

Non-Work Activities

05-499/899 Fall 2024

Celebrating Accessibility

<https://cmu-05-499.github.io>

Andrew Begel and Patrick Carrington

Welcome Franklin Li, PhD Candidate HCII



Franklin's research interests are in Human-Computer Interaction (HCI), Assistive Technology, and Ubiquitous Computing (UbiComp). His research focuses on exploring, designing, and deploying Assistive Technologies for physical space and Activities of Daily Living for people with disabilities. His dissertation aims to support and enable non-visual cooking for people with vision impairments through AI and Assistive Technologies.

Leveraging AI for Accessibility in Physical Space

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Background: People with Disabilities



Background: Accessibility Issues in Physical Space

Physical Barriers



Perceptual Barriers



Background: Existing AI-Systems for Accessibility



But...

One third of all assistive technology were abandoned

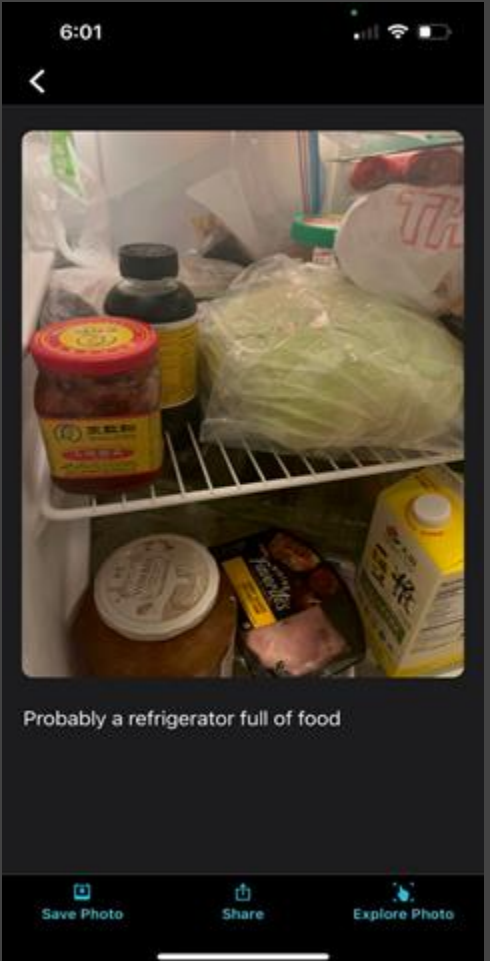
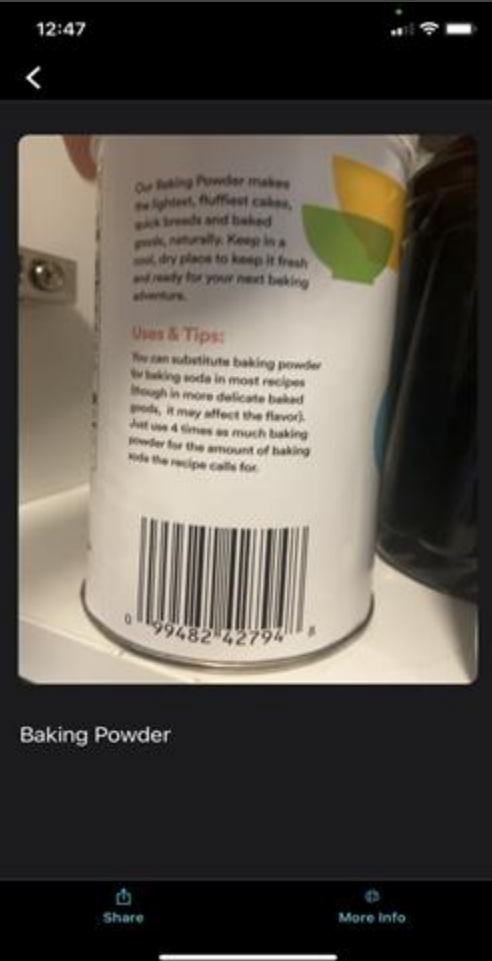
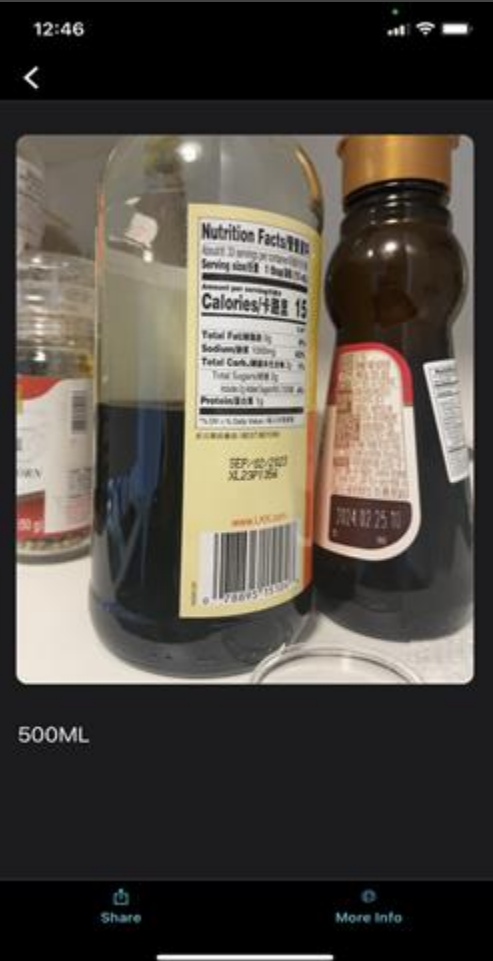


Phillips, B., & Zhao, H. (1993). Predictors of assistive technology abandonment. *Assistive technology*, 5(1), 36-45.

Background: Existing AI-Systems for Accessibility



Background: Existing AI-Systems for Accessibility



About my research

**Understand AI System
Adoption by People with
Disabilities in Physical
Space**



About my research

CHI '23, ASSETS '22, CHI '22, CSCW '22, ASSETS '21, CHI '21...

Understand AI System Adoption by People with Disabilities in Physical Space



Design Framework of AI Systems for People with Disabilities in Physical Space



About my research

Understand AI System Adoption by People with Disabilities in Physical Space



Design Framework of AI Systems for People with Disabilities in Physical Space



IUI '22, ASSETS '20, IMWUT '19...

Develop and Deploy AI-based Assistive Technologies in Physical Space to Improve the Quality of Life



Bridging Physical Barriers





Bathing



Dressing



Grooming



Oral Care



Toileting



Transferring



Moving
Around



Eating



Shopping



Cooking



Managing
Medication



Using the
Phone



Housework



Laundry



Driving



Managing
Finance



Leisure and
Other Activities

AI and Technology is everywhere!!



Bathing



Dressing



Grooming



Oral Care



Toileting



Transferring



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Leisure and
Other Activities

Readings Discussion

- [A Contextual Inquiry of People with Vision Impairments in Cooking](#)
- [Understanding Visual Arts Experiences of Blind People](#)

Non-Visual Cooking

Information Access for Self-Care



A chef with a full beard and sunglasses is shown in a kitchen setting, wearing a white apron and stirring a large green bowl with a wooden spoon. The background features a stainless steel range hood and kitchen cabinets.

Non-visual Cooking

65% of visually impaired people indicated that vision affect cooking (Jones et al., 2019)

Eat outside or frozen food that are calorie-rich (Bilyk et al., 2009)

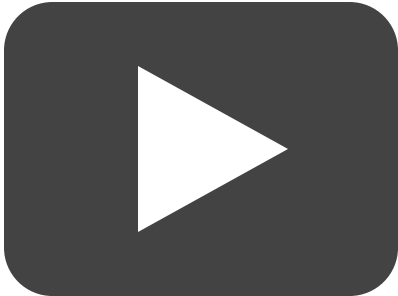
Reduce **agency and autonomy** which impact the quality of life (Bhowmick and Hazarika, 2017)

What are the current practices and challenges do people with vision impairments face while cooking?

Understanding the
Current Experience of Non-Visual Cooking

Understanding Current Cooking Experiences

YouTube Video Analysis



× 12

2

YouTube videos focused on cooking practices of visually impaired people

Semi-structured Interviews



× 12

Interviews with visually impaired people who have experience cooking

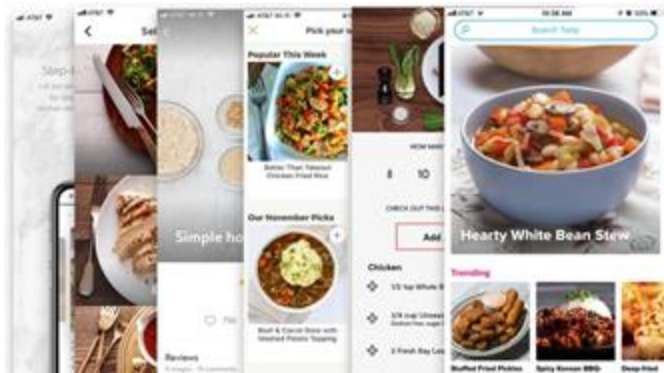
Findings: **Eight Challenges** for Non-visual Cooking



Tool Utilization



Precision



Recipe Access



Safety



Collaboration



Status of Object



Hand Feeling



Inspection

Access in the Kitchen

Non-Visual Cooking

Recipe Support

Contextual Support for Objects

Participation Activity 1

- Divide up into groups of 3-4
- Design a system that helps identify, track, and non-visually communicate with the user about the context of different objects in the kitchen?
 - Think of your favorite recipe or something you might cook often
 - Make a list of 5-10 “objects” from your kitchen (food, appliances, furniture, tools, etc.) that you need to interact with to make this recipe

Participation Activity 2

For each object, fill in relevant information for these attributes:

- Position
- Orientation
- Proximity/Grouping
- Similarity and Duplicates
- Internal State
- Safety-Related (if relevant)
- Health-Related (if relevant)

Attribute	Description
Position	The relative location to a reference point, or an “anchor,” to indicate the object’s position
Orientation	Information about how an object is currently oriented (e.g., vertical, horizontal, or tilted) relative to a reference point (e.g., human, object)
Proximity and Grouping	Information about groupings of objects relative to others and the environment
Similarity and Duplicates	Information about similar or duplicate objects, which includes differentiation between similar objects, relative positions between objects that are similar, and the overall quantity of similar objects
Internal State	Information about internal state of objects, such as cleanness, freshness, boiling water, the amount of solid or liquid inside the container, and the doneness of food
Safety-related Information	Information to monitor anything that might be harmful (e.g., knock over objects, flaming)
Health-related Information	Information to track objects with health hazards after consumption (e.g., expired food, overcooked food)
Plating and Serving	Information about the final appearance and presentation of objects upon finishing (e.g., color distribution)

Participation Activity 3

Thinking about the objects that you chose:

- What tools could you use to help identify them?
- What information would you need/want to track about each object?
- How and when should the system communicate regarding those objects? (when the user asks? when some action is performed?, random? continuously?)

Write or sketch a user story describing the hypothetical system.

Turn in your papers before you leave.



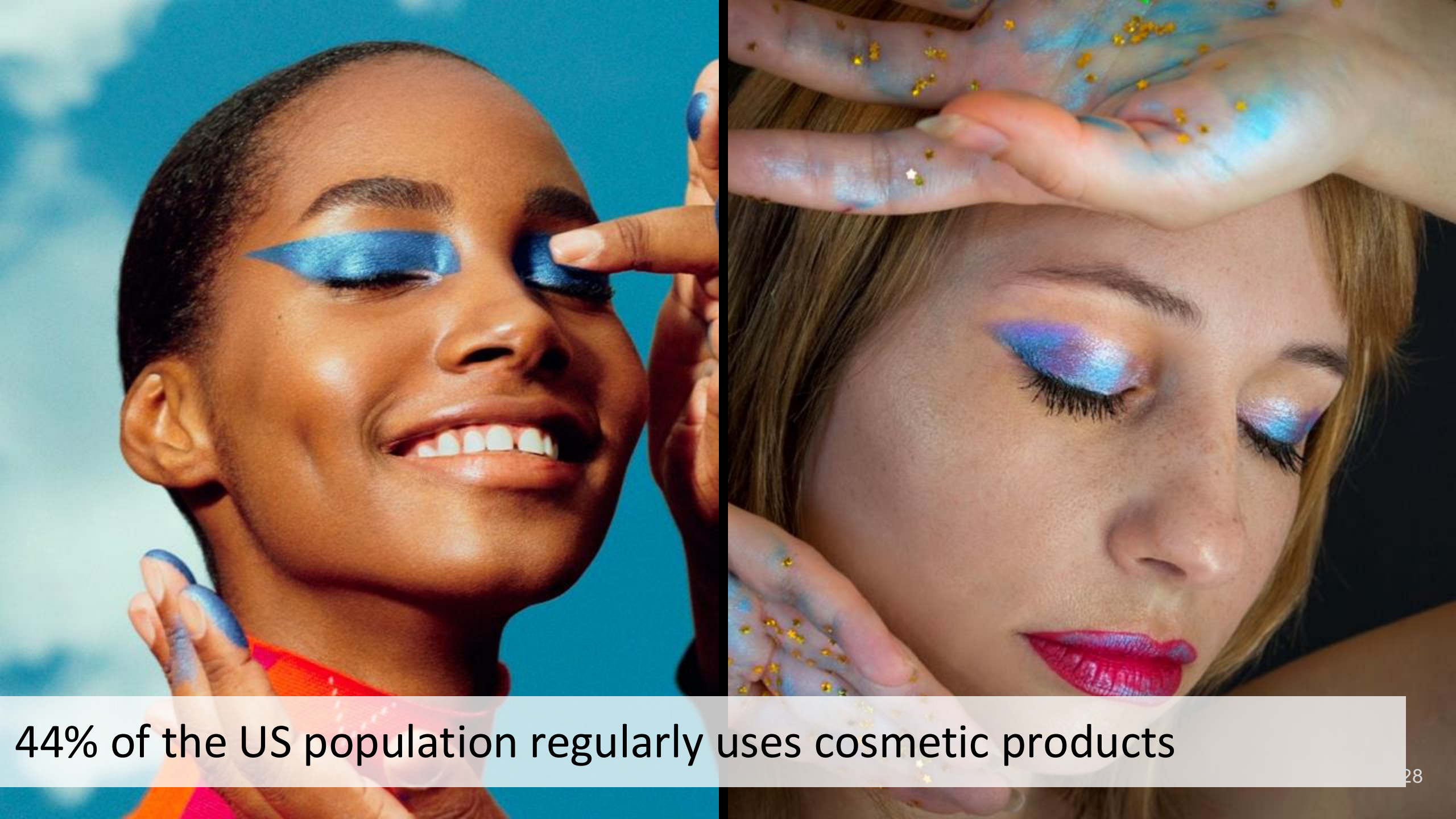
“It Feels Like Taking a Gamble”:

Exploring Perceptions, Practices, and Challenges of Using Makeup and Cosmetics for People with Visual Impairments

Franklin Mingzhe Li, Franchesca Spektor, Meng Xia, Mina Huh,
Peter Cederberg, Yuqi Gong, Kristen Shinohara, Patrick Carrington

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44% of the US population regularly uses cosmetic products

A light gray world map is visible in the background, showing the continents of North America, South America, Europe, Africa, Asia, and Australia. The map is centered on the Atlantic Ocean.

2.2 Billion People with Visual Impairments Worldwide

Purchasing
Cosmetics

Using
Makeup

Vetting,
Verifying,
and
Feedback

Barriers



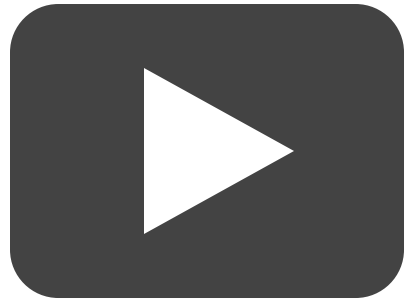
Research Questions

RQ1: What are the **existing practices** around makeup and cosmetics?

RQ2: What is the **importance and perception** of doing makeup and cosmetics?
Why?

RQ3: What are the **existing challenges** around makeup and cosmetics? How could HCI research contribute to solving challenges with makeup and cosmetics for people with visual impairments?

YouTube Video Analysis



× 14

5

YouTube videos focused on
makeup practices of visually
impaired people (RQ1)

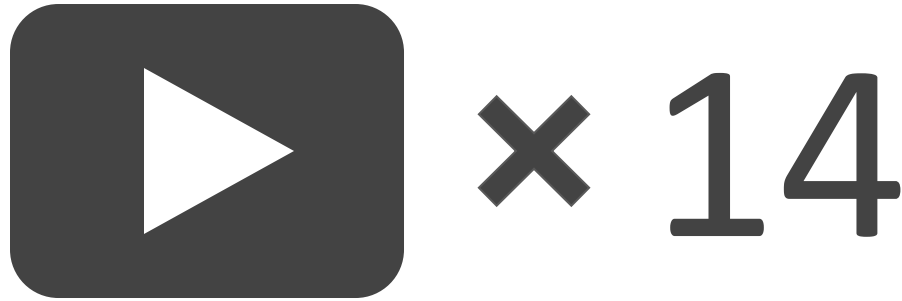
Semi-structured Interviews



× 12

Interviews with visually impaired
people who have experience with
makeup and cosmetics (RQ2, RQ3)

YouTube Video Analysis



× 14

5

YouTube videos focused on
makeup practices of visually
impaired people (RQ1)

Semi-structured Interviews



× 12

Interviews with visually impaired
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makeup and cosmetics (RQ2, RQ3)

RQ1 - Existing Practices of Makeup and Cosmetics

1) Learning Makeup



2) Makeup Selection and Identification



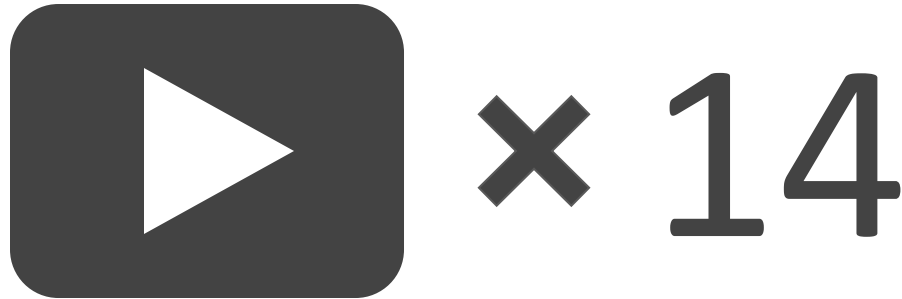
3) Makeup Application



4) Self-assessment and Feedback



YouTube Video Analysis



× 14

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YouTube videos focused on
makeup practices of visually
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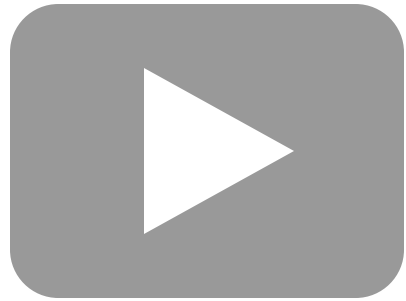
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RQ2 - Perceptions of Makeup

Broader Representations of Blindness and Beauty

- Sighted people assume blind people do not “need” makeup
- Aesthetic expression is as multifaceted for blind individuals as for sighted peers

“...Many people that I talked with who are sighted were very surprised that I do makeup. Even my family was not aware of how important doing makeup is in my social life...” - P4

RQ2 - Perceptions of Makeup

Relationship between Makeup and Self-image

“...I usually just stick to the same color and same techniques I know. The consequences of doing new makeup wrong are way more than just following simple makeup routines...” - P5

RQ2 - Perceptions of Makeup

Relationship between makeup and social interaction

- Controlling visibility
- Community & Belonging
- Importance of support & Motivation

"...I can use makeup to show other people my feelings for each day, and it can become a social medium between other people and me..." - P3

RQ3 - Challenges of Makeup

Learning barriers - Online Tutorials



RQ3 - Challenges of Makeup

Insufficient Feedback - Color Identification & Blending



RQ3 - Challenges of Makeup

Insufficient Feedback - Step Tracking



RQ3 - Challenges of Makeup

Insufficient Feedback - Makeup Assessment



RQ3 - Challenges of Makeup

Physical and Environmental Barriers - Inaccessible Product design



RQ3 - Challenges of Makeup

Physical and Environmental Barriers -
Complexity of Context



“...I cannot just wander up, and down the beauty aisle, all the products are so close to each other...” - P8

Design Considerations and Potential Opportunities

Considerations for Assistive Makeup Tools

- Is the experience of using a tool **calming and confidence building**?
- Does the tool account for **social context and personal style**?
- Is the tool **culturally competent** and account for **unique practices** of visually impaired people?
- Does the tool make a user **feel included in a community or social group**?

Improve Support for Makeup Learning Experiences

- Specialized editing instructions for content creation by visually impaired people
- Extract detailed applications and product information (e.g., brand, volume, where and how to apply)

Improve Provisions for Makeup Feedback

- Various “feedback” modes for makeup purposes
- Automatic feedback systems to provide
 - Hands-free instructional systems
 - Quality check to prevent unwanted attention
 - Actively provide detailed recommendations on makeup revision and guidelines

Create Workarounds for Physical Barriers



Create Workarounds for Physical Barriers

