

Community Accessibility for Wheelchair Users as Seen Through the Lens of I-Corps Interviews

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INTRODUCTION

Each day, people with ambulatory disabilities (PwDs) must make choices related to accessing community destinations while maximizing independence and participation. Literature regarding the navigational needs of people with disabilities primarily focuses on those with visual disabilities, and points to assumptions that there are fewer navigational needs for differing disabilities [1]. PwDs face additional barriers when navigating new or unfamiliar locations including path conditions, slope, and avoiding unexpected barriers [2]. It is imperative to engage with PwDs to better understand navigational needs and to improve community accessibility [2]. The National Science Foundation's Innovative Corps (I-Corps) program focuses on comparing researchers' ideas regarding technology to the identified needs of an industry or community [3]. I-Corps can be used for engaging PwDs and other community stakeholders regarding community accessibility needs. Through this process, unexpected responses may arise, resulting in researchers reforming interview hypotheses, and using participants' feedback to create a product that better meets stakeholders' needs. The MyPath team, who is creating a navigation system for PwDs, used I-Corps interviews with wheelchair users to assess their needs and experiences regarding community navigation and participation [4]. Two research questions were addressed in this project: 1. What were the most commonly occurring themes within participant interviews? 2. Were the researchers' initial hypotheses regarding navigation and community participation needs of PwDs confirmed?

METHODS

Interviews were conducted across five weeks with 53 participants. Participants included PwDs, and caregivers to people with disabilities. Care partners, city council members, and disability organization members were also interviewed. Interview questions included demographic information, level of community participation, use of assistive technology, and the process of mapping accessible routes. Approximately 15 minutes were allocated for each interview, with the majority conducted through an online video-conferencing platform (Zoom). Three in-person interviews were conducted.

The MyPath app's purpose is to serve PwDs. Given this, the 15 participants who used wheelchairs were selected for analysis. The first research question focused on participants who are full or part-time

wheelchair users (n=15). Table 1 describes the participants' location, age, and wheelchair type.

Five members of the MyPath research team conducted interviews. To avoid bias, interviewers were trained to avoid discussion of the MyPath product design. Instead, they discussed user perspectives on the interview methods. The interviewers administered general queries regarding:

1. Potential methods that could optimize the research process through teaching proper interview methods
2. How to ask productive questions
3. How to locate and recruit additional interviewees
4. How to get quick answers that directly relate to the original hypothesis and research question

After cleaning the downloaded interview transcripts, thematic analysis [5] was conducted by two members of the research team, who analyzed the printed transcripts separately. Words that evoked the main concepts of the

Participant State	Wheelchair User	Wheelchair type	Age Range
Ohio	Part Time	Power	18-35
Ohio	Full Time	Power	18-35
Wisconsin	Full Time	Manual Assist & Power	18-35
Ohio	Part-Time	Manual & Power	18-34
Tennessee	Full Time	Power	18-34
Ohio	Full Time	Manual Assist	55+
Wisconsin	Full Time	Manual	35-55
Wisconsin	Full Time	Manual	55+
Wisconsin	Full Time	Power	55+
Wisconsin	Full Time	Power	35-55
Washington	Full Time	Manual	18-34
Ohio	Full-Time	Power	35-55
Indiana	Full-Time	Manual	35-55
Ohio	Part Time	Mobility Scooter	18-24
Pennsylvania	Part Time	Manual	18-24

Figure 1: Wheelchair Use and Background of Participants

interviews were written in the transcript margins. These words were translated into codes, with subsequent themes generated by each individual researcher.

The method used for research question 2 consisted of gathering pre-interview hypotheses from original note-taking, and comparing them to the newly identified themes. The individually generated themes were compared between two researchers to create conclusive themes. Themes were then compared with original team hypotheses, and differences between the original hypotheses and themes were identified.

RESULTS

Research Question 1: Identified Themes

Using Braun & Clarke's methodological steps [5] researchers identified the following themes:

Prior research on community accessibility factors may not be collected by PwD before accessing the community. Often, wheelchair users do not research the accessibility of a community space prior to accessing. These spaces can include parks, paths, stores, or restaurants. Most participants discussed "just showing up"; with participants either leaving or finding a different location if the desired community space was not accessible. This did not apply to activities that might include extended planning, including concerts and trips.

Lack of community terrain knowledge affects proper accessibility device use. Non-familiarity with a community space's terrain may prevent people with disabilities from using devices that would best suit their needs. Regarding the use of both power and manual wheelchair users, one interviewee states "It's more getting over the terrain; if I hit a rock in the manual chair, it could flip over because it is so lightweight...". The same individual stated that a manual chair can be more convenient due to its smaller and lighter frame, though it cannot be used often due to the uncertainty of the terrain.

Age of local environments impacts accessibility. Discussions on the role of locations' ages were prevalent, with participants noting that older locations may be more difficult to navigate. Key features common in older locations that are troublesome include uneven surfaces, numerous steps, narrow pathways and entrances, a lack of curb cuts, smaller bathrooms, and significantly cracked sidewalks. These prevent participants from travelling, given the lack of accessibility in older cities such as those in Europe or Northeastern United States.

Cobblestone is an example of one inaccessible surface apparent in older cities:

"I hate cobblestone; it's irritating...a lot of college campuses will do cobblestones to make an area aesthetically pleasing and when I used a manual chair there have been times where a cobblestone almost knocked me out of my chair."

Accessibility is also limited in buildings that were erected prior to the instatement of disability laws.

Accessibility needs are unique to each individual. Accessibility is not a "one size fits all" concept. Many areas that are deemed "accessible" still remain inaccessible to many:

"I'll have to call and say 'are you guys accessible?', "...yes, we are accessible," and then I'll get there and there's a step, or maybe the front area is accessible, but then you have to go through a narrow hallway to get to the seating, and I can't do that."

Often, accessibility is thought of as a no-step entrance, or locations with accessible parking. Rarely are features such as the width of entrances and hallways considered when deeming a place to be "accessible". Hills are another factor often overlooked when discussing accessibility community terrains. Steep hills, and the limits they impose on accessing community spaces was a factor mentioned in many of the interviews. For those who use a manual chair for community mobility, ascending a hill can be exceedingly difficult or even impossible.

Of the four primary themes, three partially aligned with original hypotheses.

Research Question 2: Hypotheses Confirmation

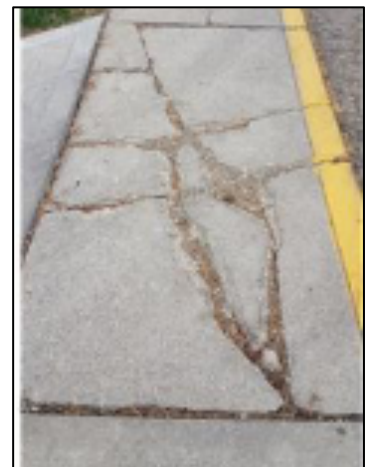


Figure 2: Inaccessible Sidewalk Located in Ohio

Conclusions from the interviews confirmed a need for MyPath however, there were themes that opposed original hypotheses. The identified themes were compared to the researchers' original hypotheses. It was hypothesized that most PwDs plan outings prior to leaving the home, with increased planning when accessing unfamiliar places. Participants proved this hypothesis partially incorrect as they often do not pre-plan when going to familiar community spaces. When going to an unfamiliar space, however, such as a new city, participants described conducting extensive research prior to venturing into the new space. This aligns with the original hypothesis.

It was also hypothesized that weather significantly impacts community wheelchair access. Participants shared that this is often true; snow and rain do not promote wheelchair accessibility. However, the researchers did not predict the participants reporting that the weather determines which chair will be used. When the weather is unknown wheelchair users are not able to use the equipment of their choosing. Given the uncertainty of weather and terrain, participants use versatile devices equipped to perform well on any terrain rather than their preferred device.

The researchers did not anticipate that the age of the city would have a significant impact on accessibility. Participant themes demonstrate that those interviewed have increased difficulty accessing older cities and buildings. Interviewees expressed the need for increased time and tools to plan routing in these spaces.

Finally, the researchers hypothesized that participants would identify a lack of available accessibility information, resulting in wheelchair users benefitting from a terrain tool such as MyPath. While the researchers were correct in this thinking, they underestimated the importance of producing an app that supports ALL PwDs. The study identified that accessibility needs are unique to every individual. This is common knowledge for PwDs, though other populations may not demonstrate the same awareness. For those without disabilities, assessing the accessibility of spaces may be limited to determining the availability of ramps and accessible parking spaces. More advanced accessibility information, such as the width of a doorway or bathroom accessibility is lacking. This demonstrates that it is critical to provide comprehensive accessibility information that is inclusive to ALL PwDs when designing the MyPath app and beyond.

The researchers were partially correct in three of the above hypotheses. The themes proved the hypotheses to be true but suggested that there were further factors that opposed and provided a new perspective. One of the themes listed was not part of the original hypotheses and was a thought-provoking theme that emerged and is now being incorporated into the MyPath project.

CONCLUSION

The I-Corps interviews, identified themes, and exploration into the researchers' hypotheses have shaped the direction of the MyPath project through providing detailed feedback on community barriers for PwDs that may have been unknown prior to the participant interviews. The themes that aligned with initial hypotheses provided the research team with ways to restructure and specify the hypotheses for future research.

Through interviews and identified themes, the researchers have begun to assess app features that will maximize accessibility information across impairments. The study's findings and their implications for the MyPath app suggest that increased independence and participation in community spaces is a realistic goal for the project. The next steps in developing the MyPath app include concluding app development and beginning user interface data collection. The MyPath team is assessing the study's findings and gaps found in the information being collected to determine how to best integrate participants' experiences into the MyPath app design.

Future research should explore the relationship between the age of a city and present accessibility barriers. Continued study of the varying perceptions for PwDs surrounding community accessibility can also serve as a future area of research. Thematic analysis proved to both confirm and contradict hypotheses to allow for project growth and further guidance towards important next steps. This critical collaboration with PwDs will lead to future improvements to the MyPath app, community accessibility, and our understanding of the unique accessibility needs of PwDs.

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