A robotic solution for assisting people with MCI at home: preliminary tests of the ENRICHME system

Claudia SALATINO[a,1], Lucia PIGINI[a], Marlies Maria Elisabeth VAN KOL[b], Valerio GOWER[a], Renzo ANDRICH[a], Giulia MUNARO[c], Roberto ROSSO[c], Angelo P. CASTELLANI[c], Elisabetta FARINA[a]

[a] *IRCCS Fondazione Don Carlo Gnocchi, Milano, Italy*
[b] *Stichting Smart Homes, Eindhoven, Netherlands*
[c] *Elettronica Bio Medicale, Foligno (PG), Italy*

Abstract Robots have the potential to support care and independence of older adults. The ENRICHME project is developing an integrated system composed of a robot, sensors and a networking care platform, aiming at assisting older adults with MCI in their home environment. This paper reports findings of the tests performed on a sample of MCI users and their caregivers, with the first version of the ENRICHME system, in a controlled environment.

Keywords. Assistive robots, MCI, elderly, usability, human–robot interaction

1. Introduction

Ageing is often accompanied with changes in mental and physical abilities that can make independent living at home challenging or even impossible for older adults. Mild cognitive impairment (MCI) may be one of these changes. To date there is no effective pharmacological treatment for MCI; this highlights the importance of non-pharmacological approaches [1], which include lifestyle changes, with focus on intellectual, physical and social activities [2]. The role of ICT within this approach has recently received increased attention, as demonstrated by the current significant amount of projects developing robots to support activities for elderly people.

Robots are seen to have potential to support the care and independence of either elderly people in general [3] or in particular of elderly with MCI [4] or dementia [5]. During the user needs and requirements analysis at the beginning of the ENRICHME project, elderly people and caregivers stated that a robotic social agent might make elderly life easier [6]. The role of assistive robotics for people with MCI is promising and worth investigating. However, using robots at home poses several challenges related to the environment (often unpredictable) and to the interaction with people who are often unfamiliar with this technology.

[1] Corresponding Author: Claudia Salatino, IRCCS Fondazione Don Carlo Gnocchi, via Capecelatro 66, 20148, Milano, Italy. E-mail csalatino@dongnocchi.it

Reprinted with permission from IOS Press from Salatino C., Pigini L., Van Kol M.M.E., Gower V., Andrich R., Munaro G., Rosso R., Castellani A.P., Farina E. (2017). A Robotic Solution for Assisting People with MCI at Home: Preliminary Tests of the ENRICHME System. Studies in Health Technology and Informatics Ebook. 242, 484-491. IOSPress. DOI: 10.3233/978-1-61499-798-6-484.
The publication is available at IOS Press through http://ebooks.iospress.nl/publication/47315

Author's copy

The project ENRICHME (www.enrichme.eu) is engaged in these challenges. ENRICHME attempts to provide a useful support to people with MCI and to tackle the progressive decline of cognitive abilities, by developing and testing an integrated platform based on a mobile robot for long-term human monitoring and interaction. ENRICHME combines a socially intelligent robot with unobtrusive activity tracking in order to provide the user with real-time, adaptive and understandable feedback. Novel context-aware Human Robot Interaction (HRI) and self-learning paradigms provide tools for cognitive and physical stimulation that automatically adapt to the state of the user. A professional infrastructure of networked care has been designed to widen the social sphere of intervention in support of elderly and caregivers. Overall, ENRICHME is expected to help persons with MCI to substantially remain independent and active and to enrich their day-to-day experience at home. In comparison with similar research works [7], ENRICHME focuses on testing technologies for supporting elderly people with MCI, but particularly in their living environment and for a prolonged time.

This paper describes the results of the tests carried out with the first version of the ENRICHME system; the system was developed after an initial user needs and requirements analysis [4,6] which provided the consortium with the necessary information to confirm and refine its functionalities. Tests were carried out in a controlled ambient assisted living (AAL) environment (smart home), with a sample of end-users and caregivers. The tests focused on usability, user experience and social acceptability. The findings were instrumental to fine-tune the system and to gain an insight into the expected challenges when the system will be installed in real homes.

2. Method

This study was approved by the Local Ethical Committee and all subjects involved signed an informed consent.

2.1. Participants

Four persons with MCI, aged 76-80, and six caregivers participated in the study. End-users lived in their own homes, one alone and three with their partners. The participants' demographics are summarized in Table 1. They were recruited by a neurologist working in the Memory Clinic of the Fondazione Don Carlo Gnocchi rehabilitation hospital located in Milan, Italy. The inclusion criteria included age >65, MCI diagnosis and sufficient independence in activities of daily living (ADL). The exclusion criteria included inability to give written consent and concurrence of other diseases that might endanger the subject's safety.

Table 1. Demographics of the MCI subjects

Subject	Gender	Age (years)	MMSE [8] raw score	MMSE corrected score
U.IT.02	F	76	20	19
U.IT.05	M	79	26	24.3
U.IT.06	F	77	23	22
U.IT.07	F	80	28	27

Author's copy

Reprinted with permission from IOS Press from Salatino C., Pigini L., Van Kol M.M.E., Gower V., Andrich R., Munaro G., Rosso R., Castellani A.P., Farina E. (2017). A Robotic Solution for Assisting People with MCI at Home: Preliminary Tests of the ENRICHME System. Studies in Health Technology and Informatics Ebook. 242, 484-491. IOSPress. DOI: 10.3233/978-1-61499-798-6-484.
The publication is available at IOS Press through http://ebooks.iospress.nl/publication/47315

The caregivers included three family members and three care professionals.

2.2. Material and setting

The ENRICHME system consists of a commercially available robot (Kompaï 2) [9], a number of environmental and movement sensors and a networked care software platform. The robot - which is 133 cm. tall and 46 x 46 cm. wide - has been enhanced and customized with new equipment and software. These enhancements include: a thermal camera for non-invasive physiological monitoring, a 3D sensor (Kinect 2.0) to monitor the user's movements, a facial detection software to distinguish the user from other people, a RFID antenna to help find tagged objects, and improved software for autonomous navigation [10].

The HMI (Human Machine Interface) has been developed to meet the needs of people with MCI [11, 12]. This HMI provides applications that users can interact with: four cognitive games (digit cancellation, jigsaw puzzle, hangman game, and a memory game), tips for healthy living, a virtual coach for performing physical exercises, a function to help find lost objects, and reminders for medications and appointments. The user can interact with the robot trough a touch screen, while the output is given both on the screen and by speech synthesis.

The ENRICHME system was tested in a controlled environment (a smart home located in the premises of the Fondazione Don Carlo Gnocchi rehabilitation hospital in Milan, Italy - Figure 1), as an intermediate step between laboratory test and real life testing, with the main purpose of fine-tuning the integration of the different components and the system as a whole. The smart home is a 130 square meters fully-furnished flat, equipped with a Konnex TM based home automation system.

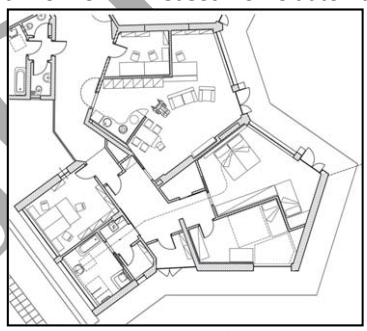

Figure 1. Floor plan of the test site.

2.3. Procedure

Figure 2 summarises the test procedure.

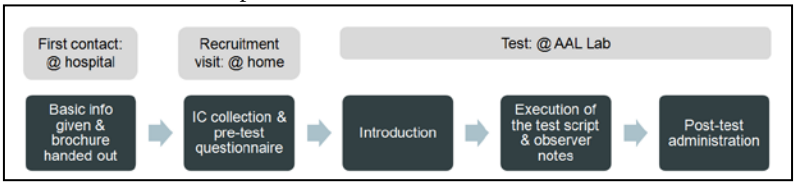

Figure 2. Procedure of the testing protocol.

Author's copy

Reprinted with permission from IOS Press from Salatino C., Pigini L., Van Kol M.M.E., Gower V., Andrich R., Munaro G., Rosso R., Castellani A.P., Farina E. (2017). A Robotic Solution for Assisting People with MCI at Home: Preliminary Tests of the ENRICHME System. Studies in Health Technology and Informatics Ebook. 242, 484-491. IOSPress. DOI: 10.3233/978-1-61499-798-6-484.
The publication is available at IOS Press through http://ebooks.iospress.nl/publication/47315

First, a recruitment visit was scheduled with the MCI patients (selected by the neurologist) who had expressed intention to take part in the test. During the visit they received detailed explanation about the project goals and their involvement in the tests, moreover they were interviewed on the basis of a pre-test questionnaire, to collect background information on the user. The participants' caregivers were also asked to participate in the test to observe and answer a brief questionnaire. Finally the day of the test was agreed.

The actual test started with an explanation of the functionalities to be tested. Then the following procedure was executed in the living room of the Smart Home:

- The robot is in stand-by position.
- The user is asked to select physical exercises from the menu and to perform them with the help of the robot.
- The user sits on the sofa; the robot detects the user's position and approaches him/her to suggest an activity (play a game); the user plays all proposed games.
- The user is asked to explore the section containing suggestions for a healthy living (i.e. diet, physical activity).
- The user has a medication recommendation already set and the robot reminds the task to the user.
- The user launches the functionality “find objects” and chooses the object to be looked for (the pillbox); the robot shows the location of the pillbox.

During the execution of the procedure (Figure 3), a researcher supported the user and another one compiled the observer's structured notes form. The test was video-recorded in order to be able to integrate the observer's notes afterwards. At the end of the test session one researcher helped the user to compile a post-test questionnaire, while the caregiver answered a caregiver-post-test questionnaire.

Figure 3. Pictures taken during tests.

2.4. Measures

A mix between a qualitative descriptive study design and an observational analytical study design was used [13]. Measures were used to evaluate system usability, system performance, social acceptability, user experience. The post-test questionnaires were designed on the basis of a systematic review on usability measures of health

Author's copy

Reprinted with permission from IOS Press from Salatino C., Pigini L., Van Kol M.M.E., Gower V., Andrich R., Munaro G., Rosso R., Castellani A.P., Farina E. (2017). A Robotic Solution for Assisting People with MCI at Home: Preliminary Tests of the ENRICHME System. Studies in Health Technology and Informatics Ebook. 242, 484-491. IOSPress. DOI: 10.3233/978-1-61499-798-6-484.
The publication is available at IOS Press through http://ebooks.iospress.nl/publication/47315

information technology [14-19], and then revised by geriatricians, neurologists and care-workers. A shorter version of the post-test questionnaire was the only questionnaire addressed to the caregivers. After each quantitative question of the post-test questionnaire, open space was available for free comments.

3. Results

The 4 older adults with MCI involved in tests were quite active. Everyone practiced at least two different physical activities; on average they assumed 5 medications per day; all declared to use daily technologies such as mobile phones, television, washing machines; nobody used tablets or mp3 players; all stated to have limitations in mental area (episodic memory) and in vision; all reported to have difficulties in remembering appointments and to lose objects inside the house.

3.1. Robot perception

Overall, the robot was well perceived: nobody was scared; on average its appearance was judged satisfactory. Some concerns were raised about the dimensions, being felt by someone as too big for small houses. There was high variability of aesthetic opinions. Figure 4 shows an example of quantitative responses (the users' answers in section 1 of the post-test questionnaire); in relation to qualitative responses, examples of recorded sentences are: *"it is cute" (USER), "It seems an alien, it is rigid, it is not human" (USER), "it should be easy to find room for the robot" (CAREGIVER), "I was agitated before coming, but then I relaxed during the test" (USER), "I think it is reassuring and it encourages interaction" (CAREGIVER).*

1. How did you perceive the robot?							
1.1.1	Unfriendly	0	0	0	2	2	Friendly
1.1.2	Unintelligent	0	0	1	0	3	Intelligent
1.1.3	Obstructive	0	0	0	2	2	Helpful
1.1.4	Object	0	0	2	1	1	Campanion
1.1.5	Impractical	0	0	0	1	3	Practical
1.1.6	Useless	0	0	0	1	3	Useful
1.1.7	Unsocial	0	0	2	1	1	Social
2. How did you feel in the presence of the robot?							
1.2.1	Agitated	0	0	0	0	4	Calm
1.2.2	Stressed	0	0	0	2	2	Relaxed
1.2.3	Afraid	0	0	0	0	4	Unafraid
1.2.4	Unsecure	0	0	0	0	4	Secure

Figure 4 – Users' answers to the first part of section 1 of the questionnaire.

3.2. Interaction

All the users were able to complete the test procedure, even if frequent suggestions were needed by the researcher despite an instruction session had been provided before. None of them was autonomous in the use of the system, sometimes even in the simplest tasks. The users reported some difficulties in interaction with the robot; complexity in interacting was highlighted also by caregivers observing the tests; both caregivers and users had concerns about the touch screen and the speech synthesis. The quality of information provided by the robot, such as for example the instructions to play cognitive games or the healthy tips, was not considered satisfactory enough by the

Author's copy

Reprinted with permission from IOS Press from Salatino C., Pigini L., Van Kol M.M.E., Gower V., Andrich R., Munaro G., Rosso R., Castellani A.P., Farina E. (2017). A Robotic Solution for Assisting People with MCI at Home: Preliminary Tests of the ENRICHME System. Studies in Health Technology and Informatics Ebook. 242, 484-491. IOSPress. DOI: 10.3233/978-1-61499-798-6-484.
The publication is available at IOS Press through http://ebooks.iospress.nl/publication/47315

caregivers. Neither the users nor the caregivers thought that the robot might take too much control on the users' daily life.

The caregivers' answers in section 2 of post-test questionnaire are shown in Figure 5. Examples of recorded critical sentences are: *"I had difficulties in using the touch screen, I never used it" (USER), "sometimes I had difficulty in understanding robot instructions"(USER), "a demo of the functionalities would be useful to facilitate comprehension of tasks"(CAREGIVER).*

How satisfied are you with....		Not satisfied at all	Not very satisfied	More or less satisfied	Quite satisfied	Very satisfied
2.1	the dimensions of the robot	0	1	0	4	1
2.2	the physical appearance of the robot	0	0	0	5	1
2.3	the expressiveness of the robot	0	0	2	4	0
2.4	the movement of the robot in general	0	0	3	3	0
2.5	the speech of the robot	2	2	0	2	0
2.6	the options that could be personalized	1	0	2	0	1
2.7	the easiness of learning to use the robot	0	2	0	1	2
2.8	the easiness of using the programs presented on the robot screen	0	0	3	3	0
2.9	the information provided by the robot	0	2	1	2	1
2.10	the dimension of the objects on the screen	1	0	2	2	1
2.11	the graphics on the screen	0	0	1	4	1

Figure 5 – Caregivers' answers to section 2 of the questionnaire.

3.3. Functionalities

The answers given in section 3 of the questionnaires show that the functionalities which were considered as most useful by the users were cognitive games, while "time management" and "medication and nutrition" raised different opinions; the caregivers considered useful all the tested functions, but perceived the robot not always efficient enough in carrying them out. Customisation is a crucial aspect but not satisfactory for both users and caregivers. In three trials out of four, the robot correctly located the users and came near to them proposing the activity; however it stopped in a lateral position which was uncomfortable for the user to reach the touch screen. In three trials out of four, the robot failed to recognize the trunk flexion /extension /lateral bending of the users and thus failed to proceed with the physical exercise session.

The users' answers in section 3 of post-test questionnaire are shown in Figure 6. Examples of recorder sentences are: *"it is useful in remembering appointments and helping the user in finding objects, not that much in physical and cognitive exercises" (CAREGIVER), "the boxes with the stick man showing movements to be performed is too small and fast, as well as the box with the image of the user" (CAREGIVER),* while performing the puzzle game: *"what a mess here, it's not easy, you know? The pieces are superimposed on one another and I don't know which one to take. Can I put one piece over another?" (USER).*

Author's Copy

Reprinted with permission from IOS Press from Salatino C., Pigini L., Van Kol M.M.E., Gower V., Andrich R., Munaro G., Rosso R., Castellani A.P., Farina E. (2017). A Robotic Solution for Assisting People with MCI at Home: Preliminary Tests of the ENRICHME System. Studies in Health Technology and Informatics Ebook. 242, 484-491. IOSPress. DOI: 10.3233/978-1-61499-798-6-484.
The publication is available at IOS Press through http://ebooks.iospress.nl/publication/47315

		Totally disagree	Partially disagree	Neither agree nor disagree	Partially agree	Totally agree
Function_A Games & Entertainment: Robot suggests you to play games for improving memory or keep your mind fit						
3.A.1	The functions I tested are useful to keep my mind fit	0	0	1	2	1
3.A.2	I was able to play the games	0	0	0	3	1
3.A.3	I perceived the robot as efficient	0	0	0	1	3
3.A.4	In daily life, I would feel too controlled by the robot.	3	0	1	0	0
Function_B Time Management: Robot helps in managing your daily routine: suggesting activities, reminding appointments, etc.						
3.B.1	The robots' suggestions are useful to be more independent	2	0	0	0	2
3.B.2	I perceived the robot as efficient in carrying out its functions	0	0	1	1	2
3.B.3	In daily life, I would feel too controlled by the robot	3	0	1	0	0
Function_D Medication & Nutrition: Robot reminds you to take medications and helps to find objects						
3.D.1	The robots' suggestions are useful to be more independent in the care of my health	1	1	0	0	2
3.D.2	The robots' suggestions are useful to be more secure in the care of my health at home	1	0	1	1	1
3.D.3	I perceived the robot as efficient in carrying out its functions	0	0	1	2	1
3.D.4	In daily life, I would feel too controlled by the robot	3	0	1	0	0

Figure 6 – Users' answers to section 3 of the questionnaire.

3.4. Acceptance

The users' comments also gave useful information on the acceptance of the robot helping them being cognitively and physically active and solving some difficulties they meet in everyday life: *"if the robot did not propose me games I would not do them, but they are useful" (USER), "a robot help finding objects can be useful for someone who is messy" (USER), "a robot reminding medication would be useful to me because at the moment I use reminders on the phone but it is complicated" (USER), "I prefer the human relationship but I am also willing to accept the robot" (USER).*

4. Discussion

This test protocol allowed gathering valuable information on the usage experience.

A critical aspect was that when administering post-test questionnaire at the end of the test session, MCI users no longer remembered details of what they had just done with the robot; it was necessary to show them once again some of the robotic functionalities, while administering the related question. In future tests, a better strategy might be asking specific questions just after each main test step. Furthermore the time interval of usage of the robot was short and the users had no time to get familiar with its functionalities; this might have influenced their perception and opinion of the system. Wu et al. [20] had also found a low user acceptance: even if the robot could help users perform some activities they had difficulties with, they stated to be able to manage them even without the robot thanks to other compensatory strategies (i.e. agenda, reminders on small sheets, partners/caregivers help). A reason could be that users had difficulties in imagining the robot in their daily routine, both because they did not test it in their homes and due to the unsatisfactory performance of some functionalities.

Author's copy

Reprinted with permission from IOS Press from Salatino C., Pigini L., Van Kol M.M.E., Gower V., Andrich R., Munaro G., Rosso R., Castellani A.P., Farina E. (2017). A Robotic Solution for Assisting People with MCI at Home: Preliminary Tests of the ENRICHME System. Studies in Health Technology and Informatics Ebook. 242, 484-491. IOSPress. DOI: 10.3233/978-1-61499-798-6-484.
The publication is available at IOS Press through http://ebooks.iospress.nl/publication/47315

5. Conclusions

This preliminary evaluation phase provided valuable information on the robot perception, the interaction with it and the system functioning in a controlled environment (different from the laboratories where it had been developed).

Users and caregivers involved in the tests generally showed a good robot perception. Despite the difficulties experienced by some users during the interaction, all judged most functionalities as useful.

The tests allowed identifying possible areas of improvement of the system. Further work should be done on speech synthesis and on the robot navigation system. Demos should be added in order to help the user learn how to use some functionalities. The interface should be further simplified and the system should be more customizable. In the next steps of the ENRICHME project, improvements and new functionalities will be implemented and a second test run will be done in AAL Labs. Once the system is robust enough, long term tests will be carried out: the robot will be tested by end-users for several months in their living environment. Long term evaluations are expected to give valuable results concerning usefulness, efficacy, impact and acceptability of ENRICHME system.

6. Acknowledgements

The ENRICHME project is funded by European Commission's Horizon 2020 Programme. The authors are especially grateful to all persons who accepted to participate in the evaluation and provided valuable information.

References

[1] Horr, T., Messinger-Rapport, B., Pillai, J. A. (2015). Systematic review of strengths and limitations of randomized controlled trials for non-pharmacological interventions in mild cognitive impairment: focus on Alzheimer's disease. The journal of nutrition, health & aging, 19(2): 141-153.

[2] Eshkoor, S. A., Hamid, T. A., Mun, C. Y., & Ng, C. K. (2015). Mild cognitive impairment and its management in older people. Clinical interventions in aging, 10: 687.

[3] Bekey, G. A. (2006). Co-existing with Robots. In Intelligent Robots and Systems. 2006 IEEE/RSJ International Conference on intelligent robots and systems. IEEE.

[4] Cylkowska-Nowak M, Tobis S, Salatino C, Tapus A, Suwalska A (2015). The robot in elderly care. In Psychology & psychiatry, sociology and health care. SGEM 2015. Conference proceedings, 1007-1014.

[5] Tapus, A., Tăpuş, C., & Matarić, M. J. (2009). The use of socially assistive robots in the design of intelligent cognitive therapies for people with dementia. In Rehabilitation Robotics, 2009. ICORR 2009. IEEE International Conference on rehabilitation robotics, 924-929. IEEE.

[6] Salatino C., Gower V., Ghrissi M., Tapus A., Wieczorowska-Tobis K., Suwalska A., Barattini P., Rosso R., Munaro G., Bellotto N., and van den Heuvel H. (2016). EnrichMe: a robotic solution for independence and active aging of elderly people with MCI. In the 15th International Conference on Computers Helping People with Special Needs (ICCHP).

[7] Bedaf, S., Gelderblom, G. J., & De Witte, L. (2015). Overview and categorization of robots supporting independent living of elderly people: what activities do they support and how far have they developed. Assistive Technology, 27(2): 88-100.

[8] Folstein, M. F., Folstein, S. E., & McHugh, P. R. (1975). Mini-mental state: a practical method for grading the cognitive state of patients for the clinician. Journal of psychiatric research, 12(3), 189-198.

[9] http://www.robosoft.com/robotic-solutions/healthcare/kompai/index.html

Reprinted with permission from IOS Press from Salatino C., Pigini L., Van Kol M.M.E., Gower V., Andrich R., Munaro G., Rosso R., Castellani A.P., Farina E. (2017). A Robotic Solution for Assisting People with MCI at Home: Preliminary Tests of the ENRICHME System. Studies in Health Technology and Informatics Ebook. 242, 484-491. IOSPress. DOI: 10.3233/978-1-61499-798-6-484.
The publication is available at IOS Press through http://ebooks.iospress.nl/publication/47315

Author's copy

[10] N. Bellotto, M. Fernandez-Carmona and S. Cosar (2017). ENRICHME Integration of Ambient Intelligence and Robotics for AAL. AAAI Spring Symposium "Wellbeing AI: From Machine Learning to Subjectivity Oriented Computing".
[11] Agrigoroaie R., Ferland F., Tapus A. (2016). The ENRICHME Project: Lessons Learnt from a First Interaction with the Elderly. In: Agah A., Cabibihan JJ., Howard A., Salichs M., He H. (eds) Social Robotics. ICSR 2016. Lecture Notes in Computer Science, 9979. Springer, Cham.
[12] Cruz-Maya, A., & Tapus, A. (2016). Teaching nutrition and healthy eating by using multimedia with a Kompai robot: Effects of stress and user's personality. In Humanoid Robots, IEEE-RAS 16th International Conference on humanoid robotics, 644-649. IEEE.
[13] Creswell JW: Mixed method procedure; in Research design: qualitative, quantitative, and mixed methods approaches (fourth edition). Sage publication, 215-234.
[14] Brooke, J. (1996). SUS-A quick and dirty usability scale. In: Jordan P.W. et al. (eds): Usability evaluation in industry, 4(7): 189-194. London: Taylor & Francis.
[15] Davis F.D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. MIS Quarterly. 13 (3): 319-340.
[16] Demers, L., Weiss-Lambrou, R., Ska, B. (2002). The Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST 2.0): An overview and recent progress. Technology and Disability, 14(3): 101–105.
[17] Bartneck, C., Croft, E., Kulic, D. & Zoghbi, S. (2009). Measurement instruments for the anthropomorphism, animacy, likeability, perceived intelligence, and perceived safety of robots. International Journal of Social Robotics, 1(1): 71-81.
[18] Laugwitz, B., Held, T., & Schrepp, M. (2008). Construction and evaluation of a user experience questionnaire. In Symposium of the Austrian HCI and Usability Engineering Group, 63-76. Springer.
[19] Venkatesh, V., Thong, J. Y. L., Xu, X.. Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. MIS Quarterly, 36(1): 157-178.
[20] Wu Y.H., Wrobel J., Cornuet M., Kerhervé H., Damnée S., Rigaud A.S.(2014). Acceptance of an assistive robot in older adults: a mixed-method study of human-robot interaction over a 1-month period in the Living Lab setting. Clin Interv Aging, 9: 801-811.

Author's copy

Reprinted with permission from IOS Press from Salatino C., Pigini L., Van Kol M.M.E., Gower V., Andrich R., Munaro G., Rosso R., Castellani A.P., Farina E. (2017). A Robotic Solution for Assisting People with MCI at Home: Preliminary Tests of the ENRICHME System. Studies in Health Technology and Informatics Ebook. 242, 484-491. IOSPress. DOI: 10.3233/978-1-61499-798-6-484.
The publication is available at IOS Press through http://ebooks.iospress.nl/publication/47315