Understanding Everyday Experiences of Reminiscence for People with Blindness: Practices, Tensions and Probing New Design Possibilities

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ABSTRACT

There is growing attention in the HCI community on how technology could be designed to support experiences of reminiscence on past life experiences. Yet, this research has largely overlooked people with blindness. We present a study that aims to understand everyday experiences of reminiscence for people with blindness. We conducted a qualitative study with 9 participants with blindness to understand their personal routines, wishes and desires, and challenges and tensions regarding the experience of reminis-cence. Findings are interpreted to discuss new possibilities that offer starting points for future design initiatives and openings for collab-oration aimed at creating technology to better support the practices of capturing, sharing, and reflecting on significant memories of the past.

KEYWORDS

Digital Memories, Reminiscence, People with Blindness, Interaction Design

1 INTRODUCTION

Material possessions play important roles in mediating people's experiences of reminiscing on past life experiences and reflecting on the future [2, 9, 15, 90]. Over a century ago, William James described the intimate and intricate ways that people consider their possessions as part of their self and stimulate recollections of significant life events across their life [36]. As technologies have become widely adopted, people's practices have extended due in part to growing amounts of personal data archives (e.g., [20, 40, 58]). Along with these shifts, there are calls in the HCI community to develop alternative approaches that enable people to draw on their personal data as resources to support and explore different perspectives on their life experiences over time (e.g., [21, 28, 82, 84]). In parallel, an established and still growing corpus of HCI research has revealed how re-experiencing digital data from the past (e.g., digital photos, audio recordings, social media content, online maps, etc.) can offer valuable resources for supporting experiences of reminiscence (e.g., [7, 12, 60, 62, 67, 69]). Yet, despite its size, this body of work has largely focused on sighted populations. We believe it is necessary and incumbent on the HCI community to include more diverse people and populations. Our research aims to open up an area that has not received much attention to date: people with blindness.

The majority of HCI research related to people with blindness focuses on overcoming practical challenges, such as spatial navigation (e.g., [11]) and usability (e.g., [6]). This work has made major contributions to designing technology that helps improve the lives of people with blindness. However, limited HCI research has explored how technologies could be designed to enrich other important aspects of blind people's lives, such as experiences of reminiscence.

This research project takes a step towards better understanding the experiences of reminiscence among people with blindness. Specifically, we conducted a qualitative field study with 9 participants with blindness (7 early blind and 2 late blind) investigating their practices of individual and social reminisce.

This paper makes two contributions. First, we offer a rich, in-depth understanding of our participants' situated practices, cherished artifacts, social interactions, as well as perceived challenges and desires related to their experiences of reminiscence. Second, we synthesize and interpret our study findings to offer a set of starting points for future design initiatives aimed at creating resources that better support people with blindness in capturing, sharing, and reflecting on significant memories from the past.

2 BACKGROUND

Related work falls in two areas: designing for and with people with visual impairment; and personal data and digital possessions.

2.1 Designing for and with People with Blindness

Researchers and practitioners across HCI, assistive technology, disability studies, and related fields have investigated the question of how technology can be designed to better assist people with visual impairment to maintain their capacity to live independently. Assistive technology often refers to supporting people with visual impairment in a world designed by and for people with sight (e.g. navigation [1, 11, 23, 24, 39, 77, 86], web browsing and usability [6, 8], and screen readers [22, 75]). Consequently, the term *assistive* has been criticized because it connotes that people with disabilities need *assistance* from an abled perspective without direct involvement and participation of people with disabilities [93]. This is a questionable proposition because every technology assists people to accomplish things in a "better" way, but it is only referred to as "assistive" when we aim to marginalize disabled people by assuming that they need assistance to take part in an abled world [13, 80].

Services and devices made from the standpoint of non-disabled persons have revealed a number of problems. The idea of "designing for disability" often introduces misunderstandings from a designer's standpoint because many designers who design for disabilities are people without disabilities. Lefeuvre et al. argue that devices that are "developed with sight in mind" can often be a burden for users with visual impairment to use [41]. These authors point out the critical need to consider the blind and vision-impaired population's situated experiences and desires in the design of new technology. The consequences of not doing so can and does lead to the creation of expensive and cumbersome devices that are not adopted. This makes users with disabilities return to their original habits and inventive workarounds that they had developed. Hersh and Johnson [33] arrive at a similar conclusion and highlighted that homemade tools and idiosyncratic workarounds developed with personal devices are more common and often work better than narrowly devised top-down technology solutions.

It is important to acknowledge that there is a growing amount of research in the HCI and design communities that advocates for moving toward focusing on designing toward the dreams, desires, and needs of people with disabilities. Researchers have emphasized that normative approaches to "practicing empathy" by mimicking being blind through using blindfolds is counterproductive at best, and often inappropriate and insulting [5]. In advocating new pathways, researchers have argued it is essential to foster rich, inclusive deep engagements with people with disabilities and populations through the design process [3, 44, 73, 74]. Relatedly, from a universal design standpoint, a world designed with disabled users in mind would lead to better accessibility for everyone [30]. Similarly, Silverman [78] encourages a heuristic learning of the challenges and preferences of people with blindness through face-to-face collaborative activities that promote the positive involvement of people who are designed for. More broadly, Hauser et al. [31] report on the rich, playful and intimate experiences shared among people with vision and impairment and their guide dogs. This work represents one of the only studies in HCI to date that has inquired into everyday routines of people with vision impairment from a ludic, experience-centered perspective.

To date, research into how people with blindness capture, keep, share, and reflect on their life experiences in support of reminiscence, self-reflection and social connection has been largely overlooked. Our work contributes to this literature by presenting a rich understanding of experiences, practices, needs and desires of people with blindness around capturing, archiving and revisiting moments in their lives through technology.

2.2 Personal Data and Digital Possessions for Remembering and Reminiscence

Material possessions play important roles as triggers for personal and shared memories; they capture and signify people's evolving life history, sense of self and social relationships with others over time. Csikszentmihalyi and Rochberg-Halton [15] articulate the complex ways material things represent the development of life goals and achievements. Belk [2] offers a framework for understanding how people extend their sense of self through their things, in part by drawing on them as resources for self-reflection on the current and past self. In parallel to Belk's theorization, McAdams characterizes identity construction as the development of a coherent life story—a synthesis of stories uniting events from the past and present interwoven with aspirations for the future [46]. Here, possessions play central roles in pointing back to the past, capturing a current sense of self, and projecting desired futures. In this way, possessions operate as resources for mediating people's experiences of reminiscing on past life experiences and prospectively reflecting on the future [9, 90].

As technologies have become widely adopted, people's practices have extended, due in part to growing amounts of personal data archives [58, 88, 89]. In part motivated by the proliferation of personal data, there have been calls in the HCI community to develop alternative approaches that enable people to draw on their personal data as resources to support and explore different perspectives on their life experiences (e.g., [10, 32, 56, 57, 61, 92]). This has led to a stream of HCI research exploring how people's practices of recollecting and reminiscing on the past could be better supported by interactive technology. A key body of work has focused on the creation of new technologies to attach digital content to existing physical mementos (e.g., [87]) as well as to support the capture and exploration of images, video, audio recordings, and location histories [35, 47, 85].

There is a body of research that highlights the value of re-experiencing digital data from the past, including social media, emails, online maps, chat logs, photos, and music, to support experiences of reminiscence [7, 17, 37, 50, 67, 69, 83, 91]. For example, Cosley et al. present a system that supports "individual, spontaneous reminiscence" by sending memory triggers collected from social media contents [66] and reflect further on the experiences of everyday reminiscence, especially autobiographical memories for self-reflection [12, 68].

Yet, prior research has largely focused on non-disabled populations, and it is important that the HCI community make efforts to include more diverse populations. Very limited research in HCI has revealed that people with visual impairment do actively engaging with personal data that include such as photographs and on social media platforms [4]. However, there has been no research into

the ways in which people with blindness experience reminiscence and the role of digital and non-digital possession shaping these practices.

Collectively, our work aims to contribute to the growing body of HCI research that investigates how personal data can provide rich resources for supporting experiences of reminiscence and recollection of the past. Importantly, we aim to build on and extend prior work by inquiring into the unique experiences and perspectives of people with blindness. Beyond work that has come before, we offer new findings on how people with blindness capture, keep, share, and reflect on their life experiences with their digital and physical possessions; and interpret these findings to present opportunities for designing technology with people with blindness.

3 FIELD STUDY METHOD

3.1 Positionality of Research Team and Participant Recruitment

For this study, our target group was people with blindness. The reason we selected this population is because in Canada, where we conducted our research, the blind community comprises only 10% of the total size of the vision-impaired community [43]. By targeting a more marginalized population, we hoped the result of the research could also be applicable and beneficial to the larger vision-impaired community. This approach does present limitations; for example, it makes it hard to generalize findings to 'all' people with blindness. However, considering the lack of work in this area, we wanted to begin with a smaller, but diverse group of people with blindness to gain a richer descriptive understanding of their practices, needs, and desires as a whole to inform what might be salient issues for future research.

Our research team was comprised of three primary researchers, none of which are blind or experience severe visual impairments; and it is important to acknowledge our positionality. Author 1 has conducted 1 year of participant engagement and observation with a local non-profit organizational branch of a major national institute for the blind. Author 2 has prior experience volunteering with a non-profit social program that paired younger adults with older adults that are living with vision impairment, where the primary goal is to support positive intergenerational socialization and dialogue. Author 3 has completed 1 year of community service volunteer work in a school for blind and visually impaired students and, more broadly, has 6 years of experience in co-designing together with people from different walks of life and different abilities. These lived experiences have provided our research team, individually and collectively, with first-hand insights into the lives of some people with vision impairment. However, in we ourselves cannot experience what it is like to live with vision impairment or blindness; and this is an important limitation to acknowledge. These experiences did play a role in our intention to conduct this research project through a sensitive and careful approach with the aims to foregrounding our participants' voices and open up new possibilities that, through further exploration, could positively shape the lives of people with blindness.

With this in mind, we first approached by visiting a local non-profit organizational branch of the Canadian National Institute for the Blind (CNIB) and used a snowball sampling approach to recruit our participants. Then, more participants were recruited through online flyers and word-of-mouth. We recruited a total of 9 participants (4 females and 5 males) from the metropolitan area of a large city in western Canada where this research was conducted. Our resulting sample represented a pool of people with blindness at different life stages and in many different occupations. Importantly, 7 participants are 'early blind', meaning that they were blind from or very soon after birth. 2 of our participants became completely blind later in life (known as 'late blind'). Although the blind community is a highly heterogeneous group, early-blind and late-blind persons were both recruited for this initial exploratory study. Our field research concluded in February 2020 as the global pandemic set in, and further in-person research with human subjects was restricted (at this time, we had already captured over 17 hours of interview data). We refer to each participant with a pseudonym.

- **Luis** (mid-30s, early-blind) loves sailing, lives on a sailboat, and is fluent with technology.
- **Ray** (mid-30s, early-blind) became totally blind at the age of three. He is a martial arts instructor and a counselor for people with blindness.
- **Meg** (early-20s, early-blind) is a recent graduate from university and lives with her beloved guide dog.
- **Carol** (late-60s, early-blind) is retired and worked as a typist and in data entry for more than 20 years. She enjoys talking with her siblings (who are also blindness) over the phone.
- **Carl** (mid-60s, late-blind) was a video camera operator (for feature films) and loves photography. He lost his sight 15 years ago, and he still is a passionate photographer.
- **Jessie** (late-20s, early-blind) loves music and is training to become a music therapist.
- **Janet** (late-60s, early-blind) is retired and worked as a special education instructor for visually impaired people for many years.
- **Frank** (early-70s, early-blind) is Carol's blind sibling who always liked the sound of boats and cars. He enjoys going on boat trips and listening to audiobooks.
- **Rob** (early-60s, late-blind) became totally blind in his 30s. He is a technology counsellor for people with blindness. Rob loves technology and travelling.

3.2 Study Details and Data Collection

We conducted one-on-one semi-structured interview sessions with each participant in their home that lasted between 1.5 to 2.5 hours. We selected participant's home settings as the site for our research because it enabled them to provide first-hand insights into where they kept meaningful possessions as well as how they mediated their practices of reminiscing on the past. Each interview session a range of retrospective and prospective topics. The retrospective part aimed to develop an understanding of each participant's orientations toward their patterns and rhythms in their practices of reminiscing on the past. This involved an introductory interview exploring how specific triggers or cues brought back past memories, the role of physical or digital possessions in these processes, and how current life experiences are captured (whether physically or digitally). This part helped establish a baseline for understanding participants' attitudes and orientations toward reminiscence.

Participants gave consent to use photos of themselves as well as their homes, possessions, and personal stories within academic publications and presentations.

We then asked participants to give us a home tour to help us understand the kinds of meaningful possessions they kept, how often and in what ways they interacted with them, and the narratives they attributed to them. We asked participants to show physical or digital possessions. We paid close attention to the language participants used to describe similarities and difference, and how they triggered reflective experiences. This often led to detailed descriptions of personal experiences, thoughts and/or challenges regarding most artifacts. These tours provided a situated approach to facilitate participants in sharing personal experiences and to probe on tensions that emerged with their significant possessions (whether digital or physical).

The final part of the interview aimed to initiate an exploratory, generative dialogue on participants' desires for capturing, keeping, and revisiting memories. Participants often shared insights on where technology failed to support their desires and practices. We concluded the study by giving participants an opportunity to ask questions about our research, future directions, or to elaborate on topics they wished to discuss.

3.3 Data Analysis

We audio-recorded all interviews and took field notes and documentary photographs. Analysis of the data had been an ongoing process as the interviews were proceeded. The recordings from the study produced 17+ hours of recordings. Relevant segments in the recordings were transcribed. After each interview, field notes, video, and photographs were repeatedly reviewed by the research team. Open coding was used to surface tentative insights that were noted and grouped to identify emergent patterns across the data [14, 29]. Through this iterative process, the research team organized data into themes. Data was coded in weekly meetings; overlaps and differences in interpretations of the data were discussed through Axial coding [14, 49]. We also created conceptual models and affinity diagrams to reveal unexpected connections across participants. Bi-weekly meetings were also held with lab members outside of the project to challenge our assumptions and to corroborate the themes.

4 FINDINGS

In the following sections, we present several examples taken from field observations and interviews with participants that capture the emerging themes: how memories are sensorially captured and evoked; how physical and digital possessions mediate individual/social experiences of reminiscence, and emergent tensions in situations of social reminiscence; and desires for future practices of reminiscence.

4.1 Pathways to Capturing and Remembering the Past

Participants described various perceptional and sensorial experiences that triggered reflection on past memories, which ranged from as regularly as a few times a day to at least once in every

month. Next, we provide examples that help illustrate these different experiential qualities, place-based associations, and social practices of capturing memories and looking back on the past.

4.1.1 Sensorial Impressions: Triggering and Capturing Memories. Taste, olfactory (smell), auditory (sound) and tactile (touch) senses each were described to offer distinct and unique pathways to memories of the past. Participants described these experiences as emerging both through accidental encounters as well as purposeful recall.

Touch represented a highly significant sense that participants frequently mentioned across our interviews. **Ray** characterized tangible textures on cherished physical objects as offering among the strongest "gateway to the past." **Ray** mentioned that he used to create his own artwork to remember special experiences. On top of that, he described a cherished set of action figures from his childhood, each of which he attributed very specific memories:

> The two action figures on the table, they are very old. They are from 1996. I remember clearly when my mom bought them for me as a child. If you go to my bedroom, you will see that I have over 500 action figures. Pretty much every single one of them is engraved in my memory. . . . This is why sometimes I go out of my way to track down an action figure that I remember from my childhood. . . . If I want these memories back, the only way is to track down those action figures that remind me of certain moments, with my brothers or sisters or parents. (**Ray**)

Nearly all participants shared **Ray's** viewpoint and remarked that tangible gateways to the past could be accessed by running their fingers over their respective material possessions. After enough tactile experiences had accumulated and the texture had been memorized, several participants reported being able to recall the 'feel' of the object and access this gateway to past memories without having to touch it.

Smell and sound offered different sensorial modalities that offered different pathways to the past. In describing meaningful memories of past travel abroad, **Janet** noted how "different countries have different smells in different times of the year." She remembered serendipitously encountering key smells in her everyday life could trigger vivid memories of past travel experiences of particular locations during a specific season. **Rob** described how he captures an important life experience through by a mixture of his senses:

> The smell is probably a bigger thing for me. I love walking through the forest or down by the beach. I just love all the smells, even just the wind blowing across at a grass field. That makes me really appreciate the different sounds of trees. With the wind blowing in the trees, they sound different, so I can identify an evergreen from a leafy tree. (**Rob**)

As our dialogue continued, **Rob** noted that his recollection of cherished memories often involved differing degrees and overlaps of olfactory, auditory, and tactile impressions.

4.1.2 Recollecting Through Being in the Place. Another key general theme in our participants' orientations toward recollecting significant life experiences was highly associated with specific physical

Figure 1: Ray's two action figures are on the table in the living room (left); Ray's artworks that resemble superheroes (right).

locations. **Janet's** statement that "Every place has its own memories" captures a sentiment that all participants shared – that simply being within a significant place could trigger the recollection of vivid memories. The locations that led to these experiences for participants were diverse, ranging from **Meg's** bedroom to **Jessie's** kitchen, to the cockpit and cabin of **Luis's** sailboat. **Meg** associated many memories with her beloved guide dogs. She elaborated on the significance of her bedroom:

> Next to my bed, kind of behind it, is **Milo**'s bed. I have a lot of fun memories in that area because that's where my first dog snored a lot. That's kind of an emotional area. (**Meg**)

Participants were often able to describe and reflect on their past experiences within places of personal significance. **Jessie** said the more time she spent in a place, the more special and meaningful it got. She remembered numerous mundane but valued memories are made in the kitchen through all the rushed and lazy mornings. When **Luis** was asked to share the most memorable place on his boat, he answered:

> Easy. Cockpit. Because the cockpit is where on a nice sunny day, you seat at the back of the boat, my friend and I are sailing, or we're having a good conversation. I go make food, when he's steering the boat or I steer the boat, he goes and makes food. It's always the cockpit. Sometimes, it's in the cabin if it's like a rainy day and we order a pizza and we're dreaming and planning out our next cruise. (**Luis**)

Just by mentioning the place, Luis was able to recall very specific details of associated memories – not only about the place, but also about the people he spent time with. Participants' favorite spots evoked emotional memories from their past. These narratives revealed how the act of occupying a specific place and simply absorbing the atmospheric sounds, smells, and tactile feelings could provide powerful cues for supporting self-reflection and reminiscence.

4.1.3 Visual Descriptions from Other People. Our participants reported it was common for visual details associated with significant life experiences or locations to be captured in part through other people's descriptions. This was most often the case when it came to experience natural phenomena, such as entangled branches of giant trees or a thousand stars in the sky or a beautiful sunset; here, capturing and recollecting such moments became a collaborative experience. As an early-blind person, **Luis** described how he remembered scenic views as he recalled the best descriptions that others have provided to him:

> I was born totally blind, so I've never seen things [like a sunset or an orange color]. If I would recall what they look like, I recall the best description that somebody gave me of it. I've been sailing, and I recall my friend describing the stars to me in a wondrous voice. I look through his eyes. Whenever it's a visual concept, it's always through the eyes of somebody else. I treasure those descriptions. I don't really have to write them down. As we get talking about them, they just all come into my mind. (**Luis**)

As a late-blind person who lost his sight completely in his 30s, **Rob** described an intimate collaborative practice shared with his sighted wife when capturing memorable landscapes and vistas:

> When [my wife] and I go for a walk, a beautiful little bay where the sun setting over the backside of the Island is quite spectacular. I will never ever lament the lack of access to that. When we see the beautiful sunset, [my wife] starts to explain what she sees; colors, shapes and all that stuff. I thoroughly enjoy it while I'm there and while I'm experiencing with her. I'm happy to experience the world as it shows up today in the places where I am. (**Rob**)

Collectively, these examples illustrate a diversity of ways that participants drew on sensorial capacities of their own and from others to capture and revisit significant experiences. They also highlight the importance of physical places and the role that their subtle atmospheric qualities, as well as more active verbal descriptions of them by others, can play in offering rich resources for reflecting on the past. Next, we turn to the varied roles that physical and digital possessions played in mediating participant's practices of capturing and revisiting memories.

4.2 Possessions as Resources for Reminiscence

Participants kept cherished possessions that were closely connected to their past memories. We observed a wide range of possessions, including physical objects like photos, analog recordings, and mementos that were kept, often in highly personalized collections in the home. We also observed a range of digital possessions, such as audio recordings, photos, videos, electronic journals and digitalized letters—that were typically fragmented across personal devices, in social media, and cloud storage platforms. Next, we offer examples that help capture themes representing our participants' interactions with and orientations towards these things.

4.2.1 Ambient and Focused Sound. Across all participants, we found that audio recordings emerged as the primary type of digital possession that they cherished and revisited. As **Ray** put it, the voice recording software on smartphones enabled him to "have the luxury [of] keeping the memories alive." During the interview, **Luis** said to the research team, "audio recordings for us are like photographs for you guys." The recordings "[serve] like a reminder" for memories as they are played.

Many participants described a tradition of making audio recordings to capture significant memories well before the existence of smartphones and digital recorders. **Ray** described his practice of carrying a tape-recorder to capture memories over the years. Similarly, **Carol** showed us her collection of analog cassette tapes that she had captured audio memories from her daily life and special occasions, such as a trip to Europe with choir members, from over a decade ago, which she still revisited to relive and reflect on past experiences. **Janet** also described her practice of re-listening to audio recordings; occasionally, she still "[takes] them out of the drawer and [listens]" to the recordings of her wedding from 45 years ago. Across these instances, participants exhibited unique personalized ways for keeping and organizing their tangible archives of audio recordings, typically through having key designated furniture or physical containers that were associated with particular times in their life (e.g., **Carol**), life events (e.g., **Janet**), or social relationships (e.g., **Ray**).

As our study progressed, it became clear that there were two distinct types of memory-oriented audio that participants captured and revisited: *ambient* and *focused*. Recordings of ambient sound were often used to capture the emotional feeling and atmospheric timbre of experience as a whole. For example, **Frank** described going on boat trips and making many digital recordings that capture a diversity of sounds from the tour:

> I said to people when I went on a boat last Summer. I said I am recording this trip because it's like a sighted person taking pictures. I can replay this over and over just like a sighted person can look at a picture and say, 'Oh yeah, I was there' and get the feeling of it! (**Frank**)

Janet described a similar practice of recording ambient sounds on her travels. She revisited the past through "[ambient] sound, as opposed to visual things." Ambient sound recordings actively reconstructed memories of scenes, events, and experiences. Our participants noted that ambient sound recordings were more "multi-directional" and could trigger a diversity of memories and associations to emerge depending on the tonal qualities that they decided to focus on when listening to them.

In addition to documenting the atmospheric qualities of a physical environment, participants also captured focused sounds to commemorate a close social relationship. **Meg** described the focused sounds she digitally captured of her beloved, now departed, guide dog snoring:

> I did make a few voice recordings for my last guide dog snoring. I keep listening to it when I miss her. I would say that's our alternative to pictures would be audio recordings. (**Meg**)

Similarly, **Janet** shared the powerful role that her now departed brother's voice played in triggering experiences of reminiscence and remembrance. In reflecting on listening to her brother's voice on a digital video she possessed, she said:

> You know, we don't have photographs. We can't see photographs. My brother died in 2012, and not long ago, my nephew put up some YouTube videos that actually have his voice. It was awesome. It really helped me remember him when I heard his voice. (**Janet**)

However, across our participants, we commonly observed that they did not have the same personalized strategies for archiving their cherished digital audio recordings as they did with their physical audio archives. Their valued digital recordings were typically distributed across online services (e.g., like **Janet's** reflection above), located on their mobile phones in and across different recording or messaging applications, and, to a lesser extent, stored on personal computers or external hard drives. Despite being among the most valued resources for reminiscence, these digital possessions occupied a precarious place in our participants' lives—a common point of anxiety across due to not having a vision of how they would hold onto them for the long-term.

4.2.2 Visual and Social Media as Bearers of Metadata. Photos and videos offered more visually oriented forms of memories, and many of our participants made frequent use of these types of possessions. All participants owned at least one or more favorite photos or videos on their personal smartphones. A key benefit of having photos and videos was the ability for them to more easily accumulate social or machine-produced metadata that, in turn, provided additional contextual details to support recollection of memories. Another benefit is that they provided forms of memories that were easily sharable with sighted loved ones. For example, **Luis** reflected on a cherished photo from his trip to Thailand that was embedded in a handmade frame, which he often used as a conversation piece with friends:
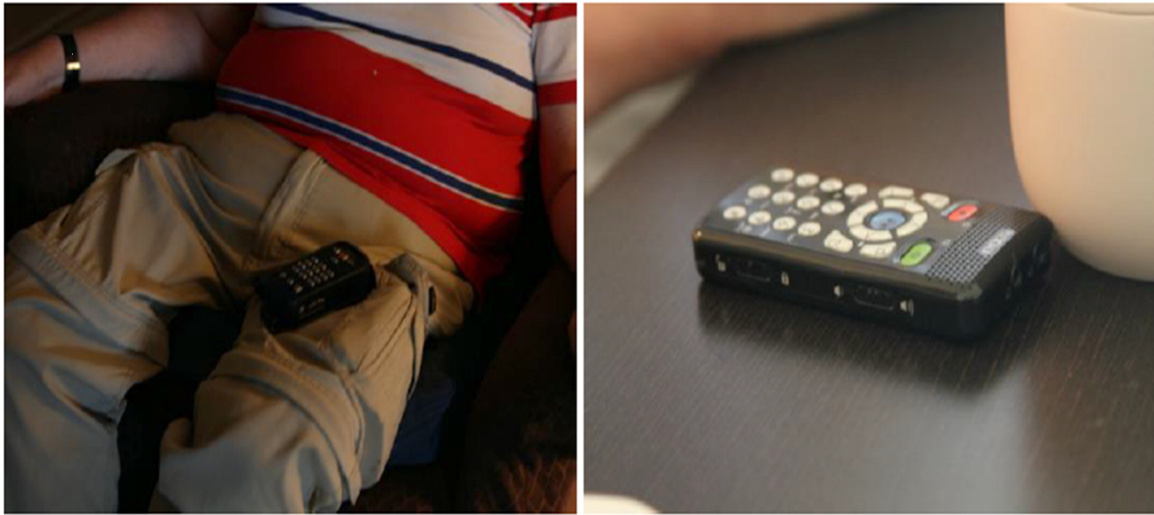
Figure 2: Frank's digital recorder which can also play audiobooks (left); Carl's digital audio recorder (right).

I rode the elephant and did all the river-wrap thing and hiking in Thailand. At the end of that, they offered me that I could buy a photo. I was, 'Okay, this would be cool to bring back to my friend,' but [the photo itself] was nothing to me, but my friends were like, 'Oh **Luis**, there you are on an elephant!' For me, the bigger memory was the handmade photo frame from the village. It has woven cloth, and all around the edges were all the beads. A photo frame was a much more significant memento or a keepsake than the actual photo inside. For sighted people, the frame would just the consolation prize, but for me, it was the main event, and the photo was the consolation prize. (**Luis**)

In general, photos acted as important triggers of past significant life experiences as well as mechanisms for sharing memories with others. The enclosures photos were kept in often also held significance. For **Luis,** the handmade photo frame is the distinguishing feature of the picture. In this sense, the photo is only a proxy for the frame, which is the trigger for a "significant memento." Here, the sensorial experiences evoked by the interwoven textures of the wood, cloth, and beads can be considered as a form of tangible, experiential metadata tying directly to the experience embodied through the photograph.

Digital photography now captures a range of metadata when a photo is taken, such as timestamp, location data, and social tags representing people, to name a few. **Luis**, like several other participants, mentioned that the metadata encoded in each digital photo could add additional layers of 'clues' about and different perspectives on the experiences captured in cherished photos:

> When I was a kid, [photos] meant something that's boring. I don't have a single photo album but a few photos that I have taken with my friends are stored on my phone. On my phone, [photos] mean more because my phone tells me the date and time that

were taken and where they were taken. . . . [When revisiting those experiences], I can discern a lot from just by the automatic [timestamp and location] data that's captured. (**Luis**)

Video was another preferred resource for reminiscence due to its combination of visual and audio components. **Jessie** describes how the synchronized integration of moving images and audio created a valued way of supporting experiences of collective reflection with loved ones:

> I think the best way to have a meaningful thing for a blind person is a video. Because [a blind person] would hear the audio as well, as well as the pictures. You may hear the actual person's voice and [others can] see what they're doing. (**Jessie**)

Echoing Jessie, **Rob** highlighted video was his most preferred way to capture memorable moments. He shared his experience of going back to recordings of family interviews, which evoked sentimental feelings and vivid recollections:

> We pulled all the recordings, lots of pictures, categorized them in different folders and put that together in two DVDs. Those recordings of my mom singing, her brothers and sisters used to harmonize beautifully. I do find that when I go back and listen to those, I'll be reaching for the Kleenex box. (**Rob**)

Our participants also widely reported using social media to capture, archive, share, and revisit cherished memories. Key features such as the digital screen reader and customized captions for annotating images for people with visual impairment (which the screen reader can read) enabled social media to offer a valuable resource to support reminiscence on the past. **Meg**, like many of our participants, described her practice of writing customized descriptions of photos that she shared on Facebook that were specifically tailored toward her friends who are blind (and which required the use of a screen

Figure 3: Similar to Frank (pictured here), many participants enjoyed showing photos on the wall and describing memories they associated with each photo.

reader to access). In this way, posting digital photos to social media could act as a catalyst for mediating and capturing reflective, memory-oriented dialogue as social metadata accumulated:

> I take some [photos] and put them up on social media and photo-describe them. Interestingly on my Facebook, there is a cache of my memories I could go through if I wanted because I recently started describing these images that I put on. It helps my blind friends and also helps me in looking back. (**Meg**)

Our participants also valued other qualities of social media, such as private groups and location check-ins, as these are adding further layers of metadata to audiovisual material. While traveling in Europe, **Rob** posted check-ins, notes, pictures and Wikipedia entries in a private group as he visited new places. Later, the group became a digital travelogue that **Rob** and his wife would revisit and reflect back on:

> We did a five-and-a-half-week tour through Europe last year. Before we left, we created a private Facebook group that we only invited close friends and family to be part of so that they could keep an eye on where we are, what we are doing. Whenever we were at somewhere interesting or a different place, we posted check-ins and linked to a Wikipedia talks about the history of the place we are at. [My wife], who is sighted and very visual, would take pictures of our day of touring and whatever and then at the end of the day, she would upload pictures to that particular

Facebook post that I had put in. People left comments and questions across our trip. Now, we can go back to that holiday, run through the Facebook group and have a look and re-read some of the experiences that we had. (**Rob**)

4.2.3 Emergent Tensions in using Digital Possessions as Resources for Collocated Reminiscence. The use of visually-oriented possessions to mediate social, collocated experiences of reminiscence could also lead to tensions. All participants reported that at some point, they felt emotionally distant when revisiting memories with others with sight, especially during family gatherings, where many past memories were shared through photo albums:

> [Photo albums] makes me sad because a lot of people have memories of just sitting and looking through photo albums. But that's the thing that I can't do. I've sat down with my mom before, flip through photo albums, but I always feel a little left out. I can't enjoy all those pictures. I feel like I am missing out on all these pictures. (**Jessie**)

Not being able to fully participate in using photos to collectively reminisce produced feelings of frustration and anxiety for **Janet**:

> I've often thought that I am the worst person in the family because everybody else has pictures of everything and I don't have many pictures of anything. Even if I had them, I wouldn't know where to find them. So, if my sister dies tomorrow, I wouldn't be
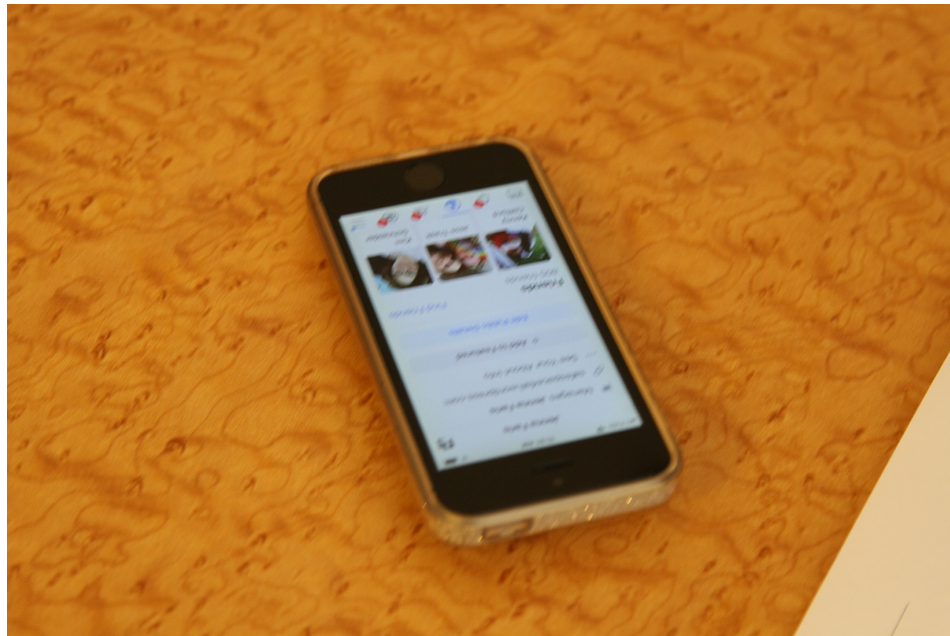
Figure 4: Participants were highly active on social media, often using it for interacting not only with people they also commonly encounter in person, but also people they meet online.

Figure 5: Photo albums often created tensions between participants and sighted loved ones when they were drawn on as resources to support the practice of collocated memory sharing.

able to put together a collage of pictures about her. I do sometimes regret that. (**Janet**)

Revisiting memories through solely audio recordings sometimes did not resonate well with sighted loved ones. For our participants, audio recordings were deeply immersive and evocative resources for reminiscence. Yet, it could be challenging for sighted loved ones to engage with these materials because of a general lack of experience or familiarity with using only audio to recollect past

experiences. Participants reported that issues with sighted loved ones commonly involved the pacing of interaction. With audio, it was necessary to listen closely and absorb segments of the recording first to establish a context for collective reminiscence, and then engage in dialogue with others that are collocated. This could lead to a sense of discomfort if the collective reminiscence process was introduced awkwardly or if loved ones began talking before the recording had finished playing. These tensions contrasted loved

one's experiences with visually-oriented possessions, like photo albums, where they could comfortably view and discuss photos as they emerged, despite our participants often feeling unincluded in this process.

Collectively, findings in this section highlight how participants drew on physical and digital possessions to capture, archive, share and revisit significant memories. They point to a diversity of ways that audio recordings, both physical and digital, could trigger evocative recollections of the past. They also show how digital photos and videos can catalyse social experiences of reminiscence; and, that their situation within social media opened up asynchronous ways for accumulating reflective accounts of valued life experiences. Yet, tensions could also emerge from a diminished sense of inclusion with visually-oriented collections for our participants and a lack of familiarity with audio-oriented content for other sighted loved ones.

4.3 Towards Future Practices of Reminiscence

Our field study also probed on our participants' future expectations and desires for how design interventions might better support their practices of reminiscence and reflection.

4.3.1 Values in AI Image Description. In earlier sections, we have reported on the value and richness that participants attributed to loved one's verbal descriptions of places and life events. These actions provided participants with vivid details of a significant memory, as well as the opportunity to establish an emotional connection with the person that conveyed the description. While it was not expected to be the 'same', our participants reported having high expectations for recent image-describing AI applications or features. Indeed, there were several positive reflections on how AI image description could generate metadata that offered contextual details that made participants' overall connection to a photo more significant, such as in **Ray's** case:

> Knowing the color for me is important, but it is more academic than emotional. For example, is it emotionally important to know that my mom dyed her hair red? No, not really. But knowing that would allow me to have a deeper connection with her image so that I know that my mom has red hair now. (**Ray**)

Although **Ray** became blind at age 3, he had no memory of the color red or what any other color "looked like." Nonetheless, knowing that his mother's hair color was red in the photo remained important to him. This sentiment was common across participants (e.g., although **Luis** had no knowledge of what the color orange is on a visual level, it was valuable for him to be aware of where it was in his photos). Many participants used AI-image description, or simply relied on other loved ones, to understand the location and connection of particular colors in relation to the people or experiences captured on photos.

4.3.2 Inclusion and Experiences with Tactile Photography. During these conversations, participants also frequently brought up the concept of tactile photography, which is a technique for adapting photography by adding tactile attributes that can be tangibly 'read' by people with blindness. Several participants were highly interested in having more opportunities to create, share, and engage with tactile photography to revisit significant memories. However, most participants had been largely unable to use tactile photography due to a high cost in production as each was one-of-a-kind hand-crafted pieces. Participants also noted that learning to 'read' tactile photography is a practice that requires time and attention. **Ray** described how learning to translate and then read three-dimensional surfaces, shapes, and textures that were previously captured in a two-dimensional photograph is an iterative process that requires ongoing practice.

Interestingly, **Janet** had prior experience teaching children with blindness to learn to read tactile photography from various stock photos that represented both abstract and real situations. She noted that a key challenge is that while people with blindness benefit from tactile photographs, they are also typically highly separated from the selection and production of them. **Janet** speculated that having more control over the creation of tactile photographs in terms of the tactile qualities and the content captured on the photographs could be productive in people with blindness overcoming the learning curve. She expressed how this could open new possibilities for creating rich resources that leverage the level of detail captured in a single photo with the sensitive tactile capabilities that people with blindness often possess. In light of the historical challenges related to the production of tactile photographs and lack of inclusion in the design process, **Ray** actively envisioned new possibilities for 3D printing technology to be extended to people with blindness to experiment with creating their own tactile photographs. In particular, he remarked on the potential that additive fabrication techniques offer in terms of creating custom shapes with a variety of textures, materials, and weights:

> Nowadays, a lot of people have the ability to make an object using a 3D printer. That technology is not available to the blind so far. I think that is one thing that I would love to see become accessible because then I can actually make physical memories. I can make physical things that would remind myself of things; statues of different designs or in different textures. (**Ray**)

4.3.3 Crafting a Legacy to Pass Down. Our conversations also led to an early and consistent theme that captures both desires and uncertainties around how our participants would craft a legacy of their life history and they would be remembered in the future. For example, **Janet** wished to live a life that can make a difference and positively influence others and hoped she would be remembered for her efforts:

> I'd like people to be able to remember what I did to make the world to be a better place. Somehow, those memories need to be preserved for that reason, to help people understand what it was like at the time when I was alive compared to how different it is when they are alive. Once, somebody gave me a little trunk and said, 'you can put stuff in since your retirement'. If I have gone travelling or something, then I journaled a little bit about it. I'll print it out and put it in that little box so that other people can read it when I'm not around. So, when I'm gone, they'll have something to help remember the things that I did. (**Janet**)

However, as our dialogue with **Janet** continued, it became clear she was ambivalent over how her digital legacy would actually be captured and passed down. Like most of our participants, Janet's archive of significant digital materials included a mixture of audio recordings, written text, photos, and videos. Janet, like all of our participants, remained hopeful that her digital legacy could be made into some form of a cohesive archive for others to remember her by. **Janet**'s story offers a salient insight into the added challenges that people with blindness face when capturing and revisiting their own memories, and in creating resources for loved ones to remember them in the future. Findings in this section also highlight the willingness of our participants to engage with new technology to support their practices of capturing and looking back on the past, even when such technologies do not fully succeed.

5 DISCUSSION AND IMPLICATIONS

While there is a growing amount of HCI research on improving technology to better support experiences of reminiscence, people who have disabilities have largely been overlooked; and, as a consequence, little is known about the practices and experiences of people with blindness. A key contribution of our study is to provide a richer understanding of how people with blindness capture, share, recollect and reminisce on past life experiences in light of their needs and desires. We found that sensorial impressions evoked from touch, smell, and sound could be powerful triggers for reminiscence. Participants mobilized various kinds of digital possessions—and, at times, their attendant metadata—as rich resources to extend their individual and social practices of reminiscence. However, these experiences were not always tension free. Various instances emerged where digital or physical possessions could disrupt reminiscence experiences for our participants or for their loved ones. Next, we describe a set of design possibilities that build on themes in our findings and extend them through a generative perspective. Importantly, our aim is not to suggest that these are the 'only' opportunities for future research. Rather they begin to give shape to a design space that future HCI research and practice initiatives can explore in the service of positively shaping the reminiscence practices of people with blindness.

5.1 Remembering Through Sound

Our findings showed that participants desired to capture, revisit, and share audio that captured specific qualities of experience, and that these kinds of recordings were among participants' most cherished possessions. It was also clear that currently there is no straightforward way for participants to easily keep, explore and interact across their personal archives of digital audio recordings in a cohesive way.

5.1.1 Pairing Ambient Recordings with Additional Metadata for Individual Reminiscence. There is an opportunity to explore how digital repositories could be designed that would enable people with blindness to better safeguard these cherished possessions and, in doing so, open up new resources for supporting individual reminiscence. Revisiting sound recordings could trigger a range of reflections as participants reconstructed memories from a loved one's voice, the trail of background noise, vocal murmurs, or the tonal timbre of a recorded environment. Here, a cohesive digital repository could

make it possible to combine recordings with other forms of metadata to create more socially- and environmentally-oriented ways of storing and interacting with personal audio.

These initiatives could enable new ways of capturing, organizing, and retrieving audio recordings as well as the ability to surface and explore potentially intriguing forgotten or yet unknown themes and patterns in snippets of recordings across the archive (e.g., by location, people's voices that were socially present, or particular atmospheric timbre, all of which encompassing qualities that were valuable to our participants). These efforts could also contribute to higher-level calls in the design and HCI communities to diversifying the populations that we engage to understand and design the digital domestic soundscape [17, 18, 64, 69]. Following the possibilities outlined above, a personal soundscape could be augmented by attaching different types of metadata. Building on prior work showing the value of geolocative reminiscence (e.g., [19, 47, 72]), location history data could be integrated with audio to allow people to explore ambient sound recordings based on their geographical location. For example, re-combining and blending sound recordings that were captured around the same geographical area, across different times in the life of a person with blindness could be one possible direction. Additionally, building on prior research proposing interactive sonic jewellery [52], future research could explore how sound archives of focused voices or ambient soundscapes alike could be embedded in a handheld ornaments or objects to explore what kinds of tangible interaction qualities are preferred by people with blindness when living with hybrid physical-digital possessions.

Collectively, these proposals represent a diversity of design proposals that could be explored individually or through varied combinations. They offer a set of generative possibilities that can be used to frame future participatory research initiatives with people with blindness to probe on their potential value and how new co-envisioned concepts could be refined and be attuned to each participants' unique practices of engaging with memory-oriented audio recordings. Future work in this area offers promise to extend the pre-existing rich individual practices of audio-based reminiscence that we observed, while opening new opportunities for rich interaction and for better safeguarding these cherished archives.

5.1.2 Exploring the Potential of Asynchronous Audio Sharing Systems to Mitigate Tensions. While our participants were highly adept at revisiting audio to personally recollect cherished memories, engaging in these practices in a social setting with sighted loved ones was not as easy and tensions frequently emerged. Our participants could deeply connect with longer-form audio recordings in rich and evocative ways, while their sighted loved ones struggled to appreciate their nuances and maintain attention. This finding connects with Dib et al. [17] and Oleksik et al.'s [64] earlier research on sonic mementos, where family members desired to distill meaningful clips from longer recordings as brief catalysts to trigger event-based social reminiscence. Yet, these studies were conducted with sighted family members and our participants faced additional challenges that stemmed from their attachment to a more diverse set of audio recordings (e.g., atmospheric, vocal murmurs) that could feel unfamiliar to sighted loved ones.

We believe there is an opportunity to explore how sighted and blind loved ones might develop a stronger sensibility for collectively

engaging with memory-oriented audio recordings. Recent work [34, 38, 42, 65] has revealed the value of asynchronous audio-based storytelling to support intimacy and reinforce close-tie relationships. A similar strategy could be extended to enable the capture and asynchronous sharing of memory-oriented audio snippets groups of sighted and blind loved ones. This direction could probe on the potential value in enabling the person recording memory-oriented audio snippets to also record, attribute, and layer annotations as a form of audio metadata to memory snippets. This could provide the necessary space to guide the listener(s) on what to listen to within a recording and their significance; and, in turn, nurture other loved ones in cultivating their own sensibility for engaging with audio-based reminiscence and attributing their own audio annotations in response.

Over time, a system like this may encourage sighted loved ones to begin capturing, annotating, and sharing their own recordings, potentially leading to the emergence of a shared archive of audio memories. This asynchronous approach could enable sighted people to learn how to produce and exchange 'audio postcards' with their blind loved ones, while supporting and respecting each other's individual pace. Future research exploring these possibilities would clearly need to be handled carefully and collaboratively. An iterative participatory design process as well as the resulting final design could collectively lead to a heightened understanding for sighted loved ones of how their blind family members or friends are sensorially-oriented to sound in the environments they inhabit and the significance it holds for their practices of recollecting the past.

5.2 Remembering through Collaboratively Annotating and Retrieving Photographs and Mixed-Media

Our findings also build on recent work that dispels a misconception that people with blindness are not interested in or engage with digital photos and visually-oriented dynamic media [4]. Although our participant pool was diverse in terms of life stage and background, all reported that photo-centric media played significant roles on individual and social levels. Clear tensions also emerged from a lack of inclusion in collocated, photo-oriented practices of reminiscence.

5.2.1 Supporting Collocated Remembering. Prior HCI research has shown the value of pairing descriptive audio with photographs [27, 45] to create more evocative media assemblages. In parallel, there is a growing body of research showing that slowing down interaction with photos and with audio can be productive in creating time for re-visitation of the past and social interaction [26, 34, 56, 59, 63, 71, 84, 85]. In efforts to alleviate the tensions noted above, future research could bring together these strands of work to explore how new digital audio-photographic applications could be collectively envisioned that emphasize the social contemplation and discussion of photos in through a slower interaction pacing.

For example, an application or tangible device could present a digital photo of a significant life event and then prompt one (or several) family members to verbally describe the image and their memories bound up in it. This design possibility could lead to a

more inclusive pathway for engaging family members with blindness and inviting them to contribute their own narratives. This approach would support many of our participants' attachments to mixed forms of media (e.g., **Rob's** DVD archive of shared life events) as well as the highly valued practice of mentally reconstructing memories through the verbal description of loved ones. Building on the earlier opportunity of a memory-oriented audio archive, other audio snippets from within temporal proximity to a photo's timestamp, for example, could be surfaced and explored as these open-ended social sessions unfolded. Indeed, the audio recordings from these collocated interactions themselves could also be captured and archived within shared memory-oriented *audio-photographic* [27] archives over time.

This part of the design space could be further explored through initiatives that probe into the potential for different interaction design strategies to generate new kinds of resources for collocated reminiscence. For example, the FM.Radio project [69] demonstrated that parsing audio-based memories into different categories (e.g., time, voices, favorites) paired with tangible interactions for moving in and across recordings was highly productive in supporting familial reminiscence. More recently, the Olo Radio project [55, 61] has shown the value in interconnecting memory-oriented data with different temporal modalities as novel resources for supporting both serendipitous and planned experiences of reminiscence. Future research can investigate the desirability of these design qualities directly in participation with people with blindness and their loved ones. This could lead to unique sets of preferred audio-photographic classifications and interaction design strategies that can applied and refined in the co-design of future interactive systems for collective reminiscence.

5.3 Remembering through Unique Tangible Experiential Metadata

Advances in additive and subtractive manufacturing (e.g., 3D printing, CNC milling) are beginning to make the production of custom objects more accessible and flexible. This offers the potential to support people with blindness through creating their own unique memory collections. We found physical features of cherished possessions were key catalysts for our participants to recollect memories. In some instances, a unique photo frame, and not the photo itself, was a significant memento. In other cases, tactile photos offered an evocative, yet under-realized resources for reflection. Across all instances, it was clear that texture, shape, material and weight came together as qualities that evoked past life experiences that participants associated with cherished tangible objects. Building off of these accounts, there is an opportunity for future research to explore the role (and limits) of tactile objects in making connections to memories in twofold; 1) translating visual memories in 2D to 3D, and 2) creating and enhancing a physical representation of memory with tangible metadata.

5.3.1 Translating Visual Memories to Tactile Photos. Tactile photos could act as a resource for connecting people with blindness with photography in supporting reminiscence. Recent research in digital fabrication around the advent of new manufacturing techniques has enabled tactile photos to be much more accessible at high fidelity and lower cost [48, 51, 54]. On a social and collective level, systems

could be designed that offer translations of significant visual photos into tactile photos. Such systems could open the possibility for both blind and sighted loved ones to create and share tactile photos.

Indeed, this area would need to be approached with caution. Currently, learning to read tactile photos is not an easy process and requires considerable training and practice. Nonetheless, as Janet and Ray reflected, if people with blindness are trained to read images through tactile information, a new opportunity for reminiscence could be explored by designing special images with unique patterns and depths on the surface of an object. Future research can combine recent technical innovation that has made tactile photos more accessible with new participatory efforts that better include people with blindness in exploring, questioning, and envisioning the role that increased access to tactile photos might play within their practices of reminiscence and their everyday lives more generally.

5.3.2 Crafting Physical Representation of Memories. Computer-Aided Design (CAD) software used in conjunction with additive and subtractive manufacturing provides people with substantial flexibility in reproducing, copying, resizing, modifying and sharing objects with a range of textures and dimensions. This generates new design possibilities for enable people with blindness to make and share their own personalized bespoke memory-oriented objects that come in different shapes, textures and weights [50, 54, 70]. While 3D modeling software is becoming increasingly accessible to novice end users, creating precise 3D forms is still not an easy task and consists of highly visual software [79]. One direction that could help alleviate some of these barriers is through leveraging existing communities, such as See3D [81], which actively brings together sighted people and people with blindness to collaboratively design, make, manufacture, and share 3D printed objects. However, translating conceptual ideas into a three-dimensional model itself comes with inherent contingencies; and this complexity is compounded by digital fabrication processes that have narrow tolerances and are prone to material failure. Such initiatives would likely not work 'perfectly' or be 'error-free' at their inception.

Yet, there may be new possibilities in these challenges. Recent work has shown that frictions emerging in translating personally meaningful experiences into physical form through such digital fabrication itself can be an important meaning-making process [16, 25, 54]. This iterative, collaborative practice offers the potential to valuably connect participatory digital fabrication with the creation of unique memory-oriented reminiscence objects as an ongoing situated social process. Through direct involvement in the design process, this opens an opportunity for people with blindness to create other forms of digitally fabricated mementos and memory objects [7, 53, 54, 76]. Likewise, this is a broader opportunity for inclusion, taking the form of either online communities or in-person maker spaces, where people with blindness and people with sight can mingle and benefit from the unique capabilities and perspectives of each other.

6 CONCLUSION AND FUTURE WORK

We have explored how people with blindness engage in practices of individual and collective reminiscence on the past. A key goal of our paper is to better understand our participants' experiences in order to establish an informed foundation for critically considering how technologies can be designed to support people with blindness based on their own practices, needs and desires. Findings revealed novel ways that our participants drew on their sensorial capabilities, their possessions, and other people's verbal translations of memorable experiences as rich resources for reminiscence. Several tensions also emerged that complicated reminiscence practices for both blind and sighted loved ones. Based on these findings, we proposed several opportunities for future research to inquire into how technology to better support people with blindness in capturing, sharing, and reminiscing on significant memories bound up in their past.

We see each of these areas as generative opportunities to directly engage people with blindness in co-design activities to further develop design interventions and to question what kind of futures are desirable (and undesirable). Through the process of conducting this research, we found that nearly all of our participants expressed the realization that they themselves wished to find out more about the reminiscence experiences of people with blindness and, in several cases, desired to meet other study participants. Also, we recognize that it is necessary and needed step to appropriately deliver the result of this study back to our participants to build on these findings together. Therefore, we are in the process of distributing the digital manuscript of this paper as well as vignettes and anecdotes distilled from our interviews in forms that we hope will be rich and engaging for our participants. Our aim is to use this opportunity to facilitate further discussion and debate among participants and progressively work towards developing co-design workshops to critically explore this emerging design space directly with individuals and communities of people with blindness. Ultimately, we hope this study inspires future research into how technology design can be more inclusive of people with different abilities and generate valuable resources for reminiscence on cherished memories—a vital practice for people that are blind as it is for any of us.

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