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Home-care robots - Attitudes and perceptions among older people, carers and care professionals in Ireland: A questionnaire study

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Abstract

Many countries face major challenges to ensure that their health and social care systems are ready for the growing numbers of older people. As a way of realising ageing in place, assistive technologies such as home-care robots are expected to play a greater role in the future. In countries such as Denmark and Japan, robots are gradually being adopted as a public policy solution to the workforce shortage. Yet there is still a strongly held belief that such technologies should not be part of human and personal care services including older people's care. Many opinion polls have shown generally negative attitudes towards technological solutions. However, little research has examined attitudes and perceptions of potential users regarding home-care robots.

In order to explore these in more detail, a questionnaire study was carried out in Finland, Ireland and Japan. This study reports findings from the Irish cohort (114 Older People, 8 Family Carers and 56 Health and Social Care

Professionals (HSCPs)). Seventy percent of the total respondents (N=178) reported being open to the use of home-care robots, and only one quarter had a negative image of robots. People with care responsibilities in their private capacity expressed more interest in, and readiness to use, home-care robots, while stressing the importance of “privacy protection” and “guaranteed access to human care”. Both Older People and HSCPs identified observing and recording of older people’s mental and physical condition as desirable functions of such robots whereas practical functions such as fall prevention and mobility support were also deemed desirable by HSCPs.

There is generally positive interest in home-care robots among Irish respondents. Findings strongly suggest that the interest is generated partly by great need among people who deliver care. Should such robots be developed, user-centred design, ethical aspects and national care policy need to be carefully considered.

Keywords: Ethics; Geriatrics; Technology; Surveys and Questionnaires; Community Health Nursing; Public Policy; Social Work

What is known about the topic:

- Assistive technologies such as home-care robots are expected to play a greater role in materialising ageing in place.
- Previous opinion polls and surveys in Europe have highlighted generally negative attitudes towards robots in care and human services.
- The lack of familiarity with robots, social acceptance, violation of privacy and human dignity, and the absence of user-driven research and development have been given as challenges for social implementation of assistive technologies.

What this paper adds

- There is great and generally positive interest in home-care robots among potential users (older people, carers and care professionals) in Ireland.
- Familiarity, social acceptance and gender do not seem to affect the

level of interest in and willingness to support research and development of home-care robots.

- Professional ethics and the protection of human dignity and autonomy are strong drivers in the decision among care professionals regarding the use of home-care robots.

1. Introduction

People worldwide are living longer than ever, and this is also true in Ireland where life expectancy has risen by several decades in the last 100 years. Life expectancy at birth in Ireland is 80.4 years for men and 84.0 for women (Eurostat, 2017). The number of people with dementia in Ireland is estimated to be 55,266 and is expected to grow at an average rate of 3.6 per cent per year over the next thirty years (O'Shea, Cahill and Pierce, 2017). Many advanced economies face major challenges to ensure that their health and social care systems are ready to make the most of this demographic shift (Ryburn et al., 2009; Kodate and Timonen, 2017; Sheehan and O'Sullivan, 2020) and to promote ageing in place which is the preference of the majority (Donnelly, Begley and O'Brien, 2019).

In this situation, and in tandem with aims to realise ageing in place (Hawley-Hague et al., 2014), increasing attention is being paid to the role of technology in supporting healthy ageing and the lives of people with disabilities (Bennett, 2019). There have been growing expectations for development and social implementation of assistive technologies beginning with home-care robots that make use of technologies beginning with Information and Communication Technology (ICT) and sensing technology. Recent studies show promising signs that technological solutions could support 'ageing in place' (Brims and Oliver, 2019; Krick et al., 2019; Mois and Beer, 2020).

Addressing the anticipated lack of formal care capacity in the era of global ageing, assistive technologies including robots are expected to play a greater role in the future. There is now the potential to provide a mix of

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human and technological applications to health and social care delivery and the technologisation of care is high on the agenda for policy and practice (Share and Pender, 2018). Home-care robots have been developed as one of the assistive technologies, and benefits and challenges of their use have been debated in many countries (Brims and Oliver, 2019).

However, assistive technologies have not yet been widely implemented in society, with some exceptions such as Denmark (Alaiad & Zhou, 2014; Granja, Janssen, & Johansen, 2018; Liddy et al., 2008; Postema, Peeters & Friele, 2012; Schreiweis et al., 2019; Wilson et al., 2020). Robotics has great potential for realising home care, and it is estimated that in Finland twenty per cent of the current nursing work could be replaced by robots in Finland (Kangasniemi & Andersson 2016). Among all the available assistive technologies for home care, devices supporting cognitive functions including robots are the least used (Hammar, Mielikäinen & Alastalo 2018). Central to the debates over the use of social robots in aged care has been concerns over the implications of robotic carers for the dignity of those using them (Bennett, 2019; Alzheimer Europe, 2010, p. 58). It has also been reported that the rate of older people's acceptance of wearable technology remains low despite technological improvements (Laitinen, Niemelä, & Pirhonen, 2016; Li et al., 2019; Rantanen et al., 2018; Turja & Oksanen, 2019).

The results of the recent public opinion poll concerning use of digital technology in Germany showed that over 80% of people (N=1986) in Germany had "negative" impressions or "ambivalent feelings" about the use of care robots (Technik Radar, 2018). Furthermore, the latest Eurobarometer (European Commission, 2017) indicates that while 61% of the respondents have a positive view of robots and artificial intelligence, 88% agreed robots and artificial intelligence are technologies that require careful management. Across EU member states, there is a great variation from Poland (45%) to Portugal (11%). In Ireland, 26 percent (the same as the EU average) of the respondents answered that they are comfortable with robots providing them services. One finding from this EU-wide questionnaire was that men are more likely to have a positive attitude to robots and artificial intelligence. Previous literature suggests differences in

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the way men and women approach the use of robots. The results of an European study indicate that gender, age, and education are all independent variables correlated with the individual's opinions on the use of robots to care for older people (Hudson et al., 2017). Another study, conducted in Russia, also found remarkable differences in how men and women perceive the acceptability of tasks that robots may do in hotel industry (Ivanov et al., 2018). The Eurobarometer questionnaire also found that the respondents with a positive view about robots and artificial intelligence were more likely to have used a robot, compared to those with a negative view (European Commission, 2017: 60). Familiarity and lived experience may create different perception. While these findings are illuminating, these questionnaires were targeted at the public at large, and no care-specific questions were asked.

There has been little research that targeted potential immediate users including older people in receipt of care, and carers and care professionals on the frontline. It is essential to ask not only about their willingness to use home-care robots, but also about their readiness to participate in research and development of such technologies. In order to tackle the issue of acceptance, privacy and ethics, public and patient involvement, co-design and co-production have to be incorporated from the initial design stage (Robinson, MacDonald and Broadbent, 2014). A recent study suggests that ethical perceptions based on professional ethical principles affect home-care staff members' willingness to use robots (Suwa et al., 2020). Therefore, it is essential to ask not only about their willingness to use home-care robots, but also about their readiness to participate in research and development of such technologies.

In recent years, some progress has been made in policy-making for older people's care in Ireland, particularly with the National Positive Ageing Strategy (Department of Health, 2013) and the National Dementia Strategy (Department of Health, 2014). However, the care sector has been underfunded for many years, and care burden for professionals and family carers has been a major issue (Donnelly, Begley and O'Brien, 2019). The demand for and interest in assistive technologies is likely to increase.

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Against this background, the questionnaire study aimed to test the following three hypotheses.

Hypothesis 1: Irish people are not generally familiar with home-care robots and the majority would have negative views towards the use and development of home-care robots for older people.

Hypothesis 2: Personal profiles (e.g. gender, residence, living arrangements) affect users' attitudes and perceptions towards home-care robots.

Hypothesis 3: Occupation and care duties affect people's attitudes and perceptions. For example, people who currently provide care would have greater demand for and expectations towards home-care robots from those without such duties.

The data was collated from three groups: Older People (OP); Family Carers (FC); and Health and Social Care Professionals (HSCP) in Ireland. While the survey was carried out in three countries (Finland, Ireland and Japan), this article reports solely the Irish aspect of the study.

2. Methods

2.1. Study Design

The study used a cross-sectional survey design.

2.2. Participants

The targeted participants in this study were potential users of home-care robots (OP, FC and HSCP) in Ireland. Potential users were approached (see 2.4.) and 283 participated in the questionnaire either online or by post. The findings are analysed with a particular focus on responses from 114 OP, 8 FC and 56 HSCP (N=178) who completed the questionnaire.

2.3. Questionnaire development

Based on the questionnaire previously carried out in Japan (Suwa et al., 2020), the interdisciplinary teams in three countries (nursing, medical

engineering, public policy, social work and public health education) iteratively developed the questionnaire. The questionnaire consisted of basic attributes (background, age, gender) and familiarity with robots, willingness to use a home-care robot, thoughts about the risks and benefits when participating in the development of a home-care robot, viewpoints regarded as important when considering the use of a home-care robot, opinions about (assisted) decision-making for those with cognitive impairments, privacy and dignity when using a home-care robot, and functions expected from a home-care robot. Questions and selection items relating to basic attributes were modified and adapted to reflect the specific context of each country, although core questions were standardised across the three country sites.

The content of the questionnaire survey includes the following:

- (1) Basic attributes: Area of residence or activity, age group, gender, and qualifications held (for professionals only).
- (2) An exploration of perceptions towards the potential ethical issues regarding research into the development and social implementation of home-care robots and sensors to watch over older people living at home.
- (3) Needs regarding the functions of robots and sensors as used in the homes of older people and places where care is provided.

2.4. Data Collection Methods

Data was collected from the following three participant groups:

- 1) Older people (OP) aged 65 years or older who are/ who may be using health or social care services;
- 2) Family caregivers (FC) of older people aged 65 years or older who are/who may be using services related to nursing care; and
- 3) Health and social care professionals (HSCP)

A different data collection strategy was adopted for OP and FC on one hand, and HSCP on the other (Table 1). In Ireland, the research team worked closely with two organisations: one non-governmental, charitable body (Age Action Ireland, AAI); and another professional academic society (Irish Gerontological Society, IGS). The AAI (established in 1992) is an advocacy group for older people, and acts as a network of individuals including older

people and carers. The IGS (founded in 1950) consists primarily of physicians in geriatric medicine, nurses and professionals associated with care of older people, psychiatry of old age, psychology of ageing, social gerontology, the therapies associated with rehabilitation of older people, and professionals involved in the social and built environments and technology.

Table 1. Recruitment and data collection for the three cohorts

<p>Older People & Family Carers</p>	<ol style="list-style-type: none"> 1) The AAI agreed to act as a gatekeeper organisation and distributed the questionnaire to their membership (N=1,154). Completion and return of the questionnaire viewed as consent to participate. The diverse membership of Age Action facilitated the recruitment of both older people and family caregivers. 2) The respondents were invited to fill out the survey questionnaire and place it in the attached stamped self-addressed envelope.
<p>Health and Social Care Professionals</p>	<ol style="list-style-type: none"> 1) The IGS facilitated the distribution of the HSCP questionnaire. Members of the IGS stem represent professions involved in areas such as health and social care, economics, the social and built environments and technology. 2) In order to comply with the General Data Protection Regulation (GDPR) in the European Union, the IGS agreed to forward a briefing out to their IGS mailing lists with an opt-in option for those interested in participating in the study to go on a new mailing list (which would be held and managed by the research team) in order to participate in the study. Once the email list of interested participants was shared with the research team by the IGS, a link to an online version of the questionnaire was administered to HSCPs via 'SurveyMonkey.' 3) Participants completed the online version of the questionnaire.

For all participants, the definition of home-care robots, combined with several pictures, was provided on the front page of the questionnaire, as follows: The term "home care robot" used in this survey is a general expression for devices and systems that perform functions such as monitoring of older people and their surroundings, and provision of support for older people and/or their caregivers (including communication that enables interactive conversation, assistance with activities of daily living or managing medications).

2.5. Data Analysis

Following data collection, data was downloaded from Survey Monkey® in an Excel format then imported into the Statistical Package for the Social Sciences (SPSS Version 19.0). Quantitative survey data was analysed using SPSS statistical software to produce descriptive and bivariate results. Chi square test was employed for the analysis.

2.6. Ethical approval

Ethical approval for the Irish study was granted by the University College Dublin's Human Research Ethics Committee – Humanities (HS-18-81-Kodate) on the 25th October, 2018. The information sheet was inserted in the questionnaire envelope or for the online survey it was included in the questionnaire. The sheet explained the purpose of the study, possible benefits to science and society, and the voluntary nature of participation.

3. Results

3.1. Familiarity and willingness to use home-care robots

As predicted, 43.8 % (n=78) of 178 respondents answered that they have never seen a robot, and 20.2 % (n=36) have not really seen one in the past. When it comes to use of robots, 144 (80.9 %) respondents answered that they have never used robots. While the majority of the respondents were not familiar with robots, 125 (70.2%) stated that they are 'open to the use of home-care robots' (Figure 1). Hypothesis 1 was negated by the fact the majority of the respondents in Ireland answered that they are willing to use home-care robots.

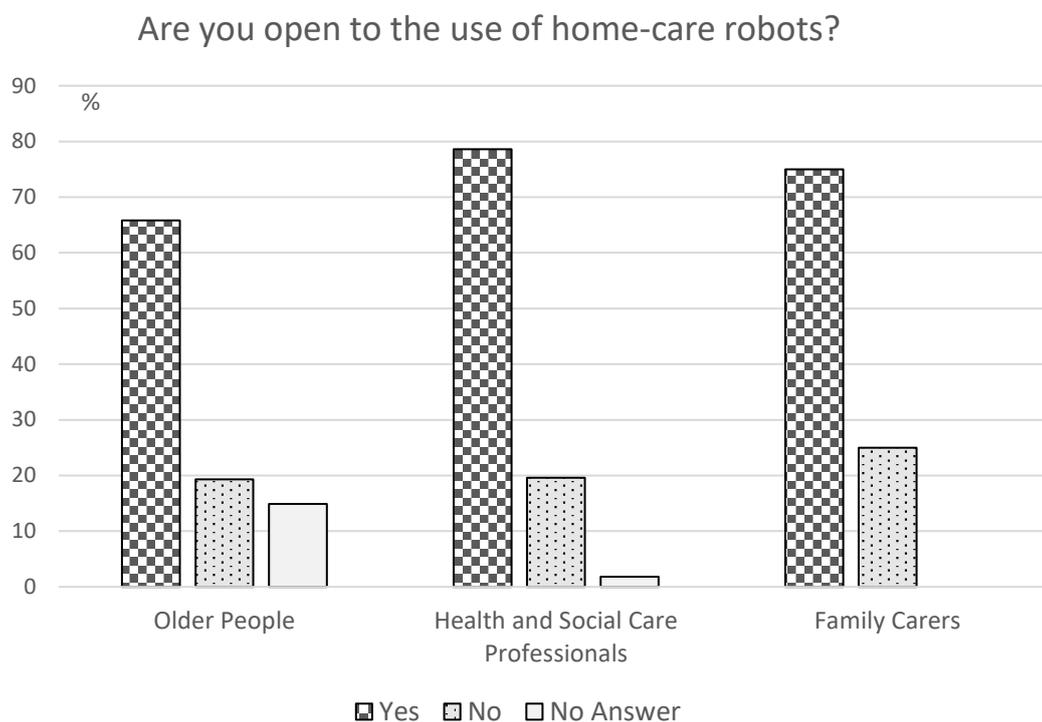


Fig 1. Openness to the use of home-care robots by category (older people, health and social care professionals, and family carers, N=178)

Although there was a drop in the support among the group of older people, compared with the other two, there was no statistically significant difference among the three groups.

Those familiar with robot-related cartoons would be more willing to use home-care robots. 96 respondents (54 %) answered that they have never or not really seen “an animation/manga in which a robot appeared”. On the other hand, 70 respondents (39.3 %) stated that they have seen or somewhat seen it before.

There was a statistically significant difference between OP on one hand and HSCPs and FC. While only 30 % of the OP group have seen such an animation/manga, almost 60 % of both HSCP and FC groups have seen one.

Examining the difference between those who have seen “an animation/manga in which a robot appeared”, and those who have not, there was more openness among the former group to the use of home-care

robots. The difference was statistically significant ($\chi^2 = 11.91$, $df = 4$, $p = .018$)

This difference, however, did not influence people's attitudes towards the use of home-care robots for their family or themselves. Comparing the answers for the following two questions "would you like to use a home-care robot at home when providing care for your family?" and "would you like to use a home-care robot at home when receiving care yourself?", the respondents who have not seen a robot-themed animation/manga were more cautious towards the use of home-care robots for their family. 62.5 % (60 out of 96) were open to the use of such robots for themselves, while 53.1 % (51 out of 96) were open if such robots were used for their family.

On the other hand, among the people who have seen a robot-themed animation/manga, almost an identical proportion (68.6 %, 48 out of 70; and 65.4 %, 46 out of 70) responded that they were open to the use of home-care robots for themselves and their family. It appears that the familiarity with robots, among this cohort, have positive impact on people's attitudes and perceptions towards them.

3.2. Personal profiles and willingness to use home-care robots

This questionnaire did not yield similar results. There was no gender difference between males and females, as nearly 70 % of both groups returned positive results to the question: whether they are open to the use of home-care robots (men: 69%, 29 out of 42; women: 72.4%, 89 out of 123) . 13 out of 178 did not reveal their gender.

In terms of news about robots, the majority of men and women (men: 76.2%, 32 out of 42; women: 74.8%, 92 out of 123) equally expressed interest.

Concerning the use of technologies in other areas, 97.6 % of men and women use mobile phones. A higher ratio of users were found among women, when it comes to Email (male: 78.6%, 33 out of 42; female: 84.6%, 104 out of 123), and Internet (male: 85.7%, 36 out of 42; female: 88.6%, 109 out of 123).

This study found that people living in larger, urban cities are slightly more open to the use of robots than those living in rural areas. Although more people living and working in Dublin provided positive answers but the difference between the two groups was not statistically significant.

Among OP (n=114), we examined whether their living arrangements have any correlations with their openness to use home-care robots.

In terms of living arrangements, whether or not people have someone to rely on in need of help, and whether people plan to continue living in their community had no correlation with the willingness of use home-care robots. 85.1 % (97 out of 114) answered that they would like to continue living in the community ('ageing in place'). Only 23 OP stated that they have someone to rely on in need of help, living close-by, but the fact that many do not have anyone did not increase older people's willingness to use home-care robots.

Forty-four out of 114 respondents (38.6%) are living with someone who is also 65 years old or older, and 58 (50.9%) are not living with another older person(s) (12 did not answer). The results show that when they are living with another older adult, they are likelier to say yes to the use of home-care robot, which was statistically significant ($\chi^2 = 51.28$, $df = 4$, $p = .000$). Hypothesis 2 was partly upheld by the findings.

3.3. Occupation and care duties

It was hypothesised (Hypothesis 3) that people who provide care in their private capacity and those who do not would have different perceptions and attitudes towards home-care robots. Since it is possible for OP and HSCPs to provide care in their private capacity, a separate question ("Do you provide care (in your private capacity as well)?") was posed. 38 respondents out of 170 belonged to that category of carers.

While there was no difference between carers (n=38) and non-carers (n=140) in their openness to the use of home-care robots, carers' attitudes towards the use of home-care robots for their family members were

significantly more open than non-carers (Figure 2).

76.3 % (29 out of 38) of carers stated that they are open to the use of home-care robots for their family members, whilst only half (51.4%, 72 out of 140) of those who are currently not providing care in their private capacity answered positively. On the other hand, when it comes to the use of such robots for themselves, there was no difference between the two groups. The fact that nearly 20 % of the respondents who do not provide care left a blank answer indicates a sense of reservation.

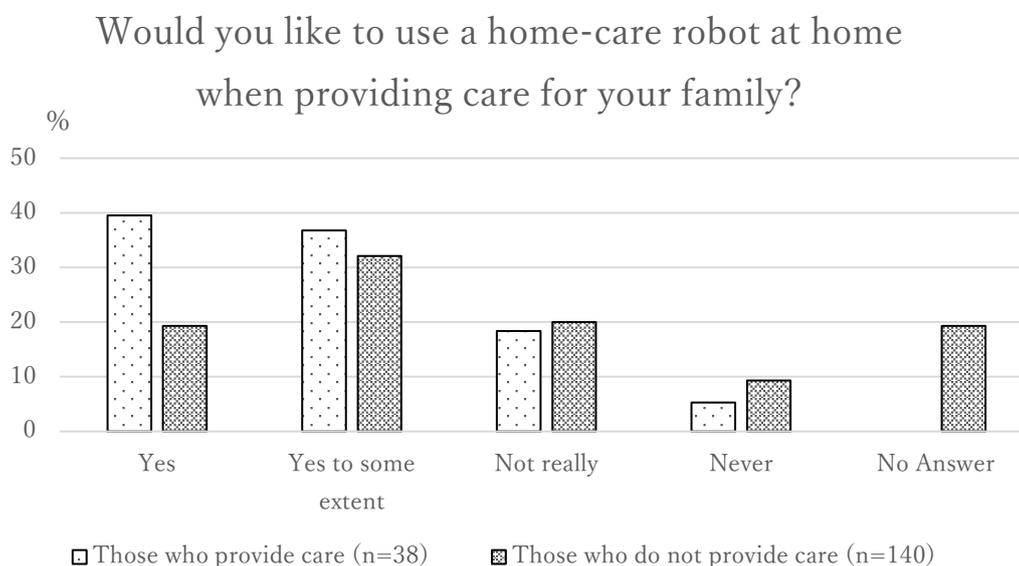


Figure 2. Willingness to use home-care robots for family members: those who provide care and those who do not (N=178).

Furthermore, the questions were asked regarding the items that respondents consider as important in their decision around home-care robots (Table 2).

Table 2. Items regarded as important in decision-making around the use of home-care robots

- | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> A. Convenience (e.g. ease of use) B. Entertainment value (e.g. fun to use) C. Economic efficiency (e.g. low running cost) D. Safety (e.g. warranty, after-service) |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

- E. High performance & capability Confidentiality (e.g. privacy protection)
- F. Social credibility (e.g. HSE-accredited)
- G. Durability (e.g. resistant to breaking, upgradable)
- H. Size
- I. Design (e.g. appearance, colour, shape, materials)
- J. Popularity & reputation
- K. Opinions of people close to you
- L. Information & instructions (e.g. special features, users' manual)
- M. Law & regulation (e.g. responsibility in case of accidents)
- N. Capacity to increase mental and physical wellbeing and comfort
- O. Guarantee of entitlement to receiving human care, irrespective of the use of home-care robots

Out of the above, those who provide care place a greater emphasis on “Guarantee of entitlement to receiving human care, irrespective of the use of home-care robots”, “Size”, and “Law and regulation”, compared with those who do not provide care. Those who do not currently provide care consider “Popularity and reputation” to be more important than the group of carers. These findings indicate that carers see the possibility of using home-care robots favourably, while they show some cautionary attitude, looking for warranty of safety protection and human care.

Lastly the two groups (OP and HSCPs, N=170) were compared. Amongst HSCP, 69.6 % (39 out of 56) answered that they would like to use a home-care robot at home when providing care for their family. On the other hand, just under half of OP (48.2%, 55 out of 114) were willing to use a home-care robot for their family. The difference was statistically significant ($\chi^2 = 11.19$, $df = 2$, $p = .004$).

There were two other sets of questions asked of the participants. A four-point scale (strongly agree, somewhat agree, somewhat disagree, and strongly disagree) was used.

Fifteen subsets of questions were asked in response to “views on decision-making and privacy protection in the use of home care robots”.

With the exception of one statement (“The user should decide whether to use a home care robot”), statistically different results were found between the two groups (OP and HSCPs). Higher levels of agreement with these statements were associated with HSCPs. A very high proportion of both groups (OP: 69.3%, 79 out of 114; HSCPs: 76.8%, 43 out of 56) stated that they “want to help other people and society by participating in the research and development of home-care robots”.

The second set of questions (“To what extent do you think it would be useful for home-care robots to provide the types of support?”) listed 15 functions (Table 3). Similarly, a four-point scale (absolutely desirable, somewhat desirable, somewhat unessential, and not at all essential) was employed.

Table 3. Functions expected of home-care robots

- | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none">(1) Notifying family members and support personnel when an unexpected change occurs in an older person(2) Informing an older person of the things he/she should be doing at the scheduled time or date (for example, take medications)(3) Providing support for the movements/mobility that older people regularly carry out in their daily lives(4) Accompanying an older person on outings, from the time he/she departs until the time he/she returns home(5) Observing and recording matters that affect the mental and physical condition of an older person(6) Observing and recording dementia-related symptoms(7) Observing and recording the status of an older person at night(8) Confirming that an older person has taken his/her medication as prescribed by a physician(9) Conversing with an older person about his/her concerns and providing companionship(10) Informing family members and support personnel of an older person's concerns(11) Taking care of pets (e.g. feeding, cleaning litter boxes)(12) Notifying the older person as well as family members and support personnel about food that has expired(13) Detecting obstacles on the floor to prevent falls |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

- | |
|------------------------------------------------------------------------------------------------------|
| (14) Notifying family members or support personnel of a home intrusion by a suspicious individual(s) |
| (15) Implementing cognitive function training (e.g. brain training) |

As Figure 3 shows, ratings given by HSCPs were higher for all the listed functions. (OP: 72.9±7.5, HSCP: 86.2±8.9).

To what extent do you think it would be desirable for home care robots to provide the types of support?

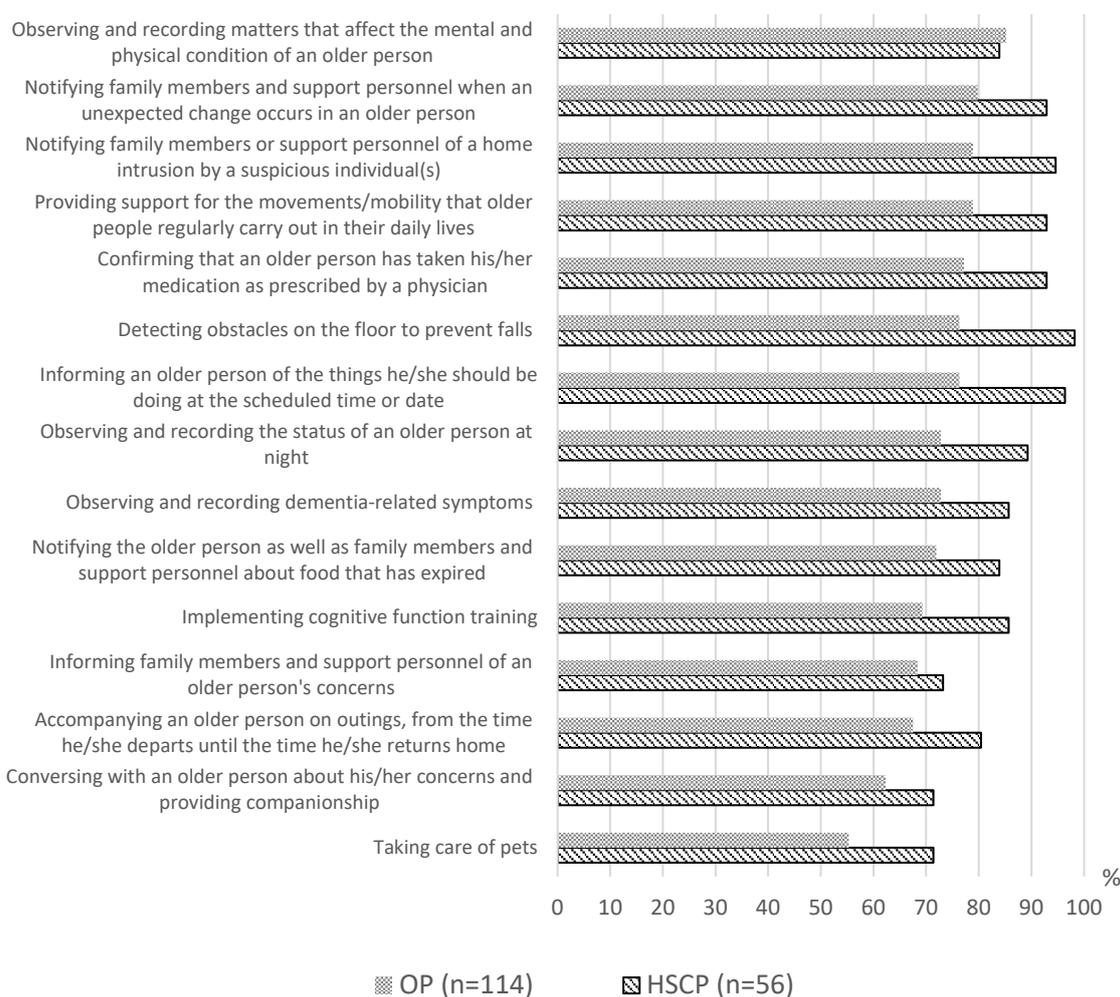


Figure. 3. The proportion of Older People (OP) & Health and Social Care Professionals (HSCPs) who answered 'absolutely desirable' and 'somewhat desirable' for the listed functions of home-care robots (N=170).

As Figure 3 shows, more than 90 % of the HSCP group provided positive answers for the six items. These are: “Detecting obstacles on the floor to prevent falls”, “Informing an older person of the things he/she should be doing at the scheduled time or date”, “Notifying family members and support personnel when an unexpected change occurs in an older person”, “Confirming that an older person has taken his/her medication as prescribed by a physician”, “Providing support for the movements/mobility that older people regularly carry out in their daily lives”, and “Notifying family members and support personnel when an unexpected change occurs in an older person”.

On the other hand, the top three items highly rated by OP were “Observing and recording matters that affect the mental and physical condition of an older person”, “Notifying family members or support personnel of a home intrusion by a suspicious individual(s)” and “Notifying family members and support personnel when an unexpected change occurs in an older person”. The only item that received a higher proportion of positive answers than HSCPs was “Observing and recording matters that affect the mental and physical condition of an older person”. Observing and recoding mental and physical condition by robots is deemed desirable by both Older People and HSCPs in equal measure. While Hypothesis 3 was strongly supported by the findings, the reasons behind these differences in preferred functions of home-care robots need further research.

4. Discussion

The results are broadly in line with the previous studies, however far more positive attitudes towards home-care robots were found amongst the participants of this study. The Eurobarometer results (European Commission, 2017) showed less than 30 per cent of the respondents were comfortable with robots providing them services. In sharp contrast to this, a positive attitude was particularly found in the way our study’s respondents showed their willingness to take part in research and development of such robots. Familiarity with such devices or users’ gender and living arrangements did not have a significant influence over their attitudes towards the use of home-care robots. Interestingly, the people who have seen a robot-themed

animation/manga show more willingness to use home-care robots for both themselves and their family.

With regard to living arrangements and people's wish for ageing in place, the willingness to use a home-care robot did not have strong correlation with whether or not they would like to continue living in the community or if they have someone to rely on for help at the moment. However this only reflects the fact that the majority of respondents expressed generally positive views. In addition, ageing in place is still a preferred option for many in this study.

Respondents were unanimous in recognising the value of home-care robots. However, positive attitudes and a greater level of interest appear to be associated with people's status as a carer, both in private and professional capacity. The results can be interpreted by their need for support and assistance in care delivery, partly created by chronic underfunding in the care sector in Ireland. There were clear differences between the groups, particularly OP and HSCPs. People with care duties in their private life, and those without, show differences in their attitudes towards home-care robots.

While it is beyond the scope of our study to explain the reasons behind these differences, it can be safely argued that HSCPs were keener to see some of practical functions (e.g. fall prevention, medication reminder, mobility support, emergency alert) materialised in home-care robots. Their positive attitudes can be partially understood by high levels of need for care support in the current care settings, both in care facilities and communities.

While there was generally a positive perception of the use of home-care robots among Irish HSCPs, respondents were less open when usage related directly to them, or their family members. Cautious attitudes were also evident in the areas of decision-making and privacy. Respondents placed significant importance on entitlement to human care regardless of the usage of home-care robots and recognised the potential of robots to increase mental and physical well-being.

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In addition, Irish HSCP's attitudes to home-care robots appear strongly influenced by their ethical positioning (Suwa et al., 2020). However, in order to validate this, issues of autonomy and control and professional identity of care professionals need to be examined further (Share & Pender, 2018).

The results have many implications for different stakeholders. For policymakers, robot manufacturers and researchers, stronger engagement with users (older people, family carers and care professionals) should be sought by way of needs analysis, co-design and co-production. There is greater curiosity about the use of home-care robots than anticipated, and for professional associations, there should be more open discussions about ethics, regulation of risks, and safeguarding of dignity as well as potential merits of using assistive technologies such as home-care robots.

4.1. Limitations

Although the study unearthed new and significant findings, the study had some limitations. The majority of respondents had little or no exposure to and familiarity with care/animal/humanoid/cleaning robot suggesting responses are based on attitudes rather than direct experience. Several respondents did not complete the questionnaire, as some of the questions were foreign to them. As a result, the study relied on a relatively small number of participants, particularly family carers. Other methods such as focus groups and interviews could have provided a better forum for visually demonstrating existing home-care robots and explaining what they currently can and cannot do.

5. Conclusions

This was the very first country-wide questionnaire survey in Ireland, targeting potential users of home-care robots. By discovering great interest in and willingness to take part in the use and development of home-care robots, the study underscored the potential for developing a more comprehensive integrated care with the aid of assistive technologies such as home-care robots. On the flipside of this general enthusiasm, the results can be interpreted in a different way. In Ireland, there may be great need for better understanding of under-resourced care in the community and

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insufficiently developed policy towards integrated health and social care.

However, moving beyond the dichotomy of human care and technology-based care, practitioners need to develop an informed and critical orientation towards emergent technologies, so that they can be part of the social shaping of technology (MacKenzie and Wajcman 1985) rather than being socially determined by it (Share & Pender, 2018). The technology could be better utilised in supporting living and ageing at home by developing national framework models which include service process models combined with general framework of technology. Social and health care professionals, users and other stakeholders should be given an opportunity to participate in the research and development process. (Lahteenmaki & al. 2020)

This field of enquiry will become of more importance and of broader interest for all those involved in the education of health and social care professions in the years to come. It would appear therefore, there is a need to establish educational and CPD supports for HSCPs and to develop pedagogical approaches in the areas of homecare and social care robots.

Furthermore, more research needs to be conducted for developing a better strategy for co-designing and co-producing assistive technologies which could enhance the quality of care and life for older people and carers in the future (Robinson, MacDonald and Broadbent, 2014).

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