

# “I Bought This for Me to Look More Ordinary”: A Study of Blind People Doing Online Shopping

Guanhong Liu<sup>12</sup>, Xianghua Ding<sup>4</sup>, Chun Yu<sup>123†</sup>, Lan Gao<sup>5</sup>, Xingyu Chi<sup>6</sup>, Yuanchun Shi<sup>123</sup>

<sup>1</sup>Department of Computer science and Technology, Tsinghua University, Beijing, China

<sup>2</sup>Key Laboratory of Pervasive Computing, Ministry of Education, China

<sup>3</sup>Global Innovation eXchange Institute, Tsinghua University, Beijing, China

<sup>4</sup>Cooperative and Information Systems Lab, Fudan University, Shanghai, China

<sup>5</sup>School of Mechanical Engineering and Automation, Beihang University, Beijing, China

<sup>6</sup>Kensington Park School, London, United Kingdom

lg17@mails.tsinghua.edu.cn, dingx@fudan.edu.cn, {chunyu, shiyu}@tsinghua.edu.cn

## ABSTRACT

Online shopping, by reducing the needs for traveling, has become an essential part of lives for people with visual impairments. However, in HCI, research on online shopping for them has only been limited to the analysis of accessibility and usability issues. To develop a broader and better understanding of how visually impaired people shop online and design accordingly, we conducted a qualitative study with twenty blind people. Our study highlighted that blind people’s desire of being treated as ordinary had significantly shaped their online shopping practices: very attentive to the visual appearance of the goods even they themselves could not see and taking great pain to find and learn what commodities are visually appropriate for them. This paper reports how their trying to appear ordinary is manifested in online shopping and suggests design implications to support these practices.

## CCS CONCEPTS

• **Human-centered computing** → *HCI theory, concepts and models*;

## KEYWORDS

Blindness; Visual impairment; Online shopping; Ordinari-ness

† denotes the corresponding author.

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, to republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from [permissions@acm.org](mailto:permissions@acm.org).

CHI 2019, May 4–9, 2019, Glasgow, Scotland UK

© 2019 Association for Computing Machinery.

ACM ISBN 978-1-4503-5970-2/19/05...\$15.00

<https://doi.org/10.1145/3290605.3300602>

## ACM Reference Format:

Guanhong Liu, Xianghua Ding, Chun Yu, Lan Gao, Xingyu Chi, Yuanchun Shi. 2019. “I Bought This for Me to Look More Ordinary”: A Study of Blind People Doing Online Shopping. In *CHI Conference on Human Factors in Computing Systems Proceedings (CHI 2019)*, May 4–9, 2019, Glasgow, Scotland Uk. ACM, New York, NY, USA, 11 pages. <https://doi.org/10.1145/3290605.3300602>

## 1 INTRODUCTION

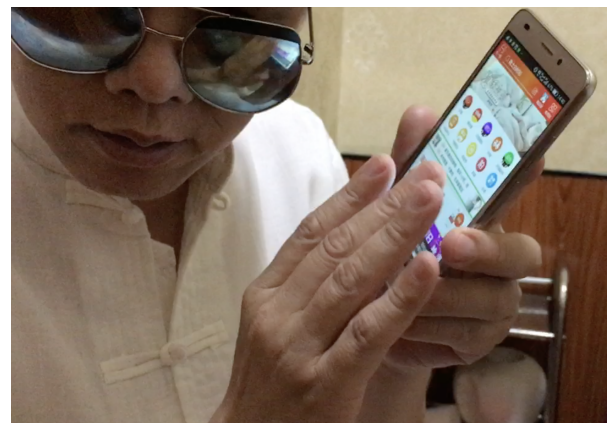


Figure 1: A participant (P8) told us about his shopping experience by operating on his smartphone

Online shopping is increasingly popular and is especially meaningful for people with disabilities who are inconvenient to travel. It enables them to shop easily without going out and greatly enhances their sense of independence and self-reliance [20]. It is especially true for visually impaired people. By using screen reader software, they could just read the commodity information directly from the screen without travel, greatly relieving navigation and object recognition issues commonly associated with their offline shopping experiences [30, 35]. Previous study [5] shows that online shopping is an integral component of the daily lives of people with disabilities in China, and particularly for visually impaired ones.

Despite the importance, research on how visually impaired people doing online shopping has been limited. Existing works focus on either investigating accessibility and usability issues of online shopping web sites [12, 16, 20], or developing technologies that can support their offline shopping activity in physical stores [7, 34, 35]. More broadly how they conduct shopping practices online, e.g., the broader challenges they are facing and the strategies they have developed, have not been fully studied.

We conducted a study in China to gain a broader and better understanding of visually impaired people's online shopping practices. In China, the particular site of our study, after nearly twenty years of rapid development, online shopping has been widely adopted by the public and there is the world's leading online shopping facility (e.g., Taobao<sup>1</sup>, JD<sup>2</sup>). At the same time, there is the largest population of visually impaired people in China [37]. However, their living conditions are far from being satisfactory. For example, they can only receive limited vocational education in a few special institutions (massage, piano attunement, etc.), and as such their career choices are very limited, with most of them working as masseuses or masseurs [32]. Public spaces are poorly accessible to them, making them difficult to travel independently. As such, people with visual impairment in China tend to rely on online shopping even more. A survey shows that for all the purposes of their using mobile phones, shopping ranks the third, only after social and chat needs [5].

In particular, we conducted a semi-structured interview with twenty blind people (7 with congenital blindness, and the rest with acquired blindness) in China. Aging from 17 to 48, they all use screen reader software on their smartphones and regularly shop online in their daily lives. From our study, we found that our blind participants paid great attention to the visual appearance of the commodities although they themselves could not see. Further analysis shows that this is part of their work to appear ordinary, which greatly shapes their online shopping practices in terms of finding out and learning about what appropriate for them. In this paper, we use the "ordinary" to mean how blind people would like to appear as ordinary members of the society [18], unnoticeable and not be treated differently, similar to "normal" used in some literatures, e.g., how patients with varied ability want to appear normal [11, 29, 47].

The rest of the paper is organized as follows. After reviewing the related work, we describe our study method and participants. Then, we present our findings in four parts:

<sup>1</sup>the largest online shopping platform in China, one of the world's top ten online shopping platforms <https://www.taobao.com/>

<sup>2</sup>the second largest online shopping platform in China, one of the world's top ten online shopping platforms <https://www.jd.com/>

ordinariness in shopping, challenges for ordinariness, shopping with social assistance and learning about visual effects. Finally, we discuss design implications to help the blind overcome the current limitations.

## 2 RELATED WORK

In this section, we first review prior research on supporting people with visual impairments to do shopping, offline or online. We then review work on ordinariness related to people with disabilities.

### Offline Shopping for Visually Impaired People

As for offline shopping, navigation and products recognition are the two main barriers for people with visual impairment [23, 34, 50].

Much of related work has focused on navigation. ShopTalk [35], a wearable system consisted of a small OQO computer, a wireless barcode reader and a numeric keypad, and it uses synthetic verbal route directions and descriptions of the store layout to direct visually impaired people to the aisles with target products. A mobile application was also developed based on ShopTalk [24]. BlindShopping [30] provided a navigation system. It combines a white cane with a portable RFID reader attached to its tip, a set of RFID taglines distributed throughout the corridors of the supermarket and a smartphone application which generates verbal navigation commands for users. RoboCart [22] is a robotic shopping cart that can navigate for visually impaired customers and carry purchased items.

Extensive work is also done for product recognition. Yang et al. [49] developed a camera-based prototype system that helps the blind recognize clothing patterns and identify clothing colors. BlindShopping [30] and Trinetra [28] are QR code or barcode-based systems that allow visually impaired users to identify products by scanning the codes with their phones. Krishna et al. [21] leveraged technologies such as Electronic Product Code (EPC) and Radio Frequency Identification (RFID) to develop a wearable wireless device capable of delivering product information at real time. Others attempt to integrate both navigation and product recognition solutions such as iShop [13].

Moreover, some researches have tried to explore the social-based approach to support blind people's shopping [9, 10, 25, 26, 33, 51]. For instance, Kutiyawala et al. [26] presented TeleShop, which enabled users to get assistance from remote sighted helpers by transmitting images and voice from their smartphones to the helpers' computers or phones. VizWiz, a crowdsourcing ask and answer platform, had been used as a fashion adviser [10] and assistant of finding a specific object [9].

### Online Shopping for Visually Impaired People

Compared with offline shopping, online shopping provides visually impaired people with a sense of independence and freedom by reducing the needs for traveling and relieving the issues of navigation and object recognition [20]. So far, the work about online shopping for visually impaired people has still been relatively limited, mainly focusing on accessibility and usability issues. Though accessibility design guidelines are well developed in industry [3, 19, 45], there are still many online shopping platforms that do not follow these guidelines.

Most existing work on online shopping emphasized the importance of picture description [12, 16, 20]. As pictures are now heavily used to convey product information, and blind people can't see these pictures. Without picture description, it is difficult for them to really know how the product is like, and determine if a selected product is in fact the one they want. Adding "alt tags" to the pictures is a feasible solution [12], but we still need more specific suggestions about how to describe the product.

When usability is concerned, it is suggested that blind people need simple interfaces to reduce their cognitive and memory burden [20]. However, as companies tend to focus very strongly on the visual appearance of a shopping platform without paying attention to accessibility, the associated complicated structure and unclear product categorization negatively influence user orientation [16]. In addition, some interface features such as moving information, pop-ups, automatic refresh of dynamic website and flash plug-ins would all interfere with the visually impaired people's exploration of the interface and decrease their shopping efficiency [16, 20, 44]. Besides, security issues and difficulties in the payment process are also reported [16].

### Ordinariness and People with Disabilities

The fact that people with disabilities value being treated as ordinary has been commonly reported in psychology literature. Rhodes et al. [40] conducted their research on epilepsy, from which they discovered that comparing with difficulties in life, what frustrates them most was being treated as disabled. For those with chronic illness, regardless of age, feeling normal and fitting in with their healthy peers is their common desire [1, 11, 29, 47, 48]. Asbjornslett et al. [4] did their research on disabled children and concluded that the children talked about themselves from their preferred self-identity as "ordinary kids". At the same time, they knew that being included in the broader community and being perceived as "ordinary" required hard work. The research of Pack et al. [38] showed that Paralympic swimmers consider themselves as swimmers rather than just someone with

disability swimming up and down. For students with disabilities, being treated as ordinary by some of the staff and fellow students facilitated their progress in studies [27]. By investigating different types of people with disabilities such as the blind and deaf, Watson et al. [46] found out that many of the informants do not see themselves as disabled and do not identify as disabled people.

For visually impaired people, in particular, researches on visually impaired children and adolescents show that there are no significant differences between visually impaired ones and sighted ones in self-concept and self-esteem [8, 17, 36, 52]. Visually Impaired people even had more positive self-concept than that of the able bodied [15, 31].

Concerning shopping, researchers in the market area have paid attention to the effects of ordinariness on visually impaired people's shopping practices. For example, Baker et al. [6] proposed that people with visual impairments are eager to obtain consumer normalcy by feeling "I am myself, I am here, I am in control and I belong".

## 3 METHOD

### Participants

We conducted semi-structured interviews with twenty participants. The participants were recruited from our previous study's contact list and the AiMang forum (the largest online forum for the visually impaired in China), based on two recruitment criteria: being blind and having online shopping experiences. Table 1 shows detailed information of our participants. Among them, twelve were female, and eight were male; seven were congenitally blind, and thirteen were acquired blind; their age ranged from 17 to 48. Most of them are masseurs or masseuses; others are students, teachers and company employees. The participants had diverse educational background, ranging from technical school to university education.

### Procedure

We conducted face-to-face interviews with fifteen participants who live in Beijing and telephone interviews with those from other cities. During the face-to-face interviews, we asked them to show their shopping historical records on their cell phones, upon their permission, and based on these records, we asked them to recall particular shopping experiences. In order to observe their shopping behavior, we also let them make intended purchases on their frequently-used online shopping platforms, and asked them to think aloud. When they encountered difficulties, we provided assistance and also used the opportunity to ask more questions about these difficulties and their strategies. For phone interviews, we also tried to make them recall of particular online shopping experiences. When some interesting points came up,

**Table 1: Summary of study participants**

No.	Age	Gender	Visually impaired degree	Frequency (times / month)	Career	Education background
P1	22	M	acquired blindness, since 7 years old	1 to 2	student	university
P2	22	F	acquired blindness, since 10 years old	5 to 6	student	university
P3	25	M	acquired blindness, since 5 years old	1 to 2	student	university
P4	31	F	acquired blindness, since 18 years old	5 to 6	counselor	junior college
P5	32	M	acquired blindness, since 17 years old	2 to 3	unemployed	senior high school
P6	33	F	congenital blindness	1 to 3	masseuse	senior high school
P7	17	M	congenital blindness	2 to 3	student	technical school
P8	48	M	congenital blindness	1 to 2	masseur	junior college
P9	42	F	acquired blindness, since 7 years old	1 to 2	developer	university
P10	42	M	acquired blindness, since 25 years old	1 to 2	developer	junior college
P11	25	F	acquired blindness, since 7 years old	4 to 5	masseuse	junior college
P12	34	M	congenital blindness	3 to 4	masseur	technical school
P13	35	M	acquired blindness, since 3 years old	2 to 3	masseur	technical school
P14	23	F	acquired blindness, since 12 years old	9 to 10	masseuse	junior college
P15	23	F	acquired blindness, since 5 years old	4 to 5	student	university
P16	34	F	congenital blindness	10 to 12	office clerk	junior college
P17	46	F	congenital blindness	1 to 2	masseuse	technical school
P18	25	F	acquired blindness, since 9 years old	4 to 5	masseuse	junior college
P19	24	F	acquired blindness, since 20 years old	3 to 4	masseuse	junior college
P20	47	F	congenital blindness	2 to 3	teacher	junior college

we followed up with questions about more details and more concrete examples. Interviews lasted from one to two hours, and our participants were provided with monetary rewards for their participation in our study.

### Data Analysis

We used grounded theory approach [43] for our analysis. All interviews were conducted in Mandarin, audio recorded, and were later transcribed into Chinese word by word. We used Google doc for interview data storage and MaxQDA<sup>3</sup> for qualitative analysis. Through open coding, 451 codes were produced. Then they were discussed among authors and collaboratively synthesized into higher-level themes through axial coding: their desire of appearing ordinary, shopping challenges, shopping with social assistance and learning about visual effects. We also discussed the internal connections between these themes, and the desire for ordinariness emerged as a core theme that shaped their shopping practices.

<sup>3</sup>Qualitative data analysis software <https://www.maxqda.com/>

## 4 FINDINGS

Through research, we found that blind people's shopping practices are greatly shaped by their desire to appear ordinary and be treated as ordinary. To appear ordinary, they care much about the visual appearance of goods despite their visual impairment. Due to visual impairments, they often have to shop with social assistance and learn what is visually appropriate for them.

### Ordinariness in Shopping

During our study, we found that our participants paid particular attention to the visual appearance of a product when they shopped online although they could not see it themselves, and our data further suggests this was part of their attempt to not draw people's special attention and appear ordinary. For example, P8 wore a pair of aviator sunglasses that could reflect light, which made him appeared as an ordinary person. He explicitly told us that to appear ordinary was the reason for him to choose them, instead of dark ones: *"Dark sunglasses are a symbol of blindness, labeling me as blind. I hope my life can be as close as an ordinary life, not too special. I want an ordinary life."* P17 told us that she would

dress herself in a way to be better integrated into the social environment:

*"Only you care about whether it looks good or not, as I won't see it anyway. The reason why I dress myself elegantly is because I don't want the people around me to treat me as an exception. I want to be part of a bigger community, so I care about my wearing, behavior, and courtesy."*

Besides wearings, ordinariness is also part of their concern. P7 revealed that he would not buy products dedicated to blind people: *"For instance, if I want to buy a blue cellphone, I will ask people around me about their opinion of this color, or the opinion of my purchase with this color. One might say that this color is often used by older adults, then I would give up. I think although we can't see anything, we still need to be as close as ordinary people. If you take out an item that makes people think you are blind, it is not good."* When he talked about how he purchased a luminous mechanical keyboard, he told us that though he himself could not see any light, ordinary people would, and their positive comment to the product would delight him.

For ordinariness, we found they also make purchases without practical reasons. For example, P13, whose eyes did not look very bad, always wore ordinary glasses in his daily life to make himself more acceptable to others:

*"I'm used to wearing it. Somebody might think it is unnecessary since I couldn't see anyway, but I wear it for you. Although my eyes do not look ugly, if I put on the glasses, you will feel less uncomfortable when you have connection with me. You are likely to accept me more, or at least, it shows my respect to others."*

P4 valued much the quality of life, and she carefully decorated her home, such as buying a frame to decorate an empty wall, and purchasing a paper roll with a squirrel image on it because of her love for squirrel. When she was interviewed face-to-face with us, she happened to need a desk lamp, so she bought one with our help:

*"The most important thing is the item's appearance. To be frank, the desk lamp is here to make things look good. Who use the light to see stuff? Actually, I bought it more for decoration. I cannot see what it's like, but I could touch it to sense whether it is of a good appearance. Buying good-looking stuff influences my mood greatly. If it is nice-looking, my quality of life would suddenly upgraded."*

In addition, ordinariness is also manifested in their overall shopping behavior. For example, if possible, they would like to shop independently. P14 always shopped on her own and

would like to help her blind peers to shop. To her, independent shopping by oneself is what ordinary people would do, nothing special:

*"I don't like others to buy stuff for me. If they shop for me, it is simply disturbing. Also, they think it is hard for a blind to shop, so as to compliment me relentlessly. They think it is extraordinary. I always try to make others consider us the same as other ordinary people, who don't often ask others for help. Many people think it is hard. However, I think shopping is the lowest standard of life. What else can you do if you can't buy clothes?"*

We also found, for online shopping, our participants tried to avoid asking customer service for help when it came to questions with blind features (questions that could be solved through looking at pictures, such as what a product looks like), also for the sake of ordinariness. For one, they usually could not get an effective reply if they asked such a question because the service providers tend to use pictures to answer instead of words. Then they had to reveal their blind identity, which might cause more troubles of meaningless explanations because the public still held a stereotype towards the blind, e.g., the blind don't need to match their clothes, the blind cannot use a smart phone and so on, which is of course far from the truth:

*"I don't always mention that I am blind because I will consider whether they would believe it. Many of my customers cannot understand why a blind person can use phones and type. They wonder that if you can type, why couldn't you see a picture. Also, I think the seller wouldn't trust me if I say I cannot see a picture. I have to explain so much, and it is very troublesome." (P11)*

As such, it seems the public's stereotype strengthened their desire to behave ordinary in the public or online to avoid troubles. For instance, they would only ask customer service when it is a question that an ordinary people would ask.

When applications for online shopping is concerned, participants would also like to use what ordinary people are using, rather than the ones specifically designed for them. In the interview, we mentioned the idea of designing shopping applications without pictures for them, but it did not gain much support from most participants. For example, P15 thought that although she did not use some stuff, she needed to know their existence, because she did not want to be left behind. P16 expressed a similar concern:

*"I don't think I need it desperately. If I use a phone to shop at my workplace and my colleagues are all sighted, I won't want them to think that I use something special."*

### Challenges for Ordinarity

While our participants tried to appear ordinary in many senses, it does not mean the ordinarity is easily achievable for them. To many, finding things that are visually appropriate to them (e.g., for their age, figure, skin color and so on) is a challenge already, as they themselves cannot see.

The first challenge comes from the heavy use of images in online shopping Apps to communicate visual appearance information of commodities, as similarly pointed out by existing works [12, 16, 20]. Although “an image is worth a thousand words”, to the blind, it is the contrary—the image cannot say anything to them as many of the Apps don’t support image reading yet. As such, they could only rely on the limited word description (such as the title, parameter and so on) in the Apps to gain an understanding of the product. One example was provided by P11: “when I bought towels, many stores put several towels in different colors in a group to sell together. Sometimes in the size of a product, it talks about set A, set B, but I do not know which combinations are in each set, so I need help from others.” What made things worse, sometimes, the limited information conveyed the wrong message. P8 reported such an experience of selecting a bedsheet on TaoBao once. When he chose the color, he knew about one called Big White, which made him think it was a pure white bedsheet. However, when his friend checked, they found that it was a bedsheet with purple strips, and had nothing to do with white.

The second challenge is that the blind “don’t know whether it looks good on me”. During our interview, we gave P8 a detailed description of how a jacket looked like, but he still dare not buy it:

*“Yes, but I still dare not make purchase, one reason is that I don’t know whether black color suits me. May it suit someone with rather fire skin? Another reason is that I don’t know how to match the outfit with other clothes.”*

Thus, although the description of a product is complete and thorough, it is still not sufficient for them to make purchase decisions as it is unclear whether it looks fine on them. Although this problem commonly exists for the sighted, it posed more of a challenge for the blind.

For the second challenge, some had formed certain strategies. For instance, they tried to find out what those who are similar to them in terms of age, figure and others would buy. P17 provided a case: “I would check what the majority of people in my age would choose. For example, someone may comment that he buys stuff for his mother, and he says it’s great and likes it. If a person can buy clothes for his mother, he at least should be eighteen, so his mother should be around forty years old, which is a similar age of mine. Thus, I will take their choice of color into consideration.”

### Shopping with Social Assistance

To address the challenge, however, the most reliable and conventional approach is to shop with social assistance. From the study, we found that they tended to ask those who they trust and know well, have good taste, are convenient to cooperate and knowledgeable about their target products. For example, P6 trusted the girls at the reception when choosing clothes, but would ask help from an experienced male when purchasing electronic devices. Participants like P5 and P8 were likely to ask opinions from those of the same age or younger when shopping clothes.

While they could accomplish most of steps involved in online shopping (such as making payment, returning products and so on) independently, the product selection step still required help the most. Some tended to make selections on their own, and only asked others about specific questions, “if I ask others to choose for me, I always don’t feel assured. Everyone has an his own taste. Although my friends know me well, sometimes I just don’t like the stuff they select.” (P4) Others tended to rely on others to pick things for them:

*“I prefer to seek help from someone who knows my taste, and knows what type of clothes I could wear. I would also like to filter the choice, but it always goes wrong. Maybe it is because the clothes I chose were not as I imagined. Therefore, the most reliable way is to ask others to help with the selection.”* (P15)

For product selection, they mainly asked others two types of questions: what is this product like and whether it is appropriate for me. For the former questions, although everyone’s concerns are different, what was common is that they wanted objective and detailed description to form an objective and accurate imagination of commodities in their mind. Take the P11’s case for example, she was attracted by the product whose description was as follows: jumper tied with embroidery on the back. It was a ladylike jumper suit, extra-chic and eye-catching. A sexy-suspenders design tightens your waist with lotus edges, pierced with light gauze, and the pink color makes you girlish. She needed to communicate with us to further her decision:

*[P11]: It has sexy-suspenders design, does it reveals body much?*

*[Interviewer]: It reveals some in the front and the back, but it is above your chest a little bit.*

*[P11]: So it’s here? (She gesticulated to herself) It’s like a bra?*

*[Interviewer]: Yes. It has a cross of the suspenders on the back, and the ones on the front are parallel.*

*[P11]: I will pay attention to the suspenders. It says about lotus edges, are they on the suspenders?*

[Interviewer]: No. The edges form a small circle appearing around the ankle strap and the chest.

[P11]: Where is the embroidery?

[Interviewer]: Objectively, it doesn't have any embroidery. It just has some pierced cravings, and each of them is small, covering all parts of your body, but they are not too transparent. This clothes can tighten your waist.

[P11]: Does tighten much?

[Interviewer]: It seems like you can loose and tighten it, as it is elastic.

[P11]: How long is the trousers?

[Interviewer]: It is a little bit above the model's ankle.

[P11]: Well, then I know. I only see the description of the style, rather than the specific type of the clothes.

As for the latter question, the blind people ask whether the product is suitable to him or her, and the feeling of using it.

*"After all, there is something that cannot be figured out by hearing about it when you buy clothes. I will ask other people, such as whether they think a set of clothes suits me if I put it on, and does it feel good if I try it, and so on. Nonetheless, people have various tastes, so I have to research a lot when I purchase clothes. The process is tiring." (P6)*

This reliance on others for shopping has some drawbacks while solving some difficulties. For one, the lack of a prompt and effective help might hinder the shopping process at all. Like P11 said: *"When you feel that a piece of clothes is great, you send it to your friend, while you can be upset when they are all busy and no one reply. From your perspective, it could be a minor thing. However, I regard that they are disloyal to me since they don't reply. When I want to buy clothes, when I have such a great desire to shop, I just couldn't do it because of this thing. Even though they reply later, and say it is good, I don't want to buy it anymore since the longing to shop diminishes."*

Then, different people have different tastes, which could be confusing for the blind. When P18 selected clothes, she would speculate the style through a limited word description, pick out something she likes and then sent them to her friends to let them help with her decision. If their evaluation of this product is just general, she would leave it aside and select again, and she would not purchase until all of them agreed that the clothes were good-looking. The most confusing thing is when everyone's views are not consistent: *"If one person says the first one was nice-looking, some regard the second or the third a good choice, I would be very bewildered, and don't know which one actually looks good."*

## Learning about Visual Effects

Besides social assistance, our participants also actively sought information from their surrounding environments to learn about what might look good on them. For instance, P6 was a masseuse. She would pay attention to what her customers were wearing, especially those who were about the same age, and of similar body figure with her, to find out what she could also wear. P16, congenitally blind, would pay particular attention to the descriptions of colors and dressings when she read books: *"Because I am not visual, I especially pay heed to the portrayal of colors, such as what kind of sky it is, and the color of the moon. Sometimes the books talk about dressings, saying that she dresses properly today, and they describe what kind of clothes, what kind of dress, and what kind of shoes she is in. I care much about these descriptions."* P17, by overhearing others' conversations, learned about how things may look good together:

*"Once, a student with low vision in my dorm talked to my male classmate: 'well, you wear a blue jacket and white trousers, which looks terrible. If you wear the opposite, like, you put on blue trousers and wear a white shirt, that would be great.' Because of his words, I knew that I should usually wear dark colors for the lower part, and the light ones on the upper side so that others will feel comfortable. My concepts of matching are all accumulated by listening to others' conversations."*

Our participants also did "online windows shopping" like sighted people. Such behavior is not only the way to relax and get discount information, but also the way to learn about the fashion trend. For example, P4 browsed an App called Renghaodian almost every day:

*"Visually impaired people have their limitations in life. Your sighted people can find new things around you easily, such as the fashion trend and the wearings of other people. But such information is hard for me to perceive. Renghaodian can not only give me a specific product description but also give me some recommendations along with the trend. It makes me feel good about the life. There are a lot of new things that you might not have imagined if you haven't seen them yet."*

However, without visual assistance, this kind of learning is far from an easy task for them, and others' comments and feedback played a critical role here in shaping their consciousness or understanding of visual appropriateness. For instance, P11 told us how she turned from paying no attention to dressing at all to caring it very much: *"When I was young, I dressed whatever my mother bought for me. When I grew up and left home, I started buying clothes on my own. When I first went to a shopping mall to try a piece of clothes*

on, my friend accompanied complimented me after I put it up, saying that I was like changing into another person. Ever since then, I've cared about whether the clothes look good on me." P11 shared a case of how she had no idea that her dressing had gone wrong until she was told by others from work:

*"I bought a suspender dress, which needs invisible bra straps. My friend and I bought an invisible bra strap with a bowknot. After wearing it for one day, the diamonds on it were missing, but I couldn't see it myself. I went out for a whole day on my own, and sweated a little. When I came back and sat down, the receptionist told me: 'darling, don't wear it. It becomes black.' I said luckily it was you who saw it. I would head to meet my husband's family in the afternoon. How embarrassing that could be!" (P11)*

That is, as pointed out by P4, they had to rely on others' to know and learn about the visual effects..

*"After I got the clothes, I can feel whether the style, size and material of the clothes is suit for me. But for the color and pattern, and what's the visual effect when I put it on, I can't know any way, I have to find someone to look at it." (P4)*

However, as they could only rely on others' feedback, sometimes, it could easily go too far and it was hard to manage it in a right level. P11 told us how it could be very confusing sometimes: *"I wear clothes for others to see. If they all say it is good, I will wear it, even I don't like it and don't feel comfortable. What is particularly confusing is that someone says good and another says not good, and I don't have my own opinion." (P11)* She also shared a story of her classmate:

*"When I was at school, a girl usually had a pony-tail. One day her roommate happened to mention that she looked great with her long hair naturally left down. Because of this casual comment, that girl did not tie up her hair for a whole week, which was kind of too much."*

## 5 DISCUSSION

In the preceding sections, we have illustrated that blind people's desire for appearing ordinary shapes their online shopping practices. More specifically, to appear as ordinary (not appear odd or reveal their blind identity), they took great efforts, e.g., through social assistance and learning on their own, to find out what will look good on them, to manage independent shopping, and so on.

Garfinkel, in his articulation of ethnomethodology, pointed out that the ordinary social fact or "ordinariness" of social life is not something to be assumed but something to be

studied [18]. As it is a phenomenon that is produced and accomplished through members' work as part and parcel of their everyday life. However, while usually the work for "ordinariness" can be easily or even unconsciously carried out by its members in their everyday life, for people with disabilities, and people with visual impairments, in particular, the work is non-trivial at all. As illustrated in our study, "simple" things such as appearing ordinary in others' eyes could pose great challenges to our participants, and often involves conscious efforts as well as others' assistance for them to achieve, which is well manifested in their practices relevant with shopping, as uncovered in our study.

Prior researches on supporting blind people's shopping have mainly focused on issues such as navigation and product recognition for offline sites [23, 34, 35], and accessibility for online sites [12, 16, 20]. However, as shown in our study, today, with the development of the Internet, the widespread use of smart phones, and the assistance of screen-readers, many of these issues, mainly at the operational level, have been greatly relieved, and independent shopping has become technically feasible. What have become more salient and have been brought forth by our study, then, are those higher level issues such as product selection, visual effect evaluation and so on.

That is, to design for blind people to shop online, not only should we pay attention to accessibility and usability issues, but also social and cultural aspects around shopping. Just as Shinohara and Wobbrock suggest, social accessibility is as important as functional accessibility [41, 42]. That is, we should address not only function, usability and cost, but also aesthetics and social acceptance, to help people with disabilities reduce stigma and integrate into society.

## 6 DESIGN IMPLICATIONS

Based on our findings, we develop a number of implications for design to address salient issues for the blind to shop online. While developed from the study of the blind, we believe many of them could also enhance experiences of the sighted to shop online as well.

### Leveraging Customer Reviews from Similar Profiles

Consumer reviews are essential for online shopping, which even more important for the blind. As shown in our study, when our participants encountered difficulties in online shopping such as "don't know whether it looks good on me", they tend to rely on customer reviews for reference, especially reviews from those who are of similar age and body figure with them. However, at this point, they could only browse the reviews one by one, and customer's profile information is usually not supplied, so they have to infer based on the

review description, as the case reported by P17. One design idea is to fully leverage customer reviews by making related profile information more visible and help bring out reviews from similar profiles.

One solution is to build a review library with user profile tags by letting users attach their profile information such as height, weight and age when they submit the reviews (under the premise of agreeing to the privacy agreement). Then, with the filter feature, users can browse the reviews produced by people with similar profiles selectively. For instance, user A is a woman with 165cm in height, 55kg in weight, 25 years old, and pear-shaped figure. When viewing the product reviews, she can see at a glance that 95% of users with similar profiles have high satisfaction with the goods. Among these people, 80% chose M size and blue color. So for her, the safest option is M size and blue color.

In addition, we can develop image models which a product is suitable for, so we can make corresponding recommendations. For instance, among those who bought long blue skirts, people of high satisfaction are those aged between 30 and 35 years old, above 160 cm tall and with an H-shaped figure. By developing such an image model for a product, we can recommend products to users based on their profile information. For example, when selecting a dress, a user will receive a recommendation from the system: styles A, B, and C, because people of similar profiles have received these styles well.

### Providing More Social Contextual Information

Visual appropriateness comes not only from a fit between an product and an individual, but also from a fit into the social environment as well as a fashion trend. Wearing clothes with suitable size and color but out of trend can also appear strange, or out of place. However, compared to the sighted, a lack of visual assistance makes the blind not easy to notice related trends around themselves. Thus, to help the blind learn about trends, the shopping platform should not only be a quiet online shopping mall, but also a shopping learning community; not only can it provide rich products, but also situate these products in a social and cultural context by providing related information, such as trend, aesthetic knowledge and so on. For example, we can incorporate trend information into product descriptions, introduce shopping expert to write topical recommendations (e.g., topics about early autumn trend, popular colors and so on), or build a high-quality Q&A community to encourage consumers to contribute knowledge.

### AI for Shopping Assistance

While for the blind independent shopping has largely been made possible with online shopping platforms and screen readers, our participants still commonly seek out for social

assistance to help them make decisions. However, the social assistance is not always available, and the reliance on external help will make the blind constrained by the assistants' time and availability. In the tendency of AI, future work could engage with the development of AI shopping assistance to address part of the problem.

During shopping, the AI assistant could give personalized recommendations based on the customer's image, fashion values and personal preferences, as well as related style, and trend information. Regarding interaction, voice + touch multi-modality can be used to create a natural experience of interaction. Thus, by saying "I want a set of wearing for the music festival", users can get reliable recommendations. After receiving the clothes, an assessment of the suitability is required. Users can get a comprehensive visual effects evaluation (e.g., whether the clothes can polish the consumers' shape, whether the size is appropriate, whether it is in line with their temperament and so on) based on aesthetics computing [14] after uploading their dressing pictures.

A possible inspiration for AI shopping assistance could come from Echo Look from Amazon [2] and Fashion AI from Alibaba [39]. We hope that these projects can take into account the blind users and create a blind-friendly shopping assistant. Because for the sighted, these projects may be the icing on the cake, but for the blind, it is indeed timely help.

## 7 CONCLUSION

In this paper, we reported findings from a qualitative study of twenty blind people doing online shopping in China. Driven by their desire of being ordinary, they care much about the visual appearance of the goods even if they themselves cannot see. Achieving ordinariness is not an easy thing, blind people have to shop with social assistance and learn about visual effects to overcome difficulties caused by insufficient product description and visual appropriateness cognition. Based on these findings, we argue that the challenges of blind people's online shopping are not only from accessibility issues, but also social and cultural practices around shopping. Then, we gave three design implications that can help them to choose products and evaluate visual appropriateness independently. Taken together, our findings expand the HCI community's understanding of the requirements, behavior, and psychology of online shopping for visually impaired people.

## ACKNOWLEDGMENTS

This work is supported by the National Key Research and Development Plan under Grant No. 2016YFB1001200, the Natural Science Foundation of China under Grant No.61672-314, No. 61572276 and No. 61672167, Tsinghua University

Research Funding No. 20151080408, and also by Beijing Key Lab of Networked Multimedia.

## REFERENCES

- [1] A Aamodt, Suellen Grassl-Herwehe, Fran Farrell, and J Hutter. 1984. The child's view of chemically induced alopecia. *Care: The essence of nursing and health* (1984), 217–231.
- [2] Amazon. [n. d.]. Echo Look | Hands-Free Camera and Style Assistant with Alexa—includes Style Check to get a second opinion on your outfit. <https://www.amazon.com/Amazon-Echo-Look-Camera-Style-Assistant/dp/B0186JAEWK>.
- [3] Apple. [n. d.]. IOS Accessibility Guideine. <https://developer.apple.com/accessibility/ios/>.
- [4] Mona Asbjørnslett, Sølvi Helseth, and Gunn H Engelsrud. 2014. 'Being an ordinary kid'—demands of everyday life when labelled with disability. *Scandinavian Journal of Disability Research* 16, 4 (2014), 364–376.
- [5] Information Accessibility Research Association. 2018. Report on mobile information behavior of visually impaired people. <http://www.capa.ac/Report20180409.pdf>.
- [6] Stacey Menzel Baker. 2006. Consumer normalcy: Understanding the value of shopping through narratives of consumers with visual impairments. *Journal of retailing* 82, 1 (2006), 37–50.
- [7] Stacey Menzel Baker, Debra Lynn Stephens, and Ronald Paul Hill. 2002. How can retailers enhance accessibility: giving consumers with visual impairments a voice in the marketplace. *Journal of Retailing and Consumer Services* 9, 4 (2002), 227–239.
- [8] Jefferey D Beach, Judy M Robinet, and Julie Hakim-Larson. 1995. Self-esteem and independent living skills of adults with visual impairments. *Journal of Visual Impairment & Blindness* (1995).
- [9] Jeffrey P Bigham, Chandrika Jayant, Andrew Miller, Brandyn White, and Tom Yeh. 2010. VizWiz:: LocateIt-enabling blind people to locate objects in their environment. In *Computer Vision and Pattern Recognition Workshops (CVPRW), 2010 IEEE Computer Society Conference on*. IEEE, 65–72.
- [10] Michele A Burton, Erin Brady, Robin Brewer, Callie Neylan, Jeffrey P Bigham, and Amy Hurst. 2012. Crowdsourcing subjective fashion advice using VizWiz: challenges and opportunities. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, 135–142.
- [11] Yu Chen, Yunan Chen, Mirana Michelle Randriambelonoro, Antoine Geissbuhler, and Pearl Pu. 2017. Design Considerations for Social Fitness Applications: Comparing Chronically Ill Patients and Healthy Adults. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing*. ACM, 1753–1762.
- [12] Terry L Childers and Carol Kaufman-Scarborough. 2009. Expanding opportunities for online shoppers with disabilities. *Journal of Business Research* 62, 5 (2009), 572–578.
- [13] DI De Silva, MRA Nashry, S Varathalingam, R Murugathas, and TK Suriyawansa. 2017. iShop—Shopping application for visually challenged. In *Knowledge and Smart Technology (KST), 2017 9th International Conference on*. IEEE, 232–237.
- [14] Paul Fishwick. 2006. An introduction to aesthetic computing. *Aesthetic computing* (2006), 3–27.
- [15] Lok-Tsang Fok and Helene H Fung. 2004. Self-Concept Among People With and Without Visual Impairment: The Role of Achievement Motivation. *Journal of Psychology in Chinese Societies* (2004).
- [16] Elisabeth Fuchs and Christine Strauss. 2012. Online Shopping Involving Consumers with Visual Impairments—A Qualitative Study. In *International Conference on Computers for Handicapped Persons*. Springer, 378–385.
- [17] Maite Garaigordobil and Elena Bernarás. 2009. Self-concept, self-esteem, personality traits and psychopathological symptoms in adolescents with and without visual impairment. *The Spanish journal of psychology* 12, 1 (2009), 149–160.
- [18] Harold Garfinkel. 1967. Studies in ethnomethodology. (1967).
- [19] Google. [n. d.]. Andriod Accessibility Guideine. <https://developer.android.com/guide/topics/ui/accessibility/>.
- [20] Carol Kaufman-Scarborough and Terry L Childers. 2009. Understanding markets as online public places: Insights from consumers with visual impairments. *Journal of Public Policy & Marketing* 28, 1 (2009), 16–28.
- [21] Sreekar Krishna, Vineeth Balasubramanian, Narayanan Chatapuram Krishnan, Colin Juillard, Terri Hedgpeth, and Sethuraman Panchanathan. 2008. A wearable wireless RFID system for accessible shopping environments. In *Proceedings of the ICST 3rd international conference on Body area networks*. ICST (Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering), 29.
- [22] Vladimir Kulyukin, Chaitanya Gharpure, and John Nicholson. 2005. Robocart: Toward robot-assisted navigation of grocery stores by the visually impaired. In *Intelligent Robots and Systems, 2005.(IROS 2005). 2005 IEEE/RSJ International Conference on*. IEEE, 2845–2850.
- [23] Vladimir Kulyukin and Aliasgar Kutiyawala. 2010. Accessible shopping systems for blind and visually impaired individuals: Design requirements and the state of the art. *The Open Rehabilitation Journal* 3 (2010), 158–168.
- [24] Vladimir Kulyukin and Aliasgar Kutiyawala. 2010. From ShopTalk to ShopMobile: vision-based barcode scanning with mobile phones for independent blind grocery shopping. In *Proceedings of the 2010 Rehabilitation Engineering and Assistive Technology Society of North America Conference (RESNA 2010), Las Vegas, NV, Vol. 703*. 1–5.
- [25] Vladimir Kulyukin, Tanwir Zaman, Abhishek Andhavarapu, and Aliasgar Kutiyawala. 2012. Eyesight sharing in blind grocery shopping: remote P2P caregiving through cloud computing. In *International Conference on Computers for Handicapped Persons*. Springer, 75–82.
- [26] Aliasgar Kutiyawala, Vladimir Kulyukin, and John Nicholson. 2011. Teleassistance in accessible shopping for the blind. In *Proceedings on the International Conference on Internet Computing (ICOMP)*. The Steering Committee of The World Congress in Computer Science, Computer Engineering and Applied Computing (WorldComp), 1.
- [27] Eli Langørgen and Eva Magnus. 2018. 'We are just ordinary people working hard to reach our goals!' Disabled students' participation in Norwegian higher education. *Disability & Society* 33, 4 (2018), 598–617.
- [28] Patrick E Lanigan, Aaron M Paulos, Andrew W Williams, Dan Rossi, and Priya Narasimhan. 2006. Trinetra: Assistive Technologies for Grocery Shopping for the Blind.. In *ISWC*. 147–148.
- [29] Leslie S Liu, Kori M Inkpen, and Wanda Pratt. 2015. I'm not like my friends: understanding how children with a chronic illness use technology to maintain normalcy. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing*. ACM, 1527–1539.
- [30] Diego López-de Ipiña, Tania Lorido, and Unai López. 2011. Blind shopping: enabling accessible shopping for visually impaired people through mobile technologies. In *International Conference on Smart Homes and Health Telematics*. Springer, 266–270.
- [31] Maria Dolores López-Justicia, Maria Carmen Pichardo Martínez, and Antonio Chacón Medina. 2005. Self-concept in low-vision children and their peers without visual problems. *Self and Identity* 4, 4 (2005), 305–309.
- [32] Blind Monthly. 2011. Focus on Sensitive Points for blind employment. <http://www.chinadp.net.cn/datasearch/journal/mryk/2011-08/13-8510.html>.

- [33] Meredith Ringel Morris, Kori Inkpen, and Gina Venolia. 2014. Remote shopping advice: enhancing in-store shopping with social technologies. In *Proceedings of the 17th ACM conference on Computer supported cooperative work & social computing*. ACM, 662–673.
- [34] Priya Narasimhan. 2006. Assistive embedded technologies. *Computer* 39, 7 (2006), 85–87.
- [35] John Nicholson, Vladimir Kulyukin, and Daniel Coster. 2009. ShopTalk: independent blind shopping through verbal route directions and barcode scans. *The Open Rehabilitation Journal* 2, 1 (2009), 11–23.
- [36] Festus E Obiakor and Stephen W Stile. 1990. The self-concepts of visually impaired and normally sighted middle school children. *The Journal of psychology* 124, 2 (1990), 199–206.
- [37] World Health Organization. [n. d.]. Blindness as a public health problem in China. <http://www.who.int/mediacentre/factsheets/fs230/en/>.
- [38] Stephen Pack, Sasha Kelly, and Monna Arvinen-Barrow. 2017. “I think I became a swimmer rather than just someone with a disability swimming up and down:” paralympic athletes perceptions of self and identity development. *Disability and rehabilitation* 39, 20 (2017), 2063–2070.
- [39] Simone Preuss. 2018. Alibaba presents shopping of the future with Fashion AI Concept Store. <https://fashionunited.uk/news/retail/alibaba-presents-shopping-of-the-future-with-fashion-ai-concept-store/2018070630597>.
- [40] Penny J Rhodes, Neil A Small, Hanif Ismail, and John P Wright. 2008. ‘What really annoys me is people take it like it’s a disability’, epilepsy, disability and identity among people of Pakistani origin living in the UK. *Ethnicity and Health* 13, 1 (2008), 1–21.
- [41] Kristen Shinohara and Jacob O Wobbrock. 2011. In the shadow of misperception: assistive technology use and social interactions. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. ACM, 705–714.
- [42] Kristen Shinohara and Jacob O Wobbrock. 2016. Self-conscious or self-confident? A diary study conceptualizing the social accessibility of assistive technology. *ACM Transactions on Accessible Computing (TACCESS)* 8, 2 (2016), 5.
- [43] Anselm Strauss and Juliet M Corbin. 1990. *Basics of qualitative research: Grounded theory procedures and techniques*. Sage Publications, Inc.
- [44] Hironobu Takagi, Shin Saito, Kentarou Fukuda, and Chieko Asakawa. 2007. Analysis of navigability of Web applications for improving blind usability. *ACM Transactions on Computer-Human Interaction (TOCHI)* 14, 3 (2007), 13.
- [45] W3C. 2018. Web Content Accessibility Guidelines (WCAG) 2.1. <https://www.w3.org/TR/WCAG21/>.
- [46] Nick Watson. 2002. Well, I know this is going to sound very strange to you, but I don’t see myself as a disabled person: Identity and disability. *Disability & Society* 17, 5 (2002), 509–527.
- [47] Brian Williams, Joanne Corlett, Jon S Dowell, Joanne Coyle, and Somnath Mukhopadhyay. 2009. “I’ve Never Not Had it So I Don’t Really Know What it’s Like Not to”: Nondifference and Biographical Disruption Among Children and Young People With Cystic Fibrosis. *Qualitative Health Research* 19, 10 (2009), 1443–1455.
- [48] Barbara V Wise. 2002. In their own words: The lived experience of pediatric liver transplantation. *Qualitative Health Research* 12, 1 (2002), 74–90.
- [49] Xiaodong Yang, Shuai Yuan, and YingLi Tian. 2014. Assistive Clothing Pattern Recognition for Visually Impaired People. *IEEE Trans. Human-Machine Systems* 44, 2 (2014), 234–243.
- [50] Hong Yu, Sandra Tullio-Pow, and Ammar Akhtar. 2015. Retail design and the visually impaired: A needs assessment. *Journal of Retailing and Consumer Services* 24 (2015), 121–129.
- [51] CHIEN WEN YUAN, BENJAMIN V HARAHAN, SOOYEON LEE, MARY BETH ROSSON, and JOHN M CARROLL. [n. d.]. I Didn’t Know that You Knew I Knew: Collaborative Shopping Practices between People with Visual Impairment and People with Vision. ([n. d.]).
- [52] M Zurich and BE Ledwith. 1965. Self-concepts of visually handicapped and sighted children. *Perceptual and motor skills* 21, 3 (1965), 771–774.