understanding of her needs and interactions with tactile color systems. The participant was a 31-year-old woman with acquired blindness, residing in Campo Bom, Rio Grande do Sul (Brazil). Her experiences provided valuable perspectives into how inclusive fashion and tactile systems can be applied to enhance autonomy and self-expression.

Data collection involved participant observation and semi-structured interviews, methods that Minayo (2001) considers essential for capturing subjective experiences and the meanings individuals attribute to their actions. The interviews aimed to understand the participant's perceptions of tactile color systems and their relevance to her daily life, while the observations focused on her interaction with these tools in practical contexts.

This study focuses on a single participant, referred to by the pseudonym "Rosa," to ensure anonymity and uphold ethical research standards. The decision to work with one subject stems from the need for depth and specificity in exploring the nuances of her lived experiences with acquired blindness. A single-case approach enables a detailed, contextualized analysis of her interactions with tactile color systems and inclusive fashion, highlighting her challenges, adaptations, and perspectives. However, a key limitation of this research is its small sample size, which, while allowing for an in-depth and personalized analysis, restricts the generalizability of the findings to a broader population of individuals with visual impairments. Furthermore, the study was limited to the implementation of a specific color palette (Winter, in Rosa's case), which may not fully address the diverse needs and preferences of all individuals with acquired blindness.

Moreover, this methodology aligns with the research's objective to investigate personal and subjective dimensions, prioritizing quality and depth of data over breadth. By centering on Rosa's unique narrative, the study captures the complexities of her experience, offering valuable contributions to the broader discussion on inclusion and accessibility.

Data analysis was interpretative, grounded in the principles of qualitative research. According to Geertz (1973), the interpretative approach seeks to uncover the meanings behind actions and social interactions, emphasizing the context in which they occur. The analysis involved construct a comprehensive narrative of the participant's experiences.

4. Results

4.1. *Participant profile: a perspective on four meetings*

The field research with Rosa began in August 2023, offering insights into her personal journey with acquired blindness and its impact on her daily life and identity. The first meeting occurred in Novo Hamburgo, following a walk advocating for disability rights, organized by the Municipal Council for the Rights and Citizenship of Persons with Disabilities. During this initial interaction, Rosa shared her story of losing her vision at 31 due to a bacterial infection of unknown origin. At the time, she was working as a retail assistant in a sporting goods store and preparing for university entrance exams in Social Work. Her medical journey was fraught with misdiagnoses and uncertainty, with suspicions of cancer complicating her quest for answers. This period was marked by emotional resilience and perseverance, despite the stigma and skepticism she faced, even from family members, who initially misunderstood her symptoms.

Rosa's experience reflects the challenges of navigating health systems while dealing with invisible disabilities. She found support through a social worker from ADEVIS (Association for the Visually Impaired) and a network of friends and family, which proved instrumental in her acceptance of her condition. Her narrative highlights resilience, as she gradually rebuilt her life by engaging in physical activities, learning traditional dance, participating in scientific projects, and advocating for others with similar conditions.

Subsequent meetings further enriched the understanding of Rosa's life. In a visit to her residence, she shared details about her daily routines and the adjustments she has made to maintain her physical and mental well-being. Rosa emphasized the importance of regular exercise and balanced nutrition as strategies to cope with the challenges of her visual impairment. These conversations deepened the researcher-participant relationship, transitioning from formal observation to a collaborative partnership. Rosa's reflections on inclusive fashion emerged naturally, revealing practical challenges such as selecting socks of the same color, discomfort with certain clothing designs like loose gym shorts, and difficulties handling zippers on jackets. Her comments underscore the need for functional and aesthetic considerations in inclusive fashion design.

Rosa's participation in cultural and community activities further showcased her ability to transcend her limitations. At a traditional dance graduation event, Rosa embodied how cultural expression can foster inclusion and belonging, demonstrating that visual impairment does not preclude participation in meaningful social activities. Her involvement in these settings reinforced the importance of accessibility in fashion, particularly in the context of formal attire, where she faced difficulties relying on others to navigate clothing choices.

The final meeting, focused on accessibility in museums and art spaces, sparked an open discussion on Rosa's experiences with fashion and the broader challenges faced by visually impaired individuals. She expressed frustrations with the lack of accessible options and the reliance on third-party perceptions during shopping. Rosa highlighted the significance of accessible labels and adaptive designs that cater to visually impaired consumers. These conversations revealed her preference for practical and comfortable clothing, such as sportswear, while also exposing the emotional and social implications of her fashion choices, particularly regarding color and style.

Rosa's journey illustrates the intersection of resilience, autonomy, and social inclusion. Her reflections on clothing choices, reliance on neutral tones, and need for accessible solutions reflect both the limitations imposed by her condition and her proactive efforts to navigate these barriers. Rosa's story emphasizes the critical role of inclusive design in fostering independence, dignity, and participation for individuals with visual impairments. Through her experiences, the research captures the intricate relationship between disability, identity, and the transformative potential of inclusive fashion.

4.2. *Interaction with the "See Color" System: fifith meeting*

The fifth meeting with Rosa, held in February 2024, marked a pivotal step in the research, as it involved conducting a personalized color analysis using the tactile language of "See Color". This encounter took place at the researcher's residence, approximately two months after the previous observation and interview. The objective was to explore how a tactile color system could offer an inclusive approach to personal color analysis, tailored to the specific needs of visually impaired individuals.

Personal color analysis is a process that identifies the most harmonious colors for an individual based on their natural features, such as skin tone, hair, and eyes. Traditionally, this method relies on visual cues to enhance appearance, but in Rosa's case, the "See Color" tactile system was introduced to translate these visual elements into a tactile format. This adaptation aimed to empower Rosa to engage with her color palette through touch, making the process accessible and meaningful.

The analysis began with an explanation of personal color theory and the tactile language of "See Color" (Figure 3). The "See Color" system, inspired by the color wheel, uses tactile symbols arranged in a clock-like format to represent primary and secondary colors. Rosa described the tactile structure, formed by overlapping triangles, as resembling a "Star of David," which helped her conceptualize the arrangement of colors. By aligning the tactile system with tangible fabrics, Rosa could connect the tactile symbols with the characteristics of different colors.

Fig. 3. Instructional material for teaching the tactile language ""See Color"".

The practical phase involved placing colored fabrics close to Rosa's face to evaluate the harmony between her natural features and the colors (Figure 4). Through tactile exploration, she interacted with the "See Color" symbols associated with each fabric, allowing her to engage with the process of determining her personal color palette. The analysis revealed Rosa's warm olive skin tone, brown eyes, and hair, leading to the diagnosis of a "Cool Winter" seasonal color palette. This palette includes deep and rich

shades such as navy blue, moss green, burgundy, dark purple, charcoal gray, and black, avoiding overly light or pastel tones that do not complement her natural features.

Throughout the session, the tactile system facilitated Rosa's understanding of color relationships, enabling her to perceive and differentiate colors through touch. This interaction not only provided her with practical tools for wardrobe selection but also fostered a deeper sense of self-awareness and confidence. Rosa expressed enthusiasm about integrating this knowledge into her daily life, emphasizing the importance of feeling comfortable and self-assured in her clothing choices.

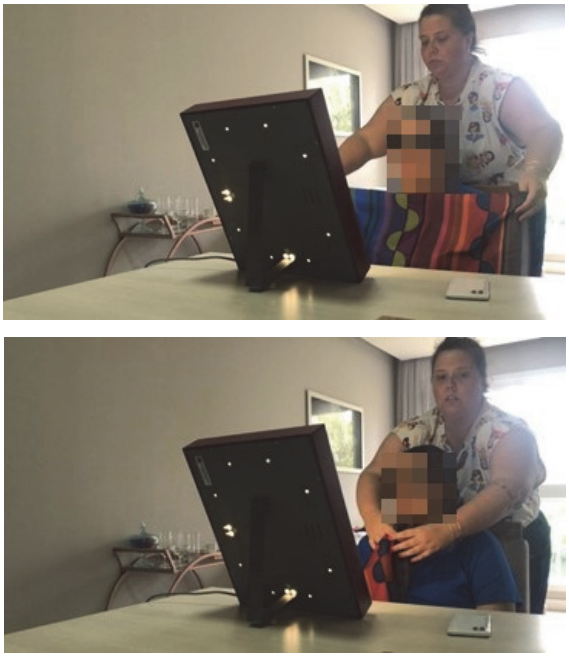


Fig. 4. Personal Color Analysis in Rosa.

The analysis concluded with a comprehensive explanation of her color palette (Winter) and guidance on how to apply it to clothing, accessories, and overall styling. The "See Color" system proved to be an effective and inclusive tool, bridging the gap between aesthetics and accessibility while enhancing Rosa's autonomy in navigating her personal style. Furthermore, we notice that this experience underscores the potential of tactile systems in inclusive fashion, highlighting their role in empowering visually impaired individuals to engage actively with color and self-expression.

4.3. *Development of inclusive tactile color palettes based on Rosa's experience*

Leveraging perceptions from the research sessions with Rosa, a tactile Winter color palette was created by the Feevale University Design Center to provide a practical and inclusive tool for visually impaired individuals. This initiative aimed to incorporate the tactile symbolism of the ""See Color" language", enabling Rosa to independently select clothing, accessories, makeup, and even hair colors that harmonize with her natural features, such as skin tone, hair, and eyes.

The design process began with a detailed study of Rosa's Cool Winter color palette, guided by the principles of personal color analysis. Using the Pantone color system as a reference, the tones of the palette were carefully mapped and validated in conjunction with the "See Color" tactile symbols. This initial stage was instrumental in aligning visual and tactile elements, ensuring compatibility with Rosa's needs (Figure 5).

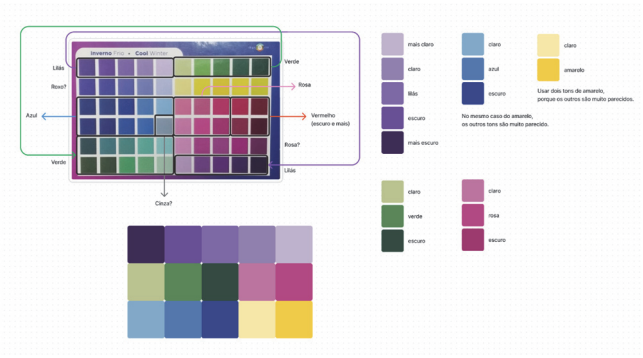


Fig. 5. Tactile color chart proposal.

The tactile palette was structured to categorize colors into universal Winter tones, further distinguishing optimal primary, secondary, and neutral shades. Each color was labeled using Braille, while the "See Color" symbols provided a tactile representation, making the palette accessible and intuitive for visually impaired users. The first prototype was printed on 180g offset paper, with raised tactile symbols created using a digital pen and EVA sheets to shape the "See Color" markings (Figure 6). The finalized tactile palette was designed to be foldable, creating a compact, portable format for practical daily use. This user-friendly adaptation ensures that Rosa can confidently refer to her palette when shopping or styling, fostering a greater sense of autonomy and control.

Fig. 6. Printed prototype of the tactile color chart.

Building on Rosa's case study, the project expanded to include generalized seasonal palettes—Winter, Spring, Summer, and Autumn—offering a versatile solution for a broader audience. These generalized palettes synthesize the overlapping colors of each season's subcategories (e.g., Cool Winter, Deep Winter, Bright Winter), providing a cohesive yet inclusive tool (Figure 7). This synthesis simplifies the system, making it accessible to visually impaired individuals who may not require highly detailed subcategories. A summary of the results for the generalized palettes is presented in Figure 8.

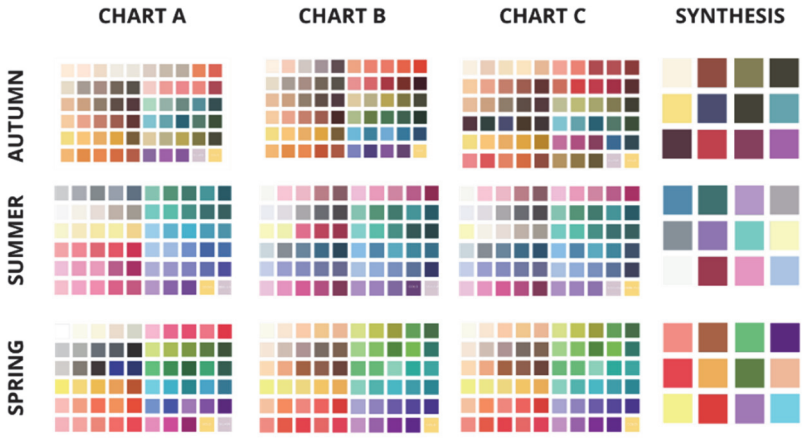


Fig. 7. Color synthesis for creating general tactile charts

Fig. 8. Expansion of tactile color palettes to other possibilities – Winter, Spring, Summer, and Autumn (in order of appearance).

4.4. *Field research: validation of the Rosa color chart in a clothing store*

A usability test was conducted in a real-world setting, specifically a clothing store, to evaluate the functionality of the personalized tactile color palette designed for visually impaired individuals. The participant, Rosa, was accompanied to the store to observe how the tool could facilitate her decision-making process in selecting garments aligned with her personal color palette.

Upon entering the store, Rosa began the process by engaging directly with a sales assistant, introducing her personalized color palette. This initial interaction established a clear communication channel between the customer and the salesperson, enabling a collaborative approach to exploring the store's inventory.

During the shopping experience, the sales assistant selected clothing items that matched the tones outlined in Rosa's color palette. Meanwhile, Rosa revisited the tactile and verbal elements of her palette to recall the colors it included. Using touch, she assessed the fabrics, textures, and silhouettes of the garments, ensuring her final choices adhered to both her color harmonies and her personal style preferences. This collaborative process emphasized the importance of integrating both color guidance and individual tastes, resulting in a more inclusive and personalized shopping experience (Figure 9).

Fig. 9. Process of using the color chart in a clothing store

The sales assistant expressed positive feedback about the tool, noting that the palette's clear and objective structure streamlined the selection process. The predefined color harmonies eliminated uncertainties, allowing for a more efficient and confident decision-making process. This interaction demonstrated that adapted tools such as the tactile color palette have the potential to transform the shopping experience, fostering greater autonomy for visually impaired customers while enhancing the efficiency of retail services.

By the end of the test, Rosa selected a blue blouse, one of the colors featured in her personalized palette. This choice underscored the tool's effectiveness in aligning her personal preferences with a strategic chromatic selection. The outcome highlighted how inclusive approaches can enhance satisfaction and build confidence in the consumer experience (Figure 10).

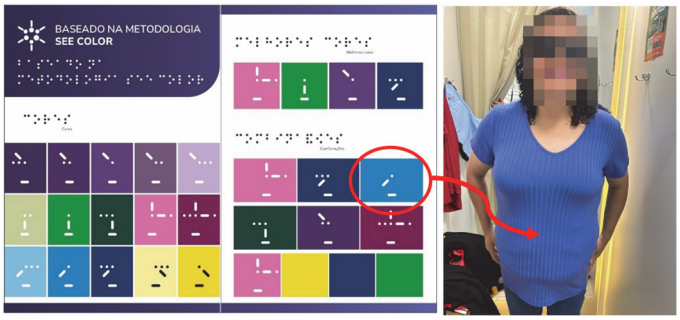


Fig. 10. Final product purchased by Rosa, aligned with her tactile color palette

5. Inclusion, personal and cultural expression in fashion: implications of the color palette in users' daily lives and inclusive fashion research

The findings highlight how fashion inclusion is enhanced through adaptive tools such as the tactile color palette based on the "See Color" method, designed for individuals with acquired visual impairments. By incorporating tactile senses into color recognition, this solution fosters essential autonomy in clothing choices, allowing users to exert greater control over their personal and aesthetic expression. As noted by Mariano (2017) and Kukiełko (2024), fashion can serve as a vector for self-esteem and social belonging, particularly by enabling individuals with disabilities to engage with traditionally visual aesthetic codes. This approach redefines the role of fashion, transforming it into a means of empowerment.

The application of the tactile color palette in users' daily lives demonstrates the ability of inclusive fashion to address specific needs, as highlighted by Brogin et al. (2024). The research participant illustrated that color selection is not solely aesthetic but also involves practical considerations, such as avoiding social discomfort and simplifying routines. In this context, the tactile approach helps translate complex color concepts into accessible sensory experiences, fostering greater autonomy for individuals. Furthermore, by

expanding the understanding of the relationship between color and identity, the palette encourages conscious consumption practices, aligning with sustainable fashion trends as argued by Busch (2018).

The research also underscores the cultural significance of inclusion in fashion. As Miranda (2008) suggests, clothing serves as a tool for social communication, enabling individuals to construct and express their identities. For visually impaired individuals, access to personalized color palettes facilitates a dialogue between individual aesthetics and the cultural meanings of fashion, increasing their participation in a historically exclusionary field. This process of cultural inclusion is reinforced by the research methodology, which prioritizes the co-participation of subjects, as advocated by Moraes (2022). This approach emphasizes that inclusion must go beyond technical solutions to actively involve individuals in design processes.

Finally, the findings reveal promising pathways for future research on inclusive fashion. By addressing visual impairment as a central factor of exclusion and developing tools that reframe this experience, the research demonstrates how functionality and aesthetics can be integrated into innovative solutions. Studies like those of Almeida and Araújo (2013) and Kukiełko (2024) emphasize that the reconstruction of sensory and motor autonomy is critical for the social reintegration of individuals with disabilities, and initiatives in inclusive fashion can play a significant role in this process. The tactile color palette, by enabling multisensory interaction with fashion, emerges as a potential innovation that transcends barriers, bridging design and inclusion from a transformative perspective.

6. Final considerations

This study addresses fashion and social inclusion for individuals with visual impairments, focusing on the following research question*: how can fashion, particularly through a tactile color tool, contribute to the autonomy and inclusion of individuals with acquired visual impairments, enabling them to make more independent and expressive clothing choices?* To answer this question, the study explores data on visual impairment, identifies the specific needs of an individual with visual impairments in selecting clothing, conceptualizes inclusive fashion and social inclusion, and develops a color palette based on the tactile "See Color" language. This tool offers adaptive and innovative solutions to meet needs often overlooked by the fashion industry.

The resulting product highlights the importance of empowering visually impaired individuals to express their identity and personal style through color. By incorporating tactile stimuli into the process, this research creates a meaningful experience that enhances autonomy and self-esteem. Inclusive solutions such as the tactile color palette significantly contribute to social inclusion, enabling more active and confident participation in daily and social activities while raising awareness about the importance of accessibility in product and service design.

This study advances the field of inclusive fashion and color studies by addressing the underexplored intersection of fashion and autonomy for individuals with visual impairments and the personal color analysis service. The tactile color palette proposal based on the ""See Color"" method goes beyond traditional approaches that focus solely on physical adaptations of clothing. Instead, it introduces a sensory dimension that transforms how visually impaired individuals interact with clothing and express their identity. Unlike previous methods prioritizing ergonomic and functional adjustments, this research broadens the concept of inclusion by incorporating a practical and pedagogical tool that empowers visually impaired individuals to actively engage in selecting colors for their wardrobe.

Future research should expand the sample size to include a more diverse group of participants with varying types and degrees of visual impairment, allowing for a broader and more representative analysis of their needs and preferences. Furthermore, future studies could explore the effectiveness of different personal color systems adapted for individuals with acquired blindness, comparing them with other inclusive methodologies. Research could also investigate the perspectives of professionals in personal color analysis, fashion, and design regarding the feasibility and challenges of implementing tactile color palettes in consultancy practices.

Ultimately, inclusive fashion becomes viable through understanding individual needs and creating tools that promote autonomy and self-esteem. The adaptation of the "See Color" tactile language exemplifies how accessible design can transform the daily lives of visually impaired individuals, contributing to a more inclusive and equitable world.

7. Conflict of interest declaration

The authors declare that there is no conflict of interest regarding the publication of this paper.

8. Funding source declaration

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9. Short biography of the authors

Fernanda Ribeiro – Master in Cultural Process and Expressions and a Bachelor degree and Fashion Design, both by the Feevale University (Brazil).

Claudia Schemes - Holds a degree in History (UNISINOS/Brazil), a master's and a doctorate in Social History (PUC-RS/Brazil). Professor at Feevale University, editor of Prâksis Journal, and author of works on history and culture. Research focuses on inclusive fashion and design for visually impaired individuals.

Ítalo José de Medeiros Dantas - PhD student in Cultural Processes and Expression at Feevale University (Brazil); master's in design from the Federal University of Campina Grande. Multidisciplinary researcher with academic and professional interests in different areas, with an emphasis on Design, Fashion and Statistics.

Licensing terms

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