# Enhancing Accessibility and Mobility: The Role of Accessible Pedestrian Signals for Individuals with Low Vision

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## Introduction

Low vision limits to access visual information and increases reliance on auditory and tactile cues for orientation and mobility, creating safety risks in pedestrian environments, particularly at crosswalks (Ma et al.,2021). Accessible Pedestrian Signals (APS) use non-visual signals to convey pedestrian timing information (Harkey et al., 2007), promoting safer and more independent crossings. However, APS are not systematically installed across U.S. cities (Li et al., 2019). Understanding the challenges faced by individuals with low vision is essential to improving accessibility and advancing inclusive urban design.

## Methods

**Design**
This qualitative study used a one-time, 20-minute interview conducted via a HIPAA compliant Zoom platform. Participants answered semi-structured, open-ended questions developed from an extensive review of current literature and credible scholarship. Prior to the interview, participants completed a brief 2-question Qualtrics survey to collect demographic information, including age and current low vision diagnoses.

**Inclusion Criteria**
- Diagnoses of profound vision loss
- Age 18 years or older.
- English as primary language.

**Recruitment and Demographics** (See Figure 1 and Figure 2)
Five participants were recruited to participate in this study through word of mouth, UAB's Center for Low Vision Rehabilitation, and a digital flyer published on UAB social media platforms.

**Data Collection and Analysis**
Each interview was transcribed through Zoom's transcribe feature and analyzed to identify recurring themes. The primary investigator reviewed each transcript three times to ensure accuracy during theme development. Deductive thematic analysis was used to extract major themes and an independent reviewer verified accuracy of the final themes.

## Results

**Theme 1 – Mobility Barriers and Crosswalk Variability**
Participants described inconsistent crosswalk design, environmental noise masking APS signals, and difficulty judging when it was truly safe to cross.

**Theme 2 – Assistive Technology and Design for Inclusion**
High-contrast markings, clear and consistent APS signals, and well-placed controls were viewed as critical features for safe, independent street crossing.

**Theme 3 – Advocacy, Awareness, and Systemic Responsibility**
Participants emphasized the need for public education, collaboration with city officials, and framing accessibility improvements as benefiting the whole community, not only people with low vision.

Figure 1. Age of Participants

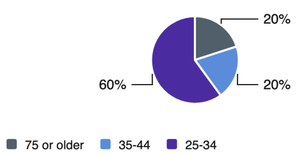
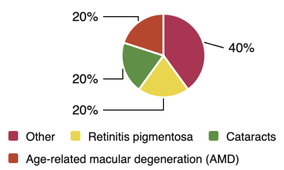



Figure 2. Diagnoses of Participants




## Results Continued

**Theme 1:Mobility Barriers and Crosswalk Variability**

**Environmental Noise Masking Auditory Signals**
- 60% of participants

"Sometimes I hear the chirping sound, but other times it's silent…"

**Poor Contrast**
- 80% of participants.

"If it's really bright, it's hard for me to tell if the signal's changing. It's just harder when there's not, like, a beep that goes with it. It's a lot of more work."

**Theme 2: Assistive Technology and Design for Inclusion**

**Contrast Markings**
- 90% of participants

"High contrast is always great,. the higher the contrast, the easier, I think."

"The crosswalks that presently have small ramps. and which are typically painted yellow in the ramp, I find them to be very helpful."

**Auditory Volume and Timing**
- 100% of participants

"The tone needs to be loud enough for people to hear, because it's a road, and the road gets busy."

**Contextual Placement of APS Controls**
- 40% of participants

"The volume could be louder "especially in areas where there's a large number of, you know, vehicles"

**Theme 3: Advocacy, Awareness, and Systemic Responsibility**

**Grassroots Education**
- 60% of participants

"The only way that I know to make people aware is to talk about it more… Do some kind of small events."

**Relationship-Building with City Officials**
- 80% of participants

"Approach the State Department of Transportation. Because those are the people who can actually do something to meet the need".

**Strategic Framing for Broader Appeal**
- 60% of participants

"Yes, I think it's important to stress, the need for people with disabilities, but I think also you have to maybe work in, how it can benefit the population as a whole."

## Discussion

**Key Findings**

***Lack of Visual Cues***
The lack of contrast within the environment was frequently discussed among participants. One interpretation of these findings suggests that absent or low contrast within the environment may hinder safe and independent navigation for individuals with low vision. Another interpretation of these findings could be that navigation through pedestrian environments is inherently a multisensory experience.

***Volume of APS***
Participants reported environmental noise masking as a major barrier to community mobility. Many described that unpredictable and poorly maintained infrastructure forced them to rely on inconsistent auditory cues, increasing their risk, cognitive load, and fatigue. Participants also reported the sound was not loud enough to be heard over environmental noise, such as traffic. The findings indicate that the effectiveness of APS is not solely dependent on consistent implementation but also ensuring adequate volume to help counteract environmental noise masking.

***Strategic Framing for Broader Appeal***
When discussing advocacy strategies, participants emphasized that framing accessible pedestrian environments as a benefit for all community members, rather than solely for individuals with low vision, can help strengthen stakeholder engagement. These insights may be explained by inclusive design principles, which aims to remove barriers and enable full participation within the community (Doniyorov et al.,2024).

**Limitations**
- Small sample size
- Limited generalizability
- Recruitment at an intended site restricted by separate IRB process

## Discussion continued

**Implications for Occupational Therapy Practice:**
- OT practice emphasizes engagement in meaningful occupations is shaped by context, both social and physical environments
- OTPs play a critical role in addressing environmental barriers
- OTPs are distinctively qualified to advocate for inclusive pedestrian environments through environmental modifications
- OTPs should educate stakeholders on how environmental barriers affect independence and safety for individuals with low vision

**Future Research:**
- Expand the study beyond Birmingham, AL
- Conduct longitudinal studies to assess long-term impact of APS
- Evaluate effectiveness of APS vs other inclusive design features

## Conclusion

This study emphasized that the implementation of APS has the potential to significantly improve safety and independence for individuals with low vision during community mobility. With their extensive knowledge of injury, illness, disease, and environmental modifications, OTPs are well positioned to advocate more accessible pedestrian environments. Through collaboration with urban planners and policy makers, OTPs can help ensure APS and other inclusive design features are consistently implemented to promote safe and independent community mobility for individuals with low vision.

## References

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