Disability and Health Journal 15 (2022) 101211

Contents lists available at ScienceDirect

Disability and Health Journal

journal homepage: www.disabilityandhealthjnl.com

Original Article

A usable home: A qualitative investigation of the relationship between home usability and community participation for people with disabilities

Lillie Greiman, MA [a, *], Lyndsie Koon, PhD [b], Johnathan A. Schulz, MPH [b], Dot Nary, PhD [b]

[a] The University of Montana Research and Training Center on Disability in Rural Communities (RTC:Rural), USA
[b] The University of Kansas Research and Training Center on Independent Living (KU-RTCIL), USA

ARTICLE INFO

Article history:
Received 25 February 2021
Received in revised form
4 August 2021
Accepted 5 August 2021

Keywords:
Disability
Home usability
Home modification
Community participation

ABSTRACT

Background: People with mobility disabilities frequently have unmet needs in their home environment, which can lead to difficulties completing daily living activities. Therefore, it is important that homes are not just accessible, but rather useable, meaning that the home complements an individual's functional, social, and psychological needs. Although previous research has shown the importance of home usability for people with mobility disabilities on health outcomes, this research explores the relationship between home usability and community participation both inside and outside the home.
Objective: The objective of this study was to understand the perception of people with mobility disabilities on the relationship between community participation and home usability.
Method: Twelve participants completed in-person semi-structured interviews to answer questions related to home usability and community participation. A content analysis was used to identify emergent themes.
Results: Results indicate that personal, social, and environment factors influence home usability and one's ability to participate in the community.
Conclusion: Home usability is a complex concept that is intertwined with a person's ability to participate in their community. Useable homes can facilitate community participation, both inside and outside the home. In fact, home usability is a critical component of community participation, as homes are not only located in the community but are sites from which people access community. Further research is needed to understand the significance of this interaction and the impact of changing home usability on one's ability to participate in the community.

People with disabilities face numerous barriers when it comes to finding housing and suitable home environments. This is acutely true for individuals with mobility disabilities for whom homes with uneven flooring, narrow hallways, high shelving, steps and stairs, or bathrooms without grab bars make it difficult for people to function in their homes.[1] People with disabilities who have unmet accessibility needs in their homes are seven times more likely to experience difficulty with activities of daily living (ADLs).[2] In fact, the Americans with Disabilities report[3] estimates that nearly 24 million adults need assistance to perform one or more ADLs (e.g., dressing, showering, bathing) or more instrumental ADLs (e.g., grocery shopping, housework). Some of this assistance could be mitigated through home modification, or even eradicated entirely with accessible or universal home design.[4]

Still, across the United States people with mobility disabilities frequently live in homes with unusable features such as lack of grab bars in the bathroom, limited floor clearance and no clear space

This article is part of a special supplement titled "Improving Community Living and Participation for People with Mobility Disabilities." The articles in this supplement were developed under various grants awarded by the National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR). The supplement was organized via the Research and Training Center on Promoting Interventions for Community Living (NIDILRR grant number 90RT5043). NIDILRR is a Center within the Administration for Community Living (ACL), Department of Health and Human Services (HHS). The contents of this supplement do not necessarily represent the policy of NIDILRR, ACL, or HHS, and you should not assume endorsement by the Federal Government.

* Corresponding author.
E-mail addresses: Lillie.greiman@umontana.edu (L. Greiman), Lyndsiek@ku.edu (L. Koon), jayschulz@ku.edu (J.A. Schulz), dotn@ku.edu (D. Nary).

https://doi.org/10.1016/j.dhjo.2021.101211

beneath sinks. Recent American Housing Survey data reveal that significant numbers of individuals with mobility disabilities lack useable housing features. Less than 50% of these households (both owners and renters) report having a bathroom large enough to allow for the use of a wheelchair and fewer yet (less than 45%) report having grab bars.[5] In addition, many homes have stairs which may prevent access to certain areas of the home, or make it difficult to enter and exit the home safely. For example, nearly 50% of people with disability who use a wheeled mobility device (i.e., manual or power wheelchair) live in homes with steps at the entrance.[5]

Beyond structural barriers, people with disabilities are more likely to experience systemic barriers that impact their home environment, experiencing higher rates of poverty and homelessness resulting in reduced choice and control over housing options.[3,6] For instance, Hoffman and Livermore[7] found that individuals with disabilities report poorer housing and neighborhood characteristics than people without; including fewer neighborhood amenities (e.g. green space and access to shopping), and more deficiencies in their homes (e.g. holes in the floor, incomplete plumbing, open cracks in the foundation).

The need to address environmental and systemic barriers is important as they can lead to negative health and participation outcomes for people with disabilities. Research shows that people with disabilities are more likely to experience injury from falls while negotiating barriers in the home (e.g. while transferring into a tub or shower).[4,8,9] Reducing injury and preventing further loss of physical function via home modifications can, in turn, help prevent institutionalization,[10] ensuring that individuals are able to remain in the community.

Recent research findings indicate that useable, barrier-free homes may influence social and community participation. In a scoping review of the impacts of home modifications, Carnemolla and Bridge[4] identified social participation as an area that warranted further research. More specifically, Greiman et al.[11] provided evidence that the ability to complete ADLs in the home is important to being able to participate in the community. For example, people with disabilities who are able to bathe, dress, and groom themselves independently are three times more likely to engage in social and recreational activities when compared to those who cannot. These findings suggest that addressing barriers in the bathroom, such as adding grab bars or shower chairs, may help facilitate community participation.

While past research has shown that home modifications, or lack thereof, can impact an individual's health and ability to complete ADLs, the link to participation remains somewhat undefined. The International Classification of Function, Disability and Health (ICF)[10] offers a framework for understanding how the home environment may impact participation. The ICF defines participation as the outcome of the interaction between a person (i.e., their health and functional ability) and the environment (i.e., the built, natural, and social). Building from this framework, we use the term "home usability" as a proxy for home environment, encompassing not just the built environment (i.e., accessibility) but also the social, psychological, and geographic elements that work together to make a space a "home". While an accessible home refers to a physical space that meets codes and standards (as outlined in the Americans with Disabilities Act or Fair Housing Act), a useable home describes a space that is complementary to an individual's functional, social, and psychological needs. Home usability recognizes that individuals need individualized spaces to meet their unique needs and abilities.

By thinking about the home environment more dynamically, home usability recognizes that there is not a clear line delineating the home from the community. In fact, the home is an integral part of the community in which a person lives, it is a space to rest and recuperate, a site where people prepare themselves to "go out into" community but also a space where they bring community in Refs. 12,13. Therefore, our definition of community participation includes participation in activities both inside and outside the home.

The purpose of this study is to gain a deeper understanding of how home usability factors interact with experiences of participation. Specifically, we aim to understand how home usability influences the experience of community participation for people with disabilities, both inside and outside of the home. These research efforts illustrate that community participation begins at home and promotes further research into the role that home usability plays in supporting people with disabilities to live fully integrated lives.

Method

Participants

The data collected for this analysis are part of a larger project studying the impacts of a personalized home usability intervention for people with mobility disabilities.[14] Disability was defined based on six items from the American Community Survey (ACS). The ACS inquires about functional ability and use of supports. Respondents indicate disability type by responding "yes" to a set of questions inquiring about difficulty with hearing, vision, cognition, mobility, self-care, and independent living abilities. Study participants were eligible if they lived independently the community (i.e. did not live in a congregate setting such as a group home, assisted living facility or nursing home), had a mobility disability (this was not restrictive, many participants reported multiple disabilities) and were at least 18 years old. Two Centers for Independent Living (CILs), one in a small Western city and the other in a larger Midwestern metropolitan area, recruited participants. CILs are peer-run, non-residential, nonprofit community resource centers on disability that support people with disabilities to live independently in the community by connecting them to services and supports.[15]

For this qualitative sub-study, we used purposeful sampling techniques to recruit participants (N = 12) from a diverse set of housing experiences (e.g., tenure, household composition, geography). Participants reported a range of education levels, from less than high school to graduate level degrees, were mostly unemployed (83%), and had low income (no participants reporting household income above $40,000). Table 1 displays demographic and housing characteristics for each participant, and pseudonyms have been used to protect participant confidentiality. The study aimed to recruit more individuals, however, an initial analysis of the interviews revealed no further unique data, thus we determined that we reached data saturation at an N of 12.[16] This study was approved by the Institutional Review Boards at both universities involved in the research.

Data collection

Researchers developed a semi-structured interview script through an iterative process to obtain a deeper understanding of the relationship between home usability and an individual's ability to participate in the community, both from within the home and out. Members of the research team conducted in-person interviews with participants in their respective regions of the United States. The interview team consisted of three individuals, two researchers and one graduate research assistant, all with expertise in conducting research with people with disabilities. All three researchers had prior experience and training in qualitative research methods and conducting interviews. The interviewers had no prior

Table 1
Descriptions of participant demographics and housing characteristics.

Participants	Demographic Characteristics	Housing Characteristics
Cora	A 57 year old white woman with multiple disabilities (cognitive, mobility and independent living), who uses a cane	Owns an expanded and modified manufactured home in a rural area and lived with her husband who also has a disability
Patricia	A 57 year old white woman with mobility, self-care and Independent living disabilities, uses a cane	Rents a main floor apartment in a four-apartment building and lives alone
Tina	A 56 year old white woman with mobility, vision, self-care, independent living disabilities	Rents an upper unit in a townhome complex built in the 80's and lives alone
Jocelyn	A 50 year old white woman with walking and independent living disabilities, who uses a cane	Rents a main floor apartment in an older subsidized building and lives alone
Daniel	A 64 year old white man with mobility and self-care disabilities, who uses a cane	Rents a main floor apartment in a newer building and lives alone
Tracy	A 43 year old white woman with mobility, cognitive, self-care and independent living disabilities, who uses a support dog, manual and power wheelchairs	Lives in a downstairs apartment below her parents' home in a rural area
April	A 21 year old while woman with mobility, cognitive, self-care and independent living disabilities.	Owns an older manufactured home, rents the lot and lives with her boyfriend
Steve	A 50 year old white man with mobility, cognitive and independent living disabilities	Owns a newly built home in small town and lived with his wife who is also his caregiver
Joe	A 60 year old black man with mobility and cognitive disabilities	Rents an apartment in a large newly built subsidized complex and lives alone
Connie	A 49 year old white woman with mobility, cognitive, self-care and independent living disabilities, who uses a walker and a cane	Rents an older single family home in some disrepair and lives alone but frequently has guests and family staying over
Theresa	A 65 year old white woman with mobility, self-care, and independent living disabilities, who uses a walker and a cane	Owns an older single family home in a small town where she lives with her family
Sheri	A 60 year old black woman with mobility and cognitive disabilities uses both a manual and a power chair	Rents an older single family home in which she lives with her family

relationship with the participants. Interviewers opened interviews with “grand tour” questions generally exploring participant's daily activities (“Can you tell me about a typical day for you? From the time you wake up until the time you go to bed?”), and general home set-up (“Can you please tell me about the physical layout of your home”). Interviews were flexible to participant responses, and questions were clarified as needed. Prompts were used to gain clarification, and explore the various factors impacting participants' interactions with their home environment and the ways in which they participated in their community (i.e. any supports they received, changes made to their homes, ways they accessed the community). Interviewers collected field notes with additional information describing the participant's home and community environment (i.e., neighborhood). The interviews ranged in length from 45 to 75 min and were audio-recorded and transcribed verbatim. Participants were compensated with a $50 gift card for their time.

Analysis

Identifying information (e.g., participant's name, home location) was removed from the transcripts to maintain anonymity and transcriptions were uploaded to a qualitative software program.[17] Two researchers initially conducted a thematic analysis to deductively identify segments that represented the higher level themes related to those of the ICF framework: personal, environmental, and social factors.[18] From there, emergent subthemes were identified inductively for each factor. The results of these individual analyses were discussed with a third researcher to finalize the corresponding subthemes for the three higher-order themes. Upon consensus of the finalized coding scheme, the transcripts were segmented and coded individually by two members of the research team. First, segments were coded with the appropriate ICF theme, then coded with subthemes. Discrepancies were discussed with the third researcher until all transcripts were coded with consensus. This iterative, integrated approach reduced interference of researcher beliefs and assumptions, facilitated the systematic organization and analysis of the transcripts and served to meet the research objectives.[19,20]

Results

We identified three high level themes that represent the personal, social, and environmental factors of an individual's perception of home usability. Each higher order theme includes a set of related subthemes, illustrating the dynamic relationship that exists between home usability and participation. Themes and subthemes are described below in detail as well as in Table 2.

Personal factors

Personal factors relate to an individual's health and function. The subthemes associated with personal factors are physical health, mental health, and perceived safety. Quotes illustrating personal factors are found in Table 3.

Physical Health. Physical health and function impact participation both inside and outside the home. As health changes or functional ability shifts, the individual's needs may change. For example, additional home modifications may be required as functional ability declines. One participant, Steve, specifically noted that while he is able to negotiate garage steps with a handrail for now, inevitably the steps will need to be replaced by a ramp as his function declines due to his disability. Changes to physical health and the resulting treatments through surgery were common barriers across participants. Functional ability post-surgery significantly impacted several participants' ability to use their homes. For example, Cora reported that she was no longer able to get up into the bed she shared with her husband and was forced to move to a room with a lower bed; another participant, Theresa, reported that her loss of strength resulted in the inability to use her bathtub independently. Additionally, declines in physical function resulted in difficulty maintaining housekeeping tasks such as organization or cleaning. As Daniel stated, his loss of function resulted in clutter to the point where he was “keeping one step ahead of the roaches”.

Mental health. Mental health is another key element related to personal factors impacting home usability and participation. One participant described anxiety related to fraught relationships with neighbors, “I had to take prescribed medication just to get though a day in that place”, resulting in extreme discomfort with the current living situation. The relationship with her neighbors resulted in

Table 2
Finalized coding scheme.

Final themes and subthemes	Definitions
Personal Factors	
Physical Health	Includes specific health conditions (e.g. cancer) and symptoms (e.g. pain, fatigue) and related medications
Mental Health	Includes depression and anxiety and related medications
Perceived Safety	Includes fear of falls and injury
Social Factors	
Interpersonal Relationships	Includes relationships and interactions with family, friend and neighbors
Services and Supports	Includes both formal and informal services and supports (i.e. social service orgs like CILs, professional services, family and friends) as well as technology supports or assistive devices
Systems	Includes social, financial, political and health systems (i.e. health insurance, social security)
Environmental Factors	
Home Design	Includes physical features, or lack thereof, both inside outside the home, such as yard features, steps or stairs, carpeting, home layout.
Geographic Context	Includes city and neighborhood characteristics such as urban or rural area, traffic, proximity to services

anxiety about leaving the house and reluctance to invite friends and family over. Additionally, physical health and illness can contribute to poor mental health. For example, a reduction in physical function could limit one's ability to maintain a household and thus, contribute to mental conditions such as worsening moods, anxiety, or depression. As reported by April, pain flares often prevented her from starting her routine, including straightening up the house and running errands, this in turn resulted in increased feelings of depression.

Perceived Safety. Perceived safety emerged as another subtheme of personal factors. Participants reported an increased risk of falling when navigating their homes, particularly for bathroom activities (e.g., bathing/showering), and entering or exiting the home. Participants reported that their home spaces were no longer suitable due to their changing functional needs. For example, where previously a simple shower stall was sufficient, functional change requires the installation of additional supports like grab bars, or a transfer bench. Cora reported experiencing considerable anxiety in the shower knowing that were she to fall (as she had in the past), her husband would not be able to help as he was also limited by his disability. For Jocelyn, the fear of falling directly influenced her decision to refrain from going out into the community, so she opted out of participating in many activities. However, participants expressed an awareness that some risk is unavoidable even when navigating spaces that are useable. For example, Tracy's home has a fully customized and useable bathroom installed by her father. However, when prompted for information about the usability of her bathroom, she stated, "Yeah, but I have broken my leg in there twice," indicating that even structural changes do not always guarantee safe use.

The personal factors highlighted above illustrate that the relations between an individual and their home environment is dynamic. The constant interaction between physical and mental health along with changing functional ability led to home spaces that participants perceived as unsafe and often anxiety-inducing. These feelings impacted participant's interest and ability to engage both inside and outside the home. This highlights that as personal factors change so may the usability supports needed in the home and out in the community.

Social factors

Social factors are comprised of interpersonal relationships (e.g., family, friends, or neighbors), services and supports (e.g., access to and receipt of personal and social assistance), as well broader systems (e.g., social security) and systemic issues (e.g., poverty, ableism). Quotes illustrating this theme and subthemes are found in Table 4.

Interpersonal relationships. Home spaces are shared spaces. Even individuals who live alone bring their community into their homes to share the space with others such as family, friends, neighbors, and personal care attendants. These interpersonal relationships are critical in informing perceptions of home usability and subsequent participation outside of the home. For example,

Table 3
Personal Factors: Subthemes and example quotes.

Subthemes	Example Quotes (Participant)
Physical Health	"I realized I wasn't able to get around in my bathroom. I still need handicapped faucets because I can't turn the bathtub off, if that makes sense. Its got one of those knob ones that's kind of like a dial like thing, but it's hard for me to turn because I lost 225 pounds four years ago when I had surgery to lose weight. I lost all my strength too." (Theresa)
	"The garage has the whole high handrail and step up, but it's also a thing that we have to think about in the future. When are we going to have to turn it into a ramp" (Steve)
	"Because I can't get in and out [of the bed]. The bed's high on two drawers so I couldn't get in and out of bed anymore. I'm now in the spare bedroom." (Cora)
Mental Health	"It makes me less depressed when my house is as clean as it can be. Things are put away and where they belong, and them I'm a lot happier and a lot more likely to start my routine earlier to be more productive or proactive." (April)
	"But I had a prescription for Xanax just for the high level of anxiety, just sitting in my home trying to watch TV. Because that person [neighbor] - you wouldn't believe the noise. I called the police, they sat out there and laughed with them about it. I had to take prescribed medication just to get through a day in that place." (Tina)
Safety	"My balance … it's getting a little worse, so I got the walker and I actually can go because I'm not worried. It [walker] allows me to, I can't even tell you. I can actually go somewhere, I can be places, I can do things." (Jocelyn)
	"The safety was our big concern because Jonny's [spouse] frail. If I have fallen, he couldn't pick me up. I did fall when I had my knee surgery. He had to leave me home and run to the neighbor. And we knew that given my knee surgery and my back, and my neck that if I would fall [again] in the shower, that would be horrible." (Cora)
	"Yeah, and it's [steps at home entrance] just been a pain ever since. Even trying to get into it or use it, for me is because there's really a wide step over and it's just that slippery area where I could fall down and bust my butt or head." (Steve)

Table 4
Social Factors: Subthemes and example quotes.

Subthemes	Example Quotes (Participant)
Interpersonal relationships	"Yeah. He [spouse] helps me get dressed. I can't bend over and do my socks. And sometimes, we've gotta remember and I have to remember that he's disabled, too. He was in a motorcycle accident so we kinda struggle." (Cora) "I'll be honest with you, I was embarrassed because I didn't have a sink in the bathroom. Or if they go in and use the facilities, you got to wash your hands in the sink or in the bathtub and that's kind of embarrassing" (Theresa) "My grandson, when he comes, he doesn't like it [bed rail] there, so I took it down. But it helps. I mean, I've got it put up and I can just slip it. But when he's on the bed, he likes to jump and that's the first thing he pulls on that. 'Nana, no,' you know?" (Connie)
Services and Supports	"Laundry, groceries. She [aide] does. She drives most of the time, I can't really. If I go somewhere where and I don't have my walker, I do it without shoes [for balance]. In fact, I went without shoes a lot of winter because I didn't have an aide and I was out in the snow." (Jocelyn) "I went to an adult daycare on Monday, they gave us two dollars …. even though man can't nobody buy nothing for two dollars, but they gave us two dollars and we go to Salvation Army. And there I seen some couches out there. I go get me one from the Salvation Army. But then I've got to pay to have people move it in here, drive the truck and everything, and I ain't got that much income." (Joe) "The only thing that keeps me from doing what I can do is that I don't have a way to get there or I don't have a ride. You give me a ride. I'm there." (Sheri)
Systems	"If it was my home, I'd be more apt to getting a handicap railing or something like that for the wintertime … But since it's a rented home, I really don't think about doing anything to it. Like handlebars. I mentioned that to the landlord and … he's kind of not one of the best landlords that there is - doubled my rent." (Connie) "I'm not risking housing for anybody … I mean I could do it, it's not worth the energy, but its ok. I'm not going to fight with her about it. I only had to wait 5 months to get housing, which is unheard of … so, you know I'm just like fine, I make concessions all the time." (Jocelyn) "It's [sleep and pain levels] have gotten a lot better since we decided to forego the waiting on the VA." *Interviewer: "Okay, so you just went and purchased [a new mattress]?"* "Yeah, on our own because it would have been a year and a half with the VA and we're going to try and work backwards." (Steve) "It's a financial burden sometimes for my family and my boyfriend." (April)

Connie reported using a rail that attaches to the bed frame to prevent falling when getting in and out of bed. However, she frequently removes the bar when her grandson visits, as he likes to jump and play on her bed. In addition, Theresa noted that, because her bathroom was in disarray (missing a sink), she was reluctant to socialize or have friends over to her house. Finally, concerns for others in the household also emerged. Cora depends on her husband, who also has a disability, for aide and access to the community, but is anxious about the perceived burden this places on him. Personal relationships inform and impact home usability, highlighting the importance of considering these social relationships when altering the home.

Services and Supports. The services that are available to help individuals within their homes impact both home usability and community participation by supporting and facilitating a variety of activities. These services and supports are invaluable to people with disabilities and can help with activities such as cooking, cleaning, and running errands, freeing up time and energy for socialization and relaxation. Supports such as personal care attendants also often provide transportation from the home into the wider community and emerged as a crucial element of home usability in our interviews. For Jocelyn, the support of both an aide and an assistive device (walker) provided safe access to the community, in terms of transportation and balance. However, often these supports alone may not be enough, Joe receives support from an adult day care program and while the program provided access to the community via local shopping trips (including transportation and spending money), the funds provided (only $2) were inadequate in addressing his need for a new couch.

Systemic barriers. The financial hardship experienced by many people with disabilities impacts home usability and participation in numerous ways. For example, the scarcity of affordable housing for individuals living in poverty typically results in long waiting lists for federally subsidized spaces. Further fear of losing housing can force individuals to "concede" their need for home modifications. This was the case with Jocelyn, whose tense relationship with her property manager prevented her from receiving the modifications she requested. Additionally, lower income individuals are more likely to rent housing rather than own, limiting their options when it comes to investing in home modifications or repair projects due to limited financial means or concerns about landlord relationships. For example, Connie identified modification needs but since it was "a renter's home" she did not feel like she had the option to request those changes. While there are programs that can help to support individuals in making modifications or purchasing items to increase usability, they can be overly bureaucratic, slow to respond to individuals' changing needs, or too restrictive to provide meaningful support. Such as with Steve attempts to get the Veteran's Administration (VA) to pay for home modifications and a new mattress. Steve and his wife ultimately decided to forgo the VA program and buy a new mattress out of pocket, hoping for eventual reimbursement.

Environmental factors

The third major theme that emerged from this analysis is the importance of environmental factors. The environment is a broad term representing both the immediate home environment in terms of home design, layout, and quality, as well as the surrounding neighborhood and geographic location (e.g., in a rural area, or different neighborhoods/communities). Illustrative quotes are found in Table 5.

Home design. Home spaces that are designed in accordance with an individual's functional needs can facilitate engagement both within the home and out in the community. Easily navigable entrances permit community and neighborhood access. Bathrooms that enable bathing with ease and comfort, kitchens configured to support meal prep, and bedrooms that allow safe transfers and are suitable for getting sufficient rest may provide individuals with more energy or motivation to go out into the community.[21] However, difficulty navigating or operating within the built home environment was an experience shared by all our participants. For example, Tina was forced to navigate a flight of stairs to use the bathroom, April was unable to close the bathroom door because she needed to use the doorknob as a grab bar, both Patricia and Cora struggled to navigate their bathrooms because of the lack of grab bars, and both Sheri and Steve were unable to comfortably and safely enter and exit their homes. For Sheri, improving the quality of her ramp had a direct impact on her ability to access and participate in the community. Her previous ramp was missing a railing and had a threshold that was difficult to navigate but with the improved ramp she states: "I just roll down … and I'm going."

Table 5
Environmental Factors: Subthemes and example quotes.

Subthemes	Example Quotes (Participant)
Home Design	"Every time I would just have to go to the bathroom, or go up to my office, or come down to my kitchen, it was up and down the stairs, and the stairs had a strange shape and it really messed with my knees. I didn't realize that until it had got to the point where I was crippled from going up and down those stairs." (Tina)
	"I've, during flares, have had a really hard time getting off of the toilet. I mean, it's really weird, the way my bathroom is, the door's right in front of you, and I had nothing to grab to get up. I'd leave it open and use the doorknob to pull myself up." (April)
	"I couldn't get out without a ramp because it rolls. And that wouldn't work going over that lip [threshold] … I just roll down and go out and I'm going." (Sheri)
Geography	"Nobody wants to help me. I wish to God I never would've bought a house in [town name]. This is my honest to God feeling because I don't feel like they're [service providers] here to help us. I didn't choose to grow old and be handicapped. I really thought I was going to grow old, work until the day I died and it didn't work out that way." (Theresa)
	"I'm out more [since moving to a new neighborhood]. The two places that I always had to go to was the Walmart and the Petco that's right over here. I don't like going over on the other side of town. [That street] gives me a lot of anxiety driving. So, I would drive clear from [former neighborhood], every month at least once or twice, or maybe three times, to go to the places that I usually shop at. It's like I have this little, concentrated community [new neighborhood]." (Tina)
	"The [support] groups were okay, but again we would be traveling into town. Jonny would have to wait and … 'cause it's not just a little meeting. It's everything around it. I have to take a shower, then drive for an hour, be there for an hour, and then drive home for an hour." (Cora)

Geographic Context. Our analysis reveals that home usability does not stop at the front door, as home usability is also about where home is located. Rural homes can lead to perceptions of social isolation from the larger community, as was Cora's experience of being far from services in town. Also, neighborhood context is important as it may provide more, or less, access to community services such as transportation, shopping, and medical providers as Tina discovered after moving from one neighborhood where she felt geographically isolated to her new place where "I have this little, concentrated community". Finally, geographic location is also closely connected with social supports and systems that determine eligibility for programs and grants. For example, Theresa needed her bathroom modified. After extensive conversations with service providers, Theresa learned that because her home was located outside of their service area, the home was not eligible for funding and stated that "nobody wants to help me. I wish to God I never would've bought a house [here]."

Discussion

The purpose of this study was to understand the relationship between home usability and participation in the community for people with mobility disabilities. Results indicate that this relationship between community participation and home usability is a complex, layered process. Home usability is a concept recognizing that home is about more than its physical structure. Rather, home usability is an interaction between an individual and their environment, illustrating how the two interact with and inform each other to produce an individual's lived experience in space. These dynamic interactions illustrate that there is no clear line between the home and the community regarding participation. While past research focusing on the home environment has typically strictly focused on the built home environment and the impact those environmental barriers have on health outcomes and functioning, such as performance of ADLs,[2,9,22] our results reveal that the associated outcomes of environmental barriers go beyond the home and into the community. Homes matter for participation as they are critical as sites of social engagement, entryways into the community, spaces of rest and rejuvenation from the community, and more. This analysis identified how three core ICF factors (personal, social, and environmental) define the iterative process underlying the relationship between home usability and participation.

Personal factors like physical, mental health, and function shape how bodies interact and inform participation both inside and outside the home. Health and function are not static; they are fluid and unpredictable, resulting in new challenges and safety concerns. A home that is safer to use supports community participation by preserving energy and mitigating risk of injury or illness. Beyond the individual, social factors like interpersonal relationships, services and supports, and systemic barriers contribute to the complexity of home usability by recognizing that people share their home spaces with family members, friends, and aides. Home usability acknowledges that these relationships exist within a broader social context that often leaves people with disabilities socially marginalized by poverty and discrimination. Finally, environmental factors, both the home design as well as geographic context, inform how an individual is able to use their homes and participate in the places where they live.

Disability is defined by the ICF as the result of the interaction between a person and their environment and home environments have the capacity to either reinforce or mitigate the experience of disability. Unusable homes (i.e., homes that are not designed for the varied functional abilities of individuals with disabilities) can reinforce the social stigma and marginalization experienced daily by people with disabilities.[18] Conversely, useable homes that support an individual's functional ability and facilitate both in-home and community participation can lay the foundation for social integration and become what Gibson et al.[23] refer to as "dignity enabling." Home usability encompasses the need for structural and physical modifications as well as addressing how individual, social, and environmental factors impact and inform a person's experiences of their home. These results reveal opportunities to develop more holistic housing and home modification programs and policies that invite consumer choice and control in addressing home usability concerns while ensuring these policies and programs are obtainable by all.

Limitations

The sample for this exploratory study was relatively small and homogenous. Our sampling strategy was designed to capture some demographic diversity; however, our priority was on examining a variety of housing contexts. This resulted in a majority of the participants being white, middle-aged women which limits the generalizability of our findings. Further research that allows for a larger sample would provide opportunity to explore additional themes and subthemes that may emerge related to cultural factors, particularly for people with disabilities with intersectional identities (e.g., Black Indigenous People of Color, LGBTQI individuals, people who are D/deaf, people with serious mental illness, or with intellectual disability). Additionally, the goal of this research was to understand the relationship between participation and home usability by unpacking the key factors driving that relationship.

Further research is needed to better understand how these various factors intersect to act as barriers or facilitators to different types of community participation (e.g., engaging outside the home in recreation or employment, socializing or working inside the home).

Conclusion

Using the ICF as a framework informing our understanding of home usability, we uncovered three core themes shaping how the home intersects with community participation: personal, social, and environmental factors. Additional subthemes for each factor group emerged, highlighting how the interaction between an individual, their home and their community are layered. Subthemes related to personal factors reveal how physical and mental health as well as perceived safety impact participation as impairment or function changes over time. Subthemes for social factors pertain to interpersonal relationships, services and supports and systemic barriers and finally subthemes for environmental factors illustrate how the built and natural environment contribute to an individual's experiences within their home and in their community. The home is a critical environment for further investigation as a space for participation, but this relationship is complex. Further research is needed to more fully understand the interactions between home usability and community participation; however, policies and programs aimed at promoting community participation for people with disabilities should consider the role of the home.

Funding

The contents of this manuscript were developed under a grant from the National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR grant number 90RT5043). NIDILRR is a Center within the Administration for Community Living (ACL), Department of Health and Human Services (HHS).

Disclaimer

The contents of this manuscript do not necessarily represent the policy of NIDILRR, ACL, HHS, and you should not assume endorsement by the Federal Government.

References

1. Stark S. Creating Disability in the Home: the role of environmental barriers in the United States. *Disabil Soc*. 2001;16(1):37–49. https://doi.org/10.1080/713662037.
2. Stineman MG, Ross RN, Maislin G, Gray D. Population-based study of home accessibility features and the activities of daily living: clinical and policy implications. *Disabil Rehabil*. 2007;29(15):1165–1175. https://doi.org/10.1080/09638280600976145.
3. Taylor DM. *Americans with Disabilities: 2014*. US Census Bureau; 2018:32.
4. Carnemolla P, Bridge C. Housing design and community care: how home modifications reduce care needs of older people and people with disability. *Int J Environ Res Publ Health*. 2019;16(11):1951. https://doi.org/10.3390/ijerph16111951.
5. Greiman L, Ravesloot C. Housing characteristics of households with wheeled mobility device users from the American Housing Survey: do people live in homes that facilitate community participation? *Community Dev*. 2016;47(1):63–74. https://doi.org/10.1080/15575330.2015.1108989.
6. Barile JP, Pruitt AS, Parker JL. A latent class analysis of self-identified reasons for experiencing homelessness: opportunities for prevention. *J Community Appl Soc Psychol*. 2018;28(2):94–107. https://doi.org/10.1002/casp.2343.
7. Hoffman DW, Livermore GA. The house next door: a comparison of residences by disability status using new measures in the American housing Survey. *Cityscape*. 2012;14(1):5–33.
8. Berg K, Hines M, Allen S. Wheelchair users at home: few home modifications and many injurious falls. *Am J Publ Health*. 2002;92(1):48. https://doi.org/10.2105/AJPH.92.1.48, 48.
9. Stark S, Keglovits M, Arbesman M, Lieberman D. Effect of home modification interventions on the participation of community-dwelling adults with health conditions: a systematic review. *Am J Occup Ther*. 2017;71(2). https://doi.org/10.5014/ajot.2017.018887, 7102290010p1-7102290010p.11.
10. World Health Organization. *International Classification of Functioning, Disability and Health (ICF)*. WHO; 2017. Accessed June 7 http://www.who.int/classifications/icf/en/.
11. Greiman L, Fleming SP, Ward B, Myers A, Ravesloot C. Life starts at home: bathing, exertion and participation for people with mobility impairment. *Arch Phys Med Rehabil*. 2018. https://doi.org/10.1016/j.apmr.2017.11.015, 0(0).
12. Moore J. Placing home IN context. *J Environ Psychol*. 2000;20(3):207–217. https://doi.org/10.1006/jevp.2000.0178.
13. Blunt A. Cultural geography: cultural geographies of home. *Prog Hum Geogr*. 2005;29(4):505–515. https://doi.org/10.1191/0309132505ph564pr.
14. Greiman L, Ravesloot C, Schinnick Goddard K, Ward B. Effects of a consumer driven home modification intervention on community participation for people with disabilities. *Disabil Health J*. 2021, 101210. https://doi.org/10.1016/j.dhjo.2021.101210.
15. O'Day B. Centers for independent living: advocates for disability rights. *Community Dev*. 2006;37(3):4–12. https://doi.org/10.1080/15575330.2006.10383103.
16. Fusch PI, Ness LR. *Are we there yet? Data saturation in qualitative research*. 2015:9. Published online.
17. Maxqda. All-in-one qualitative & mixed methods data analysis tool. MAXQDA. Accessed January 19 https://www.maxqda.com/; 2021.
18. Saugeres L. (Un)accommodating disabilities: housing, marginalization and dependency in Australia. *J Hous Built Environ*. 2011;26(1):1–15. https://doi.org/10.1007/s10901-010-9201-x.
19. Bradley EH, Curry LA, Devers KJ. Qualitative data analysis for health services research: developing taxonomy, themes, and theory. *Health Serv Res*. 2007;42(4):1758–1772. https://doi.org/10.1111/j.1475-6773.2006.00684.x.
20. Brantlinger E, Jimenez R, Klingner J, Pugach M, Richardson V. Qualitative studies in special education. *Except Child*. 2005;71(2):195–207. https://doi.org/10.1177/001440290507100205.
21. Santasier AM, Myers A, Ward B, Bainbridge D, Ravesloot C. "I have more energy to do it": how reducing the effort cost of bathing can promote community participation. *Unplublished Manuscr Reserach Train Cent Disabil Rural Communties*. 2020. Published online.
22. Hwang E, Cummings L, Sixsmith A, Sixsmith J. Impacts of home modifications on aging-in-place. *J Hous Elder*. 2011;25(3):246–257. https://doi.org/10.1080/02763893.2011.595611.
23. Gibson BE, Secker B, Rolfe D, Wagner F, Parke B, Mistry B. Disability and dignity-enabling home environments. *Soc Sci Med*. 2012;74(2):211–219. https://doi.org/10.1016/j.socscimed.2011.10.006.