Ethical Concerns of the General Public regarding the Use of Robots for Older Adults

Esther Ruf[a], Stephanie Lehmann[b] and Sabina Misoch[c]

Institute for Ageing Research, OST Eastern Switzerland University of Applied Sciences, Rosenbergstrasse 59, St. Gallen, Switzerland

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Abstract: Due to demographic change the proportion of older adults in the population is increasing, which means that the proportion of people with limitations making it difficult to live independently at home or in institutions is also increasing. As a nursing shortage is evident today and expected to increase in the coming years, several strategies are needed to address these challenges. One possibility is the use of robots to support older adults and their caregivers. Taking ethical considerations into account is an essential task. Agreement with ethical concerns identified in the literature was surveyed in a Swiss sample. The participants expressed their agreement with seven predetermined items but to varying degrees. Possible reduced human contact or problems with sensitive data received the most agreement. Nearly half of the respondents expressed no concerns about job loss or violation of privacy. Additional concerns that the older adults would be deceived, their self-determination compromised, or their dignity violated received less agreement. Further ethical considerations for future studies are discussed.

1 INTRODUCTION

As demographic change is evident in Europe due to low birth rates and increased life expectancy (Eatock, 2019), especially in industrialized countries the proportion of older adults is growing (Vaupel, 2000). Within a few decades, the proportion of people aged 65 or older is expected to rise from 19.4 % in 2017 to 28.5 % in 2050 in the European Union (EU) (Bundeszentrale für politische Bildung, 2018). In 30 years, more than a quarter of the population will be over 65 years and thus in most European countries in retirement age. Although life expectancy after retirement differs in EU-countries, it is on average 21 years for women and nearly 17 years for men (European Data Journalism Network, 2020). With this increased number of years of life, the number of years with limitations such as infirmities also increases (Hautzinger and Reimer, 2007) and independence in activities of daily living (ADL) decreases (Eurostat, 2019), leading to an increase in the need for care (Statista, 2020). Currently, a

shortage of nursing staff has been acknowledged (Die Presse, 2019), which will increase in the coming years. Further, in the inpatient geriatric sector staff shortages, time pressure and a high workload are evident today (Baisch, Kolling, Rühl, Klein, Pantel, Oswald and Knopf, 2018). Different strategies are needed to respond to these developments, and one possibility is seen in using robots to support older adults and their caregivers.

Different types of robots are being developed for use with older adults. These can be divided for example into rehabilitation robots and socially assistive robots with the subcategories service and companion robots (Broekens, Heerink and Rosendal, 2009, p. 94). Robotic systems are developed for older adults in various settings and for different tasks: at home or in retirement and nursing homes, to support activities of daily living (ADL), to maintain independence and well-being, and to provide entertainment (Graf, Heyer, Klein and Wallhoff, 2013; Lehoux and Grimard, 2018; Ray, Mondada and Siegwart, 2008; Stahl and Coeckelbergh, 2016; Wu,

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[a] https://orcid.org/0000-0002-0520-9538

[b] https://orcid.org/0000-0002-1086-3075

[c] https://orcid.org/0000-0003-0791-4991

Wrobel, Cornuet, Kerhervé, Damnée and Rigaud, 2014). Nursing staff in outpatient and inpatient settings can be relieved by robotic systems by reducing remote and routine activities and physically demanding tasks (Becker, Scheermesser, Früh, Treusch, Auerbach, Hüppi and Meier, 2013). Relatives could benefit, knowing their relatives in need of care are entertained and comfortable (Moyle et al., 2019). This shows that motives for and goals of robot use can differ. In their review, Vandemeulenbroucke, Dierckx de Casterlé and Gastmans (2018) summarize that many studies have examined how robots can be used for older adults, how effective they are, what factors influence acceptance, and attitudes toward socially assistive robots.

The high-tech-strategy of the federal government of Germany states that possibilities of robotic solutions should be exploited, but at the same time, challenges should not be overlooked (BMBF, 2015). A mere orientation towards the needs of different groups is not enough; research and innovation should also be steered in directions desired by end users and society (Kehl, 2018).

In addition to technical functionality, social acceptance is crucial for the diffusion of robots. The ethical discussion as well as legal and social implications play a decisive role (Radic and Vosen, 2020; Remmers, 2020). With increasing technical development and the use of robotic systems for older adults, there are not only advantages but also disadvantages (Lehoux and Grimard, 2018), which particularly raise ethical questions.

Therefore, in addition to questions of usability and acceptance, the discussion of various ethical aspects is essential and is being conducted intensively (Körtner, 2016; Misselhorn, Pompe and Stapleton, 2013; Portacolone, Halpern, Luxenberg, Harrison and Covinsky, 2020).

One factor to be considered is that older adults may be a vulnerable group in need of support due to potential cognitive and physical limitations. The German Ethics Council (2020) emphasizes "robotics should fundamentally represent a complementary and not a substitutive element of care, which must always be embedded in a personal relationship" (p.13).

In principle, basic biomedical ethical values (Beauchamp and Childress 2009, from Körtner, 2016) such as protection from harm, care, self-determination, and justice must also be applied to the use of robots for older adults. Additional aspects such as digital ethics which translates existing ethical standards need to be systematically considered (BVDW, 2019). With increasing digitization,

recording, and storing data is possible with robots. As the data collected from older and/or vulnerable adults is particularly sensitive, it must be protected from unauthorized access. Only necessary data on the person in need or on the supporting person should be collected. Already today, robots must comply with data protection regulations and are not allowed to collect and disseminate data without informed consent (EGE, 2018, p. 22).

In a systematic review for argument-based ethics publications, it was shown that two different forms of the ethical debate on care robots use in aged care exist: an ethical assessment of or an ethical reflection about care robots (Vandemeulebroucke et al., 2018).

From the point of view of older adults, concerns could be that they could experience reduced social and emotional support using robots and could be subjected to intrusions on their privacy, as well as being deceived and infantilized. The point of view of professional caregivers could include a change in their work towards less relationship-oriented care, and that the preferred financing of robotic systems is at the expense of improvements in personnel (instead of higher remuneration, lower work density, general upgrading of the nursing profession) (German Ethics Council, 2020). According to Yew (2020), ethical challenges in the use of robots in care concern the extent of care provided by robots, the possibility of deception of vulnerable individuals, (over)trust and (over)commitment to robots, the lack of informed consent, and the potential violation of user privacy.

There is a broad theoretical discussion of the ethical points with different emphases depending on the subject area or focus on user groups. To obtain an initial indication of whether the ethical concerns regarding the use of robots in the care and support of older adults that have been frequently mentioned in the theoretical literature are also considered important by the population, a survey study was conducted.

2 METHOD

2.1 Recording Ethical Concerns

Data on general ethical concerns were collected as part of a broad survey on attitudes, wishes and concerns of Swiss people regarding robot use for older adults, with a robot acceptance questionnaire self-developed in 2018. Regarding ethical aspects, seven items were created that cover the most frequently mentioned ethical topics in literature regarding robot use and older adults (Körtner, 2016; Sharkey and Sharkey, 2012; Sorell and Draper, 2014;

Vandemeulebroucke et al., 2018): (I) deception, (II) violation of dignity, (III) restriction of self-determination, (IV) reduced human contact, (V) violation of privacy, (VI) problems with sensitive data, (VII) job loss.

Data were collected via an online and a paper questionnaire between January 2019 and December 2020. Participants were asked: "If robots are used to assist in care or service activities with the older adults, I would have concerns that..." and had to indicate their agreement on a six-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = somewhat agree, 5 = agree, 6 = strongly agree). For a detailed description of the overall study, the entire survey, the item selection process, the recruitment procedure, and the pretest see Lehmann, Ruf and Misoch (2020).

2.2 Analysis

In this paper, the results for the seven ethical concern items are reported. For data analysis IBM SPSS 26 was used. Before analysing data, cases with more than 70 % missings were deleted. Consent to ethical concerns is shown descriptively (n for sample size, % for frequencies, M for mean value, SD for standard deviation), according to the scale level. To determine agreement or disagreement with a given ethical concern, the answers "strongly disagree" (1), "disagree" (2) and "somewhat disagree" (3) were taken together to calculate disagreement, the answers "somewhat agree" (4), "agree" (5), strongly agree" (6) were taken together to calculate agreement. To analyse differences between two groups regarding ethical concerns, t-tests were calculated. When comparing more than one group, one-way analysis of variance (ANOVA) was calculated.

2.3 Participants

Until December 2020, 188 persons participated, most of them used the online version of the questionnaire. The participants were between 17 and 96 years old (M = 65,7, SD = 16,7). More women participated (57,6 %), most were married or living with a partner (64,5 %) and Swiss (89,4 %). 65,8 % had tertiary education. Most participants lived in a private household (96,8 %) consisting of two people (53,7 %). They lived in 14 different cantons, in St.Gallen (28,2 %), Aargau (20,7 %) and Zurich (18,1 %), 50,3 % rated their residential area as rather rural. 81,8 % rated themselves as interested or very interested in technology. 59,7 % had collected more experience with technology during their life and 41,6 % had

already experience with a robot. Table 1 shows the characteristics of the study population.

Table 1: Participants.

Variable (n = number)	
Gender (n = 184)	57,6 % female 42,4 % male
Marital status (n = 183)	64,5 % married or living with a partner 13,1 % single 12,6 % widowed 9,8 % divorced or living without a partner
Nationality (n = 179)	89,4 % Swiss 10,6 % other
Education level (n = 184)	65,8 % tertiary level 24,5 % secondary level 9,2 % mandatory school 0,5 % unknown
Occupational field (current or former) (n = 187)	44,9 % other field 31,6 % social, nursing, or medical field 22,5 % technical field 1,1 % not working
Type of living (n = 185)	96,8 % private household 1,6 % care home 1,1 % other 0,5 % retirement home
Residential area (n = 183)	50,3 % rather rural 49,7 % rather urban
Interest in technology (n = 187)	52,4 % yes, interested 29,4 % yes, very interested 14,4 % no, rather less interested 3,7 % no, not at all interested
Experience with technology (n = 186)	59,7 % yes 40,3 % no
Experience with a robot (n = 183)	54,6 % no 15,8 % yes, somewhere else 11,5 % yes, at work 7,7 % yes, at a shop, hotel, restaurant 6,6 % yes, at home 3,8 % don't know

3 RESULTS

The study population expressed their agreement with all seven predetermined factors regarding the use of robots with older adults, but to varying degrees (figure 1). Agreement with concerns regarding deception, dignity of older adults, restricted self-determination, violation of privacy and job loss were expressed by fewer than 50 % of the study population.

76,5 % reported the concern that older adults could have reduced human contact. 60,4 % reported the concern that the handling of personal or sensitive data could cause problems. The strength of agreement varied (table 2).
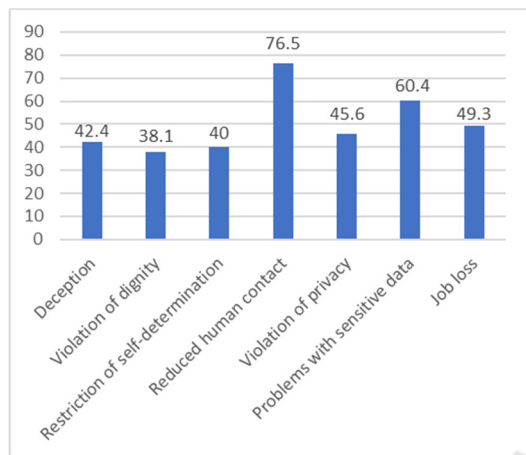

Figure 1: Frequencies of ethical concerns of the study population.

Table 2: Reported ethical concerns.

	Number	Mean	Standard deviation
(I) Deception	179	3,3	1,3
(II) Violation of dignity	184	3,2	1,4
(III) Restriction of self-determination	182	3,2	1,4
(IV) Reduced human contact	183	4,4	1,4
(V) Violation of privacy	184	3,5	1,5
(VI) Problems with sensitive data	182	4,0	1,4
(VII) Job loss	185	3,6	1,6

Comparing male and female participants there was no significant difference in ethical concerns. When comparing age-groups (oneway ANOVA with three age groups: up to 65 years (N = 65), 66-74 years (N = 63), from 75 years (N = 56)), no statistically significant differences in means of ethical concerns could be shown, as well as when comparing participants with and without interest in technology, and when comparing participants with and without technology experience, or when comparing participants from different professional backgrounds (oneway ANOVA with four groups: technical field (N = 42), social field (N = 59), other field (N = 84), not working (N = 2)).

Regarding participants with and without previous contact with robots, only the ethical concern "reduced human contact" was significant. Persons with no prior contact had more concerns that older adults would have reduced human contact when robots are used to support care or service activities for older adults (table 3).

Table 3: Ethical concerns by participants with and without prior contact with a robot.

	No prior contact	Prior contact	t-test
I	M = 3,4 (SD = 1,2; n = 99)	M = 3,3 (SD = 1,4; n = 76)	$t(144,788) = ,121$, $p = ,904$
II	M = 3,3 (SD = 1,4; n = 105)	M = 3,0 (SD = 1,4; n = 75)	$t(178) = 1,271$, $p = ,205$
III	M = 3,3 (SD = 1,5; n = 103)	M = 3,1 (SD = 1,4; n = 75)	$t(176) = ,912$, $p = ,363$
IV	M = 4,6 (SD = 1,3; n = 103)	M = 4,1 (SD = 1,4; n = 76)	$t(177) = 2,271$, $p = ,024$
V	M = 3,6 (SD = 1,4; n = 105)	M = 3,3 (SD = 1,6; n = 75)	$t(178) = 1,298$, $p = ,196$
VI	M = 4,0 (SD = 1,3; n = 103)	M = 4,1 (SD = 1,4; n = 75)	$t(176) = -,228$, $p = ,820$
VII	M = 3,8 (SD = 1,4; n = 106)	M = 3,4 (SD = 1,7; n = 75)	$t(179) = 1,744$, $p = ,083$

4 DISCUSSION

In the present study, ethical concerns of the Swiss population concerning the use of robots for older adults were collected based on the main ethical issues discussed in literature. Ethical concerns with the highest agreement were reduced human contact and problems with sensitive data. Nearly half of the respondents also agreed to concerns about workers losing their jobs and violation of privacy. Other expressed agreements were concerns that older adults would be deceived, their self-determination compromised, and their dignity violated. However, this means conversely that for five of the seven questions, the respondents were ambivalent, with 51−62 % of respondents not agreeing that these issues were of ethical concern.

Arras and Cerqui (2005) reported that individuals with more prior knowledge had a more positive attitude toward robots. In the present study, when

comparing the agreement to ethical concerns by participants with and without prior contact with a robot it seems that real-world contact with robots lessens the concerns that robot use might reduce human contact.

The focus of the present study was intentionally on the general population's viewpoint. The main ethical points to be assessed were taken from the literature and theoretical discussions. In doing so, the results fit with Ray et al. (2008) who found the lack of interpersonal relationships as negative aspects in their questionnaire survey (N = 240, 6 % over 65 years). However, it must be considered that there can be discrepancies between ethical concerns raised in theory, and those of end users in practice when they must decide to use or buy a robot. For example, in their study, Bradwell, Winnington, Thill and Jones (2020) asked 67 young adults (M = 28 years, SD = 10,99, range 18 – 65) about their concerns after interacting with four companion robots. When surveyed with an open-end question, the majority (60 %) reported having no ethical concerns, reduced human contact was the most likely. However, this was not evident in the standardised question. The (younger) participants in the study of Bradwell et al. (2020) were more concerned about economic issues and equality of access, as this is an important consideration for those involved in the care of older adults. The concerns proposed by ethicists seemed not to be a barrier to use robots.

Such studies are very important to be able to make a comparison between what is mentioned as a concern from a theoretical ethical perspective and what the actual fears and concerns of the end users are. The implementation of a robot is more likely to be determined by the attitudes and concerns of end users, for example, care facility personnel, the older adults themselves, or their relatives who purchase a robot.

Some important limitations of the study must be mentioned. As shown by the sociodemographic data of the participants, the sample is composed of highly educated participants with a high interest in technology and therefore not representative of the general population. The fact that mainly well-educated and technology-oriented people participate in such studies is also known from other studies (Classen, Oswald, Doh, Kleinemas and Wahl, 2014; Kubiak, 2015; Mies, 2011; Stadelhofer, 2000). Further, since it was a questionnaire study the participants had to make their assessment globally, without being shown a concrete robot and without interacting with a robot. This could have influenced their judgement, and as people have different backgrounds and experiences, some could have relied on experience, others only on an internal picture (Savela, Turja and Oksanen, 2018). Therefore, it cannot be excluded that the assessments would be different if a concrete robot or a concrete interaction or decision had to be assessed. Another limitation was that there were no open-ended questions where people could formulate ethical concerns. Thus important areas beyond those mentioned may have been overlooked.

To stimulate societal discourse, important ethical concerns were identified. It became clear that not just theoretical ethical concerns, but actual concerns and fears of end users should be considered. For future research, it would be important to survey specific ethical concerns of individual user groups and specific settings or related to specific types of robots, and to raise these concerns more openly.

Since we noticed that some important issues are not yet considered, in future projects and studies we will include five more ethical concerns derived from discussions with researchers, lawyers, and caregivers: (1) robots could be hacked; (2) robots could hurt the older adults; (3) older adults could feel controlled; (4) caregivers could feel controlled; (5) older adults could be afraid of the robot. In addition, inequality in terms of financial possibilities should be considered. Interviewing end users will ensure that they have the opportunity to formulate and express their concerns freely.

Moreover, it is necessary to consider ethical aspects at the stage of programming and designing robots (Yew, 2020). The robot's potential actions and decisions must be based on a basic ethical framework and the robot must also learn ethical values through interaction with its environment. Ethical guidelines, standards and regulations specifically related to the design of robots and other artificial intelligent systems are available from the European Commission (2020).

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