

Older Adult Preferences for Robot Care Providers

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As the population of older adults increases throughout the world, there is also a greater demand for specialized interventions for older adults who receive assistance from care providers. A potential technology intervention to support this population is robot care providers. Although previous research has explored older adults' perceptions of robot care providers, the studies primarily included independently functioning older adults. This study sought to explore the perceptions of robot care providers from older adults who are currently receiving assistance from a human care provider to gain insight into their understanding of successful care, and how robot care providers can be designed to effectively care for older adults. The results suggest that in the care provider context, older adults desire a robot that goes beyond simply performing the tasks, but is also caring, kind, and sociable. When designing robots for older adult care, robots should also be social to support successful interactions.

INTRODUCTION

A recent health report by WHO highlighted (World Health Organization, 2015) that there will be an increase in demand for specialized interventions for older adults as this population continues to increase throughout the world. Older adults who receive assistance from care providers will need such interventions, especially as there is likely to be an increased demand for care. Technology, such as robot care providers, can help mitigate this demand. However, despite technology acceptance research demonstrating that perceptions can influence the adoption of technology such as robot care providers (Melenhorst, Rogers, & Bouwhuis, 2006) limited work has explored what older adults who are currently receiving human care expect from a robot care provider.

In the United States, it is expected that by 2050 nearly 27 million older adults will need assistance either at home or in assisted living facilities (Services, 2013). It is vital that care is provided for this population. However, to create successful technological interventions for this population, it is key to understand these older adults' insight into what aspects of that care are key for a successful relationship between a care provider, whether human or robot.

Older Adults Perception of Home Robots

Older adults are open to accepting robots in their home (Olson, 2013; Smarr et al., 2014). After observing a mobile manipulator robot complete various tasks (delivering medication, turning on and off light switch, organizing home objects), older adults increased in a willingness to accept robot assistance (Beer et al., 2017).

Beyond this openness to accepting a robot, another key component is understanding older adults' expectations and perceptions of robot care providers to help promote adoption. Previous research has explored older adults' perceptions of home care robots ranging from the physical traits of robots or types of traits that older adults attribute to home care robots (Ezer, 2008; Olson, 2013).

Physical Traits.

One particular aspect of older adults' perception of robot care providers that has been explored are the types of physical traits older adults imagine these robots to have. In a study by Ezer (2008), older adults were asked to write and draw a

description of the type of robot they would imagine having in their home. This study showed that older adults primarily imagined robot care providers as being machine-like versus human-like in appearance (Ezer, 2008). Most of the participants gave the robot at least one arm and a head that was represented with facial features as well (eyes, mouth, etc.). In addition, participants reported the robot was mobile. When describing how the robot was controlled, around one-third reported that they directly controlled the robot via methods such as voice control or buttons, and around one-fifth imagined that the robot was programmed to do the tasks.

Another study that focused on trust also explored the type of robot that older adults imagined. Olson (2013) had participants describe the type of robot they had imagined during their discussion of a care provider robot. For the general appearance of the robot, older adults primarily described the robot as either a robot that they had seen in a movie or television show, machine-like, or human-like. Older adults reported imagining that the robot was primarily made of metal or plastic. Participants also imagined the robot was either as tall as or slightly shorter than an average human.

These studies show that there is a range of physical traits of robots imagined for these home care tasks. Gaining insight into the physical traits imagined by older adults who receive care will shed light on if they have similar perceptions of robots and their capabilities as independently living older adults.

Personal Characteristics.

Several studies also focused on personal characteristics of robots. One explored what characteristics participants reported associating with what they imagined as a home care robot (Ezer, Fisk, & Rogers, 2009). Participants reported a robot as being helpful and having a purpose, but not as focused on the robot being social (Ezer et al., 2009).

A study by Olson (2013) specifically explored trust in home care robots and what adjectives older adults used to describe a trustworthy or untrustworthy robot. Participants described trustworthy robots with words such as reliable, safe, and efficient. They used adjectives such as risky and unreliable in connection to untrustworthy robots. These results show that the independently functioning older adults primarily

focused on task related of the robot (e.g., can it do the task and is it reliable).

Despite the insights this research provides, it is not without limitation as the primary target population of robot care providers (older adults receiving care) were not part of these studies and these studies primarily included independently functioning older adults (Beer et al., 2017; Ezer, 2008; Olson, 2013; Smarr et al., 2014). Older adults who are currently receiving care have a deeper understanding of appropriate and successful home care and may therefore have unique insights into how a robot care provider should be designed for home care to continue to be successful.

The goal of this paper is to investigate the perceptions of older adults who are currently receiving care from a human care provider on what they would want a robot care provider to be like. The results are part of a larger study that explored trust in human and robot care providers (Stuck, 2017).

METHOD

Participants

Twenty-four older adults above the age of 65 ($M=81$, $SD=7.13$, age range 67-96) who were currently receiving 4 or more days of care a week from a professional care provider were included in this study (12 from independent living and 12 from assisted living). The participants on average received around 6 days of care a week with the caregiver staying around 1-3 hours each visit. Most of the participants were female (22) with only 2 males. Scoring on the Montreal Cognitive Assessment showed that on average the participants had scores associated with mild cognitive impairment (5 participants were unable to complete the cognitive assessment due to vision or physical impairment). Participants in general reported that they had fair health. For more details see Table 1.

Table 1. Participant Descriptors

Factor	Measure	Participants
Ethnicity	Black/African American	29% (7)
	White/Caucasian	67% (16)
	Other	4% (1)
Education	Less than high school graduate	8% (2)
	High school graduate/GED	17% (4)
	Some or in-progress college/Associates degree	71% (10)
	Bachelor's degree (BA, BS)	13% (3)
	Master's degree	13% (3)
	Doctoral degree	8% (2)
General Health ^a	"In general, would you say your health is..."	$M=2.38$ $SD=1.06$
Montreal Cognitive Assessment ^b (n=19)		$M=23.05$ $SD=4.01$

a. 1=Poor, 2=Fair, 3=Good, 4=Very Good, 5=Excellent

b. Score ≥ 26 = Normal

Procedure

Participants were recruited through local assisted living and independent living facilities. Participants were screened to ensure they met the requirements for the study (age of 65 or older, pass the Wechsler Memory Scale III (Wechsler, 1997) and receive 4 or more days of care a week. After approved inclusion in the study, participants gave informed consent and then completed several pre-interview questionnaires which included general demographic information, caregiver experience, and ten item personality inventory (TIPI; Gosling, Rentfrow, & Jr., 2003).

When the interviewer met the participants in person, they were then administered the Montreal Cognitive Assessment (Nasreddine et al., 2005). Following this, participants took part of a semi-structured interview that focused on exploring trust and perceptions of both human and robot care providers. For this study, we focus on the questions that were about robot care providers in general and not specific to trust. Following the discussion of the robot care provider, participants completed questionnaires that assessed if they were imagining a robot while we discussed the various tasks, and if so, what attributes were they imagining. This questionnaire was developed based on previous findings in Ezer (2008) and Olson (2013). They also completed a questionnaire where they rated their preferred personality traits in a robot care provider via a modified version of the TIPI that was adapted to reflect a form of informant report used for the personality inventory in the DSM (Markon, Quilty, Bagby, & Krueger, 2013). After participation in the study, participants were compensated \$30.00 for their time and effort.

RESULTS

Overview of Quantitative and Qualitative Analysis

Questionnaire data were analyzed using SPSS/Excel. For the qualitative data, a coding scheme was developed with both bottom-up (emerge from the data) and top-down themes (identified from previous literature). Interviews were coded by two independent coders. To ensure reliability of the coding scheme, coders independently coded the same four transcripts and calculated a Cohen's Kappa for each round of coding. A minimal threshold of 85% was set based on recommendations from prior literature (Saldana, 2013). Once this threshold was met for each round, the coders then divided up the remainder of the transcripts equally.

Robot Visualized Questionnaire

Most of the participants reported imagining a robot when discussing the scenarios (83%). Over a third of the participants reported imagining a gender of the robot, 8% imagined it was female and 30% imagined it was male. No participants reported imagining an ethnicity of the robot. Only 13% reported imagining an age; the age ranged from 30-49 years old. For the height of the robot, 16% imagined it was between 3-5 feet tall and 29% imagined it was taller than 5 feet. For the weight, 13% imagined the robot was between 100-150 pounds.

When asked if imagining a specific kind of robot, 16% reported imagining a human-like robot, 25% reported imagining a machine-like robot, 4% reported imagining an animal-like

robot, and 21% reported imagining a TV or movie-like robot. The participants reported imagining the robot was made of metal (50%), plastic (4%), and other (13%).

Most of the participants imagined the robot had a head (75%). 54% reported that the robot had a face. The facial features imagined were: eyes (54%), mouth (42%), nose (42%), and ears (25%). 75% of the participants reported imagining the robot had arms. Most of the participants imagined the robot moved around (79%). 42% imagined the robot moved around on legs and feet, 17% imagined the robot moved around on wheels, 8% reported the robot moved around on legs and feet and wheels, and 13% reported the robot moved around in other ways (2 were not sure how it moved, and 1 reported it moving in a wheelchair).

The participants mostly reported imagining the robot was being controlled in some way (67%). Of those 13% reported it was programmed to do the task, 25% reported it was controlled by them to do the task, and 33% reported imagining it was both programmed to do the task and controlled by them.

When asked how they controlled the robot, 21% reported they imagined controlling the robot by voice commands or activation, 13% reported using an interface or input, and 8% reported imagining using a remote control. 4% reported using both voice commands and an interface, and 4% reported using all three methods to control the robot.

Overall, participants imagined that the robot was male, despite not all of them imagining a human-like robot. They also imagined that the robot had arms and could move around though the way it moved varied. In addition, over half of the participants imagined that they were able to control the robot even if they also thought it was programmed to do the task.

Ten Item Personality Inventory for Robot Care Provider

On average, older adults reported strongly agreeing that they would want the robot care provider to be agreeable, conscientious, and emotionally stable. For extraversion and openness, they tended to only agree a little that those were desired traits to trust a robot care provider. One participant stated that they did not think a robot could have a personality, so they rated all the traits as neither agreeing or disagreeing that it impacted trust. For the detailed results, see Table 2.

Table 2. Desired Personality Traits

Trait	Robot Care Provider	
Agreeableness	<i>M</i> =6.48	<i>SD</i> =1.02
Conscientiousness	<i>M</i> =6.73	<i>SD</i> =0.66
Emotional Stability	<i>M</i> =6.63	<i>SD</i> =0.88
Extroversion	<i>M</i> =4.95	<i>SD</i> =1.59
Openness	<i>M</i> =4.98	<i>SD</i> =1.72

Note: 1=Strongly Disagree; 6=Strongly Agree

Description of Ideal Robot Care Provider

When participants were asked to describe what their ideal robot care provider would be like or not be like, they primarily focused on behavioral characteristics as compared to physical traits of the robot.

There were several ideal behavioral traits that they discussed. The most frequently mentioned desired traits were that the robot care provider was kind, companionable, communicative, and knowledgeable about tasks. For more details on the frequency of themes mentioned related to desired traits of the robot see Figure 1.

When discussing wanting a robot to be kind, it was stated “I would want a robot to be like a nice lady” and “(like) my grandma, nurturing, and caring.” In addition, they wanted the robot to be companionable. For example, “to behave in a friendly manner, as a friend would” and “ability to get along with people.”

In relation to communicative, one participant stated, “I want it to speak out, I want it to ask me questions” and another mentioned they would want it to “be able to communicate, able to follow orders, and able to tell when something needs to be done.” Older adults also made comments of wanting the robot to be knowledgeable about the task such as “knowing what my allergies are” and “Understand basic needs...it would be understanding and perform basic duties.”

Other traits that were desired included wanting the robot to be gentle and intuitive so that it can predict the desires of the older adult.

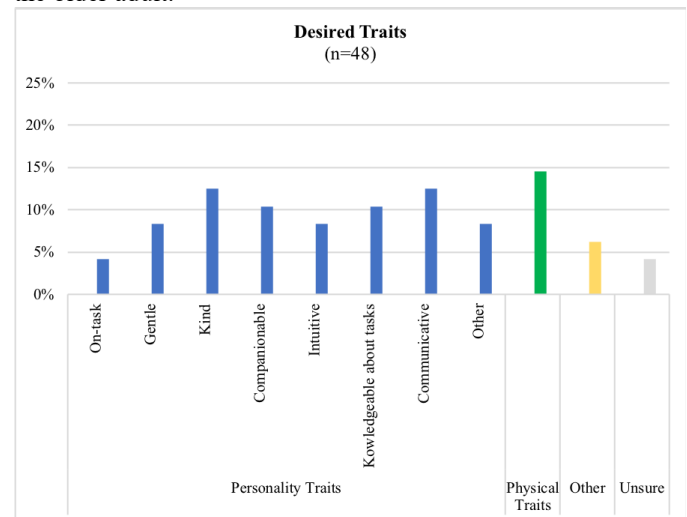


Figure 1. Desired Traits in Robot Care Provider

When discussing behavioral traits that they would not want the robot care provider to have, the two most frequently mentioned were that they did not want a robot that was mean or that was off-task. For more details on the frequency of themes mentioned related to undesired traits of the robot see Figure 2.

In relation to the statement about not wanting the robot care provider to be mean, one participant stated “don’t cuss at people...you got some of these grown folk cuss at you and a robot, I would feel better if they didn’t cuss”. Another

mentioned “angry and cross, to find fault with me...I don’t want that kind of robot”.

When discussing not wanting the robot to be off-task, participants stated they would not want the robot to, “not to take care of me properly. Maybe getting on the cell phone or something when I need something.” It was also stated they would not like it “if he didn’t like something, (and) he goes off on to another category or another thing.”

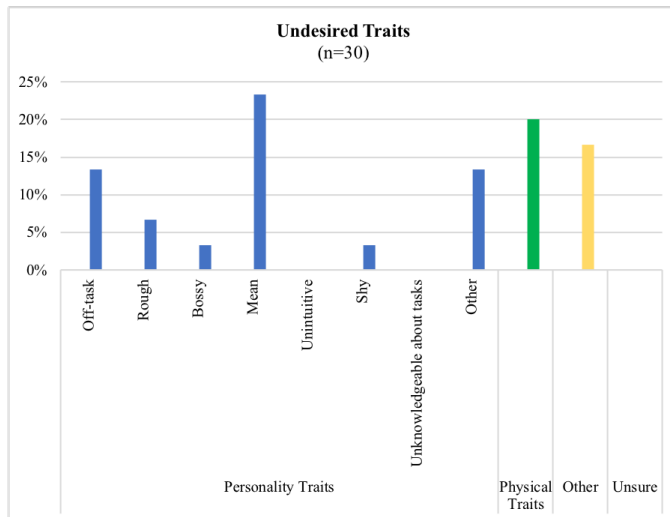


Figure 2. Undesired Traits in Robot Care Provider

There were also physical traits that the older adults discuss preferences for. 15% of the frequencies related to desired traits and 20% of the frequencies related to undesired traits were related to physical traits. When discussing desired traits older adults mentioned “made out of some cloth-like texture as opposed to Legos, metal Legos” and physical capability such as “lifting heavy things”. When discussing undesired physical traits it was mentioned “(like) a human because that would scare me...I would want my robot to be a robot.” Another participant stated “I guess I would like them not to be like a cartoon, and a number of them are...my sense is that if they are serious doers they should look (more serious).” Another mentioned not wanting the robot to be like “the concept we used to have years ago. Some metal creature clanging around.”

DISCUSSION

As the number of older adults needing care in the United States increases (Services, 2013), there is an increased demand to create technological interventions such as robot care providers. To create robots that will be accepted in the home, one key component is to understand older adults’ perceptions of care provider robots (Melenhorst et al., 2006). While previous research has explored perceptions previously, these studies were done with independently function older adults (J. M. Beer & Takayama, 2011; Ezer, 2008; Ezer et al., 2009; Olson, 2013; Smarr et al., 2014). In these studies, participants primarily focused on the task related capabilities or attributes of the robot, and less on social aspects. By conducting a study with older adults who are currently receiving care, we gained deeper insight into the factors that are needed to support successful care.

Many of the participants in this study imagined similar aspects of robots found in prior studies. The older adults mostly imagined the robot being machine-like and made of metal, but they still considered that the robot was male. In addition, many of them also imagined it had facial features and arms. This suggests that despite imagining a mechanical robot, they also attribute some ‘human’ like traits such as gender.

This study demonstrated that in the care context, social aspects are more commonly thought of by older adults that receive care than was found in prior studies. In particular, when discussing personality traits that were desirable in a robot, older adults reported wanting a robot that was agreeable, conscientious, and emotionally stable.

When discussing general desired traits in a robot, the older adults primarily focused on wanting the robot to be kind, companionable, communicative, and focused on the task. The primary focus of undesired traits was that they did not want the robot to be mean.

Older adults may imagine a metal, machine-like robot when discussing robots, but this does not suggest that these are desired physical traits. While some mentioned not wanting to robot to look human, it was also undesirable that the robot was metal and “clangy”.

When designing robots as care providers for older adults, it is essential that these robots not only perform the tasks well, but that they are also able to demonstrate care and concern for the older adult. This study shows that key aspects of successful care are related to the kindness and companionability of the care provider. These findings also suggest that a potential barrier to adoption is that many older adults imagined physical traits of the robots that they then discussed not wanting it to have (e.g., made of metal). Providing introduction materials that help older adults develop an accurate mental model of the robot might be key to help older adults accept these in their home.

This study furthers the insights into the desired traits of robot care providers by exploring the perceptions of older adults who are currently receiving care several days a week by demonstrating that for care related tasks social aspects of the robot may be essential for successful care.

ACKNOWLEDGEMENTS

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