Do You See What I See?
The shopping experiences of people with visual impairment

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INTRODUCTION

Although the needs of people with disability and designs for barrier-free living are advocated for globally (World Health Organization, 2015) and legislated in Canada (Accessible Canada Act, 2019) and the United States (Americans With Disabilities Act, 1990), legislative compliance does not ensure the needs of people with disability have been met. Designing inclusively to create retail environments with well-designed signage and wayfinding systems is a complex undertaking, especially when considering how people without full visual acuity might navigate such spaces confidently. Our research examined the shopping experiences of people with visual impairment and offers an alternative way to understand their needs. We consider taskscape theory and multiple-method ethnographic perspectives to learn the viewpoints of shoppers with visual impairment by examining shopping activities through two lenses—wayfinding and signage—to determine criteria for improved design.

Shopping is an innately human "leisurely activity" (Bradley et al., 2000, p. 80) that has drawn some scholars' attention (e.g., Miller et al., 1998). Shopping malls are environments where shoppers are "bombarded with stimulation … signage, sounds and crowds" (Dogu & Erkip, 2000, p. 738). A shopping mall in Canada typically comprises an enormous building with few exterior markings, a bus depot, sometimes rail transit, as well as parking lots and multiple entry points on two or more levels. The interior has an extravaganza of lights, color, signage, various types of flooring, crowds of people, escalators, elevators, staircases, a food court, public restrooms, and a mall directory floor plan that lists retailers.

LITERATURE REVIEW

Scant scholarly work brings together the assessment of users' needs in shop-

Abstract /

This article reports on the shopping experiences of people with visual impairment (n = 7) and offers an alternative way to understand their needs. Our study adopted taskscape theory and multiple-method ethnographic perspectives to obtain viewpoints of shoppers with visual impairment and examined shopping activities through two lenses (wayfinding and signage) to determine criteria for improved design. We used taskscape theory to gain insights into how this population perceives signage as well as a participatory, human ecological, systems approach to identify the complexity of wayfinding among people with visual impairment. We used observation, notetaking, photography, and interviews to gain insights into personal and social factors affecting participants' experiences when navigating in shopping malls. Our data-driven results include a characterization of seven activities—pre-shopping, traveling to the mall, mall navigation, in-store navigation, merchandise evaluation, checkout, and post-shopping—within the shopping taskscape of shoppers with visual impairments that help assess user needs regarding signage and wayfinding. The shopping taskscape provides a systems approach to advance ideas around designing complex environments for able-bodied people and those with disability.

Keywords /

disability; shopping malls; signage; taskscape; wayfinding

ping malls and shoppers with visual impairment. As such, this section focuses on shopping, wayfinding, and the use of taskscape theory to better understand shoppers' needs. The shopping practices of people with visual impairment have been examined through research on consumer normalcy (Baker, 2006), dependence and independence (Baker et al., 2001), enhanced accessibility (Baker et al., 2002), grocery shopping (Yuan et al., 2019), and shopping for clothing in brick-and-mortar stores (Bradley et al., 2000; Yu et al., 2015).

Collectively, studies on shopping point to personal factors related to people with visual impairments' confidence and capabilities, challenges of navigating labyrinthine spatial environments, and physical barriers. People with visual impairment struggle with attitudinal barriers, such as negative behavior from salespeople (MacDonald et al., 1994). Bradley et al. (2000) found that people with visual impairment have trouble distinguishing prices and sizes of garments, navigating fitting rooms, and struggle with ambient factors such as lighting, color perception, and signage. Yuan et al. (2019) similarly highlight difficulties with checking out, arranging transportation, parking, and locating mall entrances and restroom facilities.

Dogu and Erkip (2000) define wayfinding as "a set of tools devised to help people reach their destination in an unfamiliar environment" (p. 735). Basic requirements that people need to find their way include information booths, mall maps, visual access and signage, as well as safe and clear spaces that lead to a destination (Dogu & Erkip, 2000, p. 738). Bradley et al. (2000) identify issues with navigating merchandise displays and recommend wider aisles to mitigate difficulties for shoppers in wheelchairs, a solution that may not benefit people with visual impairment as they can become disoriented in overly large spaces.

Many scholars identify that good lighting and signage benefit people and that signage details (e.g., color, typeface size, positioning within spaces, and lighting) contribute to comprehension (Bradley et al., 2000; Dogu & Erkip, 2000; Yu et al., 2015). Architectural features, such as fixtures and fittings, often do not account for the diversity of bodily capabilities (Imrie, 2000). Spatial environments, including entrances, landmarks, and hori-

zontal and vertical circulation are not often discernible within shopping malls (Dogu & Erkip, 2000). The wayfinding route descriptions provided to people with visual impairment by those who have sight are inadequate (Saerberg, 2010), and assistive technologies, such as GPS, are either not desirable or rendered useless in the spaces typical of shopping malls (Maus et al., 2016). Such personal and social factors, combined with challenges around navigating environments, indicate a need to deeply examine the experiences of people with visual impairment in shopping malls.

Taskscape was introduced by Ingold (1993) in his essay titled "The Temporality of the Landscape" and by Kirsh (1996) from the perspective of interactive cognitive science. Ingold's original proposition, that all activities involve a set of dynamic tasks, has since been developed in other ethnographic studies; Vannini (2011), for example, examined passenger performance in catching a ferry. Tullio-Pow (2016) and Tullio-Pow and Strickfaden (2020) tease out taskscape further through explorations into the "clothing taskscape" as a means to assess user needs. Previous research on taskscape theory informs our definition as follows: while activities like shopping ostensibly are similar for everyone, they are different depending on time, place, the relationship between tasks and activities, and an individual's abilities/capabilities. For the purpose of this work, we do not provide a full critical examination of taskscape theory. Rather, we use taskscape to advance our understanding of the needs of people who are visually impaired as related to signage and wayfinding when shopping.

For instance, scholars suggest using access audits of shopping facilities to mediate the needs of people with disability (Bashiti & Rahim, 2016), to examine parking, transit stops, pedestrian walkways, curb cuts, and signage, as well as pathways, doors, stairs and ramps, reception/information counters, and washrooms. Other scholars advise adding tactile warnings (Bradley et al., 2000; Strickfaden & Devlieger, 2011b), accessible graphics and route maps (Strickfaden & Devlieger), Braille, and color contrasts (Bradley et al.). Few can dispute the value of comprehensive design recommendations, however Strickfaden and Devlieger suggest designing with visually impaired people's bodies to work toward more holistic wayfinding "systems" that are "not just

single solutions" (p. 645).

This research team is comprised of investigators with complementary expertise. The first author is an apparel designer who specializes in assessing the needs of people with disability to create inclusive clothing solutions. The second author works in the areas of consumer behavior, shopping, and evaluating retail spaces. The third author is a design anthropologist who focuses inquiry on complicated problem solving for people with disabilities. Approaching the research problem from these diverse perspectives facilitated a more holistic inquiry.

MULTIPLE-METHOD
ETHNOGRAPHIC APPROACH

Ethnography is a qualitative approach adopted by design anthropologists (e.g., Clarke, 2016; Gunn et al., 2013) and modified to have an applied focus (Norman, 2013) to investigate user experience. Applied ethnography allows the researcher to become familiar with use-contexts, interfaces between people and objects during activities within environments, and the complicated relationships people have with things (Miller, 2010), all of which enhance understanding and formulation of relevant interview questions.

Walking with people who are visually impaired fosters a heightened awareness of things that otherwise might not have been considered. This approach, walking with a person who is visually impaired, was richly described by Horowitz (2013) in *On Looking: Eleven Walks with Expert Eyes*. Strickfaden and Devlieger (2011a, 2011b; Devlieger & Strickfaden, 2012) used applied ethnographic methods to investigate disability in situ when redesigning the Brussels Metro for people with visual impairment and blindness. This study takes a more holistic view of shoppers with visual impairment within shopping malls, guided by a human ecological "systems" perspective (Ingold, 2011) and Yuan et al.'s (2019) participatory design approach.

We used observation and go-along interviews (Kusenbach, 2003) to accompany participants on their shopping trips to better understand shopping from an inclusive design perspective. This facilitated our observation of activities, environments, and objects encountered to better understand users' needs. Agar (2010) endorses field observation to observe "real moments that involve real people doing real things" (p. 294). The embodied knowledge of the people shopping is considered a kind of techné, or everyday know-how of people doing activities related to day-to day-living (Flyvbjerg, 2001). Observation of such activities allows researchers to learn the nuances of end users by examining their engagement with everyday objects, providing a way to develop empathy (Strickfaden & Devlieger, 2011a).

RECRUITMENT AND PARTICIPANTS

Recruitment was facilitated by an independent consultant from the Greater Toronto Area who was affiliated with a Canadian national advocacy group for people with visual impairment. Eligible participants were over the age of 18 with visual acuity in at least one eye equal to or less than 20/40. We provided information pertaining to the study to those who were interested. People who agreed to participate provided consent and completed the demographic survey, which collected information pertaining to age, gender, household and employment status, education, and income, as well as the cause of vision loss and level of visual acuity.

Participants (n=7) included three women and four men between the ages of 41 and 70. They identified their favorite department store and apparel retailer in a specific shopping mall. Shopping dates were scheduled and two of the researchers met each participant at the mall entrance and accompanied them while they took part in a 75-minute shopping trip. Sixty-minute interviews followed immediately afterwards. A $75 gift card to the shopping mall served as an incentive. See Table 1 for details about our shoppers (identified by a pseudonym), including gender, age at the time of their vision loss, and diagnosis.

DATA COLLECTION

Data collection began by shadowing participants as they shopped (*see* Martin & Hanington, 2012). Participants were encouraged to think out loud while shopping and to physically identify issues of concern with their bodies. The retail environments visited were

Table 1 / Participant Information

Participant*	Gender	Age	No. of years since vision loss	Cause of vision loss
Lewis	M	61-70	>10	Glaucoma
Mari	F	61-70	1–5	Retinal detachment
Bruce	M	61-70	>10	Retinitis pigmentosa
Alan	M	41-50	5–10	Stargardt's
Janice	F	41-50	Born visually impaired	Glaucoma
Dwayne	M	41-50	>10	Glaucoma
Marilyn	F	51-60	>10	Retinitis pigmentosa

*Pseudonym.

familiar to participants and this helped them to articulate the significance of and association to the surroundings, activities, and other people's actions, aiding recall of "mundane details too trivial to think and talk about during more formal research occasions" (Kusenbach, 2003, p. 470). Field notes and photographs were used to document shopping excursions. Interviews took place in a quiet corner in the mall's food court; responses were audio-recorded and transcribed. Questions focused on descriptive, grand tour narratives (Bagnoli, 2004), getting to the shopping mall, logistical barriers, challenges encountered, and suggested solutions.

DATA ANALYSIS

Taskscape theory provides a means to assess user needs in a more holistic way (Tullio-Pow & Strickfaden, 2020). Characterizing a taskscape begins with categorizing environments and activities/tasks. Before starting our detailed analysis, transcripts were verified for accuracy against the audio recordings. We then discussed key definitions for wayfinding and signage. We defined wayfinding as any activity that involved navigating from one place to another. Signage was broadly defined to comprise physical signage but also anything that our participants needed to read, including clothing price and care content tags as well as size labels, the cash register and debit machine display, sales receipts, and employee name tags. Field notes and transcripts were thematically reviewed for aspects related to wayfinding and signage and annotated during multiple readings. Photographs were viewed and matched with information in the transcripts. The data set was then sorted into themes to identify and define activity categories, and this formed the basis of what we call the shopping taskscape. Each member of the research team independently scrutinized the data related to each activity in the shopping taskscape. Discussions to re-examine the data collectively further helped us define themes and subthemes to ensure intercoder reliability.

Creswell (2009) notes that reliability and validity are enhanced through triangulation, rich, thick description, and prolonged time in the field. We shopped with participants for almost 9 hours over 7 days in different shopping malls. We discussed their shopping experiences over more than 6 hours of interviews. Shopping together and talking afterwards offered us multiple ways of knowing, revealing subtle details that may not have been apparent if participants had merely self-reported their experiences via traditional interview.

RESULTS: THE SEVEN ACTIVITIES OF THE SHOPPING TASKSCAPE

The results of this study are characterized around the shopping taskscape, encompassing seven activities that our shoppers engaged in chronologically (*see* Figure 1). The results illustrate factors related to wayfinding and signage that influence the shopping experience of people who are visually impaired. Examining user needs through the activities depicted in the shopping taskscape provides an opportunity to better understand users' needs, values, challenges, and related solutions to establish criteria relevant to the design process.

Activity	Wayfinding	Signage
Pre-shopping	• Website – mall directory • Website – retailer • Transit route/schedule • Mall directory • Construction alert	Website content: • Product information • Stock and price • Construction alert
Travelling to the mall	• Transit route simplicity • Audio announced stops • Transfer from public transit to mall entrance	• Transit signage
Mall navigation	• Information desk • Guided escort • Lighting • Architectural landmarks • Construction • Glass walls with door • Stairs	• Store signage • Lighting
In-store navigation	• Lighting/glare • Floorplan layout • Aisle space/clutter • Merchandise displays • Flooring type • Flooring color • Mirrors/glass	• Name tags • Employee uniforms
Merchandise evaluation	• Fitting room • Salesperson	• Price tags • Size labels • Care instructions • Lighting/glare • Price scanner • Magnifier
Checkout	• Salesperson • Cash register location • Start point of line-up • Flooring	• Cash register display • Debit/credit machine • Touch screen display • Sales receipt font size & contrast • Ceiling signage
Post-shopping		• Food court menu signage • Receipt verification • Online bank statements

Figure 1 / The Shopping Taskscape

Note: Results were characterized by seven activities in the shopping taskscape including: (clockwise from the top) pre-shopping, traveling to the mall, mall navigation, in-store navigation, merchandise evaluation, checkout, post-shopping.

Activity 1 encompassed the pre-shopping activities that our participants engaged in prior to leaving their homes. These include checking internet sites for product information, comparing pricing, studying the online mall directory, and phoning the store to check stock availability. Activity 2 involved the shopper physically traveling to the mall, usually by taking public transit or riding with a friend in their car. When taking public transit, wayfinding transit routes were planned in advance. Activity 3 was about navigation in the mall. This began with a visit to the central information desk to inquire about store locations and public restroom facilities. Shoppers often requested a guided escort (typically a security guard) and were attentive to architectural landmarks as they made their way to their chosen store. Activity 4 encompassed navigation in the store. Upon arrival, our shoppers would assess the retail environment, including an evaluation of physical cues such as store lighting and layout. In addition, wayfinding was scrutinized, specifically how well defined or cluttered the aisles were. Shoppers considered other factors that impacted their successful navigation, including flooring type (tile or carpet), color or surface contrast, merchandise displays, and use of mirrors and glass. Activity 5 involved the shoppers evaluating merchandise, looking at clothing styles and available colors, finding a price scanner, and sometimes using their personal hand-held magnifier to discern pricing, care instructions, and the fiber content of clothing. During this activity shoppers often searched for a salesperson who could provide assistance locating the fitting rooms. Once purchasing decisions were made, participants proceeded to the checkout/point-of-sale area, paying by cash or credit/debit card, which was Activity 6. Activity 7 included post-shopping activities. Our shoppers would often visit the food court before returning home the same way they arrived. Once at home, they verified and scanned receipts, which were saved to their computer for record-keeping. Shoppers then checked their bank or credit card statement online to confirm their purchases.

The following results identify the specific details of each of the seven activities with a focus on issues related to wayfinding and signage through each phase of the shopping taskscape. Participants sometimes suggested solutions for identified problems.

Pre-Shopping

Shoppers used the internet to gather information prior to setting out for the mall. Shopping was typically scheduled with a specific purpose. Retailers' websites were checked to gather pricing and product information; as Lewis indicated: "I'll have something very specific in mind, I don't do window shopping anymore." This sentiment was echoed by Marilyn: "I often use websites. … Pottery Barn has a fabulously accessible website … they have very complete information."

Shoppers would also review the shopping mall directory layout online to determine the locations of specific retailers. Information communicated on the website was crucial, as described by Mari:

> I use the internet a lot. Even before I came today, I checked to see about the retail outlets to make sure that Lululemon was here and where it was. … Now on the website they didn't say it was under construction because I checked.

Janice recounted using her phone to confirm product availability before leaving home:

> My normal routine is doing some pre-shopping at home for the specific item I'm looking for. … I may source it out on the internet … I don't want to make a trip there to realize they don't have it.

Before even setting foot in the mall, multiple factors influenced shopping success. Shoppers would use the internet to do preliminary wayfinding within the mall directory for the store location. Knowing about unusual situations, such as construction, allowed our shoppers to map out alternate routes or postpone their trip. Besides, being confident about stock availability and pricing details ensured that shopping trips were not carried out in vain. Knowing that these factors are essential to shoppers with visual impairment, and communicating this information effectively, is relevant to website designers, retailers, and mall developers.

Traveling to the Mall

All shoppers reported that mobility was the biggest daily challenge they faced. Unable to drive and dependent on public transportation or getting a ride with a friend,

the range of places they could shop in was limited. Wayfinding and signage impacted their success in getting to the mall; shoppers mentioned transit signage and the directness of the route travelled. Shopping in retail spaces was easier in malls they were familiar with, as Mari described:

> I often shop at the Eaton Centre even though it's far from where I live. I'm willing to travel that far because it's easy. The ease of transportation, I don't have to do any transfers, so it's a simpler process. And it's always the same, things don't change. I always get off the same place. … I can memorize it. Basically, you want to keep it as simple as possible.

Dwayne mentioned a different factor—the directness of the route from the transit system drop-off point into the mall: "I use the entrance from the subway, I don't go from the street because I don't like walking through stairs. I get distracted and scared and … I get lost. Near the Gap and Old Navy stores, there are stairs, and they crisscross."

Bruce mentioned the transit schedule and bus signage:

> I take the bus and subway on the regular routes I travel. I can't see the numbers on the bus, so I have to ask the driver. If it is a new route, I call the TTC [Toronto Transit Commission] ahead of time to find out the schedule. If the bus has an A, B, C, D behind the number, for example, I take the 39 bus, I may jump onto the wrong bus because I can't see the difference. After a couple of stops I know if I'm on the wrong bus. A, B, C, D sometimes may be challenging. On the new buses, the numbers are bigger. One of the amazing things in the last couple of years, they'll read out the stops; that is incredibly helpful.

The effort required along the transit journey was carefully considered by our shoppers. Wayfinding ease was influenced by the directness of the route and absence of transfer points as well as the simplicity of transition from the transit drop-off point to the mall entrance, notably a lack of stairs. Also highlighted were problems discerning signage that combined alpha and numeric lettering, the size of the lettering, and the advantages of audio-announced destination points. These factors are relevant to transit planners, mall developers, and architects.

Mall Navigation

Navigating the shopping mall highlighted several challenges. The mall's information desk was crucially important to our shoppers and their first stop upon arrival to inquire about store and washroom locations. Dwayne described the problems he encountered and offered a solution:

> The problem I have is finding the information desk. … [At the Eaton Centre] it is not very accessible. It's not very bright, the lighting there is very poor. I had to find it on my own and it took a long time. I had to ask people and go up stairs. For me they should have more than one information desk. And if there is only one, it should be closer to the

entrance of the mall rather than … in the middle. Or they should have a phone that you just pick up and ask a question rather than physically finding the information desk. The other problem I have is that I don't know where the washrooms are. … I can't find the washrooms in a hurry there.

Sometimes, shoppers would request a guide to escort them. This too had its challenges, as Alan indicated:

I asked [them] to verbalize [landmarks] as we were walking to the store, because I wanted to get to the store on my own in the future. …That's my biggest frustration, that people don't use audible cues; most people point. With customer relations, I often get someone [who] kind of guides me from behind and pulls on me like a dog at the end of a chain as opposed to letting me take their arm or asking.

When shopping on his own, Bruce mentioned these strategies: "I've had orientation mobility lessons. I practice those. You count your steps literally; those are pretty basic techniques to use." However, this strategy didn't work during mall renovations: "I have a good memory but sometimes you don't get specific directions. If there is construction in the middle of the mall, it's confusing. I don't remember what floor I'm on … and which direction I'm going."

Signage again was mentioned as problematic by Bruce: "I can't always read the signs even if I go close to it. … Sometimes I can't read the sign because there is no contrast, or the light is shining and it's metal." As he stated this, Bruce pointed to the storefront of a hair salon in the mall we were visiting. The sign featured shiny and reflective lettering applied to a metal background. (One of

Figure 2 / Example of Inaccessible Signage

Note: Metallic script lettering on a metallic background creates a sign that is unreadable by people with visual impairment.

the researchers photographed the sign; *see* Figure 2.)

Examining activities while our shoppers navigated through the mall highlighted how the ease of wayfinding was enhanced by the logical placement of the information desk near the main entrance, thoughtful placement of architectural landmarks in the mall to provide cues, and employees who were trained to properly guide people with visual impairment. Our shoppers indicated how optimal lighting and construction renovations in the mall either enhanced or diminished their functional abilities and commented on the problematic reflection caused by glare from certain types of lighting and shiny metal surfaces. These factors are essential to industrial designers, architects, and those who design employee training programs.

In-Store Navigation

Upon arrival, our shoppers assessed the store environment before going inside. Simply finding the entrance was an arduous task, as Lewis explained: "Glass doors, you can't tell whether they're open or closed. I can never find my way into the Gap because I can't tell … I will wait and follow someone in because I don't want to walk into the wall." After this was discussed with the research team, we became more aware of how many storefronts' entrances are embedded in a glass wall. Figure 3 shows two all-glass storefronts in a mall we visited.

Figure 3 / Concealed Entrances
A) A glass storefront with doors that have handles. B) One with sliding doors.

Mari elaborated her thought process when assessing the store environment:

> One of the first things I look for in a shop is the physical layout, lighting, and clearly defined aisle spaces with well-displayed merchandise. It makes a huge difference. I don't even bother going into a store where those elements are not in place. For instance, today we went into a large department store that had wide aisles and excellent lighting. They had good wayfinding cues, dark tiles outlining white tiles, which makes it very easy to navigate.

Our shoppers also suggested that the reflective quality of glass, mirrors, and dark colors presented wayfinding challenges. Janice highlighted the perception of mirrors and wide expanses of dark color:

> It's difficult to navigate with mirrors because they reflect light. We don't see depth the same way so we can't tell it's a reflection. So, I always walk into mirrors because they're

used as walls. It is a hazard! Shiny glass and mirrors are really hard. At a small mall near where I live, they've [renovated], replaced it all in shiny black, so not only is it black which is iffy, but it's shiny, shiny, shiny. In retail spaces, big expanses of dark color; we hate those.

Lewis discussed the flooring in relation to navigation problems: "Aisles where you walk are tiled and clothing areas are carpeted. So, you have a tactile cue; it's easier to stay where you want to be and it can help you retrace your steps, which can be a challenge." The tactility of flooring as a means of wayfinding was also mentioned by Alan: "Some parts are tile, and some parts are wood. I can feel the difference, so you know when you're in a different department." Marilyn and Alan mentioned looking for signage in the ceiling to guide wayfinding. Photographs of these factors, as encountered during our shopping trips, are shown in Figure 4.

Figure 4 / Wayfinding Cues
A) Dark tiles to indicate the store entrance. B) Concrete aisles with wood laminate in the merchandise area. C) Ceiling signage to indicate a department.

Merchandise displays served as landmarks. This could be both helpful with wayfinding and problematic. Janice stated, "I like that they have clothes by collection, all casual in one area and all dresses in another; it makes it easier to find what you're looking for. It's unhelpful when they mix it all up together." Mari mentioned, "Today I headed toward clothing that is brightly colored because I notice it. Red, it catches your eye. I will remember that bright piece of clothing in that context [display]; I'll use it as a marker." However, when merchandise was in an aisle it was tricky, as described by Marilyn:

> *I used to be meticulous about reassembling things I knocked over, but now I realize, sometimes that thing shouldn't have been there. If I knock a dress off a hanger, I will always pick it up, but if I knock over a big display that was in an unexpected place I won't. I rarely go to the Shoppers Drug Mart near where I live because they very frequently have displays in the aisle and I'm always knocking things over.*

Lighting glare and layout were mentioned frequently as factors that influenced shoppers' functional abilities. The shopping mall restrooms were an area of concern, as discussed here:

> *I find the lighting very bright in the washroom; for me when it's bright like that, it becomes more difficult to [see] things. The biggest frustration in the washroom is that there isn't soap beside every sink, or the paper towel and dryer is down the hall, and when you're carrying a cane around, you're trying to keep your hands clean and they're wet and everything, it always takes me quite a while to figure out what I'm dealing with. The other thing about washrooms is that you must be careful when you walk, and make sure the floor isn't wet.*

The layout of the interior environment impacted the functional abilities of our shoppers. Wayfinding was improved by flooring choices that contrasted one another in color (dark/light) as well as tactility (hard tile/soft carpet), the placement of merchandise displays to serve as landmarks, use of effective lighting, and signage hung up above. Large expanses of glass, mirrors, and shiny metal surfaces, especially when combined with dark color schemes, hindered shoppers' confidence when wayfinding. The impact of these design choices, generally determined by interior designers, improved or hindered the shopping experience.

Merchandise Evaluation

Evaluating merchandise included multiple activities: examining the price, size label, and care content tags on clothing (often with the aid of a magnifier or price scanner), finding a salesperson, and navigating to the change room.

Salespeople

Salespeople were an integral part of wayfinding. The shoppers in the study had challenges finding salespeople. Typical employee identifiers include uniforms and name tags, but in the absence of these, shoppers worried about approaching a customer in error. Proximity is critical to discern signage and print; our shoppers were conscious of invading others' space to read name tags. Bruce elaborated on his feelings:

> *You have to learn to ask for help; just ask people. You're still a normal person, you're just a normal person who can't see anymore. Another issue is actually finding the person to ask. It's not as easy as it sounds; you don't know which person is the person to ask. When you [are sighted] … you can identify a friendly face but that's not the case with me.*

Janice also discussed this: "In big stores, like Indigo, you can't find salespeople

because they look like everyone else. Sometimes you see the name tag, sometimes you can't." Uniforms were a visual clue that aided the identification of salespeople, as Janice elaborated:

> *A uniform is easier for me to identify ... for example, if they're wearing a red T-shirt. I easily identify the person is working there. Compared to other stores you can't tell, even if they have a name tag on their jacket or shirt; by the time I see the name tag it's too late. I have to get very close to them [to read it] and they question me.*

Finding the fitting room also presented challenges. Salespeople were helpful with wayfinding to the fitting room as Marilyn described:

> *I like it when there are people designated to show you your way to the change room and take your clothing to the change room. The Gap is really good at that I've noticed. The young people will take all your clothes and hang them up for you and walk you back to the change area. I like the unisex part too. That's helpful.*

Price Determination

Challenges with reading labels and tags were prevalent among the shoppers due to small fonts, limited color contrast between the text and background, and location of the label/tag information. Lewis offered these suggestions for improvement and pointed out the price tag shown in Figure 5, indicating it was an excellent example:

> *It helps if the price tags are nice and clear. … Those tags are so small … the numbers are so small … and they're always in amongst the other print too; you can't make them out. Increase the lighting, use large labels.*

Figure 5 / Accessible Hangtags

A) Showing pricing. B) Showing the size.

Using a Price Scanner, Magnifier, or Other Technology

Shoppers could function independently with price scanners, their personal vision aid tools such as magnifiers, or specialty iPhone apps (e.g., Zoomreader); their success depended on lighting levels and the absence of glare. Mari stated, "I think the easiest thing is if there is a scanner, then you can check the price. There has to be good lighting, but if they use an energy saver and shut down the light, then I sometimes have issues." Shoppers were almost always questioned when using their technological tools, sometimes in inappropriate ways, as illustrated by Bruce's experience using a magnifier:

> *People will ask "what's that for" or sometimes if they're more generous, they'll ask if they can help me. Some salespeople think I'm a spy in the store; 75% of the time I get questions ... that's why I try not to use it. Sometimes they think I'm taking a picture of the clothing when you're just using a magnifier to see the price.*

Magnifiers helped our shoppers function independently and overcome the limitations of pricing signage to discern information related to cost and sizing. In the photos below, Bruce showed us how the lack of contrast between the numbers and background on a regular and a red clearance tag (*see* Figures 6 & 7) could be improved by the magnifier. Additionally, the readability of size labelling on a trouser was enhanced by changing the color of the background and text, as shown in Figure 8.

On the evaluation of merchandise, we illustrate factors that influenced wayfinding and reading signage that are directly pertinent to retailers. Uniform colors and name tags were essential to identify salespeople and served as wayfinding cues. Our shoppers appreciated salespeople who led the way to the fitting room. The design of price tag signage, as well as optimal lighting, influenced our shoppers' independence. Red clearance tags and small-size text were difficult to discern but could be viewed with the aid of a personal magnifier to change the contrast.

Figure 6 / Price Tags Shown

A) on the original garment, B) with the magnifier, C) modified for increased contrast with yellow lettering and blue background, and D) modified to show lettering in white on a black background.
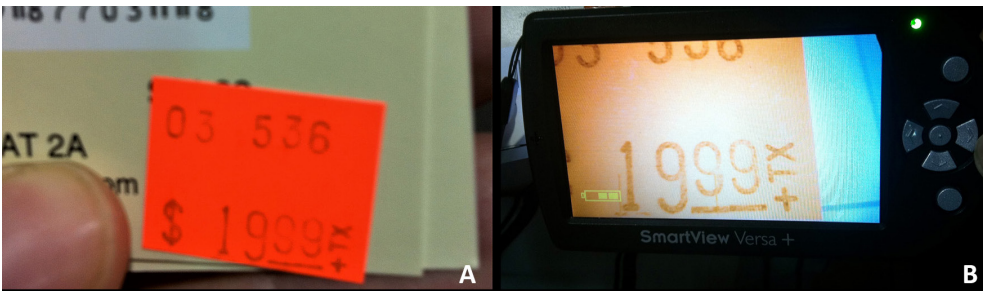
Figure 7 / Red Clearance Price Tag
A) on the original garment and B) with the magnifier.

Figure 8 / Size Label on a Trouser
A) As shown on the original garment. With B) the magnifier converting to a blue background and C) modified to show dark lettering on a white background.

Checkout

Paying for purchases created stress for the shoppers who participated in our study. Issues ranged from finding the checkout, getting in line, handling cash, using credit/debit cards, and being unable to read the cash register display and sales receipt.

Effective signage improved wayfinding to the checkout, as Alan described: "It's typically difficult to find the point-of-sale place, the area where you pay. What I look for is [something] hanging from the ceiling; that makes it distinctive. It helps." Wayfinding to the checkout was aided by flooring choices. Mari recounted a recent change at the mall she frequents:

> It is difficult when a store makes changes. The mall near me was very easy to get into, straight off the bus stop and right into the mall. The mall is being renovated. I used to go straight into the mall and then into the library; there was a bookcase that I could see on the one wall and I could follow it. It had a format. Now, it is an open space, and I can't navigate around it. [After I complained about it] … they were very understanding and are now working with the mall to get a rug that goes from the front door, right up to the checkout counter.

Bruce described another wayfinding issue with point-of-sale checkout: "Sometimes I go in front of the line-up, and the cashier tells me I have to join the line, but I don't know where the line-up starts. Some cashiers are helpful; others are rude because they don't have the time and patience."

Purchasing transactions require trust when one is unable to see. People with visual impairment typically fold specific denominations of cash in particular ways to aid identification; however, they feared errors related to how much they were charged, as described by Lewis: "I will look at the price before I go to the cashier and by the time they tell me how much they are charging me, I know it's close to what I have in my mind."

If paying with cash, shoppers were attentive to the change they received because in most cases they were unable to verify if it was correct. Janice said, "I use cash, but for accounting purposes, it's easier to have something I can go back and check." Marilyn emphasized her preference to have the change counted out: "I had no idea what kind of money she gave me. When money isn't close to me, I can't see the denominations on the bill."

Credit/Debit Cards

Alternative forms of payment also presented challenges. Certain types of credit/ debit machines were not manageable, as described by Dwayne: "I love using the keypad; I don't have to sign anything anymore. But everybody is doing the touch screen; we can't see the touch screen! The first time I tried the CHIP it was on keypad, which I loved, but the touch screen is inaccessible." Alan elaborated on the challenges he encountered:

> I had the worst problem the other day at a store. … They had a debit machine with a touch screen. I can't use that. On the Interac machine, okay, I can feel the buttons to punch in my [PIN] code, I can ask the [cashier], "can you just press checking for me?" [With the touch screen machine], I didn't know there was anything on screen. I had to just say no, I had to walk out of the store…

The described checkout activities highlighted additional information relative to wayfinding and signage. Ceiling-hung signage and distinctive flooring were helpful with wayfinding to the checkout, as was a landmark indicating where the line began. In our analysis, we considered currency as a signage category. Although we cannot change the design of currency, our shoppers made helpful suggestions to mediate their limited ability to discern money by the simple practice of counting back the change. Our shoppers were unable to read or operate machines with a touch screen. Credit/debit cards offered our shoppers confidence to track accuracy through their online statements, as discussed in the following section.

Post-Shopping

The shoppers in our study returned home the way they arrived, either by using public transportation or by getting a ride with a friend. Before heading home,

they often stopped at the food court for a break. When they wanted to eat at the food court, there were added complications. The illuminated menu signage behind the counter (shown in Figure 9) was inaccessible for several reasons, and this was a negative experience, as described by Bruce:

> [I have issues] in the food court, or even at a McDonald's because you cannot see the menu. You then have to ask questions; the more questions [you have to ask], the more negative you feel. When you have to ask the cashier [these questions], they have to spend more time to help you. That's one of the most negative feelings I have in the mall.

Figure 9 / Inaccessible Signage - Food Court Menu
An illuminated food court menu creates a sign that is unreadable by people with visual impairment.

Receipt Verification and Storage

We classified the cash register display and sales receipts as signage. Our shoppers described concerns about not being able to see the information on the cash register display and sales receipts. They worried about dealing with incorrect charges (e.g., due to cashier error or a discrepancy between the sale price tag and the actual price at checkout). Being unable to identify an error on the spot was problematic, as traveling back to the store to resolve the issue requires considerable effort. Most shoppers preferred using a credit/debit card, as they can easily track their purchases. Marilyn described her strategies: "I use one credit card. I keep my receipts to the end of the month. I have boxes of receipts. It makes life really easy. … I always shop in locations where I know I can return my purchases easily." Bruce in turn

described his strategy as follows:

> Usually I use a credit card. I write the card I used on the receipt with a big marker; I make a big logo that I understand; for example, I write TD Visa. When I get home, I file it and check it online to see if it matches. I use software to read out the information on the receipt.

Various technological tools aided shoppers with this task, as described by Lewis:

> I use a magnifier at home; and I have a scanning machine that will scan the receipts [into my computer], but it doesn't read everything and it's a real pain in the butt. … With the magnifier I can still read my bills and check that my Visa statement is correct at the end of the month. It just takes me longer.

Post-shopping included a visit to the food court, and once home, our shoppers verified their spending by comparing receipts to online banking statements. These activities highlighted issues related to signage. Menus in the food court were illuminated and our shoppers were not able to discern the text and pricing details. It was embarrassing to ask the foodservice person questions and delay other customers. Receipts with faded ink and low contrast between the text and background paper were unreadable and did not scan well, creating difficulty when attempting to verify spending.

DISCUSSION

The presented findings suggest that visual impairment influences how signage is perceived and presents several wayfinding challenges. The shoppers in our study reported techniques for dealing with these challenges, including advance planning, optimizing timing, keeping it simple, using resources, shadowing others, asking for help, and using technological tools. Many of the problems encountered by our shoppers could be mediated by choices made at the beginning of the design process. Nagi (1991) reminds us that disability is not person-specific. Rather, disablement occurs when there are gaps between a person's capability and their environment, a sentiment that is echoed by Imrie (2000). The shopping taskscape enhances awareness

of gaps through an examination of activities and the interactions between people, objects, and their environments, providing a means to better understand users' needs and values.

Retail atmospherics influence shoppers' perceptions and shopping behavior (Baker et al., 2006). This seems to be the case among visually impaired shoppers from our accompanied shopping trips. Objects, object placements, and the spatial layouts of retail environments have the potential to enable or disable. Designing for more embodied experiences requires a shift in thinking beyond sight and incorporating multisensorial experiences into spaces. For instance, interior designers must consider not only aesthetic qualities when making choices about flooring, but also meaningful contrasts between materials, tactile surfaces, and the different acoustic qualities inherent in wood, tile, and carpeting in order to create boundaries between spaces and wayfinding cues to help people get to where they want to be. Our shoppers mentioned ceiling signage was effective and it seems to be an underutilized resource for improved retail wayfinding. Lighting placement must consider glare reduction, hot-spots, and shadowed areas. Vast expanses of glass or mirrors should be eliminated because these reflect light and create confusing illusions of space. Reframing such design decisions would capitalize on what people with visual impairment can still see, thus enhancing their shopping experience.

When considering graphic information required in signage, our shoppers compensated for vision loss and ill-designed price tags and labels by using magnifiers, mobile phones, or other tools. Salespeople often treated these assistive devices as intrusive and suspicious. They would question shoppers or tell them that photos were not allowed. Shoppers offered two key insights around the use of assistive devices and the design of graphic information: (a) salespeople need to be educated on how to provide service to people with visual impairment, and (b) graphic materials need to be redesigned by putting lettering in high contrast (black lettering on a white background), using a sans-serif typeface (e.g., Helvetica), and avoiding italicized lettering.

Our shoppers also recommended streamlining checkout procedures and redesigning cashier areas with a focus on enabling independence. Shoppers mentioned checkout stress related to not knowing if they were charged the correct amount or received accurate change for their purchase and encountered inaccessible credit/debit machines with touch screens. Shoppers suggested sales associates count back currency or provide verbal cues during payment.

Norman (2013) advocates that although people are different, the way they perform activities is similar, suggesting that designers "let the activity define the product and its structure" (p. 231). The human body, in its heterogeneous young and old states, with and without full vision, allows people to confront, connect, and engage with spatial environments. A common expression among most people with visual impairment is perfectly summed up by Mari, one of our shoppers: "[I'm] still a normal person; [I'm] just a normal person who can't see anymore." What is vital is determining what remains the same and what is different.

In the past decade, wayfinding has been increasingly imparted onto consumers through the assumption that they can (and will) use smartphones, signage, and other mediative devices to augment their experience. For people who are visually impaired, this is an unrealistic expectation since "total self-sufficiency is nearly impossible" (Baker et al., 2001, p. 218). For visually impaired shoppers, wayfinding is a social activity that likely requires the help of family, friends, bus drivers, strangers, shopping mall staff, and sales associates at some point during their journey. Yet, our shoppers expressed frustration, embarrassment, and undue disablement through people and designed things. Encounters with other people were particularly challenging, a feeling exemplified by Lewis, who said "the more questions you have to ask, the more negative you feel." Based on our study, acknowledgement is required on wayfinding as a social activity, and frontline staff and sales associates need education on how to interact sensibly with shoppers with visual impairment.

LIMITATIONS AND FUTURE DIRECTIONS

While the shopping taskscape provides a systems approach to examine the complexity of how people

with visual impairment dynamically experience shopping in a mall, our study has limitations. All our participants used a cane, and none had a service dog. Our participants were Baby Boomers, most of whom had age-related vision loss. Future studies might focus on younger people born with visual impairment or blindness. Additionally, working in the field requires a team approach, as using the taskscape generates a sizeable data set that is time-consuming to collect and analyze. The nuanced design criteria we identified may be challenging to prioritize. Segments of the findings would be relevant to different groups—city developers, transit planners, retailers, and a wide range of design practitioners. Lastly, the COVID-19 pandemic has changed brick-and-mortar shopping and the way we pay for purchases. Online shopping has gained popularity as a safe, viable option. Future studies might focus on using the shopping taskscape to examine the online shopping experiences of consumers with visual impairment.

CONCLUSION

As Horowitz (2013) puts it, "'see' has many definitions" (p. 209). Shopping with people who are visually impaired helped us see wayfinding and signage in mall environments differently. It is easy to get caught up in the minutia of the shopping taskscape, however the shopping taskscape provides a systems approach that advances ideas around designing complex environments for able-bodied people and those with disability. Every decision made in the design process either enables or disables. Accessible environments enable functioning and normalcy, and this can't be taken for granted. We encourage researchers to adopt taskscape theory to inform designing.

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