

MOVING IN, OUT AND AROUND THE HOME: SOLUTIONS FROM OLDER ADULTS WITH LONG-TERM MOBILITY IMPAIRMENT

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ABSTRACT

The purpose of this study was to explore how older adults aging with long-term mobility impairment have adapted to mobility challenges in the home. Through in-home interviews, participants discussed their experience moving in, out and around their home with regard to challenges, solutions, barriers, and changes with age. This paper provides a characterization of the solutions used by participants to overcome in-home mobility challenges as well as unresolved barriers they faced. These themes illustrate the ingenuity of the participants as well as opportunities to support aging in place via design to better match a person's environment to his/her capabilities.

INTRODUCTION

It is well documented that the majority of older adults want to age in place, or continue to live independently in their communities in the housing of their choice (American Association of Retired Persons [AARP], 2010). Despite this overwhelming preference to age in place, many older adults experience age-related declines that threaten their ability to do so. Declines in mobility, cognition, and sensory function are just a few of the common barriers. Research on aging in place has largely focused on how these age-related losses impact a person's ability to live independently at home. Little attention has been paid to understanding the home experience of individuals aging with an existing impairment.

Older adults with impairments are living longer, which has contributed to a growing population facing complex issues above and beyond normal aging. A recent Census report found that approximately 38.7% of older adults (65+) reported having one or more impairments (U.S Census Bureau, 2014). Moreover, about two-thirds of this older adult population reported having an ambulatory, or mobility, impairment, in which they had serious difficulty walking or climbing stairs. For individuals aging with mobility impairment, age-related declines may lead to compounding difficulties and greater need for support.

Mobility impaired individuals, and particularly wheelchair users, are at risk of complications from a sedentary lifestyle, such as loss of strength, weight gain, and pressure sores (Groah et al., 2012). Moreover, the experience of "accelerated aging", in which age-related health declines occur earlier and more frequently, has been

associated with conditions underlying mobility impairments such as Spinal Cord Injury and Multiple Sclerosis (Groah et al., 2012; Stern, Sorkin, Milton, & Sperber, 2010). Similarly, individuals with Post-Polio Syndrome (PPS), another condition underlying mobility impairment, have reported progressive fatigue and weakness with age (Amtmann et al., 2013).

Impairments alone do not necessarily lead to disability. As suggested in the Person-Environment Fit framework, disability can be attributed to a poor balance between an individual's functional abilities and the demands of their environment (Lawton and Nahemow; 1973). Older adults with long-term mobility impairment are subject to extensive environmental demands and may be at a higher risk of losing their independence. Among wheelchair users, the presence of home modifications has been related to less difficulty with home-based tasks and lower hours of unpaid help (Allen et al., 2006; Connell et al., 1993). Although home modifications can promote independence among mobility-impaired individuals, solutions are not "one size fits all" and should be tailored to the changing abilities of an individual (Minkler & Fadem, 2002; Weeks et al., 2010). There is a need to understand how older adults aging with mobility impairment overcome the challenges posed by their environments. This study investigated the home experience of older adults with long-term mobility impairment, in which researchers conducted in-home interviews and documented challenges and solutions.

METHOD

Participants

Twenty-three older adults were recruited for this in-home study. To be eligible, participants had to be 50 years or older and have a mobility impairment that began prior to age 50. Participants were recruited from the Georgia Tech HomeLab database and through outreach at local disability resource organizations. All participants were compensated \$60 for completing this 2-hour, in-home study.

Procedure

A two-person research team conducted each home interview: One researcher led the interview, and the other was the note taker. Participants were asked to guide the researchers around their home to discuss certain activities in context. With permission of the participant, researchers took

photos of any items related to the home challenges and adaptations.

Materials

A structured interview guide was developed to administer the study questions. During the interview, participants were asked about their background, lifestyle, health, the nature of their mobility impairment, and their use of mobility aids. Participants were then prompted to discuss their process for the following activities of daily living: bed transfer, bathing, toileting, preparing food, moving around the home, and entering and exiting the home. For each activity, participants were asked if they require assistance from others, any items they use for assistance, and any changes they have made to their home. Participants were then asked to discuss how their routine has changed with age.

Analysis

Both interview data and photographs were collected in this study. This paper focuses only on the photograph data that documents home solutions and barriers of older adults with long-term mobility impairment. A systematic, qualitative, top-down and bottom-up iterative approach was used to develop the coding scheme. Each photo was categorized by activity and solution, barrier, and/or damage. Of the activities of daily living discussed during the interview, moving around the home and entering/exiting the home accounted for the most frequently photographed activities and is the focus of this paper.

The study photos illustrated some type of solution, barriers, and damages. The codes, definitions, and examples are described in Table 1. To ensure inter-rater reliability, two researchers coded photos independently. Four total researchers were involved with data collection (two research scientists and two research assistants). Coders were assigned to a mix of participants, including those with whom they conducted the home interviews, and those they did not.

RESULTS

Participants

Twenty-three older adults (14 female, $M_{age} = 61$, $SD = 9.2$; Range: 52-86) with long-term mobility impairment participated in this study. In terms of race, nineteen participants self-identified as white/Caucasian and four as black/African American. Participants represented a mix of annual, household income levels ranging from less than \$25K to more than \$75K. Eleven participants completed a bachelor's degree or higher, eight attended some college or vocational school, two completed high school/GED, and one had less than high school education.

Housing situations varied across participants, with types including single-family home ($n=12$), apartment/condo ($n=10$), and group home ($n=1$). Six participants considered their home to be senior housing. Eight lived alone and fifteen lived with another person. Fifteen reported having either a formal or informal caregiver.

Table 1. Coding Scheme for Solutions, Damages, and Barriers.

Code	Definition	Example(s)
Home Modification (HM)	A permanent alteration made to the structure of the home to meet the needs of person with a limitation.	Ramps, widened doorways, cabinetry renovations, and grab bars.
Person-Environment Accommodation (PEA)	An adjustment to the environment to facilitate activities of daily living without making a structural change to their home.	Non-slip floor rugs, plastic corner guards.
Assistive Device (AD)	A device that is designed, made, or adapted to assist a person with a limitation to perform a particular task.	Door pulls and portable ramps.
Service Animal (SA)	An animal trained to assist a person with a limitation.	Dog trained to assist with opening and closing doors.
Damage	Physical evidence of a person's impact on their environment, as it relates to their mobility limitation.	Wall scrapes and dents.
Barrier	An obstacle that prevents a person from completing an activity or accessing something.	Stairs and narrow doorways.

Participants had a range of mobility impairments, in terms of functional abilities and underlying causes of the impairment. With regard to lower body functioning, seventeen participants reported being unable to walk at all, and fourteen reported being unable to stand. Several participants reported upper body impairment, including limited arm use ($n=12$) and inability to use arms whatsoever ($n=1$). The causes of mobility impairment among participants were categorized into the following groups: Neurological Disorder ($n=3$), Spinal Cord Injury ($n=7$), Polio ($n=10$), and Birth Defect ($n=3$). The average age of onset for mobility impairment was 15.3 ($SD = 14.7$), ranging from birth to age 46. On average, participants have had their impairment for 45.8 years ($SD = 17.8$).

All but one participant reported currently using a wheelchair, at least some of the time. Of the 22 wheelchair users, 15 used a power wheelchair, eight used a manual wheelchair, one used a power-assist wheelchair, and one used a sip-and-puff wheelchair. Other mobility aids used by

participants included: canes (n=2), crutches (n=3), walker (n=3), and scooter (n=1). Two participants reported using leg brace orthotics. One participant reported using both arm and leg prostheses on occasion.

Solutions, Damages, and Barriers

There were 40 photographs associated with movement inside the home and 39 with entering/exiting the home. Table 2 displays the frequency of codes for photos associated with movement in the home and entering/exiting. Among all codes, Home Modification photo codes were the most frequent for both movement inside the home and enter/exiting, with 19 and 21 respectively. Person-Environment Accommodation, Assistive Device, and Barrier photos were associated with both activities. All Service Animal and Damage photos were associated with movement inside the home.

Table 2. Frequency counts of codes for the activities of movement within the home and entering/exiting.

Code	Movement Inside Home	Enter/Exit
Home Modification	19	21
Person-Environment Accommodation	4	6
Assistive Device	2	6
Service Animal	2	0
Damages	10	0
Barrier	3	6

Themes

The photos and descriptions for each code were reviewed by two researchers. Using a bottom-up, data-driven approach, researchers grouped the codes into the following emergent themes.

Overcoming stairs and thresholds. Solutions most commonly seen for movement in the home and entering/exiting the home addressed height transitions, such as stairs or tall thresholds (n=11). Ramps were frequently documented and represented a mix of custom, off-the-shelf, and homemade solutions. For example, one home featured a custom installed wooden ramp, from the front door to garage, complete with railings on both sides and non-slip treading. In contrast, several participants took a more low-tech route and simply utilized a sheet of plywood as a ramp. One participant showed researchers his off-the-shelf, portable (metal) ramp that he keeps in his car, in case he is visiting an inaccessible home. Minor threshold adjustments, such as attaching small planks of wood or metal next to the threshold, were also documented.

Opening and closing doors. Participants shared a number of solutions to assist with opening and closing doors (n=8). Examples included installing automatic or remote control doors (n=3), utilizing help from service dogs (n=2), and attaching items to a door to assist with pulling (n=6). These door pull items included: loops, rubber bands, scarves,

bungee cords, and additional handles. An example of one of these door pull solutions is featured in Figure 1. Of the eight participants documented using such solutions to open/close doors, six reported limited upper body functioning related to their mobility impairment and one reported being unable to use his/her arms.



Figure 1. Example of a homemade door pull. Damage from the user's wheelchair to the doorframe can also be seen.

Adjusting doorways. Door adjustments were another common solution among participants to improve in-home mobility (n=8). All door adjustment photos were documented in the homes of wheelchair users. Adjustments included removing doors, widening doorways, installing new types of doors (e.g., sliding, automatic), and installing swing away or offset door hinges.

Replacing flooring. Another common solution to enhance in-home mobility was to replace flooring (n=6). For the most part, flooring changes involved replacing carpet with hard surface materials, including wood, laminate and tile. Two participants replaced carpet with thin, indoor-outdoor carpet, to enable easier mobility in a wheelchair. One participant swapped her bath and areas rugs for thin mats with grip padding.

Protecting the home. Damages to walls, doors, and furniture from wheelchair impact were common in participant homes. One interesting theme was that several participants took measures to protect their home by preventing damages (n=3). Examples include: applying plastic guards to wall corners or attaching a sheet of metal or plywood to a wall to prevent impact damage from a wheelchair.

Re-modeling the home. For some participants, solutions for moving in and around the home involved extensive modifications to the structure of the home. Researchers agreed that four home modification photos depicted home remodels. For example, one photo features a renovated addition of a participant's home, complete with accessible bedroom, bathroom, and workspace.

Barriers. Photos of barriers moving in, out and around the home revealed common obstacles. The most common

barrier involved internal and external doorways that were inaccessible to the participant (n=5). Photos also included problematic doorways, which participants managed to use, in spite of challenging thresholds and slopes. In these situations, participants expressed concerns about these obstacles being both frustrating and potentially dangerous.

Another barrier theme that emerged from study photos was insufficient turn-around space for wheelchairs (n=2). One example of this was protruding kitchen cabinet knobs, which prevented one participant from being able to effectively turn around in her kitchen. Her solution was to remove the knobs altogether.

DISCUSSION

This study provided the opportunity to investigate the home experience of older adults aging with mobility impairment and document challenges and solutions in context. These older adults offered insightful perspectives on mobility challenges over time—solutions that have been successful as well as barriers that have not yet been overcome.

For most participants in this study, addressing home mobility challenges involved a combination of solutions. Installing ramps, replacing flooring, and adjusting doorways emerged as common solution themes. Consistent with prior research, home modifications, such as door adjustments, were common among wheelchair users, who depended on them to transition between rooms in their home (Connell et al., 1993). It is important to note that that solutions documented in this study only represent how participants have adapted their current home; accessible home features made prior to the participant being a resident are not included (e.g., accessible senior housing).

Even among participants with multiple solutions, home damages and barriers existed. Several photos displayed evidence of wheelchair use causing damage to walls and furniture in the home. Participants seemed to be well aware of home damage; in several instances, participants pointed out damages and protective measures to researchers. Problematic, and in many cases, inaccessible doorways were common barriers among participants. Similarly, insufficient turn-around space in the home was identified as a prevalent issue among wheelchair users.

Individuals with long-term mobility impairment are experienced in adapting to challenges in their environment. Despite years of dealing with the impairment, adults aging with mobility impairment face the ongoing challenge of maintaining an environment that accommodates their changing needs. The onset of age-related declines in addition to their impairment can present compounding difficulties. Impairment does have to result in disability. With a growing population of adults aging with impairment, it is essential that research investigate the environmental demands and solutions from a life-span approach.

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