Practices and Barriers of Cooking Training for Blind and Low Vision People

Ru Wang
ru.wang@wisc.edu
University of Wisconsin–Madison
Madison, Wisconsin, USA

Nihan Zhou
nzhou37@wisc.edu
University of Wisconsin–Madison
Madison, Wisconsin, USA

Tam Nguyen
nguyen58@wisc.edu
University of Wisconsin–Madison
Madison, Wisconsin, USA

Sanbrita Mondal
smondal4@wisc.edu
University of Wisconsin–Madison
Madison, Wisconsin, USA

Bilge Mutlu
bilge@cs.wisc.edu
University of Wisconsin–Madison
Madison, Wisconsin, USA

Yuhang Zhao
yuhang.zhao@cs.wisc.edu
University of Wisconsin–Madison
Madison, Wisconsin, USA

ABSTRACT

Cooking is a vital yet challenging activity for blind and low vision (BLV) people, which involves many visual tasks that can be difficult and dangerous. BLV training services, such as vision rehabilitation, can effectively improve BLV people's independence and quality of life in daily tasks, such as cooking. However, there is a lack of understanding on the practices employed by the training professionals and the barriers faced by BLV people in such training. To fill the gap, we interviewed six professionals to explore their training strategies and technology recommendations for BLV clients in cooking activities. Our findings revealed the fundamental principles, practices, and barriers in current BLV training services, identifying the gaps between training and reality.

CCS CONCEPTS

• **Human-centered computing → Empirical studies in accessibility**.

KEYWORDS

blind and low vision, rehabilitation training, cooking, kitchen

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1 INTRODUCTION

Cooking is a vital but challenging daily activity for blind and low vision (BLV) people as it involves various vision-related tasks, such as locating items, pouring, and measuring ingredients [2, 15]. Some cooking tasks can even pose safety risks, for example, handling sharp tools and hot appliances [13]. While several low-tech assistive tools are available, such as liquid level indicators and talking thermometers [7], they are limited to supporting very specific tasks and cannot fulfill BLV people's full range of needs in the dynamic and busy cooking process. Prior research has investigated BLV people's cooking experiences via interviews and observations [13, 16] and identified various challenges they face, such as getting burned during cooking and not being able to track the status of cooking tasks.

To overcome these challenges, BLV training services become a primary source where BLV people learn about assistive technologies and skills for daily activities [19], such as reading [24, 28, 29], socializing [22], and cooking [9, 20]. Many BLV organizations and rehabilitation clinics offer services to train BLV people in the kitchen. K-12 schools also offer individualized education plans (IEP) for BLV students to learn necessary living skills, including skills in the kitchen [10]. Prior research has shown that rehabilitation training can effectively improve BLV people's independence and performance in daily activities [12, 17, 29].

Despite the usefulness, current training services present barriers. For example, not all BLV people are able to access such a service [14], and some may drop out during the training [3]. Even completing the full training, not all BLV people can fully adopt the skills and technologies recommended by the professionals [26]. It is important to deeply look into this training and learning process, thus exploring how it shapes BLV people's cooking strategies and technology choices and identifying potential issues.

To achieve this goal, we conduct an interview study with six training professionals to investigate the training practices, technology recommendations, and challenges in the current training process. We find that while most professionals customize their training plans and technology recommendations according to BLV clients' abilities and needs to optimize the training efficacy, they point out that current training process cannot fully address all cooking challenges faced by BLV people. Our research identifies the training barriers and derives implications for technologies and research directions that would better support BLV training in the kitchen.

2 METHOD

Participants. We recruited six professionals who trained BLV people to cook, with training experience ranging from 7 to 25 years. Participants were recruited from BLV organizations as well as the local hospital and clinics. Table 1 detailed participants' information.

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While the scarcity of BLV rehabilitation specialists [30] resulted in a relatively low number of participants in our study, our participants presented *a good coverage of different types of trainers and organizations*: three were occupational therapists (OTs) from nonprofit organizations (pseudonym: Rachel and Lyla) or local clinics (Megan); two (Maria and Michael) were teachers of students with visual impairments (TVIs) from regular schools; and one (Kevin) was a chef coach for BLV people from a cooking school.

Procedure. The interview study was conducted via Zoom, lasting one to two hours per participant. After asking about participants' demographic information and general training experiences, we focused on their cooking-related training experiences. We asked about their training procedure (e.g., training format, length of the training, and training content) and how they came up with training plans for each client. Participants then talked about the common cooking tasks that they focused on in the training. For each cooking task, we followed up on their training principles, the cooking strategies they taught, and the rationales for their training decisions. Finally, participants talked about the tools or assistive technologies they recommended, the benefits and weaknesses of these technologies, and how they discovered these technologies. We also asked about participants' opinions on more advanced technologies, such as AI-based technology, smart glasses, and robotics.

Analysis. We analyzed the interview transcripts using thematic analysis [5]. Two researchers coded three identical transcripts independently. A codebook was generated upon agreement between two researchers. One researcher then coded the remaining transcripts based on the agreed codebook. If new codes emerged, the codebook was iterated and updated upon researchers' agreement. We then derived themes using axial coding and affinity diagram.

3 FINDINGS

Diverse Training Formats. Participants adopted different training formats. All participants but Kevin provided *one-on-one training*, where they met one client at a time and guided them through different training tasks either in a standard training space or at the client's home. Two participants (Rachel and Lyla) supported *at-home training*, which allowed participants to observe their clients' kitchen setup and cooking tools, thus coming up with a more tailored training plan. Lyla highlighted that home visits helped reflect clients' actual cooking situation better than their self-report, *"I like doing home visits because, a lot of times, [my clients] will say that they're doing fine in an area that they're really not. When I can get in and actually observe them, I see that they are struggling."*

Four participants also offered *small group training* with five or less clients per group if they observed common interests or challenges from multiple clients. Small group sessions could boost training efficiency, but they worked only for clients who were good learners and good team members. Uniquely, Kevin adopted a *large group training* format with over 50 clients with similar visual abilities at the professional cooking school. However, he still broke the large group down into groups of five to better track their progress.

Plan Customization. We found that the professionals followed different approaches to design training plans and provided different levels of customization. Rachel, Lyla, Maria, and Micahel offered high customization for each client. They first assessed the client's background and goals, and then came up with a suitable plan, including number of sessions needed, tasks to focus on, and types of technologies to recommend. The training plan was adjusted dynamically according to the client's progress and preferences. For example, if their clients had difficulty with a specific task, they would repeat the same training content in the next session, or sometimes use new training strategies. As Rachel explained, *"If [the clients] are focusing on stovetop use, for example, and they're having some challenges with it, we would do another session the next time before we move on to another skill area...and I can break the training down into a subset of [small] tasks [to help them learn better]."*

In contrast, Megan from the clinic setting and Kevin from the cooking school involved less customization. Megan provided a low level of customization by following a general routine, mainly covering a few common goals and skills, such as reading package information, measuring, and cutting. However, she was still open to adjusting her plan if the client showed interest in a particular goal. More strictly, Kevin from the cooking school followed a very standard training plan with no customization since he had a large group of students.

Training Principles. To guarantee clients' learning outcomes, participants followed some common principles below.

(1) Ensure Safety. All participants **emphasized the importance of safety in the kitchen** and used different approaches to protect clients' safety during the training: Maria and Kevin usually discussed the potential safety risks of cooking with their clients at the beginning to mentally prepare them for the underlying hazards; Michael asked his clients to first navigate around and familiarize themselves with the kitchen before the formal training; and for dangerous tasks (e.g., cutting, using hot appliances), Maria and Rachel encouraged their clients to first freely explore the specific tools or appliances instead of rushing into the task. Morever, cooking strategies and tools were introduced by our participants to facilitate BLV people's safety. For example, protection tools (e.g., cut-resistant gloves) were always recommended, hot appliances should be turned off when moving food in and out of the appliances, and heavy items should be put on a lower shelf to prevent the risk of heavy items falling on the BLV people.

(2) Recommend Strategies & Tools based on Visual Abilities. Another key principle is to **distinguish blind and low vision clients**, and suggest strategies and technologies based on clients' visual abilities. When training low vision clients, all professionals encouraged their clients to leverage their residual vision. As Megan mentioned, *"If [the clients] are low vision and they do have some residual vision, then we try to do as much as we can visually. Depending upon the range of their vision, the more vision they have, obviously the more visual support they'll get."* To maximize vision use, participants recommended kitchen tools with bright colors or strong color contrast, for example, a white and a black cutting board so that users can choose the one with high contrast according to the food they need to cut (Rachel).

For clients who are blind or have progressive low vision, our participants encouraged the use of other sensory channels in the

Pseudonym	Age/ Gender	Visual Ability	Title	Years of Experience	Target Client
Rachel	45/F	Sighted	OT	8	Mostly older adults
Lyla	48/F	Sighted	OT	13	Mostly older adults
Megan	54/F	Sighted	OT	25	Mostly older adults
Maria	43/F	Sighted	TVI	11	High school students
Michael	49/M	Low Vision	TVI	11	K-4 to high school students
Kevin	30/M	Sighted	Chef Coach	7	Adults

Table 1: Demographic information and training experience of the six training professionals.

kitchen, such as touching, smelling, and hearing. Participants recommended different ways of touching. Bare hand touching was recommended in many kitchen tasks, such as cleaning dishes, measuring, and using appliances. However, when dealing with hot food, all participants recommended using tools as "an extension of hand" for safety.

(3) Practice at Home. All participants stressed the importance of practicing cooking skills at home after training to enable the clients to better apply the learnt skills to their home environments. However, participants expressed divergent opinions on when to start practicing. Rachel, Lyla, and Maria encouraged the clients to practice at home at any time to explore their preferred way of cooking instead of following strict rules or instructions. Lyla emphasized the benefits of home practicing for clients with other disabilities, for example, enhancing the memory of older adults with memory loss and increasing the muscle tolerance of people with physical disabilities. As she mentioned, *"I tell [my clients] to go over all the things that we went over that same day, don't even wait till tomorrow and do it today to lock it in. For a lot of our clients, because they're older, they do have short-term memory loss, so they have to practice."*

However, Megan and Kevin were against practicing at home until the client could use all the techniques safely and independently. Without supervision, a BLV client at the early training stage could face safety risks in their own kitchen. As Megan said, *"Anything with the stove, heat, knives, I want to make sure that [my clients] are safe and independent using it in a kitchen before I have them practice at home."*

Technology Recommendations. Participants recommended and provided training on various technologies to support kitchen activities, ranging from low-tech tools to advanced technologies. Low-tech aids included electronic talking tools (e.g., talking scale), labeling tools (e.g., bump dots), magnifiers (e.g., wearable optical magnifier), and protection tools (e.g. cutting gloves). In terms of advanced technology, participants mentioned recognition technologies (e.g. OrCam [23], Microsoft Seeing AI [21]) to read food packages and recipes, vision enhancement smartglasses (e.g. eSight [8]) for low vision people to see better in the kitchen, and smart speakers (e.g. Alexa [1]) to control kitchen appliances.

However, **all participants tended to recommend low-tech tools rather than high-tech devices** due to multiple reasons, including cost, learnability, stability, and maintenance. First, many advanced devices were expensive and the cost could not be covered by insurance. Second, learning and maintaining advanced technology could also be difficult for BLV people, especially for older adults and people who were not tech-savvy. For example, charging and updating can frustrate some clients since they did not know when and how to charge the device (Rachel). The unstable performance of some high-tech devices further diminished BLV people's experience, for example, OCR technology failing to recognize certain fonts and unclear images. Due to these drawbacks, all professionals believed that low-tech tools were safer and more suitable to be recommended to a larger population.

Lack of access and resource to new technologies was another factor that prevented the professionals from recommending high-tech solutions. Except for Rachel and Lyla whose organization had a tech department, other participants had to do their own research to keep up with the latest technology, however, their time to do so was limited.

Although all participants agreed that high-tech devices were challenging for older clients, participants' opinions diverged on young clients' technology preferences. Michael indicated that his students would rather use their hands or low-tech cooking tools in the kitchen because they were concerned about looking different from peers if using awkward technology. However, Maria's students reacted differently. They were good at and passionate about technology and preferred to incorporate technology in their daily life, such as reading accessible textbooks on a laptop.

Training Challenges and Limitations. Except for Kevin, all participants agreed that current training could not address all difficulties that BLV people faced in the kitchen. One major challenge was that the training was usually conducted in a standard and simple environment, making it **difficult to transfer the learnt skills to a more complex kitchen in real life**. As Maria described, *"We don't have 65 bottles of spices. But, for a cook at home, that is a problem you're going to run into. Because I'm in a very controlled environment that is not like their house. I don't think I can truly mimic the real-life experience."*

Clients' emotions and motivation could also pose barriers to effective training. Participants reported that their clients expressed fear and nervousness, and some even became emotional during the training. For example, if a client experienced vision loss recently, they could be in the emotion of *"grieving their vision loss"* and felt less ready for the training (Lyla). Moreover, compared to older clients, young clients were much less motivated to learn living skills since chores like cooking were usually taken care of by their parents. Another issue unique to BLV students was their limited time for learning living skills due to their heavy academic curriculum load.

4 DISCUSSION & FUTURE WORK

Our research contributes the first investigation into BLV people's training and learning process for cooking activities. While prior research focuses on BLV people's perspective [13, 16], we take

a unique lens from the professionals' perspective to identify the training practices, technology recommendations, and barriers.

Contextualized in prior insights on BLV people's cooking experiences, we find that the current cooking training covers most cooking tasks that are identified as challenging in prior research (e.g., cutting, measuring, using oven) and the training principles reported by professionals also align with the cooking strategies adopted by BLV people in prior work (e.g., using hands to feel around, wearing gloves when cutting) [16]. The consistency between prior literature and our study indicates the *effectiveness* and *practicality* of the training. However, there are still tasks that are not well supported by the training, especially when transferred to the more complex and dynamic cooking process in real life. For example, accident handling during cooking and tracking a kitchen element that is temporarily moved and used are difficult tasks for BLV people [16], however, these tasks are not simulated and supported in an ideal, simplified training environment. This highlights the importance of new technologies that support more comprehensive and realistic cooking training. We discuss some future research directions to improve BLV people's training outcomes.

Enabling Telerehabilitation. To close the gap between the well-controlled training environment and BLV people's own kitchen, Telerehabilitation could be a promising solution that delivers remote training to the client's home with reasonable cost [6, 11]. For example, Bittner et al. [4] has explored the feasibility of video conference based telerehabilitation to train low vision patients to read with handheld magnifiers. However, unlike stationary reading, telerehabilitation for cooking could be challenging given its dynamic nature that makes it hard for a camera to fully capture the client's behaviors. Future research may consider suitable solutions to support telerehabilitation for more complex tasks, such as multiple camera setup in the kitchen or a wearable camera that capture the client's egocentric views. Beyond video conferencing, virtual reality technologies could also be considered to simulate various kitchen environments and tasks [31] in the training to mitigate potential safety risks at the early stage.

Facilitating Low-Tech Tool Adoption & Customization. Low-tech tools are more recommended than advanced technology by our participants for many reasons. While multiple stakeholders (e.g., issuance agents, policy makers, developers) should be involved to lower the barriers of accessing and learning advanced technology, in the near future, BLV people will still be using low-tech tools for most cooking tasks. However, despite the usefulness of these tools, low-tech tools can present different barriers from high-tech solutions. For example, BLV people can be overwhelmed by having too many tools designed for the kitchen [16], and commercial, mass-produced low-tech tools may not completely fulfill individual BLV user's unique needs [25, 27]. Instead of focusing only on high-tech innovations, new research directions on low-tech tools should be considered by accessibility researchers and practitioners, such as evaluating the effectiveness of different low-tech tools, and recommending methods or practices that enable BLV people to customize existing commercial tools [18].

Our research initiates the first step towards understanding the cooking training process for BLV people. More research is needed to observe the training sessions to better characterize the interaction dynamics between the professionals and the BLV clients. We will also conduct follow-up studies to observe clients' cooking activities at home after training to understand the effectiveness of transferring training skills to real world context.

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