Living with *Buddy*: can a social robot help elderly with loss of autonomy to age well?

Denis Guiot
DRM Ermes
Université Paris-Dauphine
Paris, France
denis.guiot@dauphine.psl.eu

Marie Kerekes
DRM Ermes
Université Paris-Dauphine
Paris, France
marie.kerekes@dauphine.psl.eu

Eloïse Sengès
DRM Ermes
Université Paris-Dauphine
Paris, France
eloisesenges@hotmail.com

***Abstract* — In line with the successful aging models, a preliminary qualitative study with phenomenological interviews was implemented with 40 elderly individuals and caregivers. Complementary results from 8 cocreation meetings allowed us to prioritize the robotic functionalities to be improved and determine the added value of robots in comparison with those of other IT solutions. An experimentation has been launched and is still ongoing with a domestic social robot with elderly. In this paper, we highlight the specific role that robots can play in facilitating aging adjustment strategies.**

Keywords — Social Robot, Aging Well, Co-creation, Companion, Elderly

I. Introduction

Many countries are currently facing the challenge of an aging population because of the increase in life expectancy and the aging of the baby-boom generation. The aforementioned implies providing care to a growing number of elderly individuals whose health tends to physically and cognitively decrease over time, while many countries cannot face the lack of professional caregivers. New issues are emerging around the concept of Desired Aging Well [1] and with the problem of taking care of elderly individuals with a loss of autonomy in their homes or in noncaring residences. Developing new solutions to help elderly individuals on a daily basis therefore has become imperative. Within this context, technical innovations can help better monitor elderly individuals in their everyday lives or remotely assist them, specifically for those suffering chronic diseases [2]. Robotic solutions can help fill the gap between the growing needs in healthcare and the services that occidental countries can provide today. Hence, many companies are interested in this market and in the elderly. This target population has been misunderstood both in terms of the needs to meet through technological innovations and in terms of the environment (stakeholders and living areas) within which these innovations are implemented [3]. The goal of this paper is to understand the perceived benefits of robotic solutions by the elderly individuals with a loss of autonomy who wish to age well.

II. Literature review

The well-being of elderly individuals and their networks of caregivers can be enhanced by social robots. These robots can diminish their feelings of loneliness and isolation [6]. Nevertheless, elderly individuals and their caregivers seem to be reluctant to adopt robotic solutions [7]. Even if divergences can be noticed, this reluctance is a key challenge to overcome [3]. Our research question is thus to understand the perceptions of elderly individuals with a loss of autonomy towards robotic solutions in an Aging Well framework.

A. Elderly and robots

The global literature reveals a rather positive view of technological innovations in people over the age of 50. Little research has been conducted on the acceptance of robots by elderly individuals with a loss of autonomy: samples are often composed of younger elderly individuals under 65 years of age. Nevertheless it has been shown that the more elderly individuals want to grow old autonomously, the more they will be inclined to accept new technologies to stay home as long as possible [8]. However, despite these encouraging perspectives, elderly individuals are distrustful regarding certain potential negative consequences of these technologies. Robots can give elderly individuals the impression of being permanently watched while the individuals do not want to be treated as children and dislike being supervised [9].

At least, even if elderly individuals are open-minded and are hopeful of robotic solutions, they do not forget the downsides: stigmatization, isolation because of the use of a robot and communication via virtual networks, and dependence on technology [10]. The role of a third party – the caregiver or health professional – can provide confidence to elderly individuals and contribute to an improved perception of the robot. All of the divergences identified in the literature have assumed needs that are largely not being satisfied with today's robotic solutions.

B. The use of robotic solutions in the Aging Well framework

Our research lies within Baltes and Baltes' successful aging model [4]: successful aging stems from the implementation of effective aging adjustment strategies where the individual optimizes and compensates for the losses and gains associated with aging. To question how more specifically robotic solutions can contribute to the well-being of elderly individuals with a loss of autonomy, we used the concept of Desired Aging Well which refers to the psychological, physical, social and financial objectives of aging well and can be conceptualized, within the SOC model, as the selection of aging-related objectives [1]. Ultimately, this article raises the question of whether robots can contribute to optimization and compensation strategies aimed at achieving the seniors' Desired Aging Well (i.e. the selected objectives they pursue in the quest for aging well).

III. Research Methodology

Our study was implemented within the European research project Agile CoCreation of Robots for Aging (ACCRA). The objective was to provide robotic solutions to fulfill the needs of elderly individuals coping with a loss of autonomy, in France, the Netherlands and Italy. The methodology adopted consisted of 4 steps: needs analysis, cocreation, experimentation and sustainability analysis. This paper focuses on the three first steps implemented in France and in the Netherlands. This study was conducted using the robot Buddy, which was under development and was made available by a robot developing company (Blue Frog Robotics).

A. First step: Needs Analysis

Three baseline scenarios were helped guiding the needs analysis and were based on nursing need theory [11] and on a needs classification for day-to-day activities: need for detections, reminders and notifications of situations; security needs (prevent, detect, and alert in case of danger); communication, entertainment and esteem needs.

Phenomenological interviews were conducted in France to determine the needs. Two types of people were selected: elderly between 65 and 91 years old with a loss of autonomy (assessed by the AGGIR multidimensional scale), half of whom living at home and half in senior residence, and who were not mentally impaired; and professional and informal caregivers. In France, 10 elderly individuals and 10 caregivers were interviewed, with a total of 40 semi-structured interviews for France and the Netherland, which were recorded and fully transcribed and analyzed with a thematic content analysis.

B. Second step: Co-creation phase

The purpose of this second step was to develop robotics solutions in close collaboration with the end users and caregivers. Although we followed the cocreation for use/cocreation for others approach guidelines [5].

Eight cocreation meetings were held in the Netherlands and France (4 in each country). For each session, 8 elderly individuals and 4 professional caregivers participated. From the ACCRA consortium, 2 researchers, a care organization manager and 4 engineers (robot developers) attended each cocreation session. Each cocreation session lasted approximately 4 hours and was recorded and fully transcribed. Inputs for robot improvements were noted on a board and were viewable by all participants.

C. Third step: Experimentation

The experimentation phase, which is still ongoing, allows elderly staying at home to use individually the updated robot (Buddy) for three weeks at their place. Some of the elderly participated to the previous research steps. Two phenomenological interviews were led at the elderly's place with each elderly during the three-week experimentation. This helped figuring out if there were any difference in the elderly's perceptions towards the robot during the three-week period. The robot's functionalities and practicability were both assessed during one to two-hour long interviews. At the end of the experimentation, the elderly had to tell if they were satisfied with the robot and if they would like to keep it.

From now on, 10 elderly individuals have been interviewed and observed with the robot at their home in France. At last, 20 elderly individuals will be experimenting the robot in France. It will be tested afterwards in the Netherlands.

IV. Results and implications

While the two first research steps highlighted the enthusiasm of the elderly, the experimentation results stressed elderly's had high expectations and needs about the robot. From now on, this research points out the elderly's very specific needs and the importance of security needs (in case of a fall, they need the robot to help them and call the emergency or their relatives). These security needs must be fulfilled prior testing the robot's other functionalities (communication, companion, etc.). Fulfilling elderly's security needs appears as a necessity even though it may not be a sufficient condition for them to accept the robot. Interacting with a social robot can be considered by them as "fun" and "cute" and can contribute to their enjoyment, if their security needs are already fulfilled. This research points out that positioning the robot is a crucial task that may contribute to the robot's acceptation: elderly would prefer an assistive social robot, which could help them in their daily life.

The experimentation and its analysis are still going on in France and will afterwards be set in the Netherlands. A cross-cultural quantitative survey is also ongoing and can shed light on elderly's needs, perceptions and adoption intentions of the robot. The results will allow to implement the robot in order to fully respond to elderly's specific needs.

References

[1] E. Sengès, D. Guiot, and J-L. Chandon, "Desired Aging Well: Predictive validity for consumers aged 50–80", Recherche et Applications en Marketing, 2018.

[2] J.F. Coughlin, J.E. Pope, and B.R. Leedle, "Old age, new technology and future innovations in disease management nd home health care", in Home Health Care Management & Practice, vol.18, no.3, 2006, pp.196-207.

[3] M. Čaić, G. Odekerken-Schröder, and D. Mahr, "Service robots: value co-creation and co-destruction in elderly care networks", Journal of Service Management, vol. 29, no. 2, 2018, pp.178-205.

[4] P.B. Baltes, and M.M. Baltes, "Psychological perspectives on successful aging: The model of selective optimization with compensation," in Successful aging: Perspectives from the behavioral sciences, ed. Paul B. Baltes, Margret M. Baltes, New York: Cambridge University Press, 1990, pp.1-34.

[5] A. Humphreys, and K. Grayson, "The intersecting roles of consumer and producer: a critical perspective on co-production, co-creation and prosumption", Sociology Compass, vol. 2, no. 3, 2008, pp. 963-980.

[6] J.C. Augusto, M. Huch, A. Kameas, J. Maitland, P. McCullagh, J. Roberts, A. Sixsmith, and R. Wichert, Handbook of Ambient Assisted Living: Technology for Healthcare, Rehabilitation and Well-Being, Vol. 11, 2012, Amsterdam: IOS Press.

[7] E. Broadbent, R. Stafford, and B. MacDonald, "Acceptance of healthcare robots for the older population: Review and future directions", International Journal of Social Robotics, vol 1, no. 4, 2009, pp. 319.

[8] S.T. Peek, E.J. Wouters, J. van Hoof, K.G. Luijkx, H.R. Boeije, and H.J. Vrijhoef, "Factors influencing acceptance of technology for aging in place: a systematic review". International journal of medical informatics, vol. 83, no. 4, 2014, pp. 235-248.

[9] C-A. Rivière, and A. Brugière, Bien vieillir grâce au numérique [Aging well through digital], Editions FYP, 2010.

[10] S. Glende, I. Conrad, L. Krezdorn, S. Klemcke, and C. Krätzel, "Increasing the acceptance of assistive robots for older people through marketing strategies based on stakeholder needs", International Journal of Social Robotics, vol. 8, no. 3, 2016, pp.355-369.

[11] V. Henderson, "The nature of nursing", The American Journal of Nursing, vol. 64, no. 8, 1964, pp. 62-68.