# That robot is not for me: Addressing stereotypes of aging in assistive robot design

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***Abstract*—Assistive robots designed to support independently living older adults are expected to solve diverse physical, social and mental challenges related to aging. This paper presents how older adults—the potential users of assistive robots—interpret robotic technologies in terms of their usefulness and fit in their everyday lives. We interviewed 7 older adults aged 57-72, showing them photos and videos of assistive robots designed with their age group in mind. Most participants saw the robots as potentially useful in general terms, yet also commented that "those robots are not for me." An analysis of their discussion about the robots identified several aspects of robot design that participants found problematic, particularly negative representations of aging depicted in robot use scenarios. Participants saw issues related to aging as important daily problems, but did not appreciate the manner in which robotics was expected to address those issues. They were particularly sensitive to the dominance of stereotypes defining aging primarily in terms of disability in robotics discourse and design. Based on participant feedback, we suggest a broader understanding of the experience of aging as the basis for future assistive robot design for this population, and conclude by discussing related robot design possibilities.**

## I. Introduction

Dramatic population changes projected to affect developed countries, namely the aging of the post-World War 2 "baby boom" generation and decreasing birth rates leading to older adults over 65 outnumbering other age groups, are often cited as one of the major social and economic challenges facing the world today [1, 2]. This challenge has become a central motivation for developing assistive robots for older adults as a way to solve problems related to aging (e.g., limited labor and facilities, increasing social isolation) [3, 4]. Despite wide acknowledgement of these consequences of population aging, assistive robots are not readily accepted by the public as a solution [5, 6]. HRI researchers have suggested this reluctance might be due to usability problems of current robots [7]. Social scientists provide more fundamental critiques of the use of robots as "technological fixes" for complex social problems [8]. In this study, we take both critiques into account, and investigate how older adults experience aging, as well as how they think robotic technologies might relate to their needs and experiences.

We interviewed seven individuals from the "baby boomer" generation in the United States — born between 1946 and 1964 [1] and between 51 and 70 of age in 2016 — to understand how they make sense of existing assistive robots in the context of their everyday lives. The participants acknowledged aging can cause various physical and social challenges and described robotic technologies as generally useful; however, they were not willing to adopt robots in their own lives, even in later years when they expected needing more assistance. The main concern participants voiced was that the representation of older adults in terms of their disabilities dominated assistive robot design, but did not match their self-perception and experiences. This is similar to findings by [9]. Participants pointed out aspects of their lives that went beyond seeing aging as a disability and incorporated new possibilities for social interaction, valued activities, and pleasure. In response, we suggest alternative perspectives on assistive robot design for older adults that incorporate a richer understanding of the experience of aging.

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## II. Related Work

Our research builds on prior work on the development of assistive robot for older adults, human-robot interaction research with older adults, and social studies of stereotyped representations of aging in assistive technology design. In reviewing this literature, we found the predominant focus has been on aging as a disability, and older adults as individuals needing assistance for various deficits.

### *A. Assistive Robots for Older Adults*

Assistive robots for older adults can be categorized into two main subgroups [7, 10]: 1) physically assistive rehabilitation robots and 2) socially assistive robots [3] (or social robots [7]). Rehabilitation robots primarily provide functional and physical assistance for older adults (e.g., [11], [12]), without functioning as social entities or engaging people in personal communication. In contrast, Socially Assistive Robots (SARs) [3] provide assistance through social interactions with humans. SARs can provide help with daily living tasks (e.g., [13], [14]), enable telepresence communication with caregivers and medical staff (e.g., [15]), give reminders about medication, appointments, social events (e.g., [16]), assist in cognitive training (e.g., [17]), and provide companionship and entertainment (e.g., [18], [19]). Assistive robots in general aim to improve the quality of life of older adults, and can have measurable social, psychological, and/or physiological effects on people.

HRI researchers have performed design and evaluation of SARs in institutional and domestic environments [14, 15, 18, 20]. One of the main obstacles to using assistive robots in daily life identified by this research is the issue of adoption – older adults do not readily accept the idea of using robots on a daily basis due to the "complexity of robots" and "perceived usefulness" [7, 21, 22]. Accordingly, researchers have investigated how to improve the usefulness of robots by altering their appearance and functions [23]; however, older adults have so far not had the opportunity to discuss and critique a broad spectrum of existing assistive robots in relation to their everyday lives and experience of aging.

### B. *Older adults and Aging in Robotics*

Aging is portrayed as a global social challenge, while the increasing number of older adults is depicted as both a societal and an individual problem. In this vision, assistive robots are often portrayed as a solution [3] to issues of aging that can be categorized into four groups [7, 24]: 1) physical and functional decline, 2) cognitive decline, 3) sensory decline and 4) psychological issues. Physical and functional decline indicate a loss of mobility, which increases the risk of falling and limits people's capability to perform daily activities (e.g., bathing, and shopping). Cognitive decline refers to the progression of dementia or troubles with memory and orientation. Sensory decline refers to decline in hearing and/or vision. Psychological issues refer to problems with diminished social connections, which can cause loneliness and isolation and often lead to depression.

### C. *Identifying Stereotypes in Assistive Technology Design*

A growing number of studies question the legitimacy of depicting older adults mainly as ailing bodies within assistive technology design [9, 10, 25]. Vines et al.'s discourse analysis of assistive technology studies in the past 30 years found that most studies identified older adults primarily as people suffering from mental and physical decline [25]. This suggests that assistive technology studies define older adults as a homogeneous group, with specific skills and deficits, with little regard to their diverse social contexts and situational abilities. Vines et al. suggest an alternative framing of aging within technology design to support older adults' lives, experiences, and priorities. Sparrow and Sparrow's critique of eldercare robots points out several ways in which older adults have been misrepresented and their holistic experiences disregarded, including their rights as humans, and the broader societal significance of treating aging as a problem to be relegated to robotic assistants [10].

The results of both studies suggest that we need to be more inclusive of the experiences and viewpoints of older adults to provide nuanced representations of aging as a basis for developing assistive robots. We therefore explore how older adults experience aging, and how they view existing robots in the context of their ongoing life experiences. We do this as a way of expanding the possible options and services that can be provided to older adults by assistive robots. In contrast to acceptance and evaluation experiments focusing on usability, we aim to analyze how older adults make sense of assistive robots based on their everyday life and aging experiences. Presenting assistive robots as a "technological fix" reduces aging to a problem, and defines older adults in relation to the various mental, social, and physical issues they experience, obscuring their lives beyond their disabilities. The participants in this study brought out aspects of their lives that they find significant and valuable, which we suggest using as a starting point for robot design.

## III. Method and Participants

The main aim of our study is to understand how older adults make sense of existing assistive robotic technologies in the context of their daily experience of aging, and which aspects of such technologies they find relevant to those experiences. A related concern was identifying what older adults consider as the most important attributes of aging, and exploring how assistive technology might fit within their self-defined experiences and values.

We recruited participants by posting flyers at a local public library and using a snowball-sampling method. To retain the individuality of participants, we use pseudonyms to identify them. Our study had seven participants, all living independently in their homes in the Midwestern USA. Their ages ranged from 57 to 72, with the average age being 62. Six participants were female, and one was male. One participant, Diane (72), had a considerable physical disability—she was unable to move one of her arms—but the other participants reported being in relatively good physical and mental health.

Interviews were conducted in participants' homes or other places of their choice to foster a comfortable environment. We started the interviews by saying there were no right or wrong answers to our questions, so that participants would feel free to talk about any issues they thought important. As in our previous collaborative design study [26], we found participants got nervous when we introduced our study as "robotics" research. Thus, we first asked them to write any 15-20 words (Figure 1) that came to their minds when thinking of their daily experiences, so they could first focus on their lives rather than on robots.

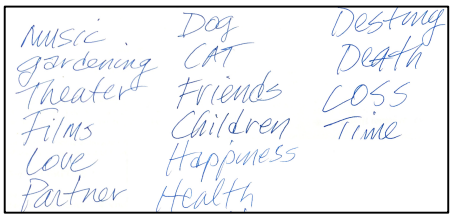


**Figure 1 James (64)'s initial list of words.**

After this first step, we conducted semi-structured open-ended interviews. We started with questions about participants' general experiences of aging, followed by a discussion of their impressions of existing technologies. We did not specifically bring up older adults' physical decline or disabilities, unless participants themselves mentioned these issues. Our questions concerned the following topics:

1. The main issues and concerns in participants' lives (e.g. What are three big issues for you these days?);
2. Their mental wellbeing (e.g. When were you happy (or sad) most recently?);
3. Their social circle (e.g. Who do you usually talk to? Who do you want to talk to most? How do you communicate with the people around you?);
4. Use of and familiarity with technology (e.g. Which technologies do you use most often?);
5. The meaning and experience of aging (e.g., What would be the biggest changes for you due to aging? How do you feel about aging?)

After discussing their everyday lives and experiences, participants were asked to critique existing assistive technologies (e.g. How do you like this technology? Do you think you would use this technology? If not, why?) We showed them existing Socially Assistive Robots (e.g. Ri-Man

earlier version, Care-O-bot, Paro, Necoro), rehabilitation robots (e.g. Ri-Man later version), and other assistive technologies (e.g. smart home systems, emergency pendants). For each technology, we provided short videos [1] and/or pictures to familiarize participants with the capabilities and projected uses of these technologies. We selected these existing robot examples to represent diverse categories of assistive robots [7], and included non-robotic assistive technologies to explore alternatives to assistive robots [27].

**Figure 2 Screen capture of Care-o-bot video (left) and emergency pendant (right)**

The interviews were transcribed and subsequently coded following a Grounded Theory approach [28], which allowed salient themes and perspectives to emerge throughout the analysis process. The authors started by discussing possible emergent themes after the interviews (e.g., the difference between older adults' actual life experiences and their representation within assistive robot studies). The first two authors then coded the interview transcripts with labels based on these initial discussions and created categories by grouping similar codes together into main themes. As Grounded Theory analysis is an iterative process, the labels of concepts and categories were amended as needed during the coding process. After initial categorizing, we conducted axial coding [28] to organize codes into categories and subcategories that enabled us to refine them into a coherent description of our findings. The final categories identified through analysis became the structure of our results section.

## IV. Results

We identified three main thematic groups from our interviews: A. Reasons why participants thought assistive robots were not for them; B. Participants' concern about the stereotypes of older adults embedded in technology design; C. Differences between older adults' daily lives and the representations of older adults in assistive robot studies.

### *A. That Robot Looks Cool, But It's Not For Me.*

A majority of participants (5/7) told us robots seemed helpful for older adults in general, describing robots as "wonderful," "great," or "work(ing) great." After discussing each technology, we asked participants whether they would be willing to use it. Surprisingly, the participants said they would not use the robots they had evaluated positively. All seven participants strongly stated they did not need robots, and did not see themselves as the target audience for them.

#### *1) "I am not the older adult in the videos."*

Our participants, who were all in their late 50s to 70s, did not perceive themselves as the older adults that assistive robots aim to support. As they were mostly healthy, and might therefore may not need robots at present, we further prompted them to tell us whether they would want to use assistive technologies 20 years later, when they might be experiencing more aging-related challenges. All the participants still responded with a definite "no." They explained their age was not a decisive factor for whether or not they would use assistive technologies; what mattered was their level of disability, which can occur regardless of one's age. Carol (63) explained that age does not determine whether one needs help or not:

> *Well, I am not sure there is a certain age [indicating that one definitely needs help]. Because some young people can't take care of themselves, while other people, even around 90 years old, can still take care of themselves. So [it] depends on people and situations [not just age].*

Rather than using age as an objective measure of being old, participants described age as relative and situational, a matter of perception, as in the following quote by Diane(72):

> *Sometimes I feel younger than I think I am. And other times I feel older than I think I am.*

#### *2) Financial and institutional barriers*

Several participants (4/7) mentioned they would not be able to afford the robot, particularly since their financial situation was not as good as it had been in years past. All our participants were retired or close to retiring; most retired participants (5/6) worked part-time or as volunteers. Three out of 7 participants mentioned finances as one of their main problems, and that they had to change their lifestyle based on their new budget. In this context, expensive robots were not an option. James (64) said he could see the benefits of robots, but they would only be accessible to the rich. Since participants were concerned about cost, some mentioned insurance companies and welfare policies as alternative ways to obtain the robots. When asked whether she would use a robot 30 years later, Judy (58) answered:

> *It depends on the health care system at that time. Because right now, I do not see any way to have it. I do not have a lot of money. So it depends on how much is available to me. Me, I'd rather cultivate younger friends and then let them help me.*

Robotics researchers often study how the design characteristics of robots or specific attributes of users (e.g. age, gender, personality) affect acceptance, but our participants discussed how broader societal constraints that are part of the daily experience and thinking of older adults should also be taken into consideration. Previous research has shown that private health insurance and a higher income

[1] Ri-Man later version (https://www.youtube.com/watch?v=LBMJCI-FzrM from 2:26 ~), Ri-Man earlier version (https://www.youtube.com/watch?v=hmtHBEU8lrk from 0:45 ~), smart home system (https://www.youtube.com/watch?v=vyqatBlfl18), Care-O-bot (https://www.youtube.com/watch?v=lccHeEiOrBc)

determined who could use automated wheelchairs [29]. We expect similar constraints will apply to robots as well.

*3) Preference for existing relationships*

Most participants mentioned they would prefer help from real humans or pets than robots (5/7). Participants particularly wanted help from their families or others with whom they have established relationships. Susan (61) explained that her mother, who had passed away, was completely disabled and not able to go to the bathroom by herself. Based on her explanation, we asked whether Ri-Man might have been useful for her mother. Susan's answer was still "no"; she did not trust Ri-Man. She wanted to take care of her mother with help from trusted friends to minimize the chance of accidents happening. Participants (4/7) also preferred real pets, with which they have relationships, rather than robots. They saw robotic pets as the last solution to having a companion.

*4) Privacy issues*

Privacy issues were mentioned as reasons for rejecting robots. Participants were sensitive to who could access their personal information, and did not want to be watched or have their home shown to someone they did not know well. Diane (72), whose disability was a big part of her life, said:

> *I don't like that people have a video of me and my home. This is why I don't buy anything similar to this [regardless of my disability].*

Judy (58) worried about the possible disadvantages to her health coverage if the insurance company gained access to surveillance video or robot logs:

> *That sounds great. As long as, the thing about this, the technology, sometimes the wrong information is sent to my insurance company. And then the rates go up and you know it will take a long time to get it fixed.*

The potential negative effect of surveillance systems on their sex lives was also a concern for Susan (61) and Carol (63), who did not want to be watched at those times.

## B. Concerns about Stereotypes of Aging

The most frequent reason our participants gave for not using assistive robots was that they did not identify with the generalized images of older adults portrayed as target users of robots (7/7). The stereotyped images even disturbed a few of them, because they represented a dominant view of aging in society. Karen (61) said that one of the biggest challenges due to aging was not her body, but others' stereotyped perspectives of her as a "granny" who is not as bright as she had been in earlier years:

> *It is not clear how you are living in the stereotypes about aging. But I think there are a lot of stereotypes, especially with women. I do want to be a murderous when people talk about Granny, like how stupid she can be.*

Diane (72) also explained that she does not conform to common assumptions about older adults. She said she has had the same mind her entire life, but people started to judge her based on their assumptions about age. She said:

> *They think old people don't have a sense of humor. They think older people are not interested in sex and romance, and yes they are. Oh boy, they are. It's unusual for a woman my age in this culture not to cut her hair… I wear my hair long because I have worn this hair like this for my whole life. That's how I like to wear it.*

Participants (5/7) explained that stereotypes about older adults negatively impacted their work and discouraged them at times, although they think that they are still the same people as in their younger years. Carol (63) asked why the age of older adults is stereotyped, even though every age has its own issues as a part of continuing life experience.

## C. Actual Life Experiences

Participants described their life after retirement as enjoyable, despite some unpleasant changes due to getting old (e.g. friends dying, losing physical strength). We discuss how older adults explained their daily lives below, compared to representations of older adults in robotics.

*1) The positive sides of aging*

Several participants (3/7)—Mary (57), Carol (63), Judy (58)—described positive aspects of aging. Decreased working hours allowed them to focus on what is important to them, and to make decisions based on their values. Carol said she no longer needs to "race," but can focus on herself:

> *When you have a full time job, you try to fit in everything in many ways, which is rather difficult. After I retired, I am careful not to overschedule myself, run the race again. I can pick and choose what really means to me.*

Judy (58) described similar positive changes in her life:

> *Sometimes in your life you feel like you just can't get anywhere. Your feet are stuck in the mud. I had to work 24 hours a day and I made a lot of money. That was a good thing. … but I guess I really don't need the money.*

Mary (57) said that she now knows better how to enjoy playing with kids than when she was a parent, because she does not need to discipline them every moment.

*2) Emotional health*

Most participants (6/7) described themselves as happy and gave us examples of what that meant in their everyday lives. Participants commonly explained that their happiness came from other people and their relationships with them. Diane's (72) answer to "when are you happy or what makes you happy?" presents ideas common to our participants:

> *The first thing that occurs to me when thinking of happiness is witnessing others' happiness. Someone else's happiness, growth, or discoveries.*

None of the participants described happiness as originating from their own activity. They were happy while playing with (grand)kids (Mary (57), Diane (72)), visiting sisters (Carol (63)), socializing (James (64), and helping others (Judy (58)).

*3) Social activity*

Participants explained they were still the same as in their early years in terms of social activities. They were still working (7/7), socializing with friends or neighbors (7/7), going to church (3/7) and dating (2/7). Although they were retired, most of the participants worked part-time or volunteered. Participants chose their second jobs based on their values rather than economical rewards, making them a

very important part of their lives. Judy (58) hosts a show at a local radio station and explained how passionate she is about music, echoing sentiments voiced by other participants:

*Everybody needs money to live. But what I think is important is getting yourself into a job you like… If you don't do what you like, then most of your life is not what you like.*

Participants were socially active regardless of disabilities. For example, Diane (72) was not able to move one of her arms, but that did not determine who she was socially. She was staff at a local senior association and enjoyed a regular social group at church. Diane also discussed her boyfriend:

*We met over the Internet. We just exchange messages and have similar interests, so we started sending e-mails. He lives in London and I live here. 9-10 months we never saw each other, not a picture, not anything, but we did fall in love (when we met) in the US.*

*4) Physical activity*

Participants all described experiencing physical changes as they aged. However, they tried not to focus on them, since physical changes did not determine who they are. Karen (61) described being "betrayed" by her body:

*I don't feel I am old. I think it is an odd thing. Honestly, I am still feeling like [I have the] same mind/brain that I have always had. But the body, it is getting older and sometimes betraying me.*

Carol (63) also tried not to let her disabled body discourage her by actively exercising and taking belly dancing lessons. Like other participants who did not define who they are by physical changes, Carol explained:

*Nothing that I can think of [has really changed]. I am trying not to grade my strength of knees, my lower back. The exercising I do, yoga, just keeps me limber, I am trying to manage aging well.*

## V. Discussion

Based on our interviews with older adults about their daily experiences of aging and the potential place of assistive technologies in them, we identified three framing ideas to consider when designing robots for this population. We emphasize factors beyond usability that are important for participants' evaluations of assistive technology: A. understanding the situated meaning of robots; B. viewing aging from older adults' perspective; C. and appreciating older adults' diverse experiences, both positive and negative.

### *A. Understanding the meaning of assistive robots is essential to designing robots for older adults.*

HRI researchers emphasized usability—robots' functions, aesthetics, size—as the most important factors affecting older adults' acceptance rate of robots [7]. However, participants were reluctant to imagine using robotic technologies now or 20 years down the line, despite confirming that robots were aesthetically pleasing and could be generally useful. A major barrier expressed by participants in our study was the difference between their self-perception and the representations of older adults in assistive robot design and use scenarios. The participants' aim was to avoid, as much as possible, being involved in such scenarios, even in their later years, so they saw robots as "not for them." Willingness to use (or have) technology was determined not only by how useful the technology could be in general, but also by what the technology meant to the participants in their own circumstances. Older adults considered an assistive robot as the last choice, to be used only if no one is willing to help them, similar to entering a nursing facility. Our participants did not see Socially Assistive Robots (SAR) as new social entities supporting older adults' independence, and for them independent life did not mean simply enabling older adults to stay at home longer with robots. This suggests that HRI researchers need to examine the meaning of robots for older adults, along with usability, to provide socially valid services.

### *B. Interpreting aging from older adults' perspectives to avoid embedding stereotyped representations of older adults in technology design.*

Participants reported they feel like the same people they have always been, even though their bodies are changing as they age. For them age was a number, rather than a signifier of common needs and experiences. A major issue they shared, however, was other people's biased and stereotyped perspectives on older adults, which they used to judge older adults' abilities, skills, appearance, intelligence, and fashion. The common aging issue that our participants experienced was not coming only from biological changes in their bodies, but also from social norms and values related to aging, which saw advanced age as a societal problem and deterioration of the individual. Our participants saw existing robot designs as reflecting and reproducing these stereotypes through their functions. What they felt they needed was help confronting the stereotyped assumptions against them, rather than technological services created on their behalf. This suggests that an initial step in developing robots for social contexts should be reflecting on and examining our pre-existing beliefs about older adults as potential users of assistive technologies. The focus of assistive robot design on disability as the hallmark of aging can reinforce stereotyped images of older adults, and impede not only the future acceptance of robots but also the engagement of older adults with the robotics community. Designing robots not for disability, but to extend the pleasure, enjoyment, and other positive aspects of aging (e.g. connecting with children and other family members) could be an alternative starting point for design.

### *C. Acknowledging the diversity of aging experiences and the social dynamics in the lives of older adults.*

Older adults were not all the same people with deteriorating biological bodies. They were institutionalized (e.g. national level health policies) and situated (e.g. living with different householders, having different jobs) in various ways. For example, the power of insurance companies in the United States causes unique issues in older adults' lives. Furthermore, older adults' numeric age was not an objective measurement explaining the level of their needs for assistance. As mentioned above, older adults have diverse experiences of aging, which can provide multiple purposes for robot

development. When designing assistive robots, understanding the contextual issues faced by older adults, rather than building technologies based on generalized images of aging, will be essential. Health and welfare policies could be as important as technical functions of robots in determining what kind of technology is adopted.

### *D. Limitations & future work*

Our participants were not representative of older adults in general, and the robots they viewed and discussed are only a small subset of available technologies. The purpose of our study, however, was not to define general characteristics for robot design or provide a systematic evaluation of existing technology. It was to explore how older adults, who might use robots in the future, make sense of and evaluate robots from the perspective of their everyday experiences. Most of our participants were healthy, so their lack of enthusiasm for robots could change with additional health problems. However, the participant with a disability and the participant whose mother had health issues both saw robots as a last recourse, which suggests our findings apply more broadly. In future work, we plan to further develop design concepts for assistive robots based on older adults' experiences and perspectives using participatory design methods.

## VI. CONCLUSION

Our study found that the common design and use scenarios for assistive robots do not appropriately address independence and other needs of older adults in the ways they themselves envision. Representations of aging and the lives of older adults in robot use scenarios reproduced stereotypes that older adults already found themselves addressing on a daily basis. While older adults may need the services that HRI researchers have envisioned in assistive robot design, we suggest an alternative perspective on developing robots for older adults. This alternative would build on a more critical reflection on the stereotyped images of older adults currently dominant in robotics and society by expanding older adults' representation within HRI. Design alternatives should include more situated and contextualized representations of older adults from their own perspectives. The focus of such design could represent more diverse experiences of aging, particularly as a time of different life opportunities that could be supported, as well as of challenges that could be alleviated, with assistive robots.

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