



## Vision Inclusive Clothing Design: A Study on Perception of Clothing by Visually Impaired People

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**Introduction:** Clothing and appearance affect how one projects themselves to society, how they are perceived by others and therefore hold a substantial role in fostering self-esteem (Lamb et al., 1992). Not having an explicit vision of clothing including its aesthetic, functional, and contextual details challenge the self-assurance of a visually impaired person. This research explores how visually impaired people develop understanding of clothing and its design features using a novel research method and presents design criteria to guide innovative and inclusive clothing design for visually impaired people.

**Literature review:** The literature so far focused on surveys and interviews of visually impaired people about their decision-making in retail environment (Ramatla et al., 2016), clothing selection habits of blind teenage girls (Kaufman, 2000), and general apparel needs focusing on clothing type and closure preferences (Chang et al., 2015). Applied design research focused on the application of Braille in clothing design to convey information such as size or color (Gumuliauskaitė, 2017) and technology development for computer vision to recognize clothing design features (Yuan et al., 2011). However, a prominent gap is found in literature on how a visually impaired person perceives clothing design through tactile experience and makes aesthetic choices.

**Methodology:** A multi-phase experimental procedure is developed to understand how people perceive aesthetic, functional, and contextual design features of clothing when their vision is temporarily impaired (Mau et al., 2018), deriving from Lamb and Kallal's (1992) FEA (functional, expressive, and aesthetic) theoretical model. In the first phase, think-aloud protocol (Cowan, 2019) is employed with ten adult participants (five male and five female) who were asked to study three garments by touching and verbalizing their thoughts aloud while being blindfolded. The inclusion criteria for participants were set as having no clothing design background as it could affect the perception of the garments. The three garments provided to participants were selected to display different types, materials, functional and aesthetic design features and wearing contexts as shown in Table 1 (coded as I1, I2 and I3). The garments were given to each participant one by one in a random order after they were blindfolded.

**Table 1.** Details of garments based on material, functional, aesthetic, and contextual design features. (The pictures of the garments are available [here](#))

Garment / Materials	I1-Chiffon Women's Top: Polyester	I2-Stretchy Denim Pant: Cotton, Polyester, Spandex	I3- Knit Jersey T-shirt: Polyester (Dri-Fit)
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Functional Features	Two-layered body with lining, pleated sleeve, nylon tag at the back neck	Functional back pocket, metal button and zipper closure, belt loops, nylon back tag	Printed brand tag at back neck
Aesthetic Features	Loose fit, full sleeve with two tired pressed pleat sleeves, floral print (with black, orange, white and blue) on the body, elastic gathered hem, textured body fabric, wide boat neck	Skinny-fit, non-functional pocket at front, full-length hem, v-yoke at the back, deep blue color, gold topstitch all around, rivets on the front pockets	Regular fit, V-neck, 3 parallel trims on shoulder, knitted border at neck and sleeve, embroidered patches on front chest, vinyl print at back, light and dark abstract print
Contextual Features	Semi-formal, woman's top, Spring and Fall	Woman's Denim legging pants, casualwear, all-weather	Unisex, sportswear, all-weather

In the second phase of the study, after participants completed their tactile analysis of each garment, the blindfold was removed, and they were asked to sketch out the garment as they perceived them. Participants were then questioned based on their sketches with a follow-up interview. Interview questions focused on how they understood the front and back, silhouette, design features, material, type, appropriate context to wear for each garment. During this phase, participants pointed out the tactile details and described structural elements of the garments that helped them identify the aesthetic, visual and contextual details of each garment.

**Results and Discussion:** For all garment types, participants started navigating the outline of the garment through touch, which allowed them to find the front and back also, neckline or waist, and hem of the garment. Results showed that aesthetic design details like large necklines confuse identifying the neckline versus the hem for tops, as in the case of I1. The gathering detail and elastic hem of I1 top caused the perception of it as a waist opening and the item as a skirt. For I1, 6 participants out of 10 had difficulty comprehending the sleeve's pleat detail. Obviously, participants had no understanding of the color and pattern design details, however they were able to perceive the tactile patterns and visually sketch it out as in the case of I3 which had Vinyl number laminated at the back and an embroidery patch on the chest. On the other hand, when the tactile patterns were located on a major structural seam line, it caused problems. Participants had difficulty interpreting the actual shoulder seam line because I3 had three trims forming a striped design on the shoulder.

Functional design features like pockets and closures were easily grasped by all participants. Especially for I2, metal buttons, metal zippers, and rivets helped participants understand that it was denim pants. Also, the shape and positioning of the pockets helped to interpret the front and back of the pants. Other functional features like tags played an important role in understanding the garments. When a sewn tag was present, participants used it as the indicator of the back; in the

case of I2, which had a printed tag, for 3 participants it created confusion to navigate front and back. The materials of the garments also helped participants understand the fit. For example, especially female participants recognized I3 as tight-fitting, legging style denim pants based on feeling the stretch of the fabric. However, this feature confused male participants as men's jeans do not commonly have Spandex blend material.

Contextual features of garments such as appropriate season, environment to wear, gender, or style were also mostly successfully captured with the tactile analysis. For example, non-functional front pockets helped participants interpret it as women's jeans. The transparent chiffon material of I1 was recognized by the tactile feel, flowiness, weight, and multiple layers of fabric, and the item was recognized as a formal women's top. Similarly, the smoothness of Polyester DriFit in I3 with the texture of Vinyl lamination helped participants understand it as activewear.

**Conclusion:** The experimental procedure used in this study sheds light on how clothing design is perceived without vision in terms of functional, aesthetics, and contextual features. Results showed that seamlines are important landmarks to navigate and understand the overall silhouette of a garment and any design details overlapping with major structural seam lines should be avoided. Tactile textures via embroidery, lamination and textural changes of the fiber can be used to communicate visual prints and patterns on a garment. Tags play an important role in locating the front and back of a garment, while closures and pockets help understand garment type. Moreover, appropriate accessories for closure and design details can convey the context of garments. Using these design criteria can serve designers to create meaningful clothing design choices for the visually impaired person and all-inclusive garments design.

### References:

- Chang, H. J., & Lee, S. Y. (2015, November). Special apparel needs of consumers with visual impairments. In *International Textile and Apparel Association Annual Conference Proceedings* (Vol. 72, No. 1). Iowa State University Digital Press.
- Cowan, J. (2019). The potential of cognitive think-aloud protocols for educational action-research. *Active Learning in Higher Education*, 20(3), 219-232.
- Gumuliauskaitė, R. (2017). *Ne vizualus kostiumo dizaino ir tekstilės pažinimas* (Doctoral dissertation, Vilniaus dailės akademija).
- Kaufman, A. (2000). Clothing-selection habits of teenage girls who are sighted and blind. *Journal of Visual Impairment & Blindness*, 94(8), 527-531.
- Lamb, J. M., & Kallal, M. J. (1992). A conceptual framework for apparel design. *Clothing and Textiles Research Journal*, 10(2), 42-47.
- Mau, B., Lupton, E., & Lipps, A. (2018). Designing Live. *The senses: Design beyond vision*, 20-23.
- Ramatla, A., & Mastamet-Mason, A. (2016). *The Decision-making Processes of Visually Impaired Consumers in the Apparel Retail Environment* (Doctoral dissertation, Tshwane University of Technology).
- Yuan, S., Tian, Y., & Arditi, A. (2011). Clothing matching for visually impaired persons. *Technology and disability*, 23(2), 75-85.