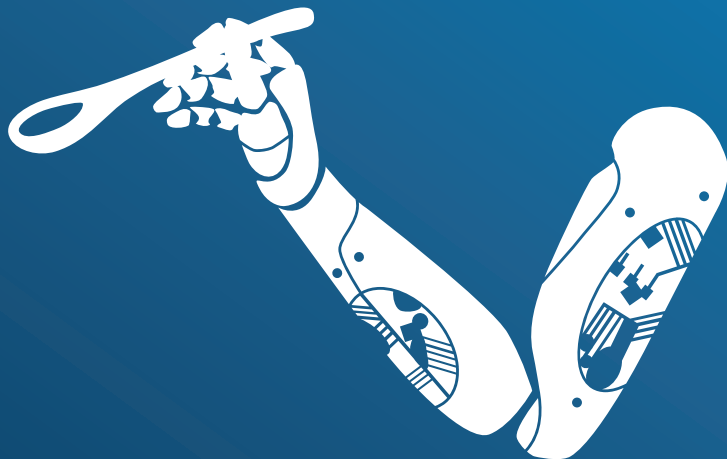


VALET

companion robot's navigation as a tool to improve
the quality of life of people with reduced mobility



COMPANION ROBOT AS A TECHNOLOGY SUPPORTING PEOPLE WITH REDUCED MOBILITY

A Practical Guide for Caregivers
and Support Institutions

Olsztyn 2025

The aging of the population and a growing number of people with impaired mobility pose challenges we face every day. We wish everyone to have a chance to live a dignified and self-reliant life. Novel, cutting-edge technologies, like companion robots, can help us achieve this goal. This guide was created to synthesize research findings and, based on them, provide guidance on how to implement innovations in practice.

Who is this guide for?

- For employees of institutions supporting people with disabilities.
- For caregivers of persons with reduced mobility.
- For all who want to improve the quality of life of persons requiring support.

What will you learn?

- How to improve the quality of life of persons with impaired mobility through adapting public spaces, institutions, and household conditions to their needs.
- What are the main architectural and social barriers and what actions can be taken to eliminate them effectively.
- How modern technologies can support people with impaired mobility.
- How to increase social awareness about the needs of people with reduced mobility to create more open and available environment.
- What tools and good practices can aid institutions effectively integrate, support, and improve the quality of life of this social group.

We hope that information provided in this guide will contribute to the implementation of effective and modern solutions supporting people with reduced mobility.

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KEY FINDINGS FROM THE VALET PROJECT

Navigation of a companion robot as a tool for improving
the quality of life of people with reduced mobility

Project financed from the state budget funds under the
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Project No. Nds/536964/2021/2021

SURVEY ASSUMPTIONS

The survey analyzed social awareness regarding the use of a companion robot in an everyday life of people with impaired mobility. Its aim was to establish the level of knowledge, perception, and potential barriers related to the acceptance of this technology.

◆ Survey methodology

The survey was based on quantitative methods and entailed statistical analysis of respondents' replies. Data was collected using the authors' own interview questionnaire, which encompassed seven key areas:

- knowledge about the companion robot,
- robot's perception,
- barriers preventing use of the robot,
- projection of robot's role and function,
- level of social acceptance,
- expected time of adaptation of this technology.

The questionnaire contained questions in an ordinal scale (from 0 to 10), which allowed precise assessment of attitudes towards robots and development of aggregate indicators synthesizing the level of social awareness.

◆ Data collection and analysis

In total, 1,064 interviews were conducted with persons suffering from impaired mobility. A random selection of the research sample was ensured.

Results of analyses allowed assessing the degree of acceptance of a companion robot across various socio-demographic groups and identifying key factors influencing respondents' attitudes towards this technology.

The methods applied enabled a comprehensive and reliable examination of the level of social awareness regarding companion robots, thereby providing valuable insights into the potential challenges and opportunities of their implementation in everyday lives of people with limited mobility.

HEALTH CONDITION, OCCUPATIONAL ACTIVITY, AND ECONOMIC SITUATION OF PEOPLE WITH LIMITED MOBILITY

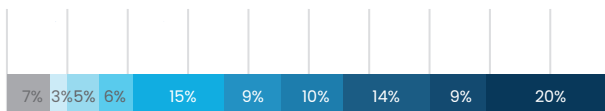
- ◆ **The health condition of persons with impaired mobility has a significant effect on the quality of their life.** In the interview, they evaluated their health condition in a scale from 0 to 10, where 0 denoted severe health problems, whereas 10 denoted very good health condition. Results indicate high variability of replies, which shows **that the reduced mobility does not always mean complete disability but can be of various severity.**
- ◆ **Occupational activity in the surveyed group is relatively high.** Over 44 of the respondents work under employment contracts and 9% under civil law contracts. About 8% of the respondents run their own businesses or employ staff. Retirees and pensioners account for approximately 20% of the survey participants, while 8% are still in education or college. Only 4% of the respondents confirmed being unemployed, which indicates a relatively good situation of the surveyed group in the labor market.
- ◆ **The economic situation of people with limited mobility depends on multiple factors, including employment type and benefits received.** The most frequently indicated source of income was the income from employment in the private (39%) and public (23%) sectors. Additionally, 17% of the respondents rely on a pension, and approximately 8% on a disability pension. Family benefits, such as the 800+ program, provide significant financial support for nearly 19% of the respondents. Social assistance benefits are a source of income to approximately 7% of the respondents.
- ◆ **Subjective assessment of the financial situation indicates that the largest group of respondents (26%) consider their economic situation to be average.** At the same time, nearly half of the survey participants consider their situation to be good or very good. In turn, approximately 24% of the respondents experience financial difficulties and assess their financial status as low, which may indicate the existence of a group at risk of poverty.

To conclude, persons with reduced mobility show a relatively high level of occupational activity, although part of them rely also on various benefits. Their financial situation varies, but most of them assess it as at least average. Key challenges include access to stable employment and social support, which can improve the quality of life of this group.

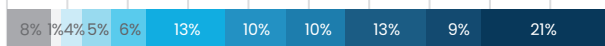
OPINIONS OF PEOPLE WITH REDUCED MOBILITY ABOUT A COMPANION ROBOT

- ◆ **Distribution of answers to a question: how do you assess the possibility of using a companion robot in everyday life? Please rate the extent to which you agree with the following statements.**

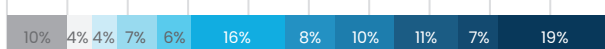
The multi-tasking of companion robots and the improvement of skills related to the operation of high-tech devices will contribute to the increased use of robots.



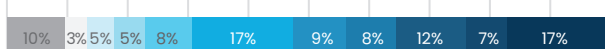
Technological advance and the aging of the population will contribute to the growing interest in and use of a companion robot.



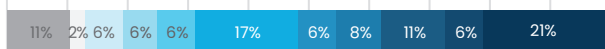
People with limited mobility are not prepared in terms of skills and familiarity with modern technologies to be able to use them at home.



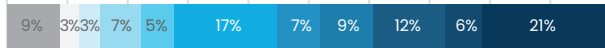
Due to the low prevalence of use, the companion robot currently does not play any significant role in the improvement of the quality of life of people with limited mobility.



The widespread use of a companion robot in everyday life is currently unreal.



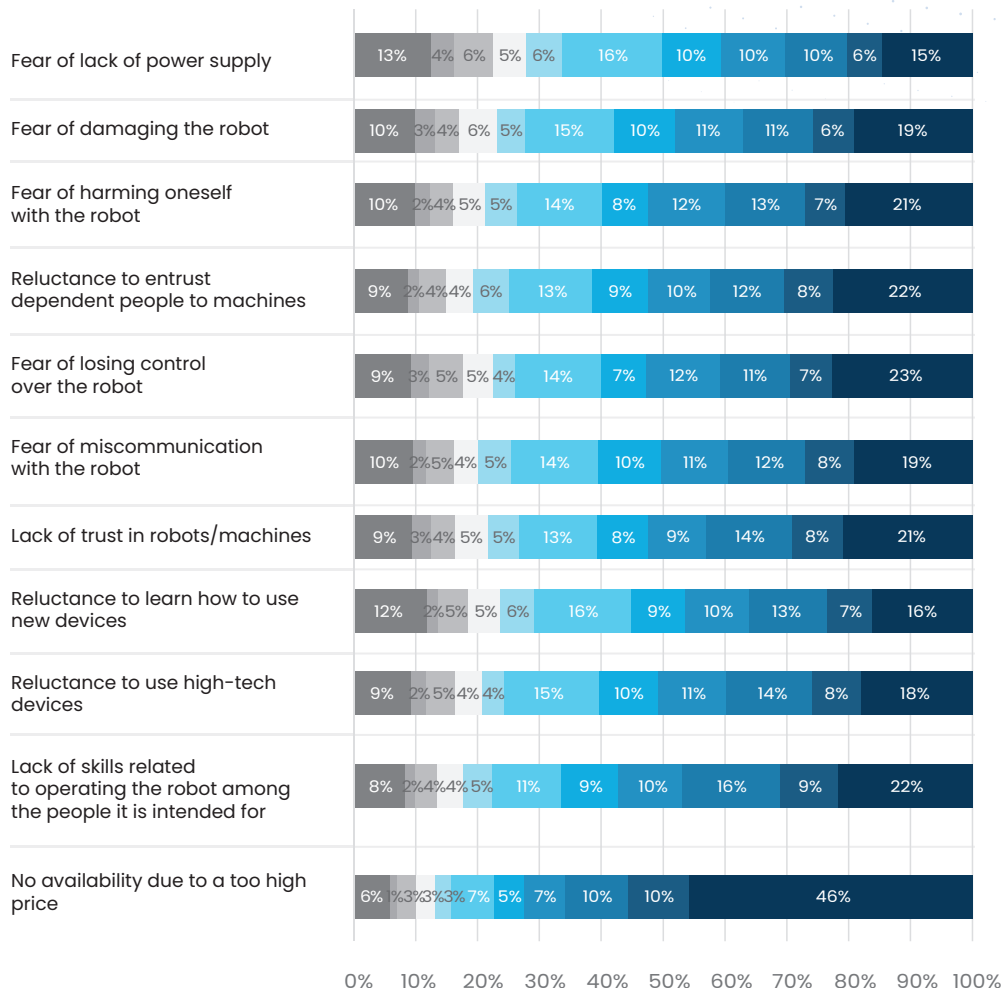
Existing robots are only prototype versions, being improved and tested in research centers.



0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

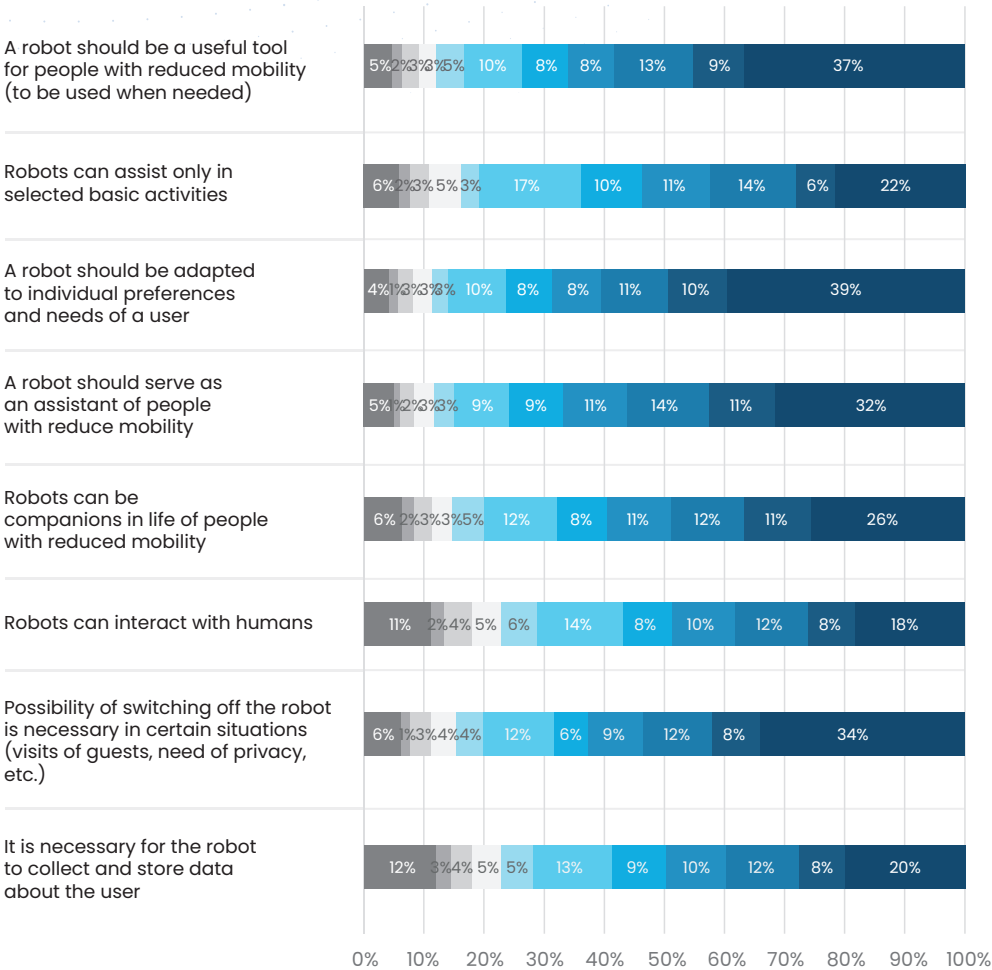
■ 0 – totally disagree ■ 10 – totally agree

◆ **Distribution of answers to a question: please assess factors which in your opinion can restrict the use of a companion robot.**



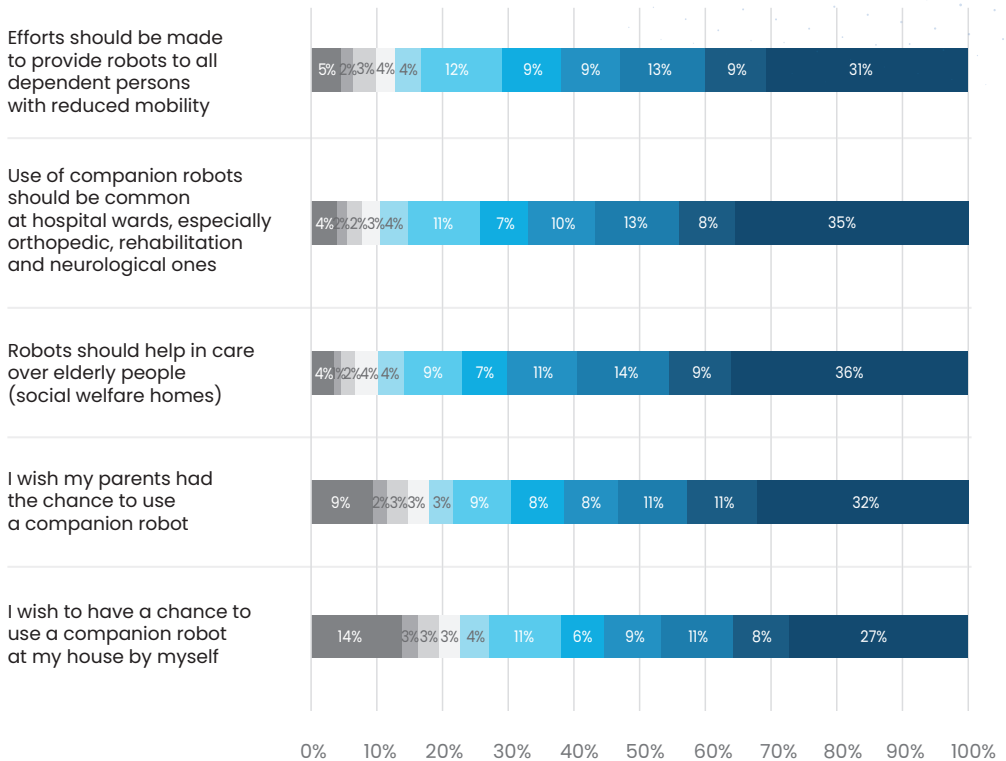
■ 0 - totally disagree ■ 10 - totally agree

◆ **Distribution of answers to a question: how do you assess the possibilities of using a companion robot by persons with reduced mobility? Please rate the extent to which you agree with the following statements.**



■ 0 – totally disagree ■ 10 – totally agree

◆ **Distribution of answers to a question: please rate the extent to which you agree with the following statements.**



■ 0 - totally disagree ■ 10 - totally agree

KEY RECOMMENDATIONS FOR CAREGIVERS AND INSTITUTIONS:

- ◆ **Increasing access to health care and rehabilitation:** persons with limited mobility should have easy access to specialized medical care and rehabilitation, which can improve their health status and increase their independence. Actions should be undertaken to support the development of rehabilitation programs and adapt medical facilities to the needs of individuals with impaired mobility.
- ◆ **Creating and supporting work places tailored to the needs of people with reduced mobility:** since the vast majority of these persons are professionally active, it is worthwhile to implement programs facilitating their employment. It is desirable to make employment forms more flexible, promote remote work, and ensure that work places are adjusted to the capabilities of individuals with limited mobility.
- ◆ **Expanding financial and educational support:** since some individuals with limited mobility are at risk of facing financial difficulties, institutions should strive to develop social support programs, e.g., grants for purchasing orthopedic equipment or funding vocational courses. Education in household budget management and applying for additional benefits can also improve their economic situation.
- ◆ **Improving the accessibility of public institutions and infrastructure:** public institutions should eliminate architectural barriers by, e.g., installing ramps and elevators, and by adapting public transport to the needs of people with reduced mobility. These actions will increase their mobility and opportunities for active involvement in social and professional life.
- ◆ **Developing psychological and social support programs:** psychological support and establishing community for individuals with disabilities is crucial for their well-being. Caregivers should ensure the social integrations of their charges, whereas institutions should organize support groups, workshops, and events aimed at preventing social exclusion. The mental health of individuals with limited mobility and the sense of belonging to a community are key challenges faced by caregivers, family members, and support institutions.

SELECTED RESULTS OF INFRASTRUCTURE AVAILABILITY ASSESSMENT

AND IT'S INCONVENIENCES FOR THE FUNCTIONING OF PEOPLE WITH LIMITED MOBILITY

(PROVINCES WITH THE GREATEST INCONVENIENCES ACCORDING TO RESIDENTS)

SIDEWALKS

PODLASKIE

WARMIA-MASURIA

ROADS

PODLASKIE

WARMIA-MASURIA

PARKING LOTS

PODLASKIE

WARMIA-MASURIA

DRIVEWAYS

LUBLIN

WARMIA-MASURIA

CORRIDORS RAILINGS

SUBCARPATHIAN

WEST POMERANIAN

STAIRLIFTS ELEVATORS

SUBCARPATHIAN

WEST POMERANIAN

STOPS

LUBLIN

WEST POMERANIAN

ROLLING STOCK

WEST POMERANIAN

LUBLIN

GREATEST INCONVENIENCE

LONG-DISTANCE
COMMUNICATION
(BUS)

SPACE
INSIDE
BUILDINGS



COMPANION ROBOTS

Supporting technologies in light of selected research findings

BENEFITS OF USING ROBOTS:

- Assistance in everyday activities, such as mobility, meal preparation, and communication.
- The ability to monitor the user's health condition.
- Supporting self-reliance and improving the quality of life.

FIRST IDEAS AND IMPLEMENTATIONS:

The Japanese Ministry of Economy, Trade and Industry (METI) introduced a program supporting the development and implementation of robots assisting in care over seniors. In the framework of this program, "Paro" robots – therapeutic robots resembling a seal that help in the therapy of individuals suffering from dementia, and "Pepper" robots – humanoid companion robots that engage seniors in social interactions and activities, were implemented in social welfare homes. These initiatives aimed to improve the quality of life of the elderly and support the caregiving staff.

EXAMPLES OF IMPLEMENTATIONS OF COMPANION ROBOTS FOR THE ELDERLY

1. TEMI in Fuenlabrada, Spain:

In November 2024, a robot named TEMI, designed to assist elderly persons at homes and in daily care centers, was presented in Spain. It helps with rehabilitation, provides information on healthy habits, and suggests various activities. Eight such robots are planned to be introduced in daily care centers in 2025.

2. ElliQ in the United States:

In January 2025, the Intuition Robotics company launched the ElliQ Caregiver Solution, namely an artificial intelligence-based systems which supports caregivers in monitoring the health status and well-being of seniors at their homes. ElliQ is a companion robot that initiates conversations, offers entertainment, and provides assistance in health and wellness. Its novel function enables sending notifications to caregivers in case of detected health issues or changes in the behavior of the charges.

Source:

<https://www.technologyreview.com/2023/01/09/1065135/japan-automating-eldercare-robots/>

3. The use of AI technology by seniors:

A survey conducted in 2024 by Carwell in the USA demonstrated that 78% of the respondents over the age of 55 use tools based on the artificial intelligence, such as ChatGPT, Alexa or Google Assistant, mainly for managing everyday tasks and finding answers to health inquiries. Eighteen percent of the surveyed seniors consider these tools as companions, which has allowed reducing their dependence on caregivers and improving their mental health.

These examples show the growing interest and implementation of robotic technologies and artificial intelligence in the care over the elderly in recent years.

Table below presents 10 European research projects implemented in 2010–2024, focusing on the use of robotics in care over the elderly.

Project name	Year	Target group	Key conclusions
ExCITE	2010–2013	Elderly in social welfare homes and their own homes	The Giraff robot increased social contact, but faced difficulties in technology acceptance.
Mobiserv	2011–2014	Elderly in their homes	The robot assisted in healthy lifestyle, but users expected more natural interactions.
ENRICHME	2015–2018	Elderly with mild cognitive impairments	The robot assisted in everyday routines and monitored health status, but it was necessary to raise acceptance of this technology.
GrowMeUp	2015–2018	Elderly living alone	The robot learned the user's preferences, but the training process needed improvement.
Caresses	2017–2020	Elderly from various cultures	The robot adapted its behavior to the user's culture, which increased technology acceptance, but required expanding the cultural knowledge database.
SPRING	2020–2024	Geriatric hospitals	The ARI robot supported the medical staff, but it was necessary to upgrade speech recognition and interaction flexibility.
SHAPES	2019–2023	Elderly in various environments	The technology-integrating platform supported independence, but users indicated the need for better interoperability of systems.
Pillo	2016–2019	Elderly in their homes	The robot reminded about medications and monitored health status, but users expected more natural interaction.
Lio	2019–2022	Social welfare homes	The assistant robot supported staff in routine tasks, but it was necessary to increase the reliability of its operation.
Pepper	2014–2021	Various environments	The companion robot increased social engagement, but interactions required greater personalization.

It is noteworthy that, although these projects aimed to improve the quality of life of the elderly through robot support, many of them faced challenges related to the acceptance of the technology, intuitiveness of operation, and issues of privacy and data security. Further research is needed to effectively integrate robots in care over seniors.

03

USE OF ROBOTS IN CARE OVER THE ELDERLY AND PEOPLE WITH DISABILITIES

from the perspective of users and their caregivers

The aim and methodology of a focus study conducted under the ENRICHME project (ENabling Robot and assisted living environment for Independent Care and Health Monitoring of the Elderly):

- gathering opinions of potential users (elderly people and their caregivers) about the needs and requirements related to the uses of robot in care.

KEY FINDINGS :

◆ Who is the potential beneficiary of the robot? (User characteristics):

- **Psychosocial issues**, like loneliness and the need for companionship, as well as the **ability to operate the robot** were emphasized. Study participants indicated that it would be good if the robot could provide "a sense of security, when one is alone".
- Medical issues, like co-occurrence of multiple diseases, cognitive disorders, and disabilities, were highlighted. Respondents emphasized that the robot could be "very much needed" by individuals with memory problems.

◆ What should the robot be like? (Robot characteristics):

- There was a discussion about the **appearance of the robot** (humanoid or more machine-like) and about tactile elements, such as skin or fur. Some participants preferred a more "machine-like" appearance to avoid feelings of fear.
- The **possibility of adapting and customizing the robot** to the user's needs was emphasized as well. It was noted that the robot "should not be talkative" and should be discreet.

◆ What a robot could be used for? (Robot functions):

- **Supportive functions** were indicated such as home security, household chores, meal preparation, information, assistance in reading, and joint prayers. However, it was noted that robots may have limitations, for example, in cleaning hard-to-reach places.
- **Essential functions related to health**, like reminding about medications and medical visits, monitoring vital parameters, maintaining medical documentation, physical exercises, and cognitive games. The potential of the robot in conveying information about the health status to medical services in case of emergencies was emphasized.
- **Social functions** were discussed, such as contact with the outside world and entertainment (card games, music playback). There was a desire for the robot to be able to read books.

◆ How to implement a robot into care over the elderly? (Barriers to overcome):

- Ethical issues were raised, such as control over the robot, access to observation data, and the right to disobey user commands. Participants were concerned about the feeling of "being controlled".
- Concerns were raised about the high cost, the risk of failure, and the loss of one's own skills if the robot performs routine tasks.
- The need for a step-wise and well-planned introduction of the robot, tailored to the user's capabilities and the initial presence of an assistant, was emphasized. Participants acknowledged that at the beginning "they would be afraid to be alone with it" and they would need time to "learn to live together".

PERSPECTIVES AND CONCLUSIONS:

The study revealed that seniors had growing and detailed expectations of robots than their caregivers. Discussion participants emphasized that a robot cannot replace a human, but it can provide valuable support. It was concluded that safety, privacy, and ethical issues are crucial when designing and implementing robots.

The research results underpin the importance of individualization and personalization of robots, as well as a thoughtful process of their implementation, taking into account ethical and practical issues.

- ◆ The SPRING project (Socially Pertinent Robots in Gerontological Healthcare) aims to develop social robots capable of natural communication with people in public places, such as hospitals or social welfare homes.

The study conducted within the Project addressed the acceptability and usability of social robots in gerontological healthcare. It was carried out at the Broca daily-care hospital in Paris, which specializes in the diagnosis of dementia.

HOW WAS THE STUDY CONDUCTED?

1. Environment and participants

- The study was conducted in daily-care hospital Broca in Paris.
- More than 60 persons participated, including patients (average age ~79 years) and their companions (~69 years).

2. Robot and its capabilities

- The study used a humanoid robot ARI (1.65 cm tall) with advanced social skills:
 - Speech and face recognition.
 - Multi-user interactions.
 - Navigation and analysis of human behaviors.
 - Robot's task was to inform about, engage in, and provide entertainment to patients waiting for the appointment visit.

3. Experimental procedure

- Two series of experiments were conducted (May 2023 – January 2024).
- The first series used an early version of robot's software, whereas the second series – upgraded version (with improved speech recognition and dialog system based on LLM models).
- Users rated interaction with the robot in terms of acceptability (AES) and usability (SUS).

4. Rating methods

- The AES (Acceptability E-Scale) and SUS (System Usability Scale) questionnaires were used to assess the level of acceptance and the ease of use of the robot.
- Qualitative interviews were also conducted, in which participants expressed opinions on the ethics of using robots in hospitals.

STUDY FINDINGS

1. Positive user response

- Increased acceptability and usability of the robot were observed in the second series of the experiment.
- Participants were more open to the technology, especially when the robot correctly recognized speech and was more flexible in conversation.

2. Preferred robot features

In the opinion of participants, the most useful features of the robot included:

- Reception and greeting.
- Assistance in orientation and navigation within the hospital.
- Assistance in the preparation for the visit.

3. Challenges and concerns

- Some participants were concerned about excessive robotization and replacing humans by machines.
- Attention was paid to the issues of privacy and data storage.
- There were also concerns about potential robot errors that could cause confusion in the hospital environment.

4. Ethics and emotional attachment

- Participants expressed mixed feelings about the attachment to the robot – some claimed that the machine should not replace human relationships.
- Participants believed that the robot should provide support to and not replace medical staff.

The study showed that social robots can be acceptable and useful in geriatric hospitals, provided they are intuitive to operate, effectively recognize speech, and do not violate patient privacy. The greatest improvement in the perception of the robot was noted after upgrading the speech recognition system and multi-user interaction.

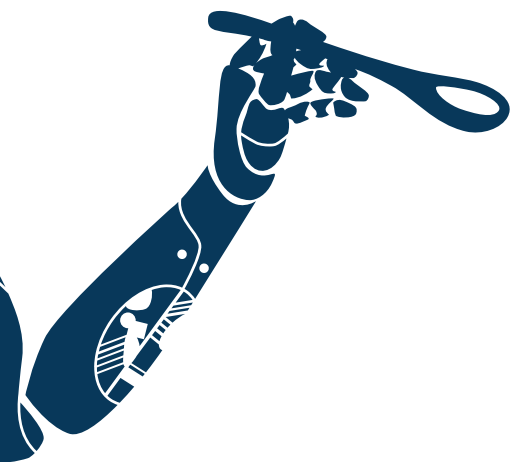


SUMMARY AND CONCLUSIONS FROM AN OVERVIEW OF RESEARCH FINDINGS:

Support, not replacement: Modern technologies can minimize the isolation of the elderly by assisting them in daily activities. However, they cannot completely replace direct interpersonal interactions and should require support from humans to facilitate interactions.

The key importance of acceptance: The effectiveness of assistive technologies depends on the perception, acceptability, and willingness to use them by older individuals. The opinions of caregivers, medical professionals, and the socio-cultural context of the acceptance of these technologies are equally crucial.

Ethical issues: Implementation of technology among seniors involves the necessity to consider ethical aspects, such as ensuring the autonomy, safety, and dignity of users.



04

CONCLUSIONS AND RECOMMENDATIONS

◆ **Cooperation of many institutions:**

- Support for the people with motor disabilities requires coordinated actions of various institutions (social care, health care, non-governmental institutions).

◆ **Role of technology:**

- Technology, including companion robots, can significantly improve the quality of life of people with disabilities.
- Poor acceptance of robots among the elderly and the young is due to the lack of knowledge and skills.

◆ **Barriers to the acceptance of robots:**

- The major barrier is the high price of robots.
- There is lack of trust to machines, particularly among seniors and women.
- The elderly more frequently express concerns related to the use of robots in everyday life.

◆ **Needs of users:**

- People with disabilities need robots that would help them in daily activities and in monitoring safety and health condition.
- The elderly appreciate the possibility of monitoring their health status by robots.
- It is important for the robots to be adapted to the individual needs and preferences of users, and to have the “switch off” option.

◆ **The necessity of pre-implementation research:**

- It is necessary to conduct surveys prior to implementation in order to map the needs and identify the concerns of potential beneficiaries.

◆ **Education and raising awareness:**

- It is necessary to undertake actions aimed at disseminating knowledge on the benefits of using robots.
- Education should be targeted at both the elderly, the young, and the caregivers.

RECOMMENDATIONS FOR CAREGIVERS:

To effectively implement robots as a helpful work tool, it is essential to:

- Search for information about available technologies providing assistance to people with disabilities.
- Actively participate in training and workshops related to the operation of novel technologies.
- Co-operate with support institutions to ensure comprehensive assistance.
- Be open to novel technological solutions that can facilitate care over a person with disability.
- Map the needs of the person being cared for.
- Pay attention to data security.

RECOMMENDATIONS FOR INSTITUTIONS:

To effectively implement robots in activities for the people with special needs, it is essential to:

- Invest in infrastructure and technologies providing support to the individuals with disability.
- Organize trainings and workshops for caregivers and people with reduced mobility related to the operation of novel technologies.
- Conduct information campaigns aimed at raising public awareness about the needs of people with disabilities and the benefits of using technology.
- Conduct questionnaire surveys among potential beneficiaries, prior to technology implementation.
- Increase the availability of companion robots through, among other things, funding and seeking solutions to reduce their prices.
- Co-operate with non-governmental institutions and local governments in order to ensure comprehensive support.



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