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“We already look amazing, we just need designers to jump on board”: Designing for female consumers that use mobility aids based on satisfaction with retail selection and garment design characteristics

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"We already look amazing, we just need designers to jump on board": Designing for female consumers that use mobility aids based on satisfaction with retail selection and garment design characteristics

An Honors Thesis submitted in partial fulfillment of the requirements for Honors in *School of Human Ecology.*

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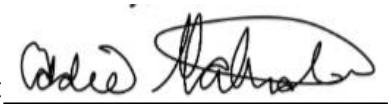
ABSTRACT

One in 4 people (85 million) in the United States has been diagnosed with a form of a disability, with 13.7 percent (44 million) having a mobility-related disability (CDC, 2020). Despite being the largest disability minority group in the US (CDC, 2020), the availability of clothes for pets is larger than the selection for people with disabilities (Ryan, 2018). The purpose of this qualitative study is to evaluate satisfaction of ready-to-wear and adaptive clothing among female consumers who use mobility aids. Fit issues, lack of availability, and lack of consideration for disability needs were found as overarching problems in both ready-to-wear and adaptive clothing. None of the participants interviewed found that ready-to-wear or adaptive clothing fully accommodates the needs of their disability. Results were used to design a 3-look collection to accommodate and empower women with disabilities.

Thesis Mentor: 
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Introduction

Clothing serves many purposes for individuals, from protecting them from weather, comfort and security, and a set of symbols to represent oneself (Chang, 2014; Tomas, 2016). In addition, clothing can enhance confidence and self esteem, as well as identify a person as a part of a group (Lennon et al., 2017). Having clothing that meets an individual's needs can increase their confidence and inclusion into societal groups (Lennon et al., 2017).

Unfortunately, the over one billion people worldwide living with disability severely lack clothing that accommodates their needs both physiologically and psychologically (Chang et al., 2009; Suri, 2016; Kosinski et al., 2018). Current market selections of both ready-to-wear (RTW) and adaptive clothing (clothing made for those with disabilities) do not suit the needs of people with disabilities (Na, 2007; Rutledge, 2017; Sarcone, 2017; Ryan, 2018; Morris, 2019). Thus, there is a large gap in the market for clothing for individuals with disabilities (Carroll & Kincade, 2007; Suri, 2016; Morris, 2019). With the effects of the COVID-19 pandemic and an aging population (*The US Population is Aging*, 2015; *Social Security*, 2019; Tenforde, 2020; WHO, 2020), the need for clothing to allow people with disabilities to dress independently as well as improve overall quality of life is extremely pertinent.

The purpose of this qualitative study is to evaluate satisfaction of ready-to-wear clothing among female consumers who use mobility aids. First, the researcher reviewed the relationship between people with disabilities and the ready-to-wear (RTW) fashion industry, including the documented problems with ready-to-wear clothing and the cause

and effect of exclusion of people with disabilities from the fashion industry. Next, the history and the features current available selection of adaptive clothing was documented. Here, a baseline of understanding is established for what adaptive clothing is and what can make a garment functional for those with disabilities. Then, documented and perceived problems with adaptive clothing are displayed by retailer. This clearly demonstrates the limited selection of appropriate adaptive clothing. Following, an explanation of currently used design frameworks is documented. Design frameworks assist scholars and practitioners of fashion design understand their target consumer and create clothing that meets their unique needs. Thus, this section assists in understanding the process of clothing design and can indicate why disability needs have been ignored or overlooked in the fashion industry.

The successive sections discuss the study; this includes the research questions, sample data, and methods for data collection and analysis. Fit issues, independent donning and doffing, and seated position comfort were found as overarching problems with RTW clothing. None of the participants interviewed found that ready-to-wear clothing accommodates the needs of their disability. Many of the women interviewed did not use adaptive clothing, and overall feelings towards adaptive clothing was negative. Participants felt adaptive clothing lacked style, affordability, and availability. In addition, the women felt “othered,” or ignored by the fashion industry as a whole.

Next, the design inspiration and its historical significance are documented. Each of the current design frameworks is critiqued to create an adapted design framework that the designer used to create the five designs. Rendered using Adobe Illustrator, the five

designs are displayed. Aesthetic and functional design features and their significance to the target market are explained, as well as how the collection works as a whole.

Overview of People with Disabilities

"Disability" has strong cultural roots that are unable to be separated from historical, political, and geographical contexts and inequalities (Burch & Patterson, 2013). The Americans with Disabilities Act (ADA), protecting people with disabilities from discrimination, defines a person with a disability as: a person with a physical or mental impairment that substantially limits one or more major life activities of that individual (ADA, 1990). According to the World Health Organization (2001), disability includes three dimensions: impairment in a person's body structure or function, or mental functioning; activity limitation; participation restrictions in normal daily activities.

Although the name "people with disabilities" refers to one population, there is a diverse range of disabilities and needs related to these impairments. This includes conditions that could be present at birth or developed at a later time and affect functions during a person's life, including cognition (memory, learning, and comprehension), mobility (navigating around the environment), vision, hearing, behavior, and other areas (Centers for Disease Control [CDC], 2019).

Overall, 85 million (26 percent) of the United States population has some form of disability. In other words, 1 in 4 people in the US have a disability (CDC, 2019). 44 million (13.7 percent) have a mobility related disability, which is about 1 in 7 people (CDC, 2019). Mobility-related disabilities are more common in women than men, with

12.1 million women (7.7 percent) versus 8.5 million men (5.2 percent) having ambulatory issues. Native Americans and African Americans are more affected by mobility issues, with 9.5 percent (224,000) and 8.2 percent (3.1 million) affected, versus 7 percent (15.5 million) white people (Erickson, Lee & Schrader, 2017).

People with Disabilities and the Ready-To-Wear (RTW) Fashion Industry

The fashion industry has long focused on a narrowly defined retail customer; one based on contemporary societal ideals of beauty: young, conventionally attractive, and high perceived physical health (Carroll, 2015). Practices in designing clothing for people with disabilities focus on creating a garment for an individual or extremely limited group of people (Rosenblad-Wallin, 1985; Stokes & Black, 2012; Menec, 1989). As such, there is extremely limited training for designers to create clothing that encompasses multiple ability levels (Kosinski et al., 2018). Thus, people with disabilities face challenges in finding clothing that fits their body shape and ability levels (Chang et al., 2009). Neglecting this market leaves people with disabilities unsatisfied with the current selection of ready-to-wear clothing available to them (Suri, 2016; Kosinski et al., 2018). Because of the lack of options, many people with disabilities feel alienated from the fashion industry (Freeman, Kaiser & Wingate, 1985-1986; Kaiser, Freeman & Wingate, 1985; Wingate, Kaiser & Freeman, 1985-1986). The sad fact is that currently there is more clothing available for pets than there are people with disabilities (Ryan, 2018).

In addition, they experience negative reactions to their personal appearances from people without disabilities. Advertising and media depictions of disabilities has portrayed

people living with disability as tragic, dependent, infantile, and negative. This inhibits people with disabilities to represent themselves as independent (Taylor, 2008). Thus, they experience negative reactions to their personal appearances, which perpetuates a stigma that they are unfashionable (Freeman, Kaiser & Wingate, 1985-1986; Morris, 2019). Coupled with the lack of fashionable clothing available, society believes people with disabilities are not interested in fashion or their appearance (Nisbett & Johnson 1992; Morris, 2019). One study found that due to lack of appropriate clothing and stereotypes of disability, participation in workplace activities is inhibited. This can increase negative stigma about disability, and lower self-efficacy of these individuals (McBee-Black & Ha-Brookshire, 2018).

People with disabilities do face an income disparity in comparison to those without disabilities. According to current figures, full-time workers with a disability earn 87 cents for each dollar earned by those without a disability (Day & Taylor, 2019). In addition, poverty rates are 17 percent higher for those with disability versus those without (DeNavas & Proctor, 2014). This perpetuates a stigma that people with disabilities do not have a large disposable income to spend on apparel items. In a Business of Fashion article, Dr. Kerri McBee-Black discusses the lack of fashionable clothing available, "[Clothing for people with disabilities] was seen as a costly endeavour, and there was an association that a majority of people with disabilities are low-income and don't care about fashion." (as cited in "The Adaptive Fashion Opportunity", 2019). The belief that people with disabilities cannot afford and do not enjoy dressing fashionable is simply untrue. In fact, people with disabilities have a total disposable income of over $490

billion worldwide. The market for adaptive clothing is expected to reach $400 billion in 2026, growing almost 70 percent since 2017 (Lieber, 2019).

Previously Identified Ready-to-Wear Apparel Issues of People with Disabilities

People who use mobility aids have a variety of unique needs when it comes to their clothing, which are not being met by current selections of ready-to-wear options. This is a major barrier to social participation for people with disabilities (Gilleard & Higgs, 2015; McBee-Black & Ha-Brookshire, 2018). Overall, people with disabilities do not find that ready-to-wear clothing satisfies their needs (Caroll & Kincade, 2007). In a clothing needs assessment of wheelchair users, it was discovered that people were most dissatisfied with the attractiveness attribute of ready-to-wear clothing, followed by ease of donning and doffing, and then movement (Suri, 2016).

Donning and Doffing

Putting clothing on and off, also known as donning and doffing, has been widely cited as one of the main issues related to apparel in people with disabilities, specifically in people with a loss of dexterity or mobility (Newton, 1976; Stokes, 2010). Garment donning and doffing is an important element of independence and in the lives of people with disabilities (Todd & Norton, 1996). A large amount of coordination, physical sensation, balancing, and strength/dexterity is needed to donn (put on) and doff (take off/remove) clothing, which some people with disabilities may not have (Newton, 1976). In addition to independent donning and doffing, considerations must be made for

individuals who cannot self-dress (Banks, 2001). Certain disabilities may require the assistance of others to dress daily (Wang et al., 2014). Because of the range of disability, ease of use must be considered in both circumstances.

Difficulty Using Fastenings

Daily dressing activities can be painful or difficult to complete for people with disabilities because of loss of dexterity and need for bilateral hand movement (Dallas et al, 1982; Reich & Shannon, 1980; Chung, Lee, & Ahn, 2007). People with physical disabilities find it difficult to use some fasteners. In a survey of satisfaction with ready to wear clothing from women with disabilities, 64 percent cited difficulties of manipulating fastening devices as one of their top issues (Chung, Lee, & Ahn, 2007). Conventional fasteners, like zippers, small buttons, hook and eyes, and invisible zippers do not accommodate varying levels of muscle manipulation needed to fasten them (Reich & Shannon, 1980; Caroll & Kincade, 2007). They have a strong desire for alternatives to buttons and zippers, like magnetic closures, hook and loop tape, snaps, and elastic waistbands on pants and skirts (Carroll & Kincade, 2007). Joint pain, weakness to upper extremities, and permanent joint changes are cited as the most common disabilities when it comes to manipulating fasteners. The invisible zipper is cited as most difficult to use (Dallas & White, 1982).

In addition, the location of fasteners must be considered as well. Various body rotation movements may be inhibited because of muscle or joint weakness (Dallas & White, 1982). Multiple studies (Na, 2007; Martins & Martins, 2012) document the

trouble with using center back closures, as they are difficult to grip and manipulate independently. Front or side front fastening garments are the easiest to use, as they keep the body in a neutral position to manipulate (Martins & Martins, 2012).

Fit Issues

The fit of garments has posed an issue, not only in attractiveness but also levels of comfort (Chang et al., 2009; Lee & Jin, 2019). People with physical disabilities find it difficult to fit into the conventional sizing system (Thoren, 1996; Li Wang, Wu, and Zhao, 2013) and disproportionately experience challenges in finding ready-to-wear clothes that achieve a desired fit (Wang et. al., 2014; Carroll & Gross, 2010; Sarcone, 2017). Anatomical changes, like curving spines or decreasing body height, also affect the way clothes fit (Ng, Hui, & Wong, 2011; Civitci, 2004; Li Wang, Wu, and Zhao, 2013). People with disabilities can experience physical discomfort due to poor clothing fit (Kidd, 2006; Ruteledge, 2017; Sarcone, 2017).

There are multiple recurring issues for people with physical disabilities in terms of fit. Pant fit for people in a seated position is a common issue, as the shape of the body is completely different from sitting versus standing (Na, 2007). Length of garments poses an issue for those with dwarfism, spina bifida, or other spinal cord issues (Kidd, 2006; Sarcone, 2017). Muscle tone can also vary from the “typical” person without disabilities (Kidd, 2006; Ruteledge, 2017). Garments should incorporate ease to accommodate artificial limbs or other mobility devices (Na, 2007; Morris, 2019). One less documented

issue for fit is the shoulder/armscye. Propelling a wheelchair often increases shoulder and arm muscularity, so it can be difficult to find shirts that fit in that area (Sarcone, 2017).

Inadequate Consideration of Physicality/Needs in Features

Many ready-to-wear clothing options do not consider any physical needs beyond a "typical, able-bodied" individual. No ready-to-wear options work with medical devices, like a colostomy bag or catheter (Black, 2010; Sarcone, 2017). People with disabilities desire clothing that reduces strain on daily living activities, like dressing or undressing and using the restroom (Wang et al, 2014). Properly designed garments can assist both the independence of the mobility aid user as well as carers and personal helpers (Nevala et al., 2003).

People with disabilities put extra wear and tear on high stress points (armpits, elbows, shoulders) of garments because of increased upper body movement (Na, 2007). In relation to fit as well, articles of clothing that are too long can be inappropriately caught in mobility aids, restricting movement (Na, 2007; Sarcone, 2017). Creating extra strength in seams with tougher fabrics can create bulky seams, which are uncomfortable for the wearer (Thorton, 1990). Certain textiles are abrasive to sensitive skin areas and create pressure sores, especially to those in the seated position (Ruteledge, 2017). Clothing designs should be designed with the end users' needs in mind, but many ready to wear designs lack this amount of thought (Rosenblad-Wallin, 1985). Despite recommendations to create mass-marketed apparel with individuals with disabilities address in mind (Kosinski, Orzada, & Kim, 2018; Morris, 2019), the fashion industry has

yet to rise to the occasion (Freeman, Kaiser, & Wingate, 1985-86; Suri 2016; Kosinski, Orzada, & Kim, 2018).

Background on Adaptive Clothing

Adaptive clothing is defined as clothing, garments, and footwear specially designed for people with physical disabilities who may have difficulties dressing themselves due to the inability to manipulate closures such as buttons, zippers, or due to a lack of a full range of motion required for self dressing (Langtree, 2016). Clothing with features in mind for people with disabilities work both to make them better able to conduct activities of daily living (ADLs) more independently. Other features can assist caregivers in better assisting the dressing process (Banks, 2001).

Although the wheelchair came to mass production in the mid 19th century ("History Of Wheelchairs", 2019), custom clothing that made the lives of people with disabilities easier was not a concern until the mid to late 20th century (Ruteledge, 2017). In the 1950s, seamstresses created a pair of pants with a longer back inseam in order to provide more comfort and security to a wearer who uses a wheelchair (Kernaleguen, 1978). In the late 1970s, some companies began to supply clothing through medical device sales and provide instructions for seamstresses to adapt the clothing themselves (Bowar, 1977).

The industry remained largely unchanged until the entrance of IZ Adaptive by designer Izzy Camilleri in 2009, which created some of the first fashionable items for people with disabilities. Unfortunately, the high price point was not accessible to the

mass consumer. The brand took a two year hiatus in 2016 to regroup as a business, and have created a line with greater breadth and lower price bracket (Klein & Madrid-Han, 2018). In 2017, Tommy Hilfiger revolutionized the fashion industry by becoming the first mainstream brand to release an adaptive clothing line. After a childrenswear partnership with Runway of Dreams Foundation, Tommy Adaptive was created with "a mission is to be inclusive and empower people of all abilities to express themselves through fashion." (Gallucci, 2018). Other brands, like Target and Zappos have started entering the arena as well (Vazquez, 2020). Overall, there is still a gap in the market for fashionable adaptive clothing for people with disabilities (Morris, 2019).

Features of Current Market Selection of Adaptive Clothing

The researcher reviewed the current market selection and disability and clothing related literature to find the extent of features actively used in adaptive clothing. Current adaptations mostly involve repositioning of closures and replacement of closures for those of easier manipulation. There is a lack of literature on what specific styles of clothing (wrap dress versus maxi dress, capris versus full length trousers, etc) people with disabilities prefer. In addition, there is a lack of literature on what fabric types work best for different types of mobility aids. A majority of literature focused on wheelchair users specifically or those with a loss of dexterity. A gap in literature exists on intersectionality of multiple disabilities and features to accommodate multiple issues.

Adaptation	**Description**
Side closures on tops/dresses	Increases modesty when accessing medical aids (feeding tubes, IVs, PICC lines, etc) (Sarcone, 2017)
Easy open shoulder openings with magnets or snaps	Increases independent dressing for someone with loss of upper body movement (Banks, 2001; Gallucci, 2018)
Side-zip pants with zipper to knee	Enables dressing for those with limited flexibility or those who cannot bear weight on joints (Na, 2007; Gallucci, 2018)
Seated Position Pants Elimination of back pockets and rivets	Increases comfort for wheelchair users (Sarcone, 2017; Gallucci, 2018) Eliminates risk of seated-related pressure sores (Sarcone, 2017; Gallucci, 2018)
Grab Loops on closures	Allows closure manipulation for people with limited muscle mobility (Na, 2007; Ruteledge, 2017)
Magnetic Closures/Hook and Loop Tape	Easier to manipulate than small closures like buttons/snaps (Gallucci, 2018)
Added flaps or grab loops on clothing	Helps carers perform safer and easier transfer to and from mobility aid (Reich & Shannon, 1980; Banks, 2001)
Zip Top Shoes	Allows people with limited lower body mobility or prosthetic to independently slip foot in and out of shoes (Ruteledge, 2017) Allows independent shoe donning and doffing for those with limited hand

	mobility (Ruteledge, 2017)

Evaluation and Previously Identified Issues of Current Market Selection of Adaptive Clothing

While functionality for people with disabilities may be increased by adaptive clothing, it does not exist without issues. Similar to ready to wear clothing, users of mobility aids were most dissatisfied with the attractiveness attribute of adaptive clothing. This was followed by style, price, and difficulty finding adaptive clothing (Sarcone, 2017). To understand the current apparel shopping situation for people with disabilities, I conducted a review of the top adaptive apparel brands & retailers. These six adaptive apparel retailers were chosen through the top results when the search term "adaptive clothing" was searched in Google search engine; I felt this would be the most common way people with disabilities would find adaptive clothing. The four features chosen as "Main Adaptive Features" were selected through the most common clothing items that people who use mobility aids have issues with as documented in a review of literature (Na, 2007; Rutledge, 2017; Sarcone, 2017; Morris, 2019).

Explanation of Perceived Issues

Each retailer's apparel selection and website was reviewed. After the evaluation, perceived issues were identified and grouped based on common themes. These issues correlate with literature stating that apparel selection of adaptive clothing does not satisfy

the needs of people with disabilities (Freeman, Kaiser & Wingate, 1985-1986; Ruteledge, 2017; Sarcone, 2017; Morris, 2019).

Lack of Color/Pattern

Most items were only available in black, white, or neutral colors with muted hues. There were very few patterns featured, and the ones included were often just stripes. While this is certainly practical, it does not add a lot of interest to the wardrobe or allow many options for customers.

Lack of Style

Adaptive clothing often achieves a better fit, but does not achieve the same level of desired style as ready to wear clothing (Sarcone, 2017). This leads many people with disabilities to express frustration when trying to find fashionable adaptive apparel (Na, 2007). As predicted, these retailers did not provide options that reflect current trends or styles. The available options were modeled after sleepwear or hospital gowns. They lacked flattering silhouettes or patterns and were created in textiles that do not embody a modern woman. There were no options that reflected a feminine or girly style, only an older, athletic, or masculine aesthetic. This leads to people with disabilities feeling alienated from the fashion industry (Freeman, Kaiser, & Wingate, 1985-86).

Limited Selection

There are a lack of options (fashionable or not) in the selected retailers. The average number of adaptive clothing items was 22 total, including clothing, shoes, and undergarments. This does not provide enough options to create a full wardrobe. There were no adaptive dresses featured, along with a lack of professional clothing or athletic wear. This leads people with disabilities to feel they are excluded from certain activities (McBee-Black & Ha-Brookshire, 2018; Morris, 2019).

High Price Point

The price points of these items were out of the range of a normal budget for clothing. The average American woman spends $141 on clothing per month and gets around 6 items for that amount (Johnson, 2017; O'Connell, 2019). But, a person purchasing adaptive clothing could buy only 1-2 items for that same amount. In addition, people with disabilities make upwards $20,000 less on average of people without disabilities, so the large disparity in clothing price has an even greater impact (Yin, 2014).

Website Issues/Low Availability

In addition to issues with the selection, I found significant issues with the ease of navigation with several of the websites. None featured a text-to-speech feature or any other accessibility accommodations to make it easier for people with disabilities to shop

on the website. The text on each page was often small and the pages were text-heavy instead of utilizing pictures. The layout of these websites was not intuitive or attractive.

In addition, adaptive clothing is almost exclusively sold online and is grouped in the same categories as wheelchairs, walkers, canes, or other hospital equipment. People with disabilities desire for adaptive clothing to be sold alongside current popular brands in typical shopping locations, like retail stores (Sarcone, 2017). This does not encourage people with disabilities to shop and makes the clothing feel more of a medical device than a fashion option.

Social/Psychological Issues

The lack of fashionable options for people with disabilities "others" the population and contributes to feelings of low self esteem or exclusion from the "in-group" (Sarcone, 2017). People with disabilities have a strong desire to be included and treated "just like everyone else," and "differently" developed clothing items can cause inner stigmatization of wearers (McBee-Black & Ha-Brookshire, 2018; Morris, 2019). Still, many people with disabilities feel alienated and excluded from current trends, fashionable clothing, and from activities where special costume is needed (i.e., athletic clothing and exercise) (Freeman, Kaiser & Wingate, 1985-1986; Kabel, McBee-Black, & Dimka, 2016).

			Main Adaptive Features				
Brand Name	Availability	Price Range	Seated Position Pants	Magnetic Closures	Adapted Shoes	Wheelchair Adapted Clothing	Perceived Issues
IZ Adaptive	Online (izadaptive.com and Zappos)	$25-$790	Yes	Yes	No	Yes	Lack of color Limited Selection High Price Point Low Availability
Tommy Adaptive (Tommy Hilfiger)	Online (Tommy, Zappos, and Macy's) & In Store	$29-$295	Yes	Yes	No	Yes	Lack of Shoes High Price Point
Zappos Adaptive	Online (Zappos.com)	$25-$250	Yes	Yes	Yes	Yes	Limited Selection - mainly shoes Lack of Style Low Availability
Buck & Buck	Online (buckandbuck.com)	$10-$65	No	Yes	Yes	No	Lack of Style Lack of mobility aid options Low Availability/ Website Issues
Silvert's Adaptive Clothing and Footwear	Online (silverts.com) and by phone	$20-$300	Yes	Yes	Yes	Yes	Lack of style Low Availability/Website Issues
Target Adaptive	Target.com and in store	$15-$50	Yes	No	No	Yes	Few Adult Sizes No Shoes Limited Selection

Explanation of Design Frameworks

The purpose of utilizing a design framework is to provide a structure to understand the multiple needs of an apparel consumer in the context of their needs, use, and lifestyle. In the past, design was only structured around the "functional needs", especially in the case of designing for people with disabilities (Orzada & Kallal, 2016). Over time, apparel design scholars realized that creating clothing with only function as the focus "othered" the intended wearers. Thus, design frameworks that consider the entire apparel consumer bring context to design problems; this creates a well rounded approach to design scholarship.

User-Centered Design

User-centered design is a design process structured so that the end user of the product influences how the design is generated and constructed. The framework was first originated by Donald Norman for use in technology (Abras, Maloney-Krichmar, & Preece, 2004). The goal is to involve the end user in the design process as much as possible. This includes background research, focus groups, prototyping, user testing, and interviews & questionnaires to assess user satisfaction (Karat, 1997).

There are five main stages of user-centered design:

a) Specify the context of use by identifying the users and how they will use the product
b) Determine the goals of the user in order to determine the success of a product

c) Create solutions by using the knowledge of the users and centering their needs in the process
d) Evaluate the effectiveness of the solutions by testing the features with actual potential users
e) Assess whether the product satisfies the users' needs (The International Organization for Standardization, 1999)

Morris, Park, and Sarkar (2017) utilized the user-centered design framework to design a nursing sports bra for women who are physically active while breastfeeding. They acknowledged the unique challenges of women who are breastfeeding and want to be physically active (like increased breast volume and sensitivity). The researchers went through the five stages to develop the product, and created a product that was able to incorporate multiple features to solve issues of active breastfeeding women. Their research only emphasized the need for a user-centered design concept in testing. The honest feedback from the users made the product perform better than the participants' typical favorite athletic bra.

Empathetic Design

One offshoot of user-centered design is empathetic design. It includes growing a deep empathy for user's experiences by close observation and niche-market development. The key is that observation is conducted in a user's own environments so researchers gain information that they would not have gathered in a laboratory setting (Leonard & Rayport, 2011). This has been utilized in a project in both merchandising and design to

create a design and business model for people with Parkinson's disease, a neurodegenerative disorder that causes tremors, limb rigidity, and balance problems (Elkouzi, 2020). Zhang and Cho (2017) reported that students were able to gain a deep empathy for the target market as well as experiencing the entire fashion business process to find out customer needs through a qualitative study. Empathetic design allows for product creators to view unarticulated user needs and intangible benefits, as well as empathize with the intended users and collaborate to make a product that is truly beneficial (Leonard & Rayport, 1997).

Functional, Expressive, and Aesthetic (FEA) Consumer Needs Model

The FEA Consumer Needs Model was created by Lamb and Kallal (1992). It provides a conceptual framework to assess the needs of a user when creating an apparel product. This model's key is that it revolves around resolving problems in apparel for consumers. Whether the garment is primarily fashionable or functional, the model is designed to meet the needs of users within their cultural context (Orzada & Kallal, 2016).

There are five needs assessed with the model:

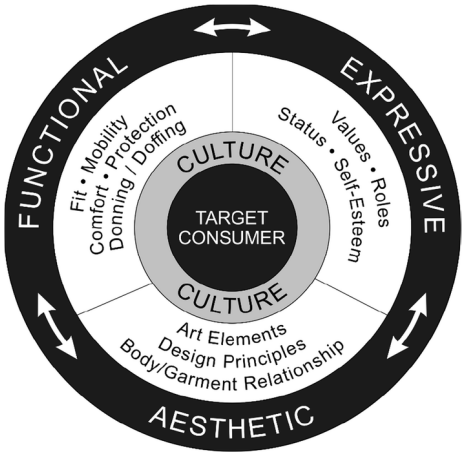
a) Target Consumer - This is the core of the model. Designers develop a profile of the user's demographics and psychographics, along with their needs and wants in a garment or product.

b) Culture - Culture is the filter between the user of a product and the item itself. This is the frame that users consider what are acceptable items to wear in a context.

c) Functional - Functional considerations are in regards to utility, like putting on and taking off, fit, and how well a person can move.

d) Expressive - Expressive elements relate to the symbolism an item of clothing communicates about the wearer. Users can choose garments that portray a certain meaning about themselves or that they feel fit into their personal style.

e) Aesthetic - Clothing is fashion as well as function, so the aesthetic element considers elements of art and beauty to create a pleasing design to the intended audience's eye.



(Lamb & Kallal, 1992)

Chae (2019) used the FEA consumer needs model to assess adaptive clothing for women with chronic neurological disorders like Multiple Sclerosis (MS). The study found that there are a lack of options for women with disabilities that address all three quadrants of the FEA model. The interviewees revealed that mass produced adaptive clothing did not meet the functional needs that they desired, like having classic styles or clothing that featured no closures instead of button or tie closures. In addition, the women

stated that adaptive clothing lacked color, desired small-scale patterns, and embellishments that they enjoy aesthetically. As shown in this study, the FEA consumer needs model allows a product developer to discover aspects of the target market in all three facets of a wearer's experience.

Universal Design

Universal design is defined as the design of products and environments to be usable to the greatest extent possible by people of all ages and abilities. This concept promotes inclusion of anyone, regardless of age or ability level (Park et. al., 2014). In terms of fashion, applying universal design means that individuals with and without disabilities can use and wear a garment in the same way. This is an important concept to consider, as special clothing for people with disabilities can promote internal stigmatization of the disability on the wearer (Freeman, Kaiser & Wingate, 1985-1986). In addition, people without disabilities tend to focus on the novel aspects of people with disabilities (Davis, 1977). Thus, clothing made "specially" for people with disabilities can increase stigmatization among people without disabilities (Wingate, Kaiser, & Freeman, 1985-86).

There are seven principles of universal design (Story, Mueller, & Mace, 1998):

Design Principles	Guidelines	Design Solutions
Equitable Use The item is equal to use for people with diverse abilities.	1a. The product is as usable for one individual as for anyone else 1b. The product does not make any group feel segregated or stigmatized 1c. The product provides needed privacy, security, and safety 1d. The design of this product is appealing	Moving a zipper from the back of the garment to the side or front for ease of access Integrating adaptive features (like magnetic closures or velcro) into a classic garment so it does not negate from the original design Consider pant length and pocket placement when creating pants for people who are in a seated position
Flexible Use Allows access and use with people with a wide range of mobilities	2a. Provide choice in methods of use 2b. Accommodate right- or left-handed access and use 2c. Facilitate the user's accuracy and precision 2d. Provide adaptability to the user's pace	Allowing garments to be reversible and tagless for those with sensory difficulties Place closures on front of garment to remove inhibitions of those who are right or left hand dominant Increasing the size of closures allows better access to people with loss of hand dexterity
Simple and Intuitive Use	3a. Eliminate unnecessary	Elimination of closures

Easy to use regardless of skills and eliminates unnecessary complexity	complexity 3b. Be consistent with user expectations and intuition. 3c. Accommodate a wide range of literacy and language skills. 3d. Arrange information consistent with its importance 3e. Provide effective prompting and feedback during and after task completion.	eliminates unnecessary motions in wearing Creating clothing that is intuitive to don (put on) and doff (take off)
Perceptible Information Includes necessary information for use	4a. Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information 4b. Maximize "legibility" of essential information. 4c. Differentiate elements in ways that can be described. 4d. Provide compatibility with a variety of techniques or devices used by people with sensory limitations.	Easy to understand how to donn and doff garment Simplicity in design and function Easy to access extra information, like care tags with washing instructions sewn into a garment
Tolerance for Error Minimizes dangerous outcomes from unintended or involuntary actions	5a. Arrange elements to minimize hazards and errors. 5b. Provide warnings of	Eliminating small closures that are difficult to manipulate The design does not

	hazards and errors. 5c. Provide fail safe features. 5d. Discourage unconscious action in tasks that require vigilance.	obstruct body movement Sizing is adaptable and flexible, made to be comfortable for many people
Low Physical Effort Can be used efficiently and effectively with minimum fatigue	6a. Allow users to maintain a neutral body position. 6b. Use reasonable operating forces. 6c. Minimize repetitive actions. 6d. Minimize sustained physical effort.	Wrap garments allow people using wheelchairs to get dressed in a seated position. Magnetic closures eliminate repeated button fastening maneuvers. Shoes with velcro/zipes and without laces allow users to minimize physical effort spent tying and fastening shoes
Size & Space for Approach and Use Adequate size and/or space provided for body manipulation regardless of size, posture, or mobility	7a. Provide a clear line of sight to important elements for any seated or standing user. 7b. Make reach to all components comfortable for any seated or standing user. 7c. Accommodate variations in hand and grip size. 7d. Provide adequate space	Eliminating back pockets on adaptive pants for wearers in the seated position Eliminating small fasteners allows anyone to donn and doff a garment Adding shoulder closures/side zips allows users to access to medical devices

	for the use of assistive devices or personal assistance.	

Multiple studies on clothing for people with disabilities have utilized the universal design framework. Park et. al. (2014) used principles of universal design to design two garments, *Pupa Butterfly* and *Inkjet Paintbrush*. The design team created each garment without complicated closures and the main design elements come from custom designed prints and dressing. This allows the garments to be comfortable for people of many body sizes while still being flattering and interesting to the wearer and viewers. Overall, the base of universal design is to create products that can satisfy the needs of as many people as possible. Small changes, like changes in closures or fabric, could create more garment options for people with disabilities.

Research Questions

There is rising interest in creating clothing for people with disabilities (Lieber, 2019). As they make up over 26 percent of the population (CDC, 2019) with a projected disposable income of over $400 billion by 2026 (Lieber, 2019), it is of high benefit to fashion brands to begin including this population as part of their total available market and creating clothing that suits their needs and wants. There is a lack of understanding of what people with disabilities desire out of clothing, both functionally and aesthetically (Rosenblad-Wallin, 1985; Menec, 1989; Stokes & Black, 2012; Kosinski et al., 2018).

Therefore, the following overarching research questions were developed:

1. What is the level of satisfaction of female mobility aid users with ready to wear clothing?
2. What is the level of satisfaction of female mobility aid users with adaptive clothing?
3. What clothing attributes would improve consumption and quality of life for mobility aid users?

Sample

The study was limited to women who use mobility aids in order to reflect the most accurate needs in regards to clothing and people with disabilities. Women are more likely to have a disability than men (Erickson, Lee & Schrader, 2017). In addition, women tend to purchase more clothing per year and are more invested in their personal appearance (Hansen & Møller, 2009; Lennon et al., 2017).

This sample was chosen due to the prevalence of mobility-related disabilities in this age range and gender (Erickson, Lee & Schrader, 2017, Kraus, 2018). As well, interest in clothing is commonly rated as higher for women (Lennon et al., 2017). A sample of 13 English-speaking from the United States were recruited through Facebook groups related to women with disabilities. The sample's self-identified ethnic composition was: 69.23% (n=9) White non-Hispanic, 7.69% (n=1) Hispanic/Latina, and 23.08% (n=3) African-American. The age range of participants was: 19-56, with a median age of 33. Participants used a range of mobility aids (such as walkers, power chairs, forearm crutches, and manual wheelchairs) both full time and part time.

Methods

Semi-structured interviews with people with disabilities ages 18-56 were conducted. Upon approval by the human subjects' review board, English-speaking women from the United States were recruited through posts in three different Facebook disability and mobility aid support groups (Wheelchair Users United, Pimp My Mobility Aid, & Women With Disabilities). The post explained the purpose of the study and the method for collecting data. For interview participation, users commented on the post indicating potential interest by commenting on the original post and the researcher contacted users via private message in order to confirm their eligibility.

Online video interviews were scheduled with those who chose to participate. The semi-structured interviews lasted from 8 minutes to 45 minutes in length. The participants were asked about their experiences with finding and wearing clothing, including questions about issues or potential improvements. Examples questions included (a) what do you find most frustrating about clothes? (b) what do you look for when shopping? (c) what is your experience with adaptive clothing? (d) if you could give apparel designers any advice on designing clothes for you, what would that advice be? The interviews were recorded and the audio recordings were transcribed verbatim.

Both inductive and deductive coding processes were used for this study, which adds rigor to the data analysis process and expands overall research findings (Creswell, 2014). The deductive data analysis tested current theories in established research and reinforced findings already documented about people with disabilities in regards to clothing. Inductive data analysis allows other findings to emerge from the data that are

not documented in other research. This allows for a richer understanding of the target group of study and for other findings to emerge that would not have if deductive were the only method utilized (Creswell, 2014).

The following a priori coding categories were developed to understand the experience people with disabilities have with both ready-to-wear and adaptive clothing:

1. Ready to Wear:
    a. Issues Donning (Suri, 2016)
    b. Issues Doffing (Suri, 2016)
    c. Difficulty Using Fastenings (Dallas et al, 1982; Reich & Shannon, 1980; Chung, Lee, & Ahn, 2007)
    d. Fit Issues (Chang et al., 2009)
    e. Attractiveness (Suri, 2016)
    f. Inadequate Consideration of Needs (Na, 2007; Black, 2010; Wang et al., 2014; Sarcone, 2017)
    g. Textile Issues (Thorton, 1999; Ruteledge, 2017)
    h. High Price Point (Day & Taylor, 2019)
2. Adaptive Clothing:
    a. Lack of Color & Pattern (Sarcone, 2017)
    b. Lack of Style (Sarcone, 2017)
    c. Limited Selection (Morris, 2019)
    d. Not Available in Stores (Sarcone, 2017)
    e. Not Available Online (Sarcone, 2017)

f. Expensive Price Point (Sarcone, 2017)

g. Othering (Freeman, Kaiser & Wingate, 1985-1986; Kabel, McBee-Black, & Dimka, 2016)

h. Does Not Fit Wearer's Needs (McBee-Black & Ha-Brookshire, 2018)

Inductive processes were used during the coding of the data in order to allow additional themes to emerge from the data. All emergent themes were identified using a grounded theory approach. This involves the construction of theory through systematic data collection. Grounded theory was used as an analytical approach to discover repeated concepts, ideas, or issues through the coding process (Strauss & Corbin, 1990). For this study, a three-stage data analysis process was utilized: first cycle coding, second cycle coding, and theory building (Saldaña, 2016).

During the first coding cycle, each transcript was reviewed and coded independently by the researcher. An open coding process was used, where the researcher read each line of the interview to allow for recurring codes to be recognized (Strauss & Corbin, 1990). During the coding process and after each interview, analytic memos were written to allow for connections between codes to be identified (Saldaña, 2016).

After the final coding guide was generated, the second coding cycle began based on deductively generated codes from review of the literature as well as inductively generated codes from original review of the interviews. The coding guide was entered in qualitative data analysis software (QDAS) NVivo 12 for Windows to add rigor to the coding process. Utilizing QDAS allowed the researcher to further organize, manage, and search the data to enhance the validity of the qualitative research (Siccama & Penna,

2008). The QDAS software was used for code weaving to search the coded data and connect the codes into categories of related codes. The faculty advisor, knowledgeable and experienced in qualitative analysis, confirmed the coding process by auditing a sample consisting of 10% of the data from each sample (Kuckartz & Rädiker, 2019) with an interrater reliability of 96.3%.

Findings

Ready-to-Wear: Fit Issues

Overall, fit issues were a common problem among ready-to-wear (RTW) clothing for participants. 92.3 percent of participants mentioned fit issues due to prolonged seated position, while 61.5 percent of participants said that fit issues cause them physical discomfort. One woman shared, “I had to get rid of all my skinny jeans really quickly (after starting to use mobility aids). If you just wear jeans and a shirt, and you’re doing the motion of pushing a wheelchair...your jeans sit really low. That’s a massive issue and it *hurts*” (Participant 9). The sentiment seemed to resonate with multiple women, saying that most modern pants “make me feel like I’m suffocating” (Participant 1 & Participant 7).

Because of mobility aid use (specifically of seated position mobility aids), 53.8 percent of participants found issues with the length of upper body garments. Participant 3 remarked, “I still don’t know how to fix long jackets. Winter coats are a lot longer because you want to be warm too but also it... makes it harder to work in a wheelchair.” As revealed by another woman, it is difficult to find clothes that are proportional with a

seated position, “Shirts look like a dress on me. So I think that is an issue.” (Participant 6). Length of sleeves was another issue, echoed by 53.8 percent of participants. Due to navigation with mobility aids, any garments with “fun or decorative” sleeves “just gets in the way” (Participant 7). One woman expressed, “Especially using my cane...the ones that go off the shoulders, you're constantly trying to make sure they don’t ride up. The less I have to mess with it the better” (Participant 1).

The fit of lower body garments posed an issue; 53.8 percent of the participants spoke of problems with the length of lower body garments. The women expressed their frustration about the lack of length options, “So, when you are sitting down, you don’t want it to ride up. But maxi dresses can be too long and get in the way of the wheels of a chair” (Participant 10). Another shared, “Dresses and skirts are always a really weird length. Like they're cute when I'm standing up, but as soon as I sit down they're too short. Of course in a wheelchair, you’re moving, so it's hard to stay modest and not flash everyone” (Participant 7).

Ready-to-Wear: Donning and Doffing

Donning (putting on) and doffing (taking off) was mentioned by 61.5 percent of participants. Participant 8 mentioned, “I wish I could go to a site where I can purchase a pair of pants that have a much longer zipper. That is something that would help me get the pants on easier.” Another woman wished for design features to aid in her independence: “So think of a creative way, an easier way to get clothes on and off. Like a shoulder opening to get things on and off. Just as far as clothing in general, mostly from

people that I know, getting things on and off is the hardest part. Trying to get it on and off by ourselves and not use help is really hard" (Participant 10).

The emphasis on donning and doffing throughout all participants was being able to dress themselves without use of assistance. Fastenings and closures have a significant impact on a person's ability to manipulate a garment independently. Over half of those interviewed spoke about difficulty using fastenings. While all 7 women agreed that both location and type of fastenings was an issue, 57.1 percent found type of fastening to be the main issue, while 42.9 percent found location as the main issue. One woman said that due to loss of mobility in her left arm, "I can't really do pants with a button, or even a snap" (Participant 10). Another person suggested that garments should, "Have fastenings at the side rather than the back, if the garment would not accommodate a front fastening" (Participant 2). While Participant 3 originally found no issue with fastenings, later on in our interview she pondered:

> "Now that I said (I haven't ever broken my arm), I look at my closet and realize if I broke my arm tomorrow, I don't know what I would do. All my shirts...I would have to pull over my head. It would be really cool to have fashionable button down shirts, but maybe have those magnets. I don't think accessible clothing has to look accessible."

All of the women preferred stretch fabrics in contrast to non-stretch options, both for comfort and ease in donning and doffing. "Everything has to be stretchy. I typically don't buy dresses that are tight because I can't get them on. Any dress with a zipper I really can't get it to work for me" (Participant 11). Similarly, another woman tended to

look for, “Stretchier fabrics, or kind of floaty fabrics that look good sitting down” (Participant 9). One woman commented, “With the ease of getting it on and off, I like stretchy. Like a top with a button up out of cotton, I won’t wear that. I wear more jersey or performance legging material. If it doesn't stretch, I really can’t wear it” (Participant 10).

Due to ease of donning and doffing, 84.6% of participants preferred skirts and dresses. Unfortunately, this preference for non-bifurcated garments develops from necessity and not personal or aesthetic preference. One woman said, “I don't wear pants, I gave up on pants because they were just a pain to put on” (Participant 8). Sharing similar sentiments, another person stated, “I would say I prefer skirts and dresses better. It’s so hard to find pants that aren’t like old lady pants. I just wear a lot of dresses because there are more options than shorts. Not really by choice, it's just easier that way” (Participant 10).

Inadequate Consideration of Needs in Ready-to-Wear

All 13 participants found that RTW did not consider the needs of their disability, making it the most common issue participants found with RTW clothing. 76.9 percent of participants said the need for extended periods of sitting is not considered. One woman stated, “My frustrations with the clothing itself is that things look nice on a seated person are so very different when you’re sat down” (Participant 2). To reduce strain, the women wished “I could find clothing that is comfortable both when I’m standing and when I’m sitting and lying down. I get tired, so I need breaks throughout the day and changing

clothes is just too much" (Participant 7). In regards to pants, another person remarked, "It's hard to find pants that stay up when I'm sitting without squeezing around the waist but also aren't too big when I stand up" (Participant 1).

61.5 percent of the women spoke about the needs for medical devices are not considered. It is frustrating to adjust clothes often: "I hate having to adjust (sleeves) a lot, especially when I was using my cane because you only have access to one hand" (Participant 1). Five of those participants also have needs for devices other than mobility devices, like infusion ports, g-tubes, or heart monitors. Participant 10 mentioned, "I have a pack in my chest. you know, like under my skin. So sometimes, I need to be able to access that area. You know, when people have a device in the chest area, you want something a little bit higher to cover that because not everyone wants their devices showing."

Ready-to-wear clothing can restrict movement needed to navigate mobility aids, as mentioned by 53.8 percent of participants. Specifically, garments lack ease in armholes or around the waist. One woman remarked, "Sleeves are really hard. Some of them are too much, but a lot of them are tight and I can't use my wheelchair" (Participant 7). Participant 4 said "I hate jeans. I hate them. They are so cute but they are not practical. I just get really bloated and having to deal with the buttons and sitting down is not worth it. I can't move when they are squishing me."

46.2 percent of participants find that RTW clothing adds extra effort or strain. Participant 1 said, "Just make it comfortable, make it stay in place easier...it is really frustrating to find things that fit." Another wishes RTW could provide her more

independence: “Getting clothes on and off is frustrating and takes a lot to think about. Trying to just go to the bathroom or get dressed by yourself is frustrating” (Participant 9).

Adaptive Clothing Among Participants

Overall, adaptive clothing was not common among participants. While 76.9 percent of participants had heard of adaptive clothing, only 20 percent of those participants owned adaptive clothing. Both participants who owned adaptive items had t-shirt style garments with shoulder openings for ease of donning and doffing and access to chest area medical devices, such as g-tubes or infusion ports. All 8 participants who did not own adaptive clothing did not feel that adaptive clothing fit their needs or disability. Participant 3 shared, “To answer your question, no. I haven’t had enough of a need for it to make it work or to make it something I consistently wear. Another said, “No, I’ve seen them and I’ve looked into them. But honestly, I don’t think that I necessarily need them. So I don’t use them” (Participant 7).

Lack of Style in Adaptive

The most common problem with adaptive clothing among participants is that it lacked style and visual interest or was created and marketed to an older or younger age group. 70 percent of participants found that they were unable to find adaptive clothing that fit their personal style. One woman shared, “Finding (adaptive clothing) that isn't designed for older people has always been difficult and quite frustrating...I feel quite limited about the sizing and the assumption about the age of people using mobility aids”

(Participant 9). Participant 3 expressed, “A lot of the ones I've seen...none of (the adaptive clothing) fit with what I like to wear.” Participant 6 said, “It's hard to find things that are age appropriate...it's hard to find clothes that don’t look too young.” When asking one of the participants if she liked adaptive clothing (being one of only two participants to own an adaptive garment), “Not at all! (laughs) It tends to be very plain, and I’m out of the box” (Participant 1).

Affordability of Adaptive Clothing

Fifty percent of participants found that adaptive clothing was too high a price point for their needs. Participant 11 said, “I think it's great that in the 21st century there is more adaptive clothing coming out, but it’s not always affordable. Most people with disabilities are on a limited budget, so these clothes just aren’t affordable.” Another shared, “(Adaptive clothing) is generally very expensive, not widely available, and too masculine in appearance! But I think it’s an area needing more attention for sure” (Participant 2). When asked about why she did not use adaptive clothing, one woman quickly remarked, “It's expensive as shit. It's so much money. And even though it's expensive, it doesn’t have much style in mind” (Participant 9).

Availability of Adaptive Clothing

Participants found that adaptive clothing was hard to find both in stores and online, with 30 percent of participants mentioning the issue during interviews. Participant 10 said she had not tried adaptive clothing mostly, “because it was hard to find.”

Specifically in person, she said, “we haven’t really found anywhere to shop honestly.” Another said, “I haven’t really seen it. I’m interested in, but the only thing I really saw consistently was adaptive underwear. That’s just not something I need” (Participant 7). Participant 6 shared similar sentiments, saying “I haven’t used any adaptive clothing because I haven’t found any.”

Alternatively, 38.5 percent of participants have altered existing clothing to make it adapt to mobility aids. These alterations ranged from hemming garments, to adding shoulder openings, to completely deconstructing garments to add a different closure method. In the same question about adaptive clothing, One person stated, “I know my last shirt, we actually cut the back and put buttons on top so I can slide them over my head easier. Same things with the sleeves of the arms; we put buttons so we can pull it apart and open it back up in case I have an arm cast on” (Participant 6). Another woman talked about, “For me personally, i'm constantly cutting my clothes to make them work for me like but that can be hard and depending on the type of clothes it just doesn’t work” (Participant 11). Participant 9 said she did not use adaptive clothing because, “I just adapt it myself.”

Shopping Experience

Shopping was mentioned by 69.2 percent of participants. 67 percent of women preferred shopping online, while 33 percent like shopping in-store better. Unfortunately, barriers to shopping experience exist in both in-store and online shopping methods. Due to issues donning and doffing and added strain, participants have a hard time trying

things on in dressing rooms in-person. One shared, “I can get a better idea if something is going to fit or not in person, but then it takes up energy which is difficult and you have to try the garment on...I have to go home try it on and take it back anyways” (Participant 8). Participant 1 shared “Having to try things on can be a struggle, especially on a flare day. So being able to go into a store and going ‘Oh, that’ll fit me’ would be really helpful.”

Another barrier to shopping is having an accessible dressing room, a problem stated by 55.6 percent of participants. Often, the mobility aid dressing rooms were being used as storage rooms. One woman frustratingly remarked, “There are accessibility issues (with in-store shopping), and usually I can’t get into the dressing room. You will not *believe* how many times the disabled dressing room is filled with stock. So I do my shopping online because of that basically” (Participant 9). Participant 10 shared, “Most of the time, wheelchair accessible dressing rooms are being used as storage rooms. You go there and it's full of mannequins. No one cares.”

While more participants preferred to shop online, it is not without unique challenges as well. 33 percent of participants mainly faced issues with bad product descriptions to gauge whether garments would work in a seated position or fabric would be comfortable against their skin. Participant 8 shared, “If brands could just describe their garments; about fabric, about closures...write if its stretchy or non stretchy, And pictures wearing the garments, if we could get better at describing garments, because then I could have a lot better time trying to buy garments.”

Empathy to Others

62 percent of the women interviewed mentioned others with disabilities during some portion of their interview. These comments ranged from mentions of a friend's experience, to comments about how their personal experience did not speak for all people with disabilities. One woman mentioned, "I think a lot of people with disabilities have the same issues because of the way we are shaped. So we tend to shy away from patterns or wording on shirts" (Participant 6). Participant 8 suggested, "But the reason I don't want pants is not the same reason that someone with my disability doesn't want pants. I know plenty of girls with my disability that do wear pants." As well, the same woman shared that she could not, "Talk about things that apply to everyone" because "People in wheelchairs, or people with limb differences, or people who are on the autism spectrum...all have different needs. It's hard to make a blanket statement" (Participant 8).

In addition, 46.2 percent of participants mentioned that the issues they face with clothing are the same as other women. This ranged from fit issues, to poor online return policies, to comfortability in clothing. Participant 8 suggested, "If brands could just describe their garments about fabric, about closures...pictures wearing the garments. If we could get better at describing garments, because then I could have a lot better time trying to buy garments. But these frustrations I think are the same frustrations with me, or you, or the girl next door you know? Everyone is frustrated." Participant 11 said, "And bras? Oh my god, don't even ask me. But like, a lot of women have problems twisting into the back to put on a bra. It's ridiculous! Did a man invent these?"

Desire for Inclusivity

76.9 percent of participants suggested that they did not want to "other" themselves because of their disability. "Often when people see you with a mobility aid, that's all they know you by. I like making a statement because I would like to be known for my personality and fashion taste rather than "the girl with a mobility aid" if that makes sense" (Participant 1). Participant 8 said, "Why is it so difficult (to include people with disabilities)? These are little things we can do to be a little more inclusive. Just taking pictures of people in the clothes sitting down. Just little things." Participant 3 said, "I love fashion, I think it's so beautiful when you finally find what works. Nothing makes me feel more like hot shit than when I got a dress that makes me feel like hot shit. I think it's something that is so important. It makes me so excited to see someone acknowledging that everyone should have a dress that makes into hot shit and that they can get into on their own. Me, and other people with disabilities just want to feel like hot shit too."

Another woman wished she could feel like everyone else and have office clothes that fit: "You know, I just wish I could shop for clothes and not feel like I'm medical equipment. Like, I just wish I could wake up and put on clothes that worked for me like everyone else. All they sell to people with disabilities is stuff to make them feel like they need to go to PT. Not to work at the office" (Participant 12). Another woman suggested, "Just adding touches that make it clear or offering extras that make it clear that we've been thought about. And actually talk to disabled people. People think they can just come along and save disabled people. Like no! We are already thriving, and we already look good, and we just need designers to jump on board" (Participant 9).

Discussion

The purpose of this research was to understand the level of satisfaction of female mobility aid users in ready-to-wear and adaptive clothing, as well as understand what apparel attributes would contribute to an improved quality of life for women who use mobility aids. These findings provide a greater understanding about the feelings and experiences surrounding clothing and the apparel industry of women with disabilities. In addition, the results bring to light insights into consumption patterns of women with disabilities and potential developments in apparel design to service this consumer group.

Ready-to-Wear Apparel Issues for People with Disabilities

The findings suggest that women are dissatisfied with ready-to-wear (RTW). Women find the most dissatisfaction with inadequate consideration of disability needs, followed by fit issues, and then ease in donning and doffing. This data echoes previous research surrounding women with disabilities, such that lack of RTW options impedes women with disabilities's ability to live and socially participate comfortably (Gilleard & Higgs, 2015; McBee-Black & Ha-Brookshire, 2018).

As found in the literature (Newton, 1976; Todd & Norton, 1996; Stokes, 2010, Wang et al., 2014), donning and doffing was cited as one of the main issues by women who use mobility aids. Previous findings were repeated that independently donning and doffing clothing may not be able to be accomplished independently for someone using a mobility aid (Banks, 2001; Wang et. al., 2014). Unlike previous studies, these results found that a large part of ease of donning and doffing comes from closures (both type of

closure and location of closure). While past findings have separated fastenings from garment manipulation (Reich & Shannon, 1980; Carroll & Kincade, 2007; Martins & Martins, 2012), these findings indicate that donning/doffing and fastenings consideration can work together in different ways to allow women with disabilities to dress independently. In contrast to previous studies (Reich & Shannon, 1980; Caroll & Kincade, 2007; Chung, Lee, & Ahn, 2007), the current studies' findings suggest that garments with a lack of fastening are preferred. Women with disabilities do have openness to alternative types of fastenings, like magnets. These were often not considered due to lack of availability.

Results of this study also indicate there is a gap in the literature regarding preferred fabric types for individuals with disabilities. All of the participants in this study preferred stretch fabrics over non-stretch counterparts due to ease in donning and doffing, ease of movement, and lack of closures. In addition, a lack of literature exists for part time mobility aid users who want to wear clothing between mobility aid use and non-use, or women who use a variety of mobility aids. This need was reflected by 46% of participants.

The study results reflect that fit issues can cause issues both with attractiveness and comfort levels and that women with disabilities have challenges finding clothing that fit due to the current sizing guide (Thoren, 1996; Chang et al., 2009; Li Wang, Wu, and Zhao, 2013; Lee & Jin, 2019). Both previous studies (Civitci, 2004; Kidd, 2006; Ng, Hui, & Wong, 2011; Li Wang, Wu, and Zhao, 2013; Sarcone, 2017) and this study's findings help establish the importance of sitting fit for women who use mobility aids. As over half

of participants in this study shared, seated position combined with movement of a wheelchair causes garments to shift and cause physical discomfort, which suggests a previously undocumented issue of body movement while manipulating a mobility device. In addition, there is a gap in the literature regarding the fit around the waist in a seated position, indicated by 69% of participants. While previous recommendations have been to add extra wearing ease into garments (Na, 2007; Morris, 2019), these results indicate that aesthetic of a tighter fitting garment is still a desire for women with disabilities.

These results echo that ready-to-wear clothing fails to consider any needs beyond temporarily able-bodied individuals (Black, 2010; Wang et al., 2014; Sarcone, 2017). Participants indicated that RTW garments can cause excess strain in daily activities, contributing to pain and discomfort. Also reflected is a lack of consideration for devices, like heart monitors or feeding tubes (Black, 2010; Sarcone, 2017). Not addressed in the literature is the need for clothing that does not need to be adjusted, including sleeves, skirts, or waistbands, which is suggested by over half of participants.

Adaptive Apparel Issues for People with Disabilities

These results indicate that adaptive clothing is not commonly used among women with disabilities. Women are most dissatisfied with lack of style/visual interest, affordability, and availability. While adaptive clothing was only used by 15.3% of participants, 38.5% participants adapted their own clothing. This suggests a strong desire for clothing that does accommodate needs of women with physical disabilities, while not "othering" the community as a separate group (McBee-Black & Ha-Brookshire, 2020). In other words, the data indicates that features that accommodate women with disabilities

can work for women without disabilities. There is a gap in the literature about creating clothing that accommodates disabilities while not separating them from the greater fashion industry. This theory is further supported by 76.9% of participants not wanting to be seen as different because of their disability, and 46.2% of participants relating their issues with clothing to women without disabilities.

These findings also reflect that attractiveness is the most common problem among women with disabilities and their satisfaction with adaptive clothing. The term "attractiveness" encapsulates style of clothing, as well as color & pattern options. There is a gap in literature surrounding the intended age for adaptive apparel versus the age of those using mobility aids. Overall, findings indicate that affordability is a barrier that barrs women with disabilities from trying adaptive clothing. This data suggests that previous studies indicating a lack of selection (McBee-Black & Ha-Brookshire, 2018; Morris, 2019) in adaptive clothing is a continuing problem for women with disabilities. There is a lack of literature surrounding shopping for adaptive clothing, whether online or in person. In addition, further research should be conducted about the intersection of women with disabilities, but those who do not feel their disability needs are represented within adaptive clothing. Such was indicated by 30% of participants who had heard of adaptive clothing.

Evaluation of Design Frameworks for People who use Mobility Aids

While each of these frameworks is a way to serve target consumers, they do not exist without limitations. User-centered design (Karat, 1997; Abras, Maloney-Krichmar,

& Preece, 2004) was originally created to develop technology, so it focuses on functionality mainly and can miss aesthetic needs. Because it focuses heavily on interviews, issues that users do not know how to articulate (like expressive or self-esteem needs) can be missed. The method functions by taking users out of their environment instead of watching them in it. This can lead to issues documented by the participants, such as 30% of participants feeling that adaptive clothing (which is supposed to be accommodating to disabilities) does not actually resolve any of their disability needs. Also, this framework can be othering, as it separates people with disabilities as a different target market group than people without disabilities. There is a strong desire by women with disabilities to be included under the "typical fashion industry" umbrella, instead of separated into a lesser group.

Empathetic design (Leonard & Rayport, 2011) does resolve some of the problems that face user-centered design, like observing users in their natural environment and being able to incorporate unarticulated user needs and intangible benefits into the final design. Unfortunately, this methodology only works on a niche market basis. This does not accommodate the need for this clothing to be mass produced in a cost effective way in order for people with disabilities to be able to afford it. Because a designer or researcher must view a specific group in their natural environment, it may not be applied generally to other users. For example, if the user group was "people who use wheelchairs," the findings may not work well for people with other mobility impairments, like those who use canes or those who have muscle weakness. Similar to user-centered design, it can be

othering as well. Thus, this method has not been widely used in either creative scholarship or industry product creation.

The FEA Consumer Model (Lamb & Kallal, 1992) leaves out several factors that should be of priority consideration when designing for those with disabilities. For one, it leaves out price as a needs factor. But when working with a group of traditionally lower income individuals, the final cost must determine materials and labor used. In addition, it does not consider emotional or internal needs as a factor. The expressive quadrant helps to define what the user wishes to project to the outside society, but not what they wish to feel about themselves through their clothes. In the studies that have used the FEA Consumer Model (Lamb & Kallal, 1992), the researchers often place the most focus on the functional aspect, and seem to leave little consideration to the aesthetic, expressive, and cultural portions. This model can also miss unarticulated needs that do not fit within the four categories as well. These problems are reflected in the issues women with disabilities have with ready-to-wear clothing. The women are trying to fit themselves into the clothing, instead of the items fitting their needs.

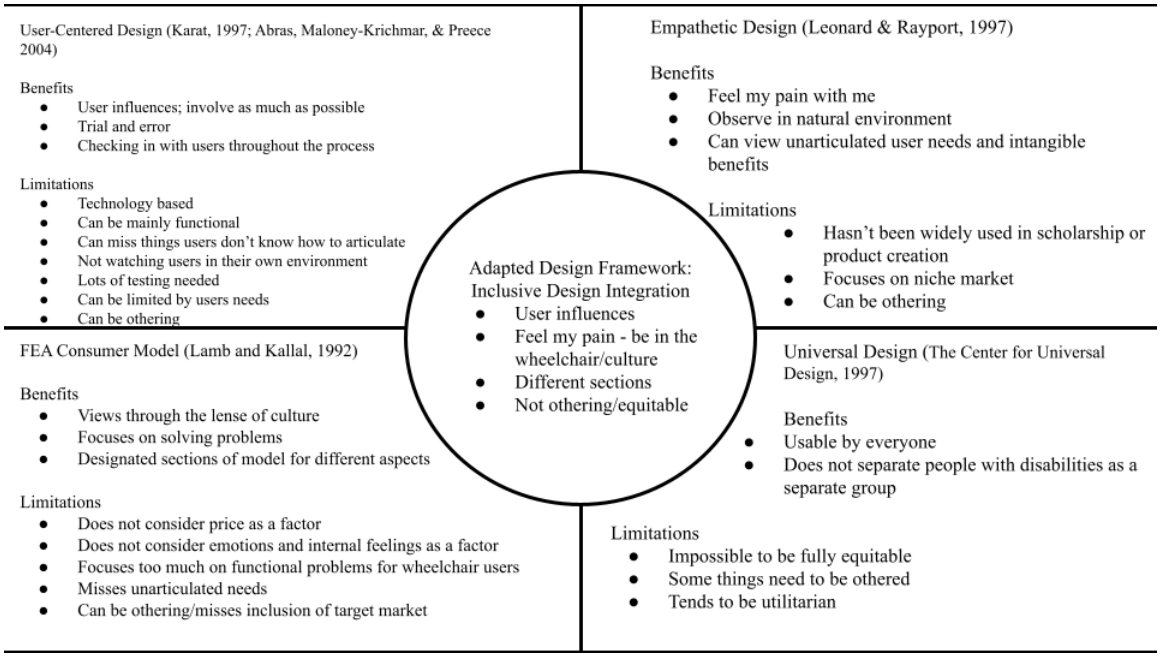
Universal design (Story, Mueller, & Mace, 1998) is unlike the other three models, in that it does not separate people with disabilities as an “othered” group. Unfortunately, no item of clothing can be fully equitable, and special needs must be considered for certain groups, as indicated by 61.5% of participants. For example, pants for people who primarily use a wheelchair should have back pockets eliminated, but that could be at the detriment of someone who uses a cane and wants easy access to small items. People with disabilities are a diverse minority group, and trying to box too many people within a

group can cause endless frustration of conflicting needs or preferences. Even within the same disability, personal taste and preferences play a role, which the universal design model does not always take into consideration. In addition, many of the designs tend to be utilitarian and the aesthetic aspect of the garments is considered of secondary importance.

Adapted Design Framework: Inclusive Design Integration

Through analysis of current design literature, previous design frameworks were integrated into one adapted framework for inclusive design. This adapted framework encapsulates the identified positive aspects from each of the design frameworks. Using each of the positive aspects of the reviewed frameworks as a basis, the adapted framework still acknowledges the way people with disabilities wish to be viewed. The adapted framework is influenced by user experiences (as with Empathetic and User-Centered Design) and encapsulates multiple aspects of the target consumer's life (influenced by the FEA Consumer Model). In addition, the framework focuses on making designs equitable to all user groups possible (influenced by Universal Design). Features accessible to people using mobility aids could also be beneficial for other consumers, like those with limb differences or people with attached medical devices.

Figure 1



People with disabilities do not want to erase their disability, and still want to be seen as "disabled" as an integral part of who they are. But, they do not want their disability to separate them from the fashion industry or society as a whole. This adapted framework (as shown in Figure 1). acknowledges that disability and ability levels can vary per person and through a person's life, and clothing should be available to be able to work for all ability levels. In addition, this framework accommodates preferences within people who use the same mobility aid type or have the same disability, as each individual can have their own desires within clothing needs. There is a range of disability, mobility and dexterity levels, and abilities; but designers also must consider that any of these people may want to shop their brand.

Significance

There are a growing number of people with disabilities worldwide. Over 1 billion people are estimated to live with some form of disability worldwide, and 190 million of people over the age of 15 have chronic health conditions requiring adaptations, like those with clothing (Shimizu, 2020). Worldwide populations are aging, especially in the US. By the year 2040, there will be over 80 million Americans over 65, which is double since 2000 (*The US Population is Aging*, 2015). Adding an assortment of clothing now can grow the availability of accessible garments for older adults and caregivers.

In addition, disability can affect younger individuals as well. In the US, 51% of the disability population is of those who are working age (Kraus, 2018). There is a severe gap in the market for clothing appropriate for the median age of those with disabilities, as many items skew towards an older consumer market.

As a result of the COVID-19 pandemic, the number of adults with disabilities is projected to increase (CDC, 2020). Out of the over 100 million worldwide cases, 10-15% become severe enough to cause permanent damage (Tenforde, 2020). This could mean an additional 15 million people between 2019-2021 with a lifelong disability (WHO, 2020). Thus, evidence suggests that there will be a significant increase in disability related needs over the next 5 years to decade (Tenforde, 2020).

Implications

Through these findings, the apparel industry can create a more inclusive experience for people with disabilities. There is a need for change throughout the entire

industry; from design to shopping experience to merchandising. Results suggest that small changes can have a large impact on those with disabilities. With the effects of the COVID-19 pandemic and an aging population (*The US Population is Aging*, 2015; *Social Security*, 2019; Tenforde, 2020), the need for clothing to allow people with disabilities to dress independently as well as improve overall quality of life is extremely pertinent. In addition, findings indicate that all people (those with and without disabilities) can benefit from change in the apparel industry. Better garment descriptions, a larger range of fit and sizing, and more accommodating shopping experiences can create higher convenience and more comfortable clothing to anyone shopping.

Future Research

This study has provided a comprehensive look into the ready-to-wear clothing industry for women who use mobility aids. There is a need to continue this research to fill gaps in literature due to the limited amount of research available. Future studies should be conducted in a variety of areas around the world, as disability is prevalent in many places. This study was limited to English-speaking women living in the United States, and the qualitative data cannot be generalized to all women who use mobility aids. To further understand the frustrations and desires of women who use mobility aids and what they desire out of clothing, a larger study from a more encompassing geographic area is needed. In addition, a differing study conducted using quantitative methods could provide a broader understanding of the needs in clothing of women using mobility aids.

This current study investigated only women who use mobility aids. A future study involving men who use mobility aids could be conducted, as there is little published research on men and their desires with ready-to-wear and adaptive clothing in regards to disability needs. In addition, this study found participants via Facebook. Thus, this excludes anyone who is not able or has access to a computer due to accessibility issues or socioeconomic status. A study involving people from different levels of accessibility could provide a more overarching view of disability needs in clothing. Finally, this study attracted mainly younger women, but the prevalence of disability in older individuals signifies a need for a study to be conducted with older people who use mobility aids as well.

Design Background & Concept

The inspiration behind this clothing collection is 1940s women's fashion. Because of World War II, each available resource was maximized and beautiful fashion took extremely creative thinking. Designers had to strike a balance between individuality and utility (Kay & Storey, 2018). Traditional concepts of fashion (like freedom of choice and individual personality) were being challenged by governmental control of resources. This was the first time women became increasingly involved in the workforce (Shrimpton, 2014). As their male counterparts were deployed to fight in the war, women took jobs in manufacturing and developed their own uniform (Reddy, 2020).

Utility clothing was part of the rationing program, and such styles could be bought with ration coupons. These styles did not do much to improve morale, so the

Incorporated Society of London Fashion Designers (Inc. Soc.) were employed to improve the fashionability of garments (Kay & Storey, 2018).

American designers (like Norman Norell and Claire McCardell) were able to use fashion to brighten a bleak wartime atmosphere (Reddy, 2020). The designs were feminine, casual, and fun. Designers like McCardell ingeniously worked around fabric rations by using new textiles like denim, jersey, and seersucker to create designs.

After the war ended, previously occupied Paris hopped back on the fashion scene with "The New Look," the opposite of the silhouettes popular during the rationing era. This "new look" emphasized the new "modern" woman. It combines elements of menswear from the previous era with the femininity they felt was put on pause during the war (Shrimpton, 2014).

To me, the ideas emphasized in the 1940s fit perfectly with design for people with disabilities. It involves a great amount of creativity, challenging traditional concepts of fashion, and combining femininity and required functionality. Designers of adaptive fashion must be intentional with every detail and maximize resources.

My goal is to use the combination of femininity and masculinity in the era to influence my designs (and thus the people that wear them). This was a revolutionary time where women forged a new path. Now, in the 2020s, is a time where people with disabilities are forging a new path as well. They deserve to have fashionable and functional clothing choices just as much as anyone else. In times of crisis, women went from being the "othered" gender to being on a more equal footing with men. Now, people with disabilities can have clothing that allows them to be just like everyone else.

Design Process

After selecting an inspiration, I began sketching garments using photos and garment design textbooks from the 1940s as references. My goal was to capture trends from the period in an adaptive way. For example, shoulder plackets were a popular garment element. These plackets can be used to increase the armscye of an armhole area in order to increase comfort for someone using a mobility aid. During the sketching process, I created fifteen different design options.

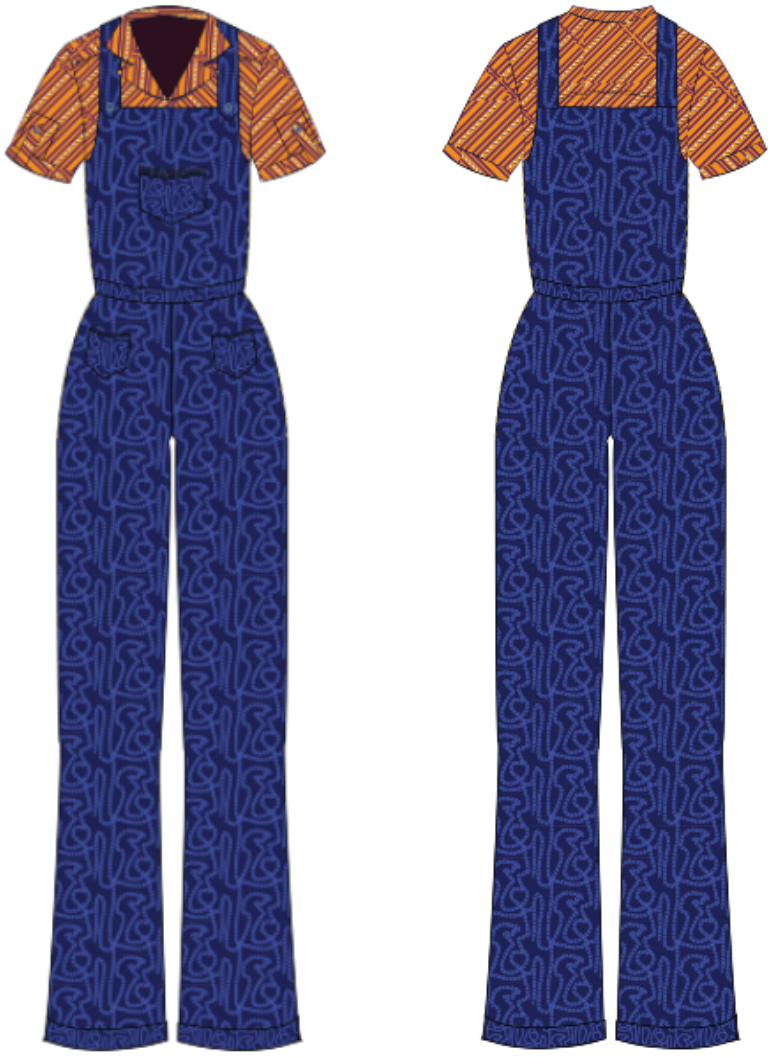
Following this, I evaluated the design elements that were most important from my research findings in order to prioritize which sketches I would move forward with for my three-look collection. In addition, I considered cohesiveness and breadth in design elements in order to create a visually appealing and interesting collection. From these fifteen sketches, I selected three to bring to fruition. To include a strong variety, I chose one set of top and bottom separates, one dress, and one jumpsuit.

From this point, I decided to create my own custom prints in order to give my collection an original visual element. These prints also include symbolism of different mobility aids to bring empowerment towards mobility aid use. It also creates a distinctive vintage-inspired look, which has been used to escape the anxiety of constantly changing trends (Armstead, 2018). I created the six prints in Adobe Illustrator and had the fabrics digitally printed.

During this sketching process, I also measured my models. Because of restrictions due to COVID-19, I recruited fit models that were in my inner contact circle. In order to

achieve the most accurate final product targeted to women who use mobility aids, I measured my fit models both sitting and standing. This was to evaluate the changes in measurements between a sitting and standing body.

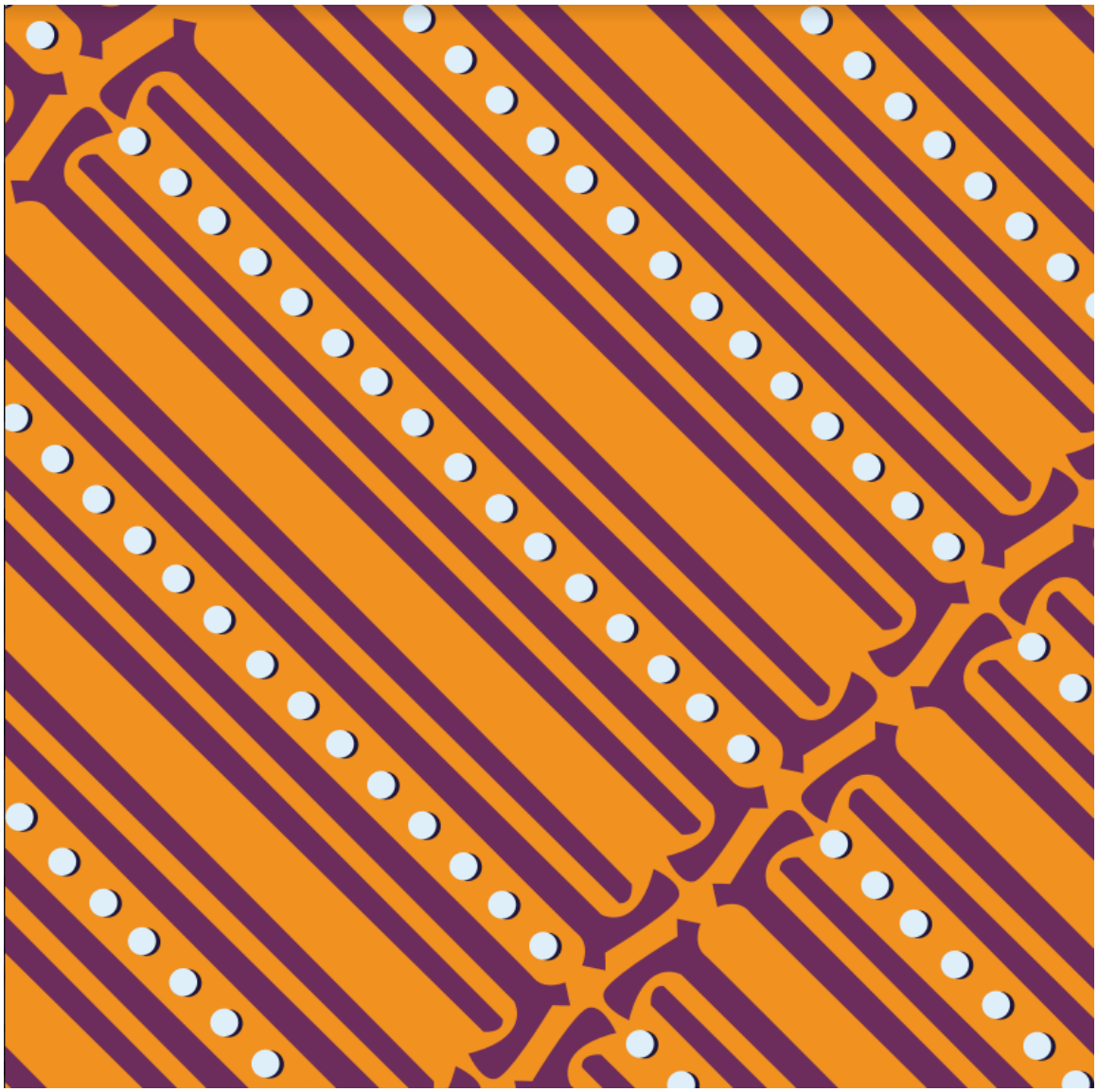
Design 1

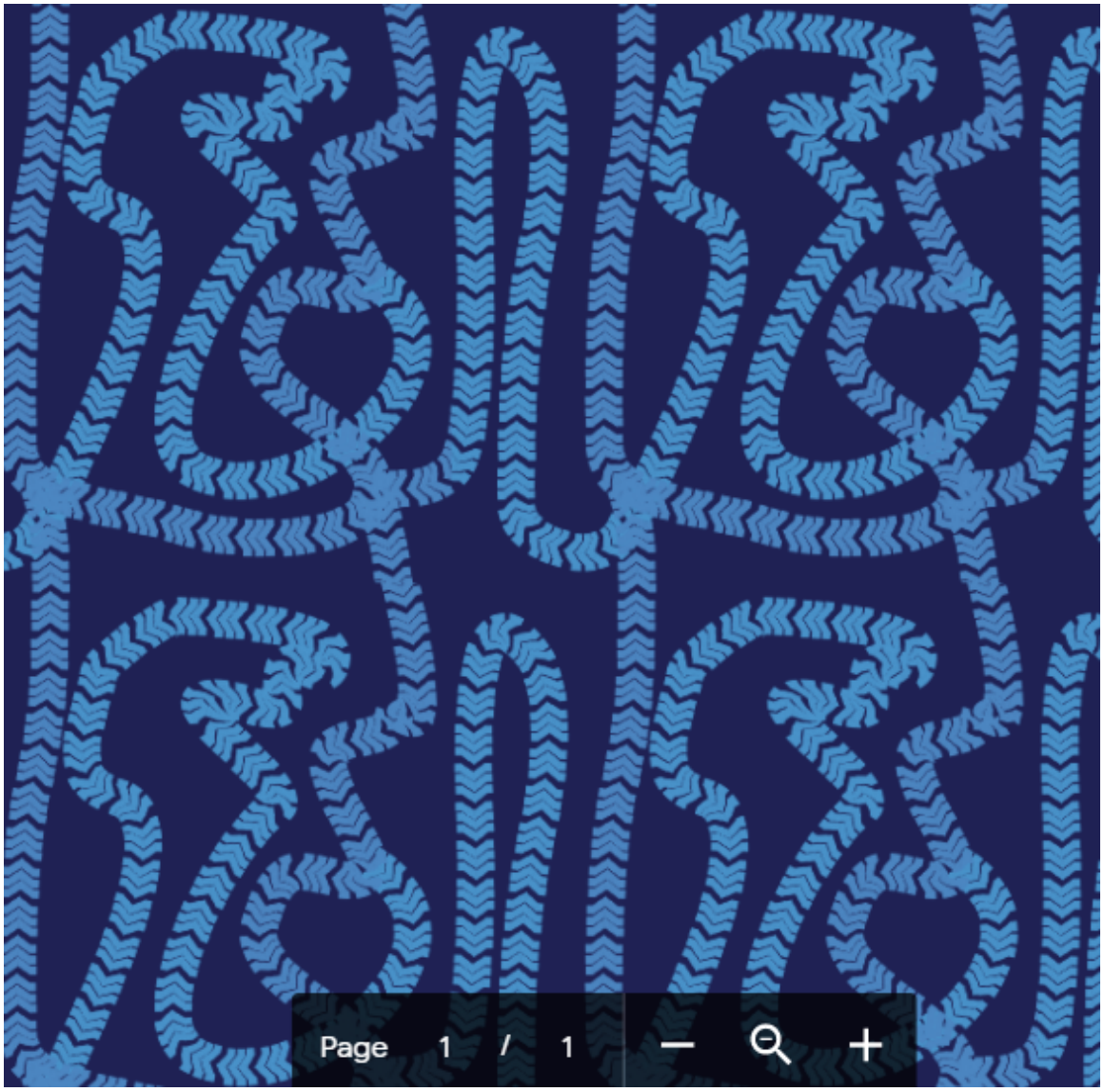


This first look is composed of a faux button blouse that is closed with magnets. On the sleeve, there is a credit card pocket with a placket strap to secure it. The placket strip is secured with a magnet and allows for adjustability in the sleeve length. On the

back, the yoke is curved in order to accommodate the shape of the backrest of a wheelchair. The overalls have side snap closures extending from the armhole to the knee to allow for ease of donning and doffing. The straps are secured with a magnet to allow for ease of access. This garment includes three front patch pockets and no back pockets to accommodate the need for sitting.

Look 1 Prints





The first print is a mobility walking cane converted into 45 degree angle stripes. In order to reference 1940s style prints, white polka dots with a drop shadow were added to break up the design. This movement draws the eye up to the wearer. The second print is an abstract take on tire tracks that a wheelchair would create. This print has a strong impact with the graphic lines, but is placed on a dark background to hide dirt or staining from mobility aid use.

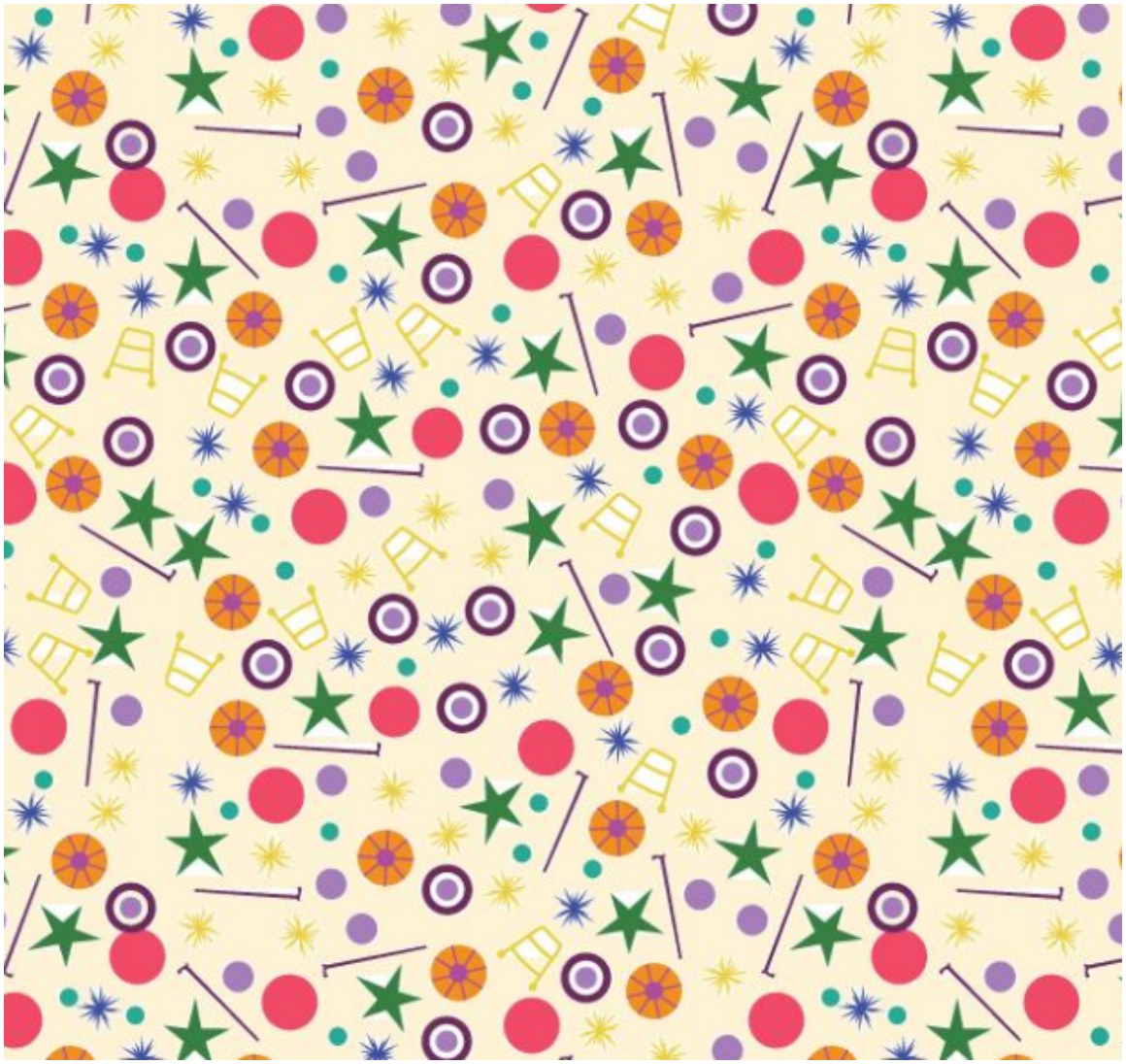
Design 2

This dress design emulates stylized casualwear from the 1940s. I wanted to incorporate style lines to control the added fullness of the skirt at the waistline. This adds a dramatic effect while still fitting in the restrictions of mobility aid use. There is an upper yoke that contains an invisible zipper to add access to medical devices at chest level, like ports or monitors. The design also features an empire waistline to take away stress and discomfort from a high movement area.

In order to add definition at the waistline, there is an optional tie belt. This can be adjusted to multiple sizes or not used, which adds more agency for the wearer on styling and gives more value in a single garment. The dress is donned using snap closures at the shoulders and a keyhole tie neckline that can be adjusted based on comfort. I

incorporated a high-low hemline to allow for length changes in a sitting versus standing position.

Look 2 Prints



The first print contains scattered iconography of different mobility aids. Specifically, a walking cane, walker, and wheel of a wheelchair are sketched within the print. These elements are surrounded by polka dots and stars of various sizes to create visual interest within the design.

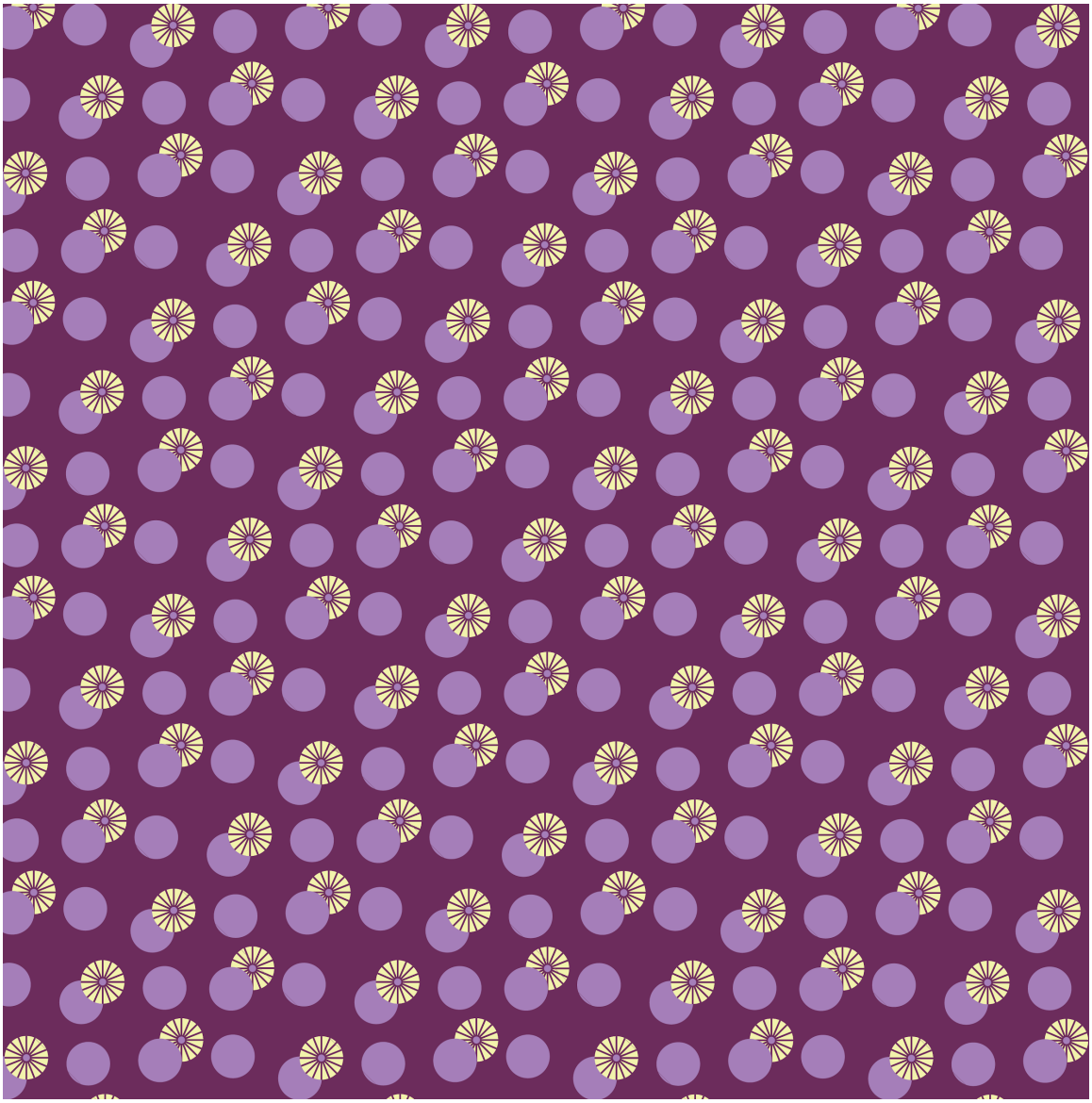
The second print is a varying colorway to the tire track print from Look 1. I wanted to have cohesiveness among the collection, so I used some of the prints over multiple garments. This balance of more saturated colors against the lighter background of the dress print brings attention to the waist area to create a more flattering silhouette.

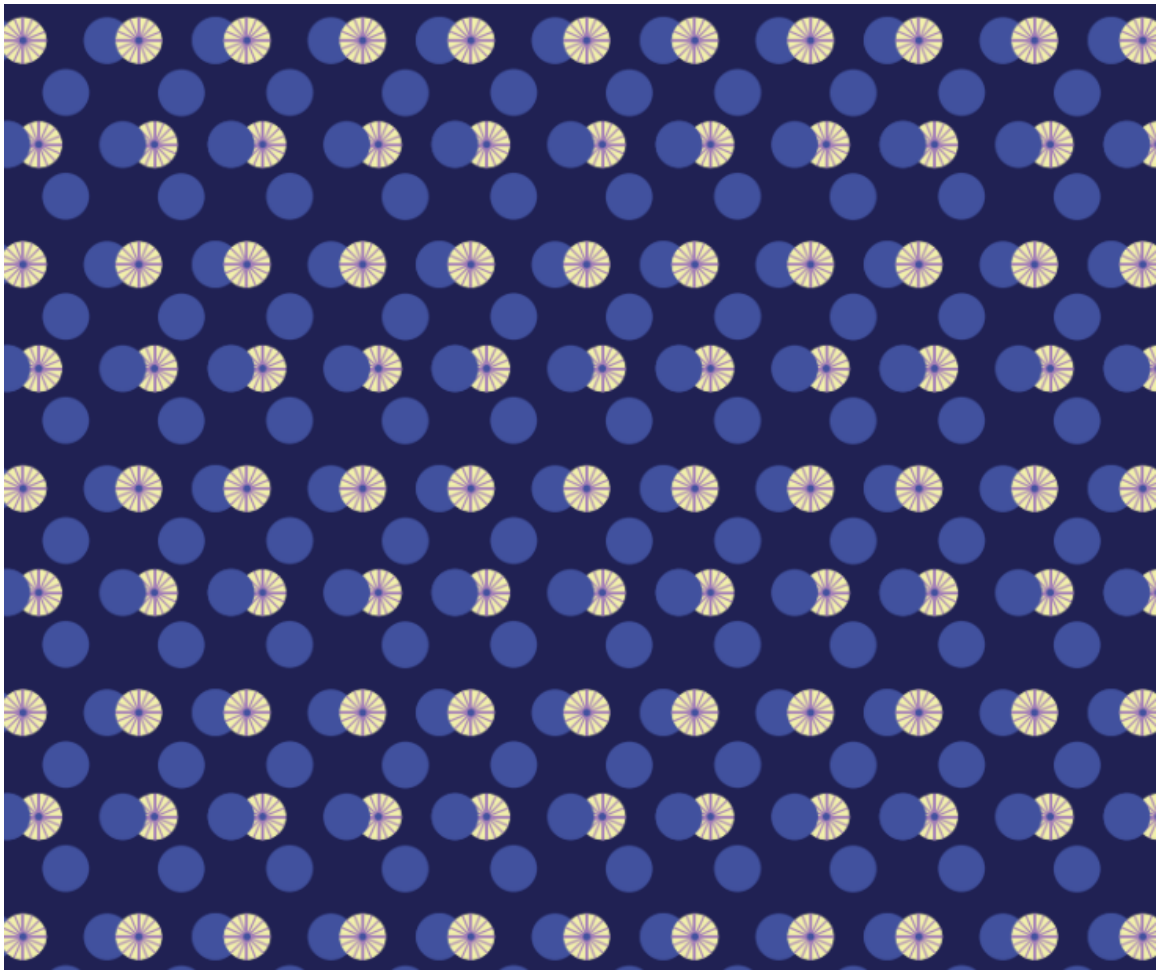
Design 3

This jumpsuit is inspired by workwear from the 1940s. The garment features a surplice design in order for the garment to be donned and doffed in a seated position. Shoulder plackets add room into the armscye for higher comfort when navigating with a mobility aid. The cuffs at the bottom of the legs and the wrists are secured with snaps. They can be unsecured to assist with donning and doffing and to create a different look based on personal taste. A hood allows for protection from weather elements. There are four pockets on this design. The two chest pockets are a fisherman style pocket, which

opens at multiple places to allow for greater storage of small items. The leg pockets are placed at the top of the leg for ease of access in a mobility aid and are divided to create a two-in-one pocket. The added belt allows for a more flattering silhouette and can be adjusted to multiple sizes.

Look 3 Prints





These two prints are the same symbols in two different colorways. It is inspired by the wheels of a wheelchair, which I used to create a polka dot motif. The background colors are in a darker color to disguise dirt and stains that come from mobility aid use. I scaled the prints differently to incorporate greater visual interest in the garment and utilize the same motif in multiple ways.

Reflective Critique

Throughout this research process, I have developed a greater understanding of the fashion industry, the process of research, and about the world of people with disabilities. While this project has not been linear, it has been the most impactful experience of my college experience by far. Having worked on this project over the course of two years, I can truly say that the lessons I have learned by completing my thesis will carry with me for the rest of my career and life.

First and foremost, I have learned some of the silent difficulties of those who live with disabilities. While I have been around people with disabilities all my life, I never realized how great of a hindrance that activities of daily living can be. People without disabilities rarely think about making spaces and items equitable for everyone. During this process, I was diagnosed with a disability myself. Having worked on this project, I instantly realized how the issues I had been researching now were personal to me. I do not have a mobility-related disability, so I cannot fully understand the experience of having a visible disability. But in my own small way, I have a better understanding of the importance health has on quality of life and can try and extend myself with kindness when I have to put my health first.

In addition, I have become more aware of the correct approach of working with marginalized communities and amplifying their voice instead of my own. When I first began the project, I created a survey to collect my data. As I began posting this in my selected Facebook groups, it was not received well. The disability community felt I was taking advantage of their emotional labor and reducing them to merely textboxes and

numbers. Realizing this, I was able to pivot my project to an interview based data collection system. This method was received much better, and I collected most of my participants within three days. Overall, I feel I learned much more by listening to the voices of women with disabilities directly. I have been able to amplify their voices beyond my own and truly make the women the focus of my thesis.

Along with that, I have developed skills in interviewing and transposing speech to text in a narrative format. It can be difficult to maintain confidence in an interview while still making the spotlight point towards the interviewee. Throughout this process, I learned how to truly listen and intake information and experiences contrary to my own. It takes a level of self-awareness to suspend preconceived notions of a situation or experience. Through talking with my participant group, I was afforded the opportunity to learn about a huge part of their daily lives. I wanted to translate their emotion into a narrative format that conveyed the gravity of their experiences while still remaining academic. Continually, I did my best to center the entire thesis around the actual experience of people with disabilities and how we can be more equitable as a fashion industry.

One of the most significant things I have gained is learning how to accept feedback without reflecting it on my personal worth. It can be difficult to open up to criticism as an academic, researcher, and writer. But the entire time I have worked with my mentors and my honors research class, I have been challenging myself to accept criticism with grace while understanding that everyone's goal is to make me a better student. As well, I have acquired more skills on working with others and respecting the

time and effort mentors put into their students. I truly could have never done this without the time Dr. Martindale has graciously poured into me. Someday, I hope to advise people with half the skills she has been able to for me.

This is the first large project I have significantly managed on my own, and it can be difficult to hold myself accountable to deadlines and feel motivated throughout the entire process. Between COVID-19, political unrest, and my own heath causing setbacks, I am proud of myself for preserving and reaching the goals I set for myself in the beginning. While my project has changed over time, it is a culmination of hours upon hours of work I poured into reading, writing, drawing, and sewing my way to communicating the importance of people with disabilities in our society.

Throughout this process, I have gained many technical skills. Now, I know how to use qualitative data analysis software, have printed my own fabric, learned new skills in Adobe Photoshop and Illustrator, and used sewing techniques I have never attempted before. This hands-on experience has been immeasurable to my growth as a designer and will only assist me in graduate school and continuing to the industry.

Also, I wanted my thesis to be understood by people outside of the fashion industry. People with disabilities are 25 percent of our country's population; this issue spans beyond the realm of fashion. My honors research class I have been in for the last three semesters has helped immensely on this front. Thank you for your wonderful feedback throughout the last year and a half.

Finally (and most significantly), I have gained immense amount of confidence in this subject matter and in myself as a scholar, designer, and person. Throughout the last

two years, I have defended the importance of my subject matter and ideas to dozens (if not hundreds) of people. Many had a severe lack of understanding about the gravity of this problem, as I also did when I started. Now, I can confidently communicate why solving this problem is important, how many people it affects, and what some of the potential solutions could be. During my junior year, I presented parts of this research as a business idea in a new venture pitch competition. Throughout the contest, I faced scrutiny from other contestants about how "marketable" my problem and solution were. This truly pushed me to communicate my ideas with confidence. At the end of the competition, I won! As much as it felt like a win to me, it felt more important that people finally understood why we should pay attention to people with disabilities. Overall, I am extremely thankful that this thesis has impacted my life as much as it has. I hope to continue this research in graduate school and beyond; my goal is to use fashion design to make everyone feel confident, no matter what your ability level is.

References

Abras, C., Maloney-Krichmar, D., & Preece, J. (2004). User-centered design. *Bainbridge, W. Encyclopedia of Human-Computer Interaction. Thousand Oaks: Sage Publications*, *37*(4), 445-456.

Americans with Disabilities Act of 1990, Pub. L. No. 101-336, § 2, 104 Stat. 328 (1991).

Armstead, C. S., (2018) *Presenting a retro appearance through sewing for oneself: Motivations and methods* (Doctoral dissertation). Graduate Theses and Dissertations. 17141. https://lib.dr.iastate.edu/etd/17141

Banks, K. (2001). Adaptive clothing—Preserves independence and assists the caregiver. *Professional Case Management*, *6*(6), 243-245.

Bowar, M. T. (1977). *Clothing for the handicapped: Fashion adaptations for adults and children.* Minneapolis: Sister Kenny Institute.

Burch, S., & Patterson, L. (2013). Not Just Any Body: Disability, Gender, and History. *Journal of Women's History 25*(4), 122-137. doi:10.1353/jowh.2013.0060.

Carroll, K. E., & Kincade, D. H. (2007). Inclusive Design in Apparel Product Development for Working Women With Physical Disabilities. *Family and Consumer Sciences Research Journal*, *35*(4), 289-315. doi:10.1177/1077727x07299675

Carroll, K., & Gross, K. (2010). An examination of clothing issues and physical limitations in the product development process: The clothing product development process. *Family and Consumer Sciences Research Journal*. *39*, 2-17.

Carroll, K. (2015). Fashion design and disability. In A. Gwilt (Ed.), *Fashion design for living* (151-167). New York: Routledge.

Centers for Disease Control. (2020, September 16). *Disability and Health Overview.* Disability and Health Promotion. https://www.cdc.gov/ncbddd/disabilityandhealth/disability.html

Chae M., (2019) "Stimulating Creative Thinking: Project Based Learning to Design Fashionable Adaptive Clothing", *International Textile and Apparel Association Annual Conference Proceedings* 76(1). doi: https://doi.org/10.31274/itaa.8254

Chang, W., Zhao, Y., Guo, R., Wang, Q., Gu, X., (2009). Design and study of clothing structure for people with limb disabilities. *J. Fiber Bioeng. Inform (JFBI)* (2, 62-67).

Chung, S. H., Lee, S. J., & Ahn, I. S. (n.d.). Universal Fashion Design Aesthetics to Accommodate Disabilities. *International Textile and Apparel Association*. doi:http://findingaids.lib.iastate.edu/spcl/manuscripts/MS342.pdf

Çivitci, Ş. (2004). An ergonomic garment design for elderly Turkish men. *Applied Ergonomics, 35*(3), 243-251. doi:10.1016/j.apergo.2004.02.001

Creswell, J. W., & Creswell, J. D. (2018). *Research design: qualitative, quantitative, and mixed methods approaches*. SAGE Publications, Inc.

Dallas, M.J., & White L. W., (1982). Clothing fasteners for women with arthritis. *The American Journal of Occupational Therapy*, *36*, 515. https://doi.org/10.5014/ajot.36.8.515

Davis, F. (1977). Deviance disavowal: The management of strained interaction by the visibly handicapped. In J. Stubbins (Ed.), *Social and psychological aspects of disability.* Baltimore: University Park Press.

Day, J. C., & Taylor, D. (2020, August 17). Do People With Disabilities Earn Equal Pay? Retrieved September 23, 2020, from https://www.census.gov/library/stories/2019/03/do-people-with-disabilities-earn-equal-pay.html

DeNavas-Walt, C., & Proctor, B. D., (2015), U.S. Census Bureau, Current Population Reports, P60-252, Income and Poverty in the United States: 2014, U.S. Government Printing Office, Washington, DC.

Elkouzi, A. (2020). What Is Parkinson's? Retrieved from https://www.parkinson.org/understanding-parkinsons/what-is-parkinsons

Erickson, W. Lee, C., & von Schrader, S. (2020). 2017 Disability Status Report: United States. Ithaca, NY: Cornell University Yang Tan Institute on Employment and Disability (YTI).

Freeman, C. M., Kaiser, S. B., & Wingate, S. B. (1985-1986). Perceptions of functional clothing by persons with physical disabilities: A social-cognitive framework. *Clothing and Textiles Research Journal* 4 (1) , 46-52.

Gallucci, N. (2018, April 6). Tommy Hilfiger unveils innovative clothing line for people with disabilities. Retrieved from https://mashable.com/2018/04/06/tommy-hilfiger-tommy-adaptive-disibility-friendly-clothing/

Gilleard, C., & Higgs, P. (2015). Aging, embodiment, and the somatic turn. *Age, Culture, Humanities: An Interdisciplinary Journal*, 2(2015), 17-33.

Hansen, T., & Møller Jensen, J. (2009). Shopping orientation and online clothing purchases: the role of gender and purchase situation. *European Journal of Marketing*, 43(9/10), 1154-1170. https://doi.org/10.1108/03090560910976410

ISO 13407:1999. ISO. (1999). https://www.iso.org/standard/21197.html.

Johnson, E. (2017, December 9). *The Real Cost of Your Shopping Habits*. https://www.forbes.com/sites/emmajohnson/2015/01/15/the-real-cost-of-your-shopping-habits/.

Kabel, A., Dimka, J., & Mcbee-Black, K. (2017). Clothing-related barriers experienced by people with mobility disabilities and impairments. *Applied Ergonomics*, *59*, 165–169. https://doi.org/10.1016/j.apergo.2016.08.036

Karat, J. (1997). Evolving the scope of user-centered design. *Communications of the ACM*, *40*(7), 33–38. https://doi.org/10.1145/256175.256181

Kay, F., & Storey, N. R. (2018). *1940's Fashion*. Amberley Publishing.

Kernaleguen, A. (1980). *Clothing designs for the handicapped*. University of Edmonton P.

Kidd, L. K., (2006). A case study: creating special occasion garments for young women with special needs. *Clothing and Textile Research Journal, 2*4(2), 161-172.

Klein, F., & Madrid-Han, J. (2018, September 24). *IZ Adaptive Launches Expanded Inclusive Fashion Collection*. PR Newswire: news distribution, targeting and monitoring. https://www.prnewswire.com/news-releases/iz-adaptive-launches-expanded-inclusive-fashion-collection-300717215.html.

Kosinski, K., Orzada, B., & Kim, H.S., "Commercialization of Adaptive Clothing: Toward a Movement of Inclusive Design" (2018). *International Textile and Apparel Association (ITAA) Annual Conference Proceedings*. 107. https://lib.dr.iastate.edu/itaa_proceedings/2018/presentations/107

Kraus, L., Lauer, E., Coleman, R., and Houtenville, A. (2018). 2017 Disability Statistics Annual Report. Durham, NH: University of New Hampshire.

Kuckartz, U., & Rädiker, S. (2019). *Analyzing qualitative data with MAXQDA*. Switzerland: Springer International Publishing.

Lam M., Wing Y., Yu M. W., et al. Mental Morbidities and Chronic Fatigue in Severe Acute Respiratory Syndrome Survivors: Long-term Follow-up. *Arch Intern Med.* 2009;169(22):2142–2147. doi:10.1001/archinternmed.2009.384

Lamb, J. M., & Kallal, M. J. (1992). A Conceptual Framework for Apparel Design. *Clothing and Textiles Research Journal*, *10*(2), 42–47. https://doi.org/10.1177/0887302X9201000207

Langtree, I. (2016). *Adaptive Clothing: Adapted Clothes Information and Suppliers*. from http://www.disabledworld.com/assistivedevices/adaptive-clothing

Lee, H., Jin, H. (2019). Conceptual design framework as a model for wheelchair users' sportswear comfort. *Fash Text 6,* (23). https://doi.org/10.1186/s40691-019-0179-z

Leonard, D. A., & Rayport, J. (2011). Spark Innovation through Empathic Design. *Managing Knowledge Assets, Creativity and Innovation*, 355–369. https://doi.org/10.1142/9789814295505_0016

Lennon, S. J., Johnson, K. K. P., & Rudd, N. A. (2017). *Social Psychology of Dress*. Fairchild Books, an imprint of Bloomsbury Publishing Inc.

Lieber, C. (2019, October 22). The Adaptive Fashion Opportunity. Retrieved September 23, 2020, from https://www.businessoffashion.com/articles/professional/the-adaptive-fashion-opportunity

Li, J., Wang, Y., Wu, D. & Zhao, M. (2013). Evaluation on an ergonomic design of functional clothing for wheelchair users. *Applied Ergonomics, 45*(3), 550-555.

Martins, S. B., & Martins, L. B. (2012). Ergonomics, design universal and fashion. *WORK: A Journal of Prevention, Assessment & Rehabilitation, 41*(1), 4733-4738. doi:10.3233/WOR-2012-0761-4733

McBee-Black, K., & Ha-Brookshire, J. (2018). Exploring clothing as a barrier to workplace participation faced by people living with disabilities. *Societies*, *8*(1), 19.

McBee-Black, K., & Ha-Brookshire, J. (2020). Words Matter: A Content Analysis of the Definitions and Usage of the Terms for Apparel Marketed to People Living With Disabilities. *Clothing and Textiles Research Journal*, 38(3), 166–181. https://doi.org/10.1177/0887302X19890416

Menec, J. M. (1989). A team approach to special needs garment design. *Canadian Home Economics Journal*, *39*(1), 3-5.

Morris, K. (2019) “Adaptive Active – Embedding Inclusion into Activewear”, *International Textile and Apparel Association Annual Conference Proceedings*. 76(1). doi: 10.31274/itaa.9544

Morris, K., Park, J., & Sarkar, A. (2017). Development of a Nursing Sports Bra for Physically Active Breastfeeding Women Through User-Centered Design. Clothing and Textiles Research Journal, 35(4), 290–306. https://doi.org/10.1177/0887302X17722858

Na, H. (2007). Adaptive Clothing Designs for the Individuals with Special Needs. *Journal of the Korean Society of Clothing and Textiles, 31*(6), 933-941. doi:10.5850/jksct.2007.31.6.933

Nevala, N., Holopainen, J., Kinnunen, O., Hanninen, O., 2003. Reducing the physical work load and strain of personal helpers through clothing design. *Applied Ergonomics*. 34. doi: https://doi.org/10.1016/S0003-6870(03)00080-2

Newton, A. (1976). Clothing: A positive part of the rehabilitation process. Journal of Rehabilitation, 42(5), 18-22.

Ng, S. F., Hui C.L., Wong, L.F., 2011. Development of medical garments and apparel for the elderly and disabled. *Textile Prog. 43,* 235-285.

Nisbett, D., & Johnson, K. K. (1992). Clothing and individuals with a disability: Impressions of social and mental competencies. *Clothing and Textiles Research Journal*, *11*, 39-44.

O'Connell, L. (2019, November 19). *Average number of clothing items purchased by women U.S. 1996-2021*. Statista.

https://www.statista.com/statistics/828040/average-number-of-clothing-items-purchased-by-women-us/.

Orzada B. T. & Kallal M., (2016) "FEA Consumer Needs Model: Looking Forward, Looking Back", *International Textile and Apparel Association Annual Conference Proceedings* 73(1).

Park, J., Morris, K., Stannard, C., & Hamilton, W. (2014). Design for Many, Design for Me: Universal Design for Apparel Products. *The Design Journal*, *17*(2), 267–290. https://doi.org/10.2752/175630614x13915240576103

Reddy, K. (2019, May 8). *1940-1949*. Fashion History Timeline. https://fashionhistory.fitnyc.edu/1940-1949/.

Reich, N., & Shannon, E. (1980). Handicap: Common Physical Limitations and Clothing-Related Needs. *Home Economics Research Journal, 8*(6), 437-444. doi:10.1177/1077727x8000800608

Rosenblad-Wallin, E., (1985). User-oriented product development applied to functional clothing design. *Applied ergonomics, 16 4*, 279-87. https://doi.org/10.1080/17543266.2012.700735

Rutledge, B., (2017). *Autoethnographic Study in the Process of Applied Design: Creating Adaptive Clothing for a Child with Spinal Muscular Atrophy* (Master's thesis, Thesis/Dissertation ETD, 2017) (pp. 11-21). Atlanta: Georgia State University. doi:https://scholarworks.gsu.edu/art_design_theses/212/

Ryan, F., (2018, July 18). Why are there more clothing lines for dogs than disabled people? *The Guardian.* Retrieved from

https://www.theguardian.com/society/2018/jun/18/why-are-there-more-clothing-lines-for-dogs-than-disabled-people

Saldaña, J. (2016). *The coding manual for qualitative researchers*. Thousand Oaks, CA: Sage.

Sarcone, K. (2017). *Marginalized Consumers Exploring Disability, Body Image, and Clothing Consumption*. (Master's thesis, Brown University School of Public Health, Rhode Island). Retrieved from https://static1.squarespace.com/static/5914aedc5016e1fa958ecd79/t/5a56b86c9140b755af452455/15156327500

Shimizu. (2020, December 1). *Disability and health*. World Health Organization. https://www.who.int/news-room/fact-sheets/detail/disability-and-health.

Shrimpton, J. (2015). *Fashion in the 1940s*. Shire Publications.

Siccama, C. J., & Penna, S. (2008). Enhancing Validity of a Qualitative Dissertation Research Study by Using NVIVO. *Qualitative Research Journal*, *8*(2), 91–103. https://doi.org/10.3316/qrj0802091

Social Security. SSA. (2019). https://www.ssa.gov/disabilityfacts/facts.html#:~:text=Disability%20is%20unpredictable%20and%20can%20happen%20to%20anyone%20at%20any%20age&text=The%20sobering%20fact%20for%2020,disability%20benefits%20for%20income%20support.

Stokes, B. M. (2010). *Clothing Needs of Teen Girls with Disabilities* (Master's thesis). Washington State University.

Stokes, B., & Black, C. (2012). Application of the functional, expressive and aesthetic consumer needs model: Assessing the clothing needs of adolescent girls with disabilities. *International Journal of Fashion Design, Technology and Education*, *5*(3), 179-186. Suri, P. (2016). Clothing needs assessment for wheelchair users. *(Electronic Thesis or Dissertation)*. Retrieved from https://etd.ohiolink.edu/

Story, M. F., Mueller, J. L., & Mace, R. L. (1998). *The universal design file: Designing for people of all ages and abilities*. Raleigh, NC: School of Design, the Center for Universal Design, NC State University.

Strauss, A., & Corbin, J. (1990). Basics of qualitative research: Grounded theory procedures and techniques. Newbury Park, CA: Sage.

Taylor, M. (2008). Disabled in Image and Language. In Swain, J & French, S. (Eds). *Disability on Equal Terms*. Los Angeles: Sage Publications. 31-41.

Tenforde MW, Kim SS, Lindsell CJ, et al. (2020). Symptom duration and risk factors for delayed return to usual health among outpatients with COVID-19 in a multistate health care systems network. MMWR Morb Mortal Wkly Rep 2020;69:993-998. DOI: http://dx.doi.org/10.15585/mmwr.mm6930e1external icon.

The History of Wheelchairs. (2020, February 13). https://unitedspinal.org/wheelchairs-the-evolution/

The US Population Is Aging. Urban Institute. (2015, April 3). https://www.urban.org/policy-centers/cross-center-initiatives/program-retirement-

policy/projects/data-warehouse/what-future-holds/us-population-aging#:~:text=The%20number%20of%20Americans%20ages,The%20nation%20is%20aging.

Thoren, M. (1996). Systems approach to clothing for disabled users. Why is it difficult for disabled users to find suitable clothing. *Applied Ergonomics*, (27), 389-396.

Thornton, N. (1990). Fashion for disabled people. London: B.T. Batsford.

Todd, W. L., & Norton, M. J. (1996). Garment-Doffing Kinematic Analysis. *Clothing and Textiles Research Journal, 14*(1), 63-72. doi:10.1177/0887302x9601400108

Vazquez, S. M. (2020, July 22). *5 Women's Adaptive Clothing Lines That Will Help You Get Dressed With Ease*. Woman's World. https://www.womansworld.com/gallery/fashion/best-womens-adaptive-clothing-lines-169076

Wang, Y., Wu, D., Zhao, M., & Li, J. (2014). Evaluation on an ergonomic design of functional clothing for wheelchair users. *Applied Ergonomics*, (45), 550–555.

Wingate, S. B., Kaiser, S. B., & Freeman, C. M. (1985-1986). Salience of disability cures in functional clothing: A multidimensional approach. *Clothing and Textiles Research Journal, 4*(2), 37 – 47. DOI: 10.11.77/0887302X8600400206

World Health Organization. (2007). *International Classification of Functioning, Disability, and Health: Children & Youth Version: ICF-CY*. World Health Organization.

Yin, M. (2019, January 17). *Those with Disabilities Earn 37% Less on Average; Gap is Even Wider in Some States*. American Institutes for Research. https://www.air.org/news/press-release/those-disabilities-earn-37-less-average-gap-even-wider-some-states.

Zhang, R., & Cho, S., "User-centered design and niche-market development: Engaging Students in the design and merchandising" (2017). *International Textile and Apparel Association (ITAA) Annual Conference Proceedings. 12.* https://lib.dr.iastate.edu/itaa_proceedings/2017/presentations/12