

Functional Period Panty for People with Disability

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Contextual review and concept statement. People with Disabilities (PWDs) can express multiple identities to others and themselves through apparel (Roach-Higgins and Eicher, 1992). However, finding functional and attractive intimate apparel is difficult (Chapin, 2015, Van De Graaff, 2020). These unmet apparel needs create barriers to social participation (Kabel, McBee-Black, and Dimka, 2016). It is reported that the global market for "period-friendly" underwear is expected to reach \$1.3 billion by 2026 (Mafuire, 2021). Traditional sanitary napkins and tampons result in a devastating effect on the environment and are an eco-disaster (The Guardian, 2017). It's reported that an average woman discards 250 to 300 pounds of used "pads, plugs, and applicators" in her lifetime (Hindustan Times, 2017). These non-biodegradable pads contain more than 90% plastic (Hindustan Times, 2017) and can remain in the soil for up to 1000 years (Frech, 2002). This design aims to explore functional underwear that is easy to wear, skin-friendly, and environmentally friendly. This research was conducted using User-Centered Design (PWDs) as the framework. First, this design uses Velcro to ensure that the underwear is more accessible and easier to don and doff. Secondly, sitting in a wheelchair for a long time can cause skin tissue fragility and sensitivity (Levy, Kopplin, and Gefen, 2013). Therefore, this design used functional fabrics and a seamless bonding process to alleviate the skin problem. Third, this design combines the convenience of sanitary napkins and the environmental friendliness of menstrual panties to create a panty with replaceable pads. Regarding the challenges of this study, although some apparel brands are beginning to focus on menstrual briefs, design, and research on replaceable menstrual briefs for people with disabilities is still limited. Therefore, the challenge is to develop menstrual briefs with a high degree of flexibility and to meet the functional requirements of the wearer and societal demands on textiles.

Aesthetic properties and visual impact. Considering the characteristics of underwear and the needs and desires of PWDs, this design focused on using soft and delicate fabrics and subtle colors to convey delicate emotions in our products' aesthetics and visual effects. We hope that through this close-to-skin garment, PWDs can feel the warmth and love of being touched and cared for through their underwear. Therefore, all the most delicate parts have been deeply considered in this "simple but not simple" product. Soft Velcro links ensure that the skin is not harmed. The pads are designed according to the ergonomic curves of the body. The pattern has been modified several

times to match the shape of the hips, and the entire panty is free of stitches, ensuring a comfortable wearing and perfect visualization.

Process, technique, and execution. The design involved several design steps including design conception, sketching, pattern making (Figure 1), testing the performance of fabrics and accessories, testing the volume and speed of fluid absorption by the pads, testing the washability, and testing the comfort and convenience of the wearer. For technique, after repeated pattern making, samples, modifications, and readjustment, the panties and pads were finally working with each other in terms of size and firmness. For material selection, the fabric was chosen to ensure high moisture wicking properties to ensure the wearer's skin is dry. The replaceable pads are made of three layers of fabric. If you are not menstruating, you may not wear the pad. This panty can be worn as a daily less flow panty. The first layer is chosen for its antibacterial and quick-drying function. The second layer is made of high-volume wicking and water-locking properties. The third layer is made of using a barrier function to ensure that liquids do not penetrate. (Figure 2). The period panty was constructed using a dot glue bonding process. The advantage of this construction is that it provides excellent breathability, high resilience and superior comfort. The dot glue construction process allows for comfort to the skin, low levels of degradation during washing, and the elimination of friction between the seams and the skin. For execution of the garment design the designer began by cutting the final fabric and pads and then bonded the panties together to form the base of the design, leaving the side seams open. Next, the designer attached the front and back panties together using Velcro at each side seam. Finally, three sizes of replacement pads were made (Figure 3).

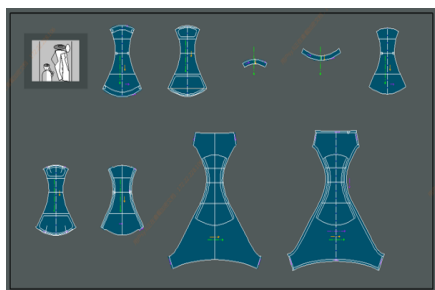


Figure 1: pattern making



Figure 2: quick absorption



Figure 3: three sizes

Cohesion. This design aimed to provide a solution, using textile innovation, to meet the needs of PWDs who face challenges with existing menstrual underwear that may be uncomfortable or

challenging to wear, while also meeting the needs of all people who wear menstrual panties. The design is based on a "user-centered" design approach to explore functional underwear that is easy to wear, skin-friendly and environmentally friendly. The ergonomic shape of the briefs and pads represents a human-centered design philosophy. Functional antibacterial, quick-drying, and absorbent fabrics are the best expression of technical textiles for the user. The bonding process is well-matched with the underwear products, avoiding the damage caused by sewing and skin friction. Velcro, that the user can easily open, allows PWDs to put on and taken off to the maximum extent possible, thus avoiding over-reliance on caregivers. Functional menstrual briefs designed for PWDs maximize comfort, convenience, and functionality for the user. These briefs reflect the proliferation of innovations that integrate design aesthetics, bonding technology, and fabric technology, presenting the future of functional menstrual briefs in the underwear market.

Significance, rationale, and contribution. We performed structure development and pattern prototyping using various design techniques (bonding processes, multifunctional fabrics, and soft accessories) and completed the production of menstrual briefs. The design achieved easy wearability, reduced skin irritation caused by users' prolonged wheelchair use, and replaced traditional sanitary napkins. These innovations serve the user and contribute to the environmental and sustainable development of textile garments. By taking on the challenge of textile innovation, we demonstrate the potential of functional design combined with functional fabrics for the user's apparel design. The existing menstrual briefs on the market today are underwear and pads together, which is neither easily replaceable nor more environmentally friendly. As a result, menstrual briefs with replaceable pads fill a gap in the market.

Originality and innovation. This functional menstrual brief is original and innovative in (a) developing a functional textile innovation for menstrual briefs; (b) making them with a 100% spot bonding process without using any other traditional sewing process, and (c) using replaceable pads instead of traditional sanitary napkins that filling a gap in the market.

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