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The Attitudes and Perceptions of Older Adults With Mild Cognitive Impairment Toward an Assistive Robot

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Abstract

The purpose of this study was to explore perceived difficulties and needs of older adults with mild cognitive impairment (MCI) and their attitudes toward an assistive robot to develop appropriate robot functionalities. Twenty subjects were recruited to participate in either a focus group or an interview. Findings revealed that although participants reported difficulties in managing some of their daily activities, they did not see themselves as needing assistance. Indeed, they considered that they were capable of coping with difficulties with some compensatory strategies. They therefore declared that they did not need or want a robot for the moment but that they considered it potentially useful either for themselves in the future or for other older adults suffering from frailty, loneliness, and disability. Factors

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underlying unwillingness to adopt an assistive robot were discussed. These issues should be carefully addressed in the design and diffusion processes of an assistive robot.

Keywords
assistive robot, care of elderly people, mild cognitive impairment, technology acceptance

With the aging of our society and the foreseen shortage of caregivers for older adults in the coming years, robotics and other emerging technologies, such as ambient intelligence, are increasingly proposed as a potential solution to this societal concern. In Europe, several research projects dedicated to the development of robots for elderly care, such as ACCOMPANY (http://accompanyproject.eu/), ALIAS (http://www.aal-alias.eu/content/project-overview), CompanionAble (http://companionable.net/), Domeo (http://www.aal-domeo.eu/), Florence (http://www.florence-project.eu/), KSERA (http://ksera.ieis.tue.nl/), and MobiServ (http://www.mobiserv.eu/) are being financed by Ambient Assisted Living Joint Programme and the EU's Seventh Framework Programme. Sharkey and Sharkey divide the use of robots in elderly care in three main domains. First, robots have been conceived for assisting older adults with functional deficiencies, and/or their carers, in performing basic daily activities, such as walking, transferring, feeding, and so on. Second, robots have also been designed to monitor and supervise the health and safety of older adults, reminding them of routine activities (taking medicines, going to appointments, and so on) and monitoring signs of fall and other emergency situations. Third, companion robots, such as Paro, Aibo, and My Real Baby have been proposed for lonely older people in an attempt to add extra interest to their lives and even to improve their social life (Sharkey & Sharkey, 2012). In addition, for the older adults experiencing different degrees of cognitive decline, robots have been conceived to (a) provide assurance that they are safe and are performing necessary daily activities, and, if not, alert their caregiver; (b) help them compensate for their impairment, assist them in the performance of daily activities; and (c) assess their cognitive status (Pollack, 2005).

Despite the growing interest in developing this kind of technology for supporting elderly people with cognitive impairments in their daily living, there are few in-depth studies dealing directly with their needs in relation to robot use and with what they would like robots to do. Researchers often speculate that, in the future, the robots will become part of older people's everyday life

as their assistants or companions, but there is little knowledge about how older adults perceive robots and react to their use in the elder care. In the literature, we can find some studies identifying key areas of needs to be met for persons with dementia (Johnston et al., 2011; Miranda-Castillo, Woods, & Orrell, 2010; van der Roest et al., 2009; van der Roest et al., 2007) and Information and Communication Technology (ICT) solutions that could contribute to meet the most frequently mentioned unmet needs of people with dementia as well as those of their informal carers (Lauriks et al., 2007). However, the studies investigating the needs in relation to robot use to support older adults with mild cognitive impairment (MCI) are sparse. MCI is associated with impairments in complex instrumental activities of daily living (IADL), for example, finances and medication management, which are dependent on memory and executive functioning (de Rotrou et al., 2012; Schmitter-Edgecombe, Woo, & Greeley, 2009; Yeh et al., 2011). It was suggested that individuals with MCI have the potential to benefit from technologies that would assist them with IADL completion. If a technological system was provided early enough in the MCI process, it might help keep a person functioning more independently in his or her daily activities (Seelye, Smith, & Schmitter-Edgecombe, 2010).

Some studies nonetheless explore a variety of issues on the social perception (positive/negative attitude, robot functionalities, and appearance) and intentional acceptance of robots with a quantitative approach. Arras and Cerqui (Arras & Cerqui, 2005) suggested that among all age groups, older adults had the best image of robotics and were the most inclined to believe that robotics could somehow contribute to their personal happiness. In addition, they were the group that was most likely to believe in a robot for helping them regain independence at performing their daily tasks. However, they did not want to depend on robots, for fear that it might lead them to have fewer social contacts. In the study by Ezer, Fisk, and Rogers (2009), the older adults reported more willingness than younger adults to have robots perform critical monitoring tasks that would require little interaction between the robot and the human. In the study by Wu, Faucounau, Boulay, Maestrutti, and Rigaud (2011), authors showed that among the various functionalities of robots, older people with cognitive complaints preferred cognitive stimulation programs, followed by safeguarding functions, fall detection, and automatic help call. In these studies, questionnaires were used to collect responses from surveys. The findings might be biased because, on the one hand, the items proposed in closed questions are often based on researchers' assumptions and on the other hand, subjects might be forced to choose some response items even if they do not reflect exactly what the subjects think. Therefore, these quantitative studies might not exactly reflect older people's attitudes and opinions

toward the use of robots in elderly care. Addressing these issues with a qualitative approach could allow one to better explore the willingness of older adults to adopt these kinds of technologies.

Purpose

The present study was carried out within the framework of two robotic projects aiming at conceiving a robot that might support older adults with MCI living independently at home. The main objective of this study was to explore these adults' images, attitudes, and opinions toward an assistive robot. We tried to identify the difficulties encountered by older adults with MCI in their daily living, as well as their perceived needs, to adjust and propose appropriate functionalities for the robot. The study was approved by the local Ethical Committee.

Method

Design

Two qualitative data collection methods, focus group discussions and semi-structured interviews were used. The focus group is considered as an appropriate technique for preliminary data gathering, used to obtain insight into the research topic and the needs of a specific group of people. It makes it possible to obtain a wider range of experiences and ideas (Barrett & Kirk, 2000; Johnson, 2002; Morgan, 1988). We then conducted individual semi-structured interviews to further investigate participants' ideas and thoughts.

Twenty older adults were recruited for this in-depth study from the Memory Clinic of the Broca hospital in Paris. They were community-dwelling older people, meeting the following criteria for MCI (Petersen et al., 1999): (1) cognitive complaint, (2) performance at least 1.5 standard deviations (*SD*) below age normative values on a cognitive test, (3) normal general cognitive function, (4) no significant limitation of functional independence due to their cognitive deficits, and (5) no dementia criteria. The focus group was carried out in 2009. MCI subjects of the focus group were contacted by telephone from a list of volunteers who had previously agreed to participate in research studies. Semi-structured interviews were conducted in 2010. Patients with MCI were approached when waiting for their consultation. Researchers explained the purpose of the study, and patients who agreed to participate in the interview were invited to the living lab of our research unit to be interviewed. Informed consent was obtained for all participants of the study.

Table 1. Guide of Questions for Focus Group Discussions and Semi-Structured Interviews.

Key questions
1. Could you try to describe the difficulties when performing your daily activities?
2. What kinds of strategies do you use to cope with the mentioned difficulties?
3. In which aspect of your daily life would you like to have assistance? What kind of assistance would you like to have?
4. Do you think that the development of technologies could contribute to improve your quality of life? What kinds of technologies could contribute to improve your quality of life?
5. Some engineers and care professionals think that a robot could be useful to have in your home. What do you think about this idea?
6. What kind of thoughts does a robot evoke in your mind?
7. How could a robot be useful for you?
8. What do you think about an assistive robot with the following possibilities:
a. A robot assisting me in my daily organization :
i. It tells me where I've put away my belongings and where I could find them.
ii. It tells me what time I have my appointments.
iii. It reminds me when to take my medicine.
iv. It helps me to order groceries from the Internet.
b. A robot stimulating my mind: It provides cognitive exercises.
c. A robot connecting me with others: I video conference my friends and family members who live in other cities/areas.
d. A robot keeping an eye on me: If I fall down and cannot pick myself up, it can call someone to rescue me.
e. A companion robot: It keeps me company. It can have some reactions if I talk to it and if I give it a hug.
f. Do you have some comments on functionalities of an assistive robot?

Focus Group

The focus group consisted of five subjects. The average age of the participants was 73 years, ranging from 63 to 88 years. There were four women living alone and one man living with a spouse. Two research members conducted the group. The session lasted approximately 60 min. Special considerations for elderly focus group participants, as suggested by Barrett and Kirk (Barrett & Kirk, 2000), were followed. A guide (Table 1) composed of three axes of questions was elaborated and developed to provide a framework for focus group discussions. The first axis aimed to explore the problems and difficulties experienced in their daily life and the strategies used to compensate for them. Second, we asked older adults to talk about how technologies could enhance their well-being. Third, we explored their images of robots.

Finally, we described an assistive robot with the following functionalities: event and appointment reminder, object-finding, cognitive stimulation, video conferencing, remote surveillance, and companionship (Table 1, Question 8). Attitudes and opinions toward these functionalities, provided by the robot to assist people, were explored.

Semi-Structured Interviews

The sample of semi-structured interviews consisted of 15 older adults with MCI. Their ages ranged from 64 to 87 years, with an average age of 76.3 years. There were 3 males and 12 females. Seven lived alone and eight lived with a spouse. Semi-structured interviews were conducted by three researchers who followed the topic guide also used in the focus group. At the end of each interview, to identify the participants' willingness to continue taking part in our projects, we asked participants whether they would like to test at home an assistive robot when available.

Data Analysis

Focus group discussions and interviews were audio taped and then transcribed. Then, the analyses of the transcripts and field notes were performed according to the inductive thematic analysis (Braun & Clarke, 2006). After familiarizing with data and then generating initial codes for data, a number of common emerging themes and issues were identified from the ideas expressed by participants during the focus group discussions and interviews.

Results

Almost all participants reported cognitive difficulties, such as word-finding difficulties, "lull in the conversation," forgetting telephone numbers, and forgetting where they had put things away. They used different kinds of compensatory strategies to cope with the difficulties encountered in their daily lives. Concerning needs for help, the participants, as a whole, did not express spontaneously the need to be assisted.

The following section presents themes on participants' attitudes and reactions to robots in general, and more specifically to an assistive robot.

Images of Robots

When participants were asked what a robot evoked in their mind, they mentioned robots as automatic or autonomous machines, capable of assisting or substituting humans for doing certain tasks. This aspect was considered to be

advantageous for humans by some participants, and negative by others, who viewed robots as something frightening, potentially dangerous, with an imposing bearing. Participants also mentioned robots as household electrical appliances as, in French, the term "robots" is also used to refer to food processors or mixers. Finally, some participants did not have any ideas on robots. Taken together, we can distinguish positive and negative images of robots.

- Positive images

A robot can do what a human can't do. (Female, age 66)
A robot is a machine functioning autonomously, useful for many tasks. (Female, age 82)

- Negative images

It's a big thing . . . It's good but it takes jobs away . . . What will the young do otherwise? Now, we can even have an automatic cash desk. (Female, age 82)
The inhuman side of things . . . automatic . . . This doesn't please me. I'm against robots. (Female, age 64)
Imagine a body of 40 kg in metal . . . If it runs into your windows, there will be inconsiderable damage. I don't trust that. (Female, age 79)

Opinions Toward Functionalities of an Assistive Robot

Participants were not enthusiastic about the functionalities proposed by an assistive robot (Table 1, Question 8). They argued that these functionalities were available in existing systems, such as diary, computer, mobile phone, Global Positioning System (GPS), and wearable pendant and did not see any added values to robots.

I don't need the robot to take note and remind me of my appointments. I can do these things with my own diary. (Female, age 83)

However, some of them were interested in cognitive stimulation ($n = 6$) and object-finding system services ($n = 2$).

The robot could guide a person to do cognitive exercises. Some elderly people need to be motivated and encouraged to do them. (Male, age 67)
This (object-finding system) can be useful! I'm always looking for my belongings. For example, I put my key in one drawer and sometimes in another drawer. I end up unable to remember in which drawer I've put my key. (female, age 82)

Whom Did Participants Consider as Potential End-Users of an Assistive Robot?

None of the participants considered robots as immediately useful for themselves. Some ($n = 4$) did consider robots useful, but only for those who were alone/lonely, very old, or very disabled.

> It must be for people who are very handicapped. It's not for me . . . It makes me think that my life is terminated. I'd rather die than live with a robot. (Male, age 77)
>
> My neighbor lost her two children. She sees nobody but me. A robot for her, why not? (Female, age 64)

Many of them ($n = 7$) would only consider having a robot in the future, in advanced old age, or if they were impaired.

> The elderly are not ready to converse with a robot . . . Me? I don't consider that I'm impaired enough to have a robot. (Female, age 80)
>
> I think it could be useful for me later on . . . maybe in 4 to 5 years. (Female, age 71)

Therefore, in their opinion, an assistive robot was associated with disability and loneliness. Furthermore, depending on a companion robot reminded participants of their impairments or inevitable upcoming deficiencies and frailty.

Concerns About an Assistive Robot

Many of them ($n = 6$) emphasized the importance of human presence and contact.

> It (assistive robot) is useful only for people who are alone. As far as I am concerned, I can't imagine myself living with a robot. I prefer human contact. If I became dependent, I would prefer hosting someone at home . . . the contact, the touch are important. (Female, age 68)

The lack of authenticity of a companion robot was an issue raised by participants. The uniqueness of human beings was highlighted. For most of older people, robots were not creatures, like a human being or an animal. Robots are not sentient and do not have a real state of mind (intention and emotion). For some participants, robots should not be allowed to intervene in human relationships.

> I'm on my guard against robots. One of the interests in life is conviviality. A robot for cleaning floors, it's ok. A robot for cooking, I find it weird.

> But a robot that accompanies you to movies or theatres, I don't find it nice. (Female, age 82)
>
> A machine that can express emotions . . . It's attractive but dangerous. Emotions pertain to life and machines pertain to logic. For example, I've seen a little robot dog in Japan. I'm not so sure that it's good . . . Human beings for me . . . somehow pertain to divinity. (Female, age 64)
>
> I find dogs and monkeys fantastic. These animals have a real intelligence. That's extraordinary. If you are sad, a dog comes to you. It can feel things. A robot doesn't have a heart. (Female, age 80)

Another participant mentioned a lack of caregivers who can take care of the dependent elderly. She was reluctant toward the idea of a companion robot but considered that, in the future, it might be a "necessary evil." Some participants ($n = 3$) in the focus group considered the potential economical benefit of an assistive robot because "it costs less to have a robot 24h/7 with you than to hire someone." Furthermore, they said that they were not ready yet to adopt this technology but expressed concerns about the timing to adopt it. Another concern raised was that they might have difficulties learning to use it when they got older or when they had significant cognitive impairment.

At the end of the interview, they were asked whether they accepted taking a robot home with them when available. Half of the participants ($n = 7$) accepted this idea, even though most of them showed negative attitudes toward robots.

Discussion

The findings showed that older people with MCI reported some difficulties in their daily living, but difficulties that they were still capable of managing by creating some adaptation strategies. As a result, they did not consider themselves as needing help. Participants were rather interested in two functionalities offered by an assistive robot: cognitive stimulation and object-finding systems. However, they did not perceive an assistive robot as useful, and they claimed that they did not need or want a robot presently. They were even reluctant to robot use for themselves for the time being. Nonetheless, they considered that it would be useful for them later in the course of their life or for those who were older, frailer than them, or disabled. This attitude could be considered as passive resistance (Mick & Fournier, 1998; Szmigin & Foxall, 1998) to robot adoption. In the following section, we try to discuss the factors underlying the reticence to the use of an assistive robot in this population.

First, the issue of autonomy could be raised. Although proponents of assistive technologies (AT) often view the use of AT as a way to promote independence and autonomy of older adults (Magnusson, Hanson, & Nolan, 2005), worries are expressed that AT use could lead to de-skilling and thus, diminish or undermine autonomy (Zwijsen, Niemeijer, & Hertogh, 2011). Participants expressed the desire to keep doing things on their own by making adaptations or elaborating compensatory strategies to manage difficult circumstances, instead of depending on something that might prevent them from making an effort. It is suggested that among older adults, the desire to maintain independence and control outweighs other needs and desires, and adaptation is a means to achieve this (Dunér & Nordström, 2005). Other studies indicated that the older adults found it difficult to ask for help and that the move from being independent to becoming a service user was seen as a considerable life-changing step to take, because it was strongly associated with the idea of "giving up" or of admitting defeat (Forlizzi, DiSalvo, & Gemperle, 2004; Valkila, Litja, Aalto, & Saari, 2010). In addition, fear and trepidation are often associated with the decision to try a new product or service, partly because of the fear of the unknown and partly because accepting these products and services is often seen as stigmatizing (Forlizzi et al., 2004). Several studies have indicated that the need to maintain a certain desired self-image might impede the adoption of assistive devices (Thielke et al., 2012). A case study showed that the real usage of a digital assistive device by persons with dementia was quite low even if it was developed in a rigorous participatory process and personalized for each person who would use it. One plausible explication is that usage of the cognitive device reminded the user of his or her cognitive impairments and thus compromised his or her self-image (Karlsson, Axelsson, Zingmark, & Sävenstedt, 2011). In our study, participants did not attribute a positive signification to robot use in the elder care, which was generally perceived as stigmatizing. Just like the older adults in the study of Neven (Neven, 2010), our participants associated the use of an assistive robot to old age, loneliness, and needing care. Therefore, an assistive robot was not for them but for the elderly—who were very old, very frail, and alone or lonely. Even if our participants had cognitive impairment, they did not consider themselves as potential users. Showing that they were active and helpful by participating in research projects, they tried to distance themselves from the negative images of older people "inscripted" into robots.

Second, the fear that robot use might lead to social isolation and decrease of human contacts could also explain the unwillingness of the elderly to adopt a robot. When evoking a companion robot, older adults talked about the uniqueness of a human being, authenticity, and desire for human contact. The older adults were wary of lifelike characteristics of robots conceived to facilitate

relationship engagement. A robot was considered a machine or an instrument that could not play a social/relational function. Therefore, older persons were not willing to establish an authentic relationship with it. There is an ethical issue to be raised. When proposing an assistive robot to older adults, we (members of this robotic project) must be on our guard against the idea of substituting humans for robots. We must reflect on the notion of companionship, which cannot be reduced to be a baseline of "interacting with something" (Turkle, 2011). This ethical issue was also addressed by Sparrow (Sparrow & Sparrow, 2006). He argued that "it is not only misguided, but actually unethical, to attempt to substitute robot simulacra for genuine social interaction." After all, for older people, being supported and cared for by someone is essential because it enhances security and reduces feelings of loneliness. Robots and other innovations were not regarded by the older adults as an alternative for enhancing this feeling of security (Valkila et al., 2010). Thus, in robotic projects, it is important to reflect on how to conceive an assistive robot as a supplement rather than as a substitution to human aids, since the older adults emphasize that the social dimension of interaction with health and care professionals is as important as the technical intervention provided (King & Farmer, 2009). In the same line of thought, Arras and Cerqui reported that older adults rejected the concept of autonomy as a synonym of living alone with a robot. They further argued that a misunderstanding of the term autonomy or independence could impede the acceptance of robots in care for elders (Arras & Cerqui, 2005).

The main limitation of this study lies in the small sample size (20 participants with MCI). In addition, our findings are based on the conceptual perception of an assistive robot rather than the actual use in a sample of elderly people with MCI. However, they match previous themes of non-use of assistive technology devices by older adults in the literature (Gitlin, 1995; Mann, Goodall, Justiss, & Tomita, 2002). Our findings are also very similar to those in the study of Neven (Neven, 2010), who observed and interviewed older adults interacting with an assistive robot in a laboratory. The strength of this study lies in the fact that all participants were older adults with MCI. Whereas many robotic technologies often targeted older people with MCI, they are, for methodological reasons, often tested with cognitively healthy older adults. Our study allows one to highlight the feelings of older people with MCI about robots, which are rarely addressed.

Conclusion

This study used a qualitative approach to investigate difficulties and perceived needs of older adults with MCI and their attitudes and opinions about robot use for elder care. There are two major results. First, for building appropriate

robot functionalities, cognitive stimulation and object-finding systems should be considered. Second, the present study brings in-depth knowledge about potential barriers to robot acceptance in this population: no expression of perceived needs to be met by a robot, in relation to a desire to keep a certain degree of autonomy and self-image; attribution of a negative signification to robot use; and a fear of reduction of human contacts. These issues must be carefully addressed in the design and diffusion processes of an assistive robot if we want this new type of assistant to be accepted by older adults. Finally, our findings lead to reflect on assistive technologies and older people. Most of the care professionals in gerontology and designers of assistive devices are convinced that the elderly with physical or cognitive impairments do have needs to be met, either by human care or technology assistance. However, the elderly rarely express their needs and are not receptive to assistive technologies. Although developers claim that promising and distinct advantages could be provided by technologies, older adults do not seem ready to embrace them.

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