

Hispanic Older Adult's Perceptions of Personal, Contextual and Technology-Related Barriers for Using Assistive Technology Devices

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Abstract Assistive technologies (AT) are tools that enhance the independence, safety, and quality of life of older people with functional limitations. While AT may extend independence in ageing, there are racial and ethnic disparities in late-life AT use, with lower rates reported among Hispanic older populations. The aim of this study was to identify barriers experienced by Hispanic community-living older adults for using AT. Sixty Hispanic older adults (70 years and older) with functional limitations participated in this study. A descriptive qualitative research design was used guided by the principles of the Human Activity Assistive Technology Model to gain in-depth understanding of participants' perspectives regarding barriers to using AT devices. Individual in-depth

semi-structure interviews were conducted, using the Assistive Technology Devices Cards (ATDC) assessment as a prompt to facilitate participants' qualitative responses. Data analysis included descriptive statistics and rigorous thematic content analysis. Lack of AT awareness and information, cost of AT, limited coverage of AT by health care plans, and perceived complexity of AT were the predominant barriers experienced by the participants. A multi-level approach is required for a better understanding of the barriers for using AT devices. The personal, contextual, and activity-based barriers found in this study can be used to develop culturally sensitive AT interventions to reduce existent disparities in independent living disabilities among older Hispanics.

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Introduction

There is a greying of the population around the world, including Puerto Rico. In the year 2010, people aged 60 years or more represented 14.5 % of Puerto Rican population and is expected to increase to 28.3 % by 2025 [1]. As the population ages, the occurrence of disabilities also increases. Sizable racial and ethnic disparities in late-life disability exist, with US national data reporting greater challenges in maintaining independent living skills among Hispanic older adults compared to any other racial or ethnic group [2]. For example, in the year 2012, the reported disability rate for Hispanic older adults living in Puerto Rico was substantially higher (49.6 %) than that of non-Hispanic white older adults living in the USA whose disability rate was 35.1 %. Using the Behavioural Risk Factor Surveillance System (BRFSS), it was found that older Hispanics living in Puerto Rico reported being less educated,

receiving less annual income, having less access to health care services, being more physically inactive and having poorer health than older white, non-Hispanics respondents living in the USA [3]. While inequities in these health determinants and health outcomes may account for higher disability rates seen in older Hispanic living in Puerto Rico, racial and ethnic disparities in assistive technology device use may also account for the higher disability rate.

Racial and Ethnic Disparities in Assistive Technology Use

Use of assistive technology devices (ATDs) is one way to overcome challenges imposed by disabilities in old age [4, 5]. Research has shown that ATDs can attenuate functional decline, increase older adults (OA) independence and safety in daily living activities and have the potential to assist OA in remaining in the community, reducing hospitalizations, lowering health-related costs and enhancing OA quality of life [1, 6, 7]. Thus, there has been a substantial increase in recent years in the use of assistive technology by members of the older US population who have difficulty with daily tasks [8].

While ATDs may extend independence in ageing, there are racial and ethnic disparities in late-life ATD use, with lower rates reported among minority older populations [8–10]. Hispanic older adults face significant challenges. A National Health Interview Survey on Disability found that Hispanics older adults were 0.78 times less likely to use ATDs for mobility as were non-Hispanic Whites [11]. This difference was attenuated by age, with a 30 % increased likelihood attributable to being Hispanic and aged 65 to 75, and a 130 % increased likelihood attributable to being Hispanic and older than 75. Moreover, a study that explored differences in ATD use with 2000 adults across disability subpopulations in California revealed an overall disparity of assistive technologies (AT) use, with Latinos having the lowest ATD use rate [12]. These studies highlight the need to explore barriers for ATD use for Hispanic populations. Findings could assist assistive technology practitioners in developing strategies to expand use and to promote equal access to technologies.

Barriers for Using ATDs

Many barriers to successful use and adoption of ATDs have been identified in OA. A major barrier to the use of AT is the absence of clear points of access, information and awareness of the availability of ATDs which leads to a lack of awareness about its benefits [13]. In addition, older adults are not aware of the benefits of using AT in promoting independence and quality of life, thus not perceiving it as useful for their lives. Costs of assistive technology devices and lack of perceived need for using ATDs have been also shown to constitute a barrier for its adoption in older adults [14, 15]. Most ATDs require an initial cost. As few people have knowledge about

the benefits of ATDs, the initial cost might refrain them from investing.

There are also reported reasons for abandonment of ATDs. Four significant features relevant to the abandonment of ATDs are (1) lack of consideration of the user's opinion, (2) inability to procure the device easily, (3) poor device performance, and (4) change in users needs [16, 17]. In addition, device failure, failure to achieve improved functions, and perceived lack of need have been reported by consumers for non-using ATDs [14, 18, 19].

Stigma towards ATDs is another reported barrier to the uptake of ATDs, since the willingness to use assistive devices will depend on whether it supports or undermines the personal identity and self-image of the individual [14]. In the qualitative study conducted by Resnik et al., users of mobility devices expressed feelings of shame for needing help and felt that people with mobility problems were not seen as normal [20]. Furthermore, in a systematic review conducted by Peek et al. about the barriers older adults find for using ATDs, it was found that the participants were worried that older people may perceive them to be in poor health or frail [5].

While some studies have investigated the barriers for using or adopting ATDs by older people, there are major gaps about the barriers for using ATDs from the perspective of older Hispanics. Knowledge about these barriers has come primarily from non-Hispanic OA living in the USA and countries other than Puerto Rico. More specifically, research on barriers to using ATDs faced by older Hispanic living in Puerto Rico is non-existent. Understanding personal, contextual and cultural specific barriers to ATD use by OA is important since culture and personal biography shape the course of ATD acceptance. Differences might exist between Hispanic and non-Hispanic OA in their perceived barriers for using ATDs due to specific personal and socio-cultural considerations.

For assistive technology service providers, it is essential to identify personal, contextual and technology-related barriers that have an impact on OA use and adoption of ATDs. The removal or modification of barriers experienced by older Hispanics for using ATDs might help in reducing the existing and persistent health disparities in independent living disabilities experienced by this population.

The aim of this study was to identify barriers to successful use of assistive technology from the perspective of community-dwelling older Hispanics with functional limitations living in Puerto Rico.

Methods

Guiding Framework

The Human Activity Assistive Technology (HAAT) model [22] was the guiding framework of this study. This model

outlines clinically relevant variables for consideration in practice when prescribing ATDs. These variables are the *human*, the *activity*, the *assistive technology* and the *context*. There is a continuous and dynamic interaction between the human, the activity and the ATDs, and the influence of the context on all of them. The *human* element considers the cognitive, physical and emotional skills and abilities necessary for using ATDs. *Activities* are conceptualized as those daily tasks in which a person wants or needs to engage, including self-care, productivity and leisure activities. *Context* refers to different aspects of the environment that affect the person, the activities in which they engage and their use of ATDs. The context considers the physical environment, the social element, the cultural environment and the institutional element that affect daily life. The *assistive technology* refers to the device and its interface with the user. The HAAT model provided a useful framework to describe older Hispanic perceived barriers related to the human, the activity, the context or the assistive technology.

Study Design

We implemented a descriptive qualitative research design [21] guided by the principles of the HAAT model [22] to gain in-depth understanding of consumer perspectives regarding barriers to using AT devices for a sample of community-living Hispanic older adults with functional limitations. Descriptive qualitative research was the most suitable method for this study because its goal is to provide a comprehensive account of specific events in the everyday terms of event insiders [21]. We conducted individual semi-structured interviews with the participants to explore barriers for using AT devices as expressed in the lived and told stories of individuals. The phenomenon of interest to this study was the experience of barriers to using ATDs that emerged from the human, the context, the activity and the assistive technology. For the purpose of this study, we defined assistive technology as any device, equipment or service that enables older people with functional limitations to increase their functional gains, independence and participation in a meaningful range of activities of daily living, instrumental activities of daily living, social activities, rest and sleep activities and social participation.

Participants

We recruited a convenience sample of 60 Hispanic adults (40 women and 20 men) with functional limitations who lived in Puerto Rico. We define Hispanic as Spanish-speaking adults. The selection of 60 participants was determined on the basis of their availability and the number of participants to achieve data saturation or the point in which new categories, themes or explanations stop emerging from the data [23, 24].

Inclusion criteria were (1) Spanish-speaking Hispanic men and women, 70 years and older; (2) living independently in the community; (3) not receiving home care; (4) report the need for help or difficulties with two or more instrumental activities of daily living (IADL) or one or more activities of daily living (ADL); and (5) demonstrate evidence of no severe cognitive impairment (a score of 24 or greater in the Minimental State Examination as recommended by the literature) [25]. These criteria were assessed using a screening questionnaire designed by the study investigators which included the participant's nationality, age, place of living, and use of home care services and assistance with 31 ADL or IADLs and the Minimental State Examination score. Those excluded were institutionalized older adults, individuals with dementia, and individuals with significant impairment (e.g. individuals with low vision, blind, deaf or severe mobility impairments) that require the use of specialized ATDs. These criteria were designed to enrol older people who experience some difficulties with everyday activities but who were not totally dependent, homebound or receiving services to address functional problems.

Data Collection Instruments

Minimental State Examination (MMSE) This is a brief screening tool to provide a quantitative assessment of cognitive impairment [26]. The MMSE consists of 30 questions grouped into 7 domains: orientation to time, orientation to place, registration of three words, attention and calculation, recall of three words, language and visual construction. This instrument has evidence of sound psychometric properties with Hispanic populations [27].

Assistive Technology Device Cards (ATDC) The ATDC was developed by the researchers for the purpose of this study based on a comprehensive literature review, a content-validity ratio exercise with five experts in assistive technology and ageing, and pilot testing of the preliminary version of the instrument with ten older people 70 years and older, followed by individual interviews. This process resulted in the development of the ATCA, an interview-based tool used to measure the ATD needs of community-dwelling older adults with functional limitations. It consists of 50 AT device cards across 11 categories that resulted from the content validity process: AT for reading (five equipment), AT for mobility (seven equipment), AT for personal hygiene (six equipment), AT for toilet use (three equipment), AT for cooking (four equipment), AT for home care (six equipment), AT for medication management (two equipment), AT for communication (four equipment), AT for home accessibility (eight equipment) and AT for home security (five equipment). Each card measured 5" × 7" and consists of one picture and the name in text of an AT device in each card. After each card was shown, the

interviewers asked the participants the following question: If you have such a device, would you use it? A follow-up question was addressed if participants answered “no” to the first question: Why would you not use this AT device?

Semi-structured Interview The interview topic guide consisted of four open-ended questions (see Appendix 1) addressing participant-perceived challenges, barriers or obstacles for using AT devices. The interview questions were created and developed after reading existing assistive technology qualitative and quantitative research and consulting with researchers in varying fields (i.e. assistive technology practitioners, occupational therapy researchers in ageing). Prompts were used to assist in focused elaboration and depth in participants’ responses related to the specific personal, contextual, activity or assistive technology factors resulting in the experience of barriers for using AT devices. The guide was also structured to capture information through field notes about participants’ enthusiasm, body language and possible themes in the responses to the key questions.

Recruitment Procedures

We posted flyers in locations frequently visited by older adults, such as senior centres, churches, and doctors’ offices. In these flyers, we asked interested participants to call the principal investigator (PI) to determine their eligibility for the study. If they were deemed eligible by this telephone contact, an appointment was then scheduled for administration of Minimental State Examination (the last eligibility criteria), the consent form procedures and the study’s assessment tools at a location of their choice (i.e. their home, the PI’s office). We also used the snowball sampling. In this procedure, the researchers asked previous participants who agreed to participate in the study to make an initial contact with someone they knew who might be willing to participate. If the person they contacted was interested in participating in this study, they asked them to call the researcher to know more about the study, determine their eligibility and set up an appointment for an interview in their location of preference. None of the recruited participants refused to participate.

Data Collection Procedures

Informed consent was obtained from all individual participants included in this study. The primary author and three occupational therapy graduate students trained by the primary author administered the study’s measures. The first step involved administration of the screening questionnaire during the first telephone contact with the participant to assess eligibility on the basis of the first four inclusion criteria. Next, an individual face-to-face meeting was scheduled for those

eligible. During this meeting, the interviewers provided participants with a full explanation of the study and the consent form. After addressing the participants’ questions and obtaining the signed consent, the interviewers administered the Minimental State Examination (MMSE), the last eligibility criteria to determine cognitive ability. All screened participants obtained the cutoff score of 24 or above on the MMSE, indicating the absence of marked cognitive impairment. Interviewers then asked eligible participants to complete a paper-based socio-demographic questionnaire developed for the study, followed by the Assistive Technology Card List instrument. Finally, the semi-structured in-depth interview was conducted during the same meeting with each participant. The interview discussions were stimulated by a list of 50 assistive technology device pictures that are typically used by community-dwelling older adults with functional limitations.

The interviews lasted between 1 and 2 h and were conducted in the participants’ site of preference, such as their home or a local coffee shop. The interviewers digitally recorded each interview, and an independent transcriber made verbatim electronic text transcriptions of audio-recorded interviews for subsequent analysis. We maintained anonymity by assigning a coded number instead of the participant’s name to the audio data and the transcriptions. The transcriptions and data banks were destroyed upon completion of this study. All interviews, transcriptions and data analysis were conducted in Spanish and translated into English for publication purposes.

Data Analysis

The PI, an assistive technology researcher and three occupational therapy graduate students analysed the qualitative data from transcribed interviews using a rigorous thematic content analysis as described by Patton [28]. Thematic content analysis is a useful approach when the purpose is to classify and summarize descriptive qualitative data. We used a theory-driven approach to categorize the codes within the conceptual organization of the HAAT model [22]. By using this approach, the PI and each coder began by conducting their own data analysis of the field notes and the interviews. During this process, each reviewer identified the recurrent categories that gave meaning to the data within the human, context, activity and assistive technology domains to develop the initial coding scheme of significant statements. Afterwards, the PI, as well as the four independent coders, met four times to compare their initial coding scheme, discuss discrepancies and establish inter-coder agreements, resulting in the recodification of the data into major themes and sub-themes within the HAAT domains. Finally, the PI and the four coders developed definitions of the resulting themes and sub-themes. We used NVivo software (version 10) as a data manager and organizer.

Results

Sample Description

Sixty-seven percent ($n = 40$) of the sample was women (see Table 1). The mean age of the participants was 77.4 years, with an age range of 70 to 97 years. Most of the participants ($n = 50$; 83 %) had a low monthly income (<\$1000) and an educational level of high school or less ($n = 48$; 80 %). The predominant health conditions reported by the sample were musculoskeletal disorders ($n = 33$; 55 %), hypertension ($n = 35$; 58 %) and diabetes ($n = 32$; 53 %).

Emergent Themes and Sub-themes

The results related to the perceived barriers to the uptake of assistive technology were grouped according to the HAAT model: “human barriers”, “assistive technology barriers” and “context barriers”. We expanded these domains into themes and sub-themes with frequencies of verbalizations within each sub-theme (see Table 2). We describe the findings from the qualitative analysis below.

Human Barriers

Human barriers refer to the physical, cognitive and affective components related to the participants, as well as the skills and

Table 1 Socio-demographic characteristics of the participants

Characteristics	Hispanic older adults ($n = 60$)
Age Range (years)	70–97
Age (mean, SD)	77.4 (6.27)
Sex ($n, \%$)	
Female	40 (67)
Male	20 (33)
Education Level ($n, \%$)	
High school or less	48 (80)
Some college education	12 (20)
Monthly Income ($n, \%$)	
Low (<\$1000)	50 (83)
Medium (\$1000–\$2000)	8 (13)
High (>\$2000)	2 (3)
Health conditions ($n, \%$)	
Musculoskeletal	33 (55)
Hypertension	35 (58)
Diabetes	32 (53)
Visual	15 (25)
Respiratory	13 (23)
Cardiac	12 (20)
Overweight	12 (20)

Table 2 Frequencies of verbalizations in each code related to perceived barriers for using assistive technology

Barriers for using assistive technology	Frequencies of verbalizations ($n = 60$)
Human barriers	
Lack of assistive technology information and knowledge	26
Safety concerns	24
Dislike for AT	12
Concerns of losing functional capacities	1
Assistive technology barriers	
Complexity of assistive technology	17
Assistive technologies experienced as obstacles	10
Device failure	10
Unattractive appearance	3
Inadequate assistive technology fit	1
Context barriers	
Finance restrictions	35
Lack of access of the physical environment	5
Institutional systems barriers	
Lack of funded provision	3
Bureaucracy in the acquisition process	2
Lack of AT prescriptions by health care services provider	1
Social stigma associated with assistive technology use	2

abilities that were perceived to interfere with using AT. Sub-themes include *lack of assistive technology information and knowledge*, *safety concerns*, *dislike for AT*, *failing to meet perceived functional needs* and *concerns of losing functional capacity*.

Lack of Assistive Technology Information and Knowledge

Lack of AT information and knowledge was one of the most frequently cited barriers to using AT with 26 quotations coded in this sub-theme. This sub-theme refers to deficits in information and knowledge in relation to the availability, acquisition or use of the AT to support performance and participation in daily activities. Lack of knowledge about the existence or availability of the AT was raised by most of the participants when they were asked about what would stop them from using AT devices. Some answers to this question were “I didn’t know that these devices existed” and “There were many that you mentioned that I didn’t even know existed.” Most participants also mentioned lack of knowledge related to how to acquire the AT, evidenced by the following voice: “I don’t know where they’re sold.”

Other participant answers to this question provided evidence about the lack of knowledge related to the necessary skills for using AT, as expressed by the following voice: “not

knowing how to use them, because otherwise, it would not have a positive effect.” This participant recognized that having skilled knowledge was an important enabler of functional performance. One participant stated that “Many devices are difficult to use” which is a reflection of the lack of knowledge and skills for effective use of AT devices.

One of the participants also indicated that the lack of consistent use of owned AT devices resulted in barriers to retain the necessary knowledge and skills for effective use of AT devices, as evidenced by the following voice: “If you have them (the AT) and you don’t use them often, you can forget what they are for.”

Therefore, lack of AT knowledge and skills was an important perceived barrier for using AT to support functional performance and participation in everyday life activities.

Safety Concerns Twenty-four quotations assigned to this sub-theme revealed that using specific types of AT was perceived as a hazard for their physical health and integrity. Mobility devices was the predominant category of AT perceived as being unsafe and resulting in fear of falling. For example, a common theme was the experience of fear of falling as the major disadvantage of using canes to support functional mobility as evidenced by the following voices: “I have the impression that I might fall” and “the cane is not safe”. The use of a standard walker was also perceived as being unsafe to support walking activities by the following participant:

Well, the disadvantage is that it might break (the walker) or that it might trip over a stone. Because they are light devices... and she (his wife) might fall on her face.

For this participant, the design of the standard walker compromised its safe use due to being lightweight and visually obstructive of potential obstacles. Lack of experience and skills for using scooters also resulted in the experience of fear by some of the participants, evidenced by the following narrative: “I’ve never driven and I’m afraid (to drive scooter)”.

The long-handle support stool was also commonly perceived as being unsafe, resulting in fear of falling as expressed by the following participant: “I have the impression that I might fall”. Similarly, AT used to raise the height of toilets, chairs and bed were perceived as being unstable: “It look unstable (bed risers), I would prefer a higher bed”. These participants preferred using more stable surfaces for this purpose, such as raising the toilet base instead of the add-on raised toilet seat. Finally, a common experience was the perception of unsafe use of nail cutters with magnifiers: “I’m afraid to cut or hurt myself”.

In summary, the use of some assistive technologies, predominantly the use of mobility devices, resulted in safety

concerns associated with fear of falling and injury, plausibly due to the lack of knowledge and skills for using this type of technologies.

Dislike for AT Twelve participants’ quotations assigned to this sub-theme elucidated a feeling of dislike associated with some AT devices. The expressions of “I don’t like it” or “I wouldn’t waste my time buying one” were frequently cited as reasons for not using some devices such as the buttonhook or dressing stick. Lack of perceived usefulness of some AT devices contributed to the experience of dislike for ATDs as evidenced by the following voice: “I see that some of them aren’t so practical.” These voices indicate the importance of exploring the users perceptions of AT to understand reasons for non-use of AT devices.

Failing to Meet Perceived Functional Needs Four participants’ quotations assigned to this sub-theme considered that the potential use of some ATDs would not satisfy their actual functional needs. For example, despite the need for assistance in carrying shopping bags, one participant felt that a wheeled cart did not fulfilled her shopping needs because of being “too small”. For another participant, a bag handle did not fulfil her need for carrying bags because “the bags are heavy anyway”.

These comments demonstrate that the function and potential utility of AT depends on the individual’s felt needs and the potential of the AT to fulfil these needs. Even when there are perceived functional needs, it does not mean that the participants will be willing to use an AT if it does not match their functional goals.

Concern of Losing Functional Capacities An expressed concern of one of the participants was that using AT that are not yet needed would make life too easy, leading to laziness and accelerated functional decline. This participant perceived that the use of a remote control for controlling electrical appliances around her home would have the following disadvantage: “having things that you don’t need yet and you’re not going to use yet, like the remote controls, can make a person lazier and deteriorate quicker”. Therefore, people can delay or avoid the use of AT with the potential to decrease fall risks or conserve energy for other meaningful activities because of the perception of losing functional capacities or becoming dependent.

Assistive Technology Barriers

This sub-theme refers to obstacles related to AT devices that result in barriers for using AT for improving functional performance. Sub-sub-themes that emerged in this category are *complexity of AT*, *AT experienced as obstacles*, *device failure*, *unattractive appearance*, and *inadequate AT fit*.

Complexity of AT A major barrier to the use of assistive technologies was the perception of complexity in the use of the AT. Seventeen quotations coded in this sub-theme elucidated participants' perception that some AT devices were seen as difficult to use. For example, although AT devices were perceived as beneficial by one of the participants, he believes that older adults' perceptions of complexity in the use of these devices is the reason for not using AT:

They're very good devices because they help us, but some seem difficult to use. I think for that reason many people would not like to use them. Maybe, if it is well explained, they would use them.

Devices such as the buttonhook, the remote control for electrical appliances, and the scooter were frequently cited as "too complex" to be used. The perception that cell phones were difficult to use resulted in a negative emotional response in one of the participants of this study: "I feel anxious about technology. It's not easy to use the cell phone".

Therefore, the perception of complexity in the use of AT devices not only is a barrier for using such devices but also may have a negative emotional impact in older people. Since lack of AT information contributes to the perception that AT is difficult to use, older people would benefit from knowing more about the availability and necessary skills needed for using the range of AT devices for older people.

AT Experienced as Obstacles Ten participants' quotations assigned to this sub-theme indicated that some ATs were perceived as causing undesirable problems. For example, it was mentioned that the long-handle duster would not be used because it "spread more dust" and the night light "wastes electricity". Sometimes, AT was perceived harmful to the participants' physical health: "I would not use it (hands-free magnifier) because of cervical problems". These voices evidenced lack of participants' knowledge about how AT can improve functioning and how to effectively use the AT devices.

Device Failure Ten participants' in this sub-theme made reference to failure of the AT device to work properly. Assistive technologies must work properly, reliably and safely in order to increase participants' willingness to use these devices. Assistive technology failure was perceived as one of the disadvantages of these devices: "Well, a disadvantage could be that some would break". A common experience mentioned by most of the participants in this sub-theme was failure of electric can openers to perform up to standards: "They are expensive and they break fast". These participants' voices demonstrate that product quality is important to adopt the use of AT.

Unattractive Appearance Three participants' quotations coded in this sub-theme related to the unattractive appearance of aids and devices as the reason for not being willing to use some of the AT devices. For example, the visual appearance of raised toilet seats was described as devices that "look ugly in the bathroom". The visual appearance of some AT devices is an AT-related cultural barrier important to older Puerto Ricans.

Inadequate AT Fit This sub-theme emerged from the experience of one of the participants. This participant talked about the experience of her father using an AT device that resulted in a mismatch between the person's needs and the performance of the AT device: "The hearing aid is too expensive for me, it cost thousands of dollars... After my father spent thousands of dollars, he cannot get accustomed to the vibration because it bothers him". Therefore, an inadequate fit between the AT device and the individual needs can be costly and time consuming. It also may result in difficulty with using a device, in having the device perform differently than expected, in frustration, and even in discontinuing use of the device.

Context Barriers

This theme includes extrinsic factors of the environment that emerged from the data when participants talked about aspects of the physical, cultural, social or institutional context that directly or indirectly affect the acquisition or use of the AT. Sub-themes of this category are *financial limitations, lack of access of the physical environment, limited availability of local distributors, institutional systems barriers and social stigma associated with ATD use*.

Financial Limitations Having economical constraints was the most cited barrier to ATDs access among the participants of this study with 35 quotations assigned to this sub-theme. The participants predominantly indicated that "not having the money to buy them" and "the cost of the devices" was a major barrier for purchasing their own equipment. The devices were perceived as relatively expensive, preventing participants from purchasing them: "If they are expensive, I cannot buy them".

Lack of Access to the Physical Environment Five participants' references were coded in this sub-theme. Respondents identified characteristics of the physical environment hindering the use of AT devices. For example, one participant mentioned that "Not having enough space in my apartment to move around with them" stopped him for using mobility devices. Similarly, a woman mentioned that "not having enough storage space to put them", was a disadvantage for using AT.

Inaccessibility of sidewalks was also raised by one of the participants as a barrier for using mobility devices: "Is possible to have the device and not be able to use it... the

surroundings are not adequate to use it. For example, the bad conditions of the sidewalks”. Therefore, the accessibility of the physical environment is essential for using certain AT devices that support community mobility.

Institutional Systems Barriers This sub-theme is defined as the obstacles originated from social systems, including the health care industry and government services that prevented the participants to access AT devices and services. Three factors relating to institutional systems barriers emerged from the participants discourse as barriers for using AT: lack of funding for ATDs, bureaucracy in the acquisition process, and lack of AT prescriptions by health care providers.

Three participants’ quotations talked about experiencing difficulties with financing ATDs. Assistive technologies that are not considered durable medical equipment are not covered by health care plans, as evidenced by the following voice: “sometimes the health plan covers them and sometimes it doesn’t and then you have to look for too many”. Not only this participant lack access to ATDs due to lack of funded provision, but obstacles also arise from the bureaucracy of the acquisition process imposed by health care plans as seen in the next institutional system barrier.

Two participants’ references elucidated the experience of difficulties with the provision of ATDs due to bureaucratic burden imposed by health care plans. Long acquisition process of ATDs was evident in the following participant’s experience: “Haven’t I’ve been telling you that I ordered the bed and they still haven’t send it”. One of the participant’s answers to the question about what prevents her from using ATDs was “Well, first you have to go to the doctor and have him approve the device and then with the health plan”. Therefore, the bureaucratic burden in the acquisition process of ATDs influences adequate provision of these devices to people who needs them.

One participant talked about the lack of assistive technologies prescriptions by health care service providers. This participant’s answer to the question about what things prevent her from using ATDs was “that my doctor won’t recommend them”. General practitioners, who are first in contact with the patient for prescription of ATDs, seem to not having adequate knowledge of ATDs for older people. Prescription of ATDs by health care professionals is important if the device is to be used by older people.

Social Stigma Associated with AT use Two participants’ references that were coded in this sub-theme related to culturally related stigma associated with being viewed as a weak and dependent person. For example, one participant’s view about the disadvantages of using ATDs was the following: “it could seem that others see you as not being able to do things correctly. I mean that they might see you weaker, as if I can’t do the things on my own”. Another participant talked

about his reluctance for using the cane stating the following: “People could make fun of me”. Therefore, people may be resistant to using helpful devices in public because they may feel embarrassed by attitudes of other people.

Discussion

The aim of this study was to identify barriers to successful use of assistive technology from the perspective of community-dwelling older Hispanics with functional limitations living in Puerto Rico. The participants of this study provided evidence that older adults face barriers at the personal, environmental and technology level for using ATDs. Some of these barriers were grounded on cultural values that affect ATD use. Using a mixed method design resulted in a comprehensive understanding of the multiple dimensions that play a role in restricting older adults’ access to ATDs.

The most commonly experienced barriers related to the human component was lack of assistive technology knowledge, safety concerns and dislike for AT. The participants felt that they were not aware of ATDs to support independent living. Extensive research evidence shows that limited information and knowledge about available AT products, how these products can be used and obtained and the right of provision of AT are persistent and common barriers among older adults from different countries [13, 14, 29–32]. Since learning to use new technology can be challenging, older adults could be best motivated when perceived benefits outweigh perceived costs.

The participants of this study commonly reported safety concerns related to using canes, raised toilet seats, and bed risers. Although canes are often prescribed to improve mobility and maintain balance while performing activities of daily living, previous research has shown that problems associated with cane use fall under the category of risky to use [33]. Participants of the current study also preferred AT design to be built-in instead of add-on because of the perception of increased stability. Since deterioration of balance and mobility is common during the ageing process, AT that is perceived as stable is important for its adoption among older people. Dislike for AT use was also a common barrier obtained from the answers to the question about why they would not use a particular type of AT. This result highlights the importance of including older adult preferences in the selection of AT to support its use.

The perception that AT is complex and difficult to use was also a common experience among the participants of this study. This finding is not surprising, since it is closely related to lack of knowledge of how to use AT devices, low educational levels that characterized the participants of this study, and limited English proficiency of Hispanic older people that restricts access to AT devices instructions. Problems related to

the English instructions and AT device controls have been identified in the literature as a usability concern shared by Korean and Hispanic women in the USA [34].

The theme of assistive technologies experienced as obstacles is an under-reported barrier in the previous literature. Sometimes, perceived obstacles of ATDs, such as the increased cost of electricity caused by using nightlights or the perception that using ATDs will result in other health risks, were related to lack of knowledge and information.

Moreover, device failure and lack of product quality have been identified in the literature as reasons for not using AT devices [14, 35]. These devices must work properly, reliably and safely to increase the uptake of ATDs by older people. The visual appearance of AT devices is also an important cultural barrier for older Puerto Rican. The particular style and design of AT devices can impact on the confidence of users and how they feel about their changing physical condition [13]. Since an attractive design of AT devices increases the willingness of using AT devices in older people, AT service providers must pay attention to this feature in addition to the functional benefits of using AT devices.

The most commonly reported contextual barrier was the experience of financial limitations. Values regarding finances are very important in Puerto Rico. Being an island with a history of low economics makes it relevant how much you are going to spend on AT devices. Therefore, the potential user would better stay dependent at home than afford the expensive technology. In addition, research has shown that cost associated with acquiring, installing and maintaining AT devices is a considerable barrier for using assistive technologies [13, 29]. As few older people have knowledge about the benefits of assistive technology, the cost is often enough to prevent them from investing.

Lack of access to the physical environment was also a new culture-related contextual barrier for using AT found in this study. Older people that raised this concern were living in the residential apartments for older people in Puerto Rico. These apartments are characterized by being small, with a very limited space for accommodating personal belongings. Therefore, space restrictions of the living environment restricted using AT devices (such as scooters) that were perceived as beneficial. Inability to participate in community mobility may have a negative impact in this population health and well-being.

At the institutional system, lack of funded provision, bureaucracy in the acquisition process and lack of AT prescriptions by health care service providers were the perceived barriers for using AT. At national and local levels, AT devices that are not considered primarily medical in nature are not subsidized by public [36] and private health insurances. Consistent with the findings of a survey conducted in the USA by Carlson and Berlan [37] with people with disabilities, lack of funding was a barrier to access AT devices. Under-resourcing of

government equipment provision schemes has also been identified in Australia as a barrier for AT [38].

In Puerto Rico, bureaucracy in the acquisition process by the public health care plan consists of the need for referrals from primary care physicians to see specialists and obtain prescriptions for AT [39]. This results in older adults perceive burden due to difficulty to gain access to primary health physicians and long acquisition process of the AT devices. Finally, limited prescriptions of AT devices by health care professionals in Puerto Rico could be explained by the lack of knowledge of these professionals about the whole range of AT devices. The Center for Technology and Aging [40] has reported that general practitioners who are first in contact with the patient do not have adequate knowledge about AT needs and devices.

The degree of importance attributed to physical appearance is also an important cultural barrier for older Puerto Ricans. Using AT was associated with feelings of embarrassment and weakness by some of the participants of this study. Since many people in Puerto Rico associates elders with disease, disability, death and dying, using AT devices can be seen as a visual reminder of diminished abilities and dependency, thus contributing to the social stigma of old age. Social stigma associated with AT use has extensively been reported in the literature in countries other than Puerto Rico [14, 35, 41, 42].

Study Limitations

Limitations of this study include the use of a small, homogeneous, purposive sample that cannot be generalizable to older adults living in rural areas, living institutionalized, with significant cognitive disabilities, and having diverse socio-economic and ethnic backgrounds. The recruitment of the sample through the use of flyers could also have introduced sampling bias with possible under-representation of less active older adults who could have different perspective about the barriers for using ATDs. In addition, the use of pictures of ATDs rather than having a “hands on” experience in using the ATDs as part of the data collection process could have made a difference in the acceptance and perceived barriers found in this study.

Conclusions

This study identified significant barriers to the adoption of ATDs from the participants’ perspectives which have the impact to provide a comprehensively understanding about ways in which assistive technology interventions for older Hispanics can be developed to help them attain their desired potential in daily activities. In researching barriers for using ATDs for daily activities, a valuable perspective is gained through examining barriers at the human, technology and

environmental levels. Most ATD interventions focus on changing human behaviours to encourage the adoption of ATDs, but this study highlights the importance of considering other critical barriers. ATD cultural barriers such as the visual appearance of technology as well as contextual barriers such as bureaucracy in the acquisition process require a system approach by health care professionals if the promise of assistive technologies is to be realized.

Implications for Practice and Research

- Education programmes and assistive technology interventions for older adults are urgently needed to help elders learn how to use ATDs to participate in meaningful activities and occupations.
- Older adults must be involved in the design and selection of ATDs.
- Rehabilitation practitioners must expand their attention to encompass not only the individual but also the physical and institutional system context that impacts the adoption of ATDs by older people.
- The feedback given by participants may also be helpful in developing future ATDs or modifying existing technology to meet the needs of older adults.
- Community outreach campaigns should have the dual objectives of addressing lack of awareness regarding the benefits of ATDs, as well as the common misconceptions and stigma associated with using ATDs.
- Public policies and community actions must address issues related to funded provision and timely acquisition of ATDs.
- Since sociocultural factors shape individuals' decisions and choices about AT use, future research involving specific social and cultural groups would allow generalizability to a larger group of older adults.

Appendix

INTERVIEW GUIDE QUESTIONS

- 1) What do you think are the barriers or obstacles to using assistive technology devices?
- 2) What are the disadvantages of using assistive technology devices?
- 3) What might stop you from using assistive technology devices?
- 4) Is there anything else that I should know about what problems face older people for using assistive technology devices?

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