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Searching for the elements of safe, meaningful, and valuable human-robot interaction (HRI) with elderly people

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Abstract

The purpose of this study was to learn how the elderly people perceive the Human-Robot Interaction (HRI) and if their impressions contain elements regarding safe, valuable, and meaningful life.

The theoretical part of the study takes a look at the demographic transformation that justifies the need of robotics research in the field of socially assistive robotics with the elderly people. The empiric part of this research benefits the data produced by the Wellbeing Enhancing Technology research team of Satakunta University of Applied Sciences. In their experiment elderly people were interacting with the humanoid robot Pepper and afterward filled a structure questionnaire about their impressions. First experiment was done in August 2018 and it was repeated in the modified format in June 2019 for the part of original sample.

The qualitative study brings forward the need of supplementary services to the elderly care. It also provides evidence on how the elderly people seem welcoming new types of services to support their life and that they could consider robots bringing added value to their experience of safe, valuable, and meaningful life. It was expressed that robot could be a social companion, but not only if there is not another human available, and it was expressed that to the neutral robot could be even easier to talk. In order to release the full potential of socially assistive robotics with elderly people, it would require paying attention to the fluent functionality of the robot, including in the environment with normal background sounds. If the robot does not work as intended, this may lead to the difficulty to maintain the interest in interaction with it, despite of the positive attitude of an elderly person.

Key words
Welfare Technology, Human-Robot Interaction (HRI), human dignity, elderly people

CONTENTS

1 INTRODUCTION

Due to ageing population, demographic, economic and human factors require active research in all fields. Demographic change and economic factors can be measured with the numeric figures, but an individual experience of quality of life can have a very subjective nature. This research is focusing to the interface between the societal needs and the human experience from the elderly point of view by examining a situation where elderly people are interacting with a humanoid robot.

It is possible that the welfare technology implementations being used can be seen useful for example from the service care provider's, elderly person's relative's or society's perspective (Hofmann 2013, 394). However, this study aims to understand how the elderly persons perceive the communication with the robot and if added value can be found from their perspective.

1.1 Safe, meaningful, and valuable in this study

An opportunity to inclusion and to influence how the services are developed must be given for the elderly people (Talentia Union of Social workers 2019, 17). Sparrow and Sparrow (2006, 158) have stated that, instead of seeing elderly people as a problem which needs to be solved, robotics should pursue to resolve issues which elderly people have.

The Social Welfare Act in Finland, § 30 states that the customer has a right to have a good quality social care and good treatment without discrimination and that his/her conviction and privacy are respected (L 1301/2014). Act on the Status and Rights of Social Welfare Clients, § 4 obliges the customers be treated in such a way that their dignity is not offended, and their faith, interest and privacy is respected. Their wishes, opinion, and individual needs must be considered when implementing social care. (L 2000/812.) The Constitutional

Law in Finland, § 7 stipulates that everyone has the right to personal freedom, integrity, and security and § 10 declares that everyone's privacy, honour and domestic privacy are protected. (L 1999/731.)

The point of view which constitutes the title of this study and research question is derived from the Finnish principles of long-term elderly care. These principles are described in the § 14 of Act on Supporting the Functional Capacity of the Older Population and on Social and Health Care Services for Older Persons (L 2012/980) in Finland. According to this article, the services must be adapted in terms of content and quantity to match the service needs of the elderly person. Second chapter of this article states that long-term health care and social services must be carried out in such a way that the elderly person can feel his/her life safe, meaningful and valuable, and that he/she can maintain social interaction and engage in meaningful activities which support and maintain well-being, health, and performance (L 2012/980).

The definitions for the terms "safe", "meaningful" and "valuable" are defined in a general level in this study and these terms are not adjusted on how the participants of this study understand these matters.

"Safe" refers to the state where threats and risks are or are intended to be controlled, or a feeling that they are under control (Finnish Terminology Centre TSK 2017). When considering safety from its reverse side, Uusihannu (2015 1, 45 - 46) describes insecurity among elderly people that still live at home as "*an individual emotional state that shakes one's inner well-being and life control causing fear, psychosomatic symptoms and anxiety*". This feeling may have various aspects, from physical safety to the psychological impact of darkness, but it can be caused because of individual feeling of vulnerability, their health condition, or their performance. Especially feeling of loneliness and weak social networks may increase the feeling of insecurity.

A word ”meaning” may simply refer to the word that what it means in language. In psychology and philosophy, the same word refers to how particular thing affects to the person (Honkela 2017, 67).

“Valuable” is understood via “value” and “human dignity” concepts. The concept of “value” can be a combination of individual values and values of society or between different actors in society or can represent one only one or some of these. Values are broader entities than prohibitions, commandments, laws, or guidelines. Values are subjective as opposed to objective knowledge and they can be ethical states or attitudes of ethical consciousness behind human activities on a conscious and unconscious level. (Finnish Terminology Centre TSK 2019a.) Human value is absolute value that each human has by default and that existence is valuable as such. Human dignity is inviolable and therefore must be a Finnish basic value (Finnish Terminology Centre TSK 2019b.) The articles 1, 6 and 7 of the Charter of Fundamental Rights of the European Union stipulates that human dignity is inviolable and it must be respected and protected, and everyone has the right to liberty and security of person. Everyone has the right to respect for his or her private and family life, home and communications. According to article 25, the Union recognises and respects the rights of the elderly to lead a life of dignity and independence and to participate in social and cultural life. (European Union 2016.)

1.2 Structure of the study

The most relevant basic concepts regarding this study - regulatory and ethical principles, societal need for robotics usage and Human - Robot Interaction (HRI) are explained in the theoretical part. The empiric part of this qualitative study relies on the data produced by the Wellbeing Enhancing Technology research team of Satakunta University of Applied Sciences (SAMK) in Finland. Available data is composed of video material and questionnaires which are collected from the Finnish elderly care home.

1.3 Pepper robot

The robot being used in this experiment was 120 cm tall humanoid robot called Pepper, produced by Softbank Robotics. According the manufacturer, Pepper is designed to interact with humans, and he has high level of acceptance for the users. Pepper can perceive the environment and it is able to discuss with people. “Pepper has:

- 20 degrees of freedom for natural and expressive movements;
- speech recognition;
- perception modules to recognize and interact with the person talking to him;
- touch sensors, LEDs and microphones for multimodal interactions;
- infrared sensors, bumpers, an inertial unit, 2D and 3D cameras, and sonars for omnidirectional and autonomous navigation;
- open and fully programmable platform.”

(SoftBank Robotics N.d.)

1.4 Research questions

The aim of this research is to find out if Human-Robot Interaction (HRI) can be observed on making increase or decrease to the individual experience of the added value which robotics aims to bring. The objective of this study is to observe the HRI situations on a general level and if connections to safety, meaningfulness and valuable experience can be found, but not to interpret participants’ expressions deeper on a personal level.

The main research question is:

- How the principles of safety, meaningfulness and valuable life are reflected in the elderly persons’ humanoid robot interaction situations?

Main research question is split to the following sub-questions:

- How do elderly people perceive the interaction with the humanoid robot Pepper?
- What do the elderly people's expressions communicate in the humanoid robot interaction situations?
- How does the elderly people's humanoid robot interaction change when the robot customises its functions based on identification of the interlocutor?

2 ROBOTS AS SOCIETAL ACTORS

Relationship between humans and robots is an actual topic in these days and the number or research is growing fast. On 2018 Google Scholar returned 29 000 hits with the search string “Human-Robot Interaction” (Bodenhagen et al. 2019, 198) whereas on early 2020 the same search returned 134 000 hits. This was just an indicative increase in the figures to get an impression of the research volume in this field. However, the viewpoint of prior Headmaster of Helsinki University Kari Raivio about research information in general is worth of mentioning in this context. He points out that Google Scholar faced some accusations of the poor-quality control regarding the published articles, but also that in the field of research the competition is merciless. Even if the publications are published in the most respected scientific magazines, it does not automatically guarantee the quality of the research, because the researchers are competing to be pioneers in their field. Consecutively this may sometimes lead to that the speed of research is prioritized in the cost of being scientifically accurate in the research. (Raivio 2019, 48, 50.)

2.1 Demographic and economic aspects

The shape of population pyramid has strongly changed in Finland, and statistical analysis shows that the progress will continue in the next decades. The Tilastokoulu of Statistics Finland has made an animation where the population pyramid has been in a shape of the pyramid in the beginning of the 20th century, but until 2060 the shape is forecasted to be the completely different. In the transition time of the decades, the population pyramid has no longer been a pyramid, but the shape has started to turn more round like an onion. When the forecast period in the animation ends, Tilastokoulu calls the new shape – justifiable, but also quite ominously - as an urn. (Statistics Finland n.d.)

The situation in Finland appears to be very similar in many other EU countries which is also confirmed based on the data form 28 EU member counties (Bodenhagen & al. 2019, 197; Eurostat 2019). According to Eurostat (2019), as result of ageing baby boomers, working age population, which means age range 15-64, is expected to narrow significantly. This happens when the number of 65 years old and above is increasing and especially the share of 85 years or up is growing particularly quickly. Life expectation is becoming longer and as result of that more that 60% of population are estimated to live until the age of 75 or higher. (The National Advisory Board on Social Welfare and Health Care Ethics ETENE 2008, 5.) According to Eurostat nearly 20% of the EU population was aged 65 or above on 2018, and by the year 2100 it is estimated that the share of people aged 80 years will be nearly 15% of the whole population (Eurostat 2019). Extended life expectancy of population has been identified as one of the biggest challenges in the 21st century (European Parliament 2017, chapter F). Despite of that lengthen lifetime can be seen positive change as such, it also requires that the way to cover the increasing health care costs must be found (Bodenhagen & al. 2019, 197). As example of welfare service needs, it is estimated that one third of 75 years olds need help in their daily life (Nivalainen & Volk 2002, 95).

As result of the demographic change, the economic dependency ratio in Finland and in many other European countries becomes weaker and there will be less people to do the required work (Tilastokeskus 2012; Bodenhagen 2019, 297). A concept called economic dependency ratio means the ratio of the number of employed persons to unemployed persons and persons in the inactive population. The inactive population includes all persons outside of the labour force containing children aged 0 to 14, students and pupils, conscripts and those in non-military service, pensioners and others in the inactive population. (Statistics Finland Findicator 2019.) At the same time, people who are working are producing the goods and services - in other words; the added value to the gross domestic product, that can be distributed to the whole population (Myrskylä 2012, 221).

In short, these are vicious trends, as at the same time when demand is growing, the number or people who are doing the work and budget that can be spent to the services are decreasing. Robotics has been proposed to be at least part of the solution to find sustainable balance to the above described situation. According to Bodenhagen et al. (2019, 198) there is a wide consensus among the experts in this field that in next 20 years, robotics will have significant role in the change of healthcare and welfare sectors and Rose Consortium in Finland calls increasing demand of welfare and health services as well as a rise of cognitive robotics as “revolutions” that are on-going at the same time (Rose Consortium n.d.).

However, it appears to be difficult to predict on how fast the structural changes happen and on 2016, it was estimated in Finland that one fifth of the work which was done at that time by the nurses and practical nurses could be carried out with the robots and automated applications in two or three years (Kangasniemi & Anderson 2016, 37). This estimation turned out to be too optimistic and later Anderson pointed out that the favourable attitude does not help if the practical measures remain low (Keränen 2019).

Some societal transformation due to robotics has already happened for example in Japan, which is one of the pioneer countries of the robotics. According to David, computer technologies are forecasted completely to wipe out some of the professions and replacing even half of all professions in short or midrange timeline. It appears that least riskiest occupations are such professions which require high creativity, dexterity, or social intelligence. (David 2017, 82–83.) Nevertheless, even if the machines cannot be creative, machines can still be used as a tool to express creativity and for example, even if the machines cannot compete with the artist, machines can be used as a new tool the create art. The strength of the creativity of machines is that computers can significantly expand humans’ capacity to solve the problems. (Honkela 2019, 193-198.)

It seems that in this era of robotics, job descriptions are transforming permanently (Haavisto, Tähtinen & Törmänen 2016, 89) and it is estimated that because of technologies, the humankind will evolve more in the next 30 years than how much development has happened during the last 300 years. (Limnéll & Iloniemi 2018, 151.) However, Raivio (2019, 23) reminds about the reality and that human and society's development cannot be seen as a linear grow but rather as a scrabbling and reiterations with "two steps forward and one step back".

When connecting economic factors and robotics as a contributor to the welfare services, Rose Consortium (2015) reminds about the structural risk of inequality which robotics may bring. This may happen, at least in two ways; if the new technologies are so expensive that all people cannot afford it, or if humane and personal touch will become so expensive that all people cannot afford it. (Kyrki et al. 2015, 7.) Regarding inequality that may increase among disadvantaged population in general level, Ohisalo (2018, 89) points out that poverty is not only lack of various resources, but it may also lead to the weak opportunities to use those slight resources that are available.

The question of robotic as being part of the society has been considered on a political level and in February 2017 European Parliament has adopted the Civil Law Rules on Robotics. These rules have been compiled by comprehensive range of reasons why the rules for robotics are needed and the need is justified with the social, economic, ethical, and demographical reasons. The Chapter O of these rules highlights that especially in the fields of human care and companionship the systems should be developed to consider and support the dignity, autonomy, and self-determination of the individual. (European Parliament 2017.)

2.2 Ethics and concerns regarding Artificial Intelligence and robotics

When innovating and implementing social-technical system, such as robotics solutions in practice to support elderly people, it is important to bear in mind a human behind the figures and true needs of the customer. Honkela (2017, 35, 61-62) reminds that social-technical systems should not be done only technology in the frontline, but development requires also deep understanding on how people and society work. Honkela highlights for example linguistic aspects which are automatically considered in humanities and social sciences, but linguistic side is not always noticed in engineering and natural science.

Without ethical and moral discussion in planning and implementing robotics use cases, a robot may function exactly as programmed and technically expected, but without ethical consideration, the result can be something undesired or even harmful. Therefore, it is crucial to gain evidence that the robot use cases are worth of trusting also in terms on social norms, such as ethics and laws. (Kuipers 2018, 86.) However, trust is not a straightforward matter in that sense that it also requires having enough judgement in which situation to trust and in when not to trust to the robot (Ollila 2019, 286).

Limnéll & Iloniemi (2018, 162) state that the discussion about the ethics of Artificial Intelligence (AI) is actually related to our own ethics and choices. Ollila (2019,17-19) reminds that it is a false conclusion that Artificial Intelligence is not good nor bad as such and these things depend on how AI is being used. Instead, human and technologies will compose together completely new system, where also the technology makes an impact to the people, and Ollila says that while developing new technologies, at the same time a new dimension for a human is being developed as well.

Even a human comprehension is not static as it is not given at birth, but it is built up via learning and experience. Therefore, also Artificial Intelligence requires further development via machine learning. (Honkela 2017, 32.) It is stated that the in future, at first place we do not have to think what is possible

to do with the machines and algorithms, but instead, what we will let the machines and algorithms do (Limnéll & Iloniemi 2018, 161). It the future scenarios regarding ethics, the future is only that far away than how we can imagine it being. However, sometimes discussion about ethics related to Artificial Intelligence can be more dramatic than necessary and a danger of AI can be exaggerated. (Ollila 2019 12, 25.)

One type of concern is a fear if the technologies and Artificial Intelligence, including robots as a practical implementation of AI, will start to rule the world and in the most ultimate case the fear is if the technical singularity happens. There are plenty of slightly different kind of definitions to singularity, but according to the online dictionary singularity means: "*A hypothetical moment in time when artificial intelligence and other technologies have become so advanced that humanity undergoes a dramatic and irreversible change"* (English Oxford Living Dictionaries 2018). According to the futurist and Google's Director of Engineering Ray Kurzweil, whose predictions have had 86% accuracy rate since 1990, the process of singularity has already begun and happens in the next 30 years and he also estimates that already on 2029 the computers will have human-level intelligence. (Reedy 2017).

More down-to-earth but still tremendous aspect is the data which is collected of the people in various situations. In terms of usage of robotics, this may mean sound or video data which is collected in the communication situations or even in the situations when the robot is present and happens to be online, even without specifically interacting in the situation. A prior consent should be required for using robotics with vulnerable people and the consent should be get from the person that is aided, not only from their relatives or caretakers (Nevejeans 2016, 22). The question of consent may concern also other people that live in the same house (Hofman 2012, 397). Inversely this means that there must also be a possibility to refuse of robotics care.

It is possible that a person interacting with a robot may have an illusion of relationship including mutual feelings and connection may develop between

human and a care robot. A person may for example feel empathy to a ‘pain’ that the robot ‘feels’ (Ollila 2019, 229- 234). European Parliament stresses that vulnerable groups, such as children, the elderly and people with disabilities should be protected be against the serious emotional or physical impact of the potential emotional attachment and it must made sure that the control about the technologies is always on humans. (European Parliament 2017, Chapter 3.) Attitudes and understanding of robots may still transform by the time, as in the past there have not been any creatures that remind living beings, despite that they are machines. The future generations that are to used see robot for example as a toys or companions, may have completely whole orientation to the robots. (Ollila 2019, 234, 249.)

2.3 Human – Robot Interaction (HRI)

Like the concept name suggests, Human- Robot Interaction (HRI) means interaction between human and robots and research work in this field aims for understanding, designing, and evaluating robotic systems for use by or with humans. This interaction may happen remotely in separate time and space, such as controlling Mars-rover remotely or the robot and human can be close to each other in the same space. Depending on the communication distance, these categories are called remote interaction and proximate interaction. (Humanrobotinteraction.org 2012a.)

According to Humanrobotinteraction.org, HRI research requires multidisciplinary contribution for example from the fields of cognitive science, engineering, mathematics, and computer science; and from human factors engineering and design (Humanrobotinteraction.org 2012b.) With good reasons, in these days this list should be amended at least with the welfare services related sciences, social sciences, legal and political considerations.

In terms of human-robot interaction, especially in the fields of health care and social services it is worth remembering that a human is not a standardized being in terms of the interaction with any other counterparts. Temperament

researcher Keltikangas- Järvinen (2019 20, 48) gives an example that for example a shy person might be shy only in the situations that are not familiar to them or with the people they do not know and with the people familiar to them they can very fluent and talkative. Being shy is part of person's temperament that can be defined as person's tendency to approach new and surprising situations.

2.4 Level of autonomy

Different levels of the autonomy that the robot is able to reach, with or without human intervention, are described with the Level of Autonomy (LOA) and about which Sheridan's division (Humanrobotinteraction.org 2012c) gives an example with the following scale:

1. Computer offers no assistance; human does it all.
2. Computer offers a complete set of action alternatives.
3. Computer narrows the selection down to a few choices.
4. Computer suggests a single action.
5. Computer executes that action if human approves.
6. Computer allows the human limited time to veto before automatic execution.
7. Computer executes automatically then necessarily informs the human.
8. Computer informs human after automatic execution only if human asks.
9. Computer informs human after automatic execution only if it decides to.
10. Computer decides everything and acts autonomously, ignoring the human.

(Sheridan 1978)

The following scale (Figure 1) illustrates different kind of elements in different types of HRI situations.

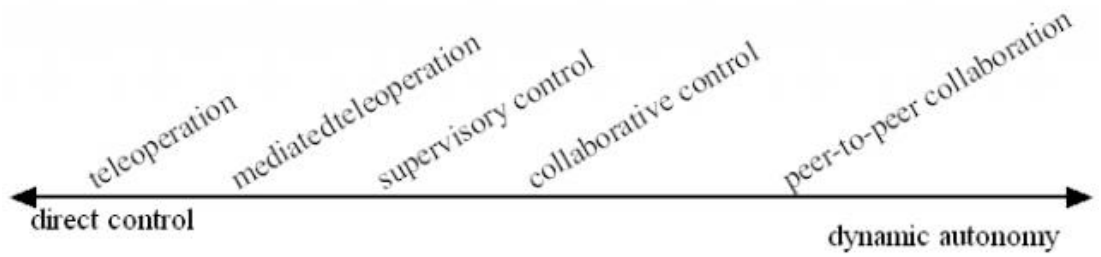

Figure 1. Levels of autonomy with emphasis on human interaction. Source: humanrobotinteraction.org/ autonomy

The nature of the challenges is very different in the outer boundaries of the scale above, and whereas on the side of direct control the challenge is related more on how to control the robot via teleoperation, when for the peer-to-peer collaboration, the challenge is rather on the robot's side how to make it interact naturally with a human. (Humanrobotinteraction.org 2012.c). Beer, Prakash, Mitzner & Rogers (2011, 14) describe the borders by using scale from zero to 100: If a teleoperated system is fully under control of a human (control level 100), the robot does not have control at all, whereas a robot that is able to operate and locate itself autonomously has a full autonomy then human intervention is zero. Due to social interaction it is more challenging for the robot to achieve peer-to-peer collaboration than a full autonomy (Humanrobotinteraction.org 2012c).

For the robot, limitations are more technical by their nature, but from the human point of view the obstacles are more psychological or prejudiced, and as a concept this is called acceptance.

2.5 Acceptance

By the dictionary a simple and common word 'acceptance' has various definitions, such as the action of consenting to receive or undertake something offered; the process or fact of being received as adequate, valid, or suitable; agreement with or belief in an idea or explanation and as a sub explanation of the latest one willingness to tolerate a difficult situation. (English Oxford Living Dictionaries 2019.) Once we move to the user acceptance in terms of robotics, the word turns to a concept and has even more dimensions.

Acceptance can be divided for three types, which are attitudinal, intentional, and behavioural acceptance. Attitudinal acceptance means how positively or confidently person thinks about the technology, intentional acceptance means the plans to use or act with the technology and behavioural acceptance means how person eventually acts or uses the technology. In terms of acceptance, important factors are, for example, the LOA, robots' social capability and how does the robot look like. In case the robot's capability does not meet user's expectations, it may make a negative impact to the acceptance, even if the robot is able to complete the tasks it is designed to in a reliable way. Beer et al. (2011 4–11, 16, 35.)

The physical appearance of robot has an important role in terms of how people are behaving towards to the robots and more human-like robots are usually treated more politely, but for example dog-looking robots are not treated in a similar way than to real pets. Depending on the appearance of a robot, some signs were found to confirm that the theory about social distances between human-human (for example what is the range how near usually people accept their friends or foreigners to come) can be applied to the human-robot interaction as well. (Walters et al. 2006 430, 437.) Sometimes people may think that lifeless, mechanical object can perceived to have a mind and it appears that positive attitude towards to the robots can increase the likeliness this to happen (Tanibe, Hashimoto & Karasawa 2017 1,10).

Regarding linguistic aspects of HRI, whereas for the human language is natural and can be used for example to communicate information, express emotions or as a tool of poetry, for the robot the linguistic and communication are results of definition and development process what kind of social communication has been programmed in to it. Human can also naturally adapt the style of speaking for example complexity level, grammar, dialect which is not the case with the robot. On the other hand, the social companionship with human and robot can also happen without spoken communication, if the robot is seen more like a pet. (Baron 2015, 259-262.)

2.6 Security, safety and privacy aspects

The Civil Law rules of Robotics states that the current era of sophisticated Artificial Intelligence, androids and robots appear to be ready to start revolution that touches all layers of the society. In the ethical principles these rules is stressed that: "…*potential for empowerment through the use of robotics is nuanced by a set of tensions or risks and should be seriously assessed from the point of view of human safety, health and security; freedom, privacy, integrity and dignity; self-determination and non-discrimination, and personal data protection*." as well as that "…*special attention should be paid to robots that represent a significant threat to confidentiality owing to their placement in traditionally protected and private spheres and because they are able to extract and send personal and sensitive data*." (European Parliament 2017, paragraphs B, 10, 14).

In terms of widely cited Three laws of robotics (Asimov 1943) it is important to understand that implementing these principles are meant for the robot developers, manufacturers and people that are operating the robots, as these rules a way too complicated to be translated as a program code. (European Parliament 2017, paragraph T). These Three Laws of Robotics state that:

0) *"A robot may not harm humanity, or, by inaction, allow humanity to come to harm.*
1) *A robot may not injure a human being or, through inaction, allow a human being to come to harm.*
2) *A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.*
3) *A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws."*

Wikipedia 2020

Potential security breach can violate the primary user of the robot and expose details of their private life, but in addition to that breach can violate also any such third parties that are present in the situation and security breach can also

compromise privacy of the caregiver or family members, without them even being aware of the risk (Nevejeans 2016, 22).

Mikko Hyppönen (2016) the Chief Research Officer of cyber security company F-Secure has stated that whenever an appliance is described being "smart", it is vulnerable. Aalto University cyber security professor Limnéll and Finnish honorary minister Iloniemi have assessed risks related to the technologies even a bit further by stating that considering the history, everything that is possible to exploit, will be exploited. However, it is important that the trust of the technological opportunities will not be ruined by overemphasizing the threats. (Limnéll & Iloniemi 2018, 151, 160.)

3 DATA COLLECTION

This research is analysing the data collected in HRI demonstration situations in elderly care facilities by Wellbeing Enhancing Technology research team of Satakunta University of Applied Sciences in Finland. The data consist of video recordings and structured questionnaires. The author of this research has not been involved in data collection but is analysing the ready existing data.

Questionnaires and the format of video recordings were designed and conducted by the researcher group completely separately of this report, and the data is not explicitly designed for this report. The author of this paper has not been part of the mentioned research group; has not influenced to the design, phrasing of the questions or the raw content of the data in the survey forms, neither on how the video material was planned to be recorded or how the recordings were eventually done. Nevertheless, the existing data turned out to be perfectly ideal corresponding the research question in this study.

Pepper application code, made by the research group, was programmed by the progressive JavaScript framework Vue.*js (https://vuejs.org/). For* the first round the robot is programmed to ask for example simple and friendly questions such as: "*I cannot see from the window right now; how is the weather?*" or "*Have you had a good day today*?" or just to chat by saying: "*Phew, I would like to have a nap now*". On the second round the face detection was used to identify the robot's interlocutor and once the person was identified, the robot started to discuss about more person-related matters, such as "*Marja-Terttu* [generic sample name in the program code] *likes most of the red berries*".

By respecting the transparency and to support the potential further development, the open source program code was made publicly available in Github with the MIT licence.

Questionnaires were collected and video recordings were done in two rounds in the same elderly care home: in August 2018 and June 2019.

3.1 Questionnaires

The questionnaires (original in Finnish annex 1, translations in English annex 2) consist four questions, predefined answering options and school grading type scale to each question. Free comment field was included after each question as well as one general free comment field in the end of the survey.

As a background information, the gender and the year of birth were asked. There was also a line for a person’s name in the questionnaire, but this information was not collected in either first or second round and for the researcher the participants were potentially identifiable only by the age or gender.

3.2 Video material

The second group of data in this research are the videos recorded in the interaction situations with the Pepper-robot in the elderly care home.

At the first video shooting round in August 2018, the participants were communicating with Pepper robot when the robot was having similar functionalities when it met each participant. The robot was programmed to have a simple chit-chat (greet, introduce himself and ask how you are) as well as some physical movements and upon request Pepper was able dance a small choreography with his upper body or shake hands when proposed to do that.

For the second round Pepper was programmed to tell an individually tailored story to the participants. The content of these digital stories was collected from each participant in cooperation with the nursing staff. In these situations, the participants had told basic information on their life, such as name and when they were born as well as any such details, like hobbies, milestones or significant people of their life that they have found relevant to mention in this context. Written notes were implemented to the Pepper's code and when Pepper identified a relevant person, it started to tell this story to the participant.

4 DATA ANALYSIS

This research has phenomenological approach that aims to bring forward people's individual, thus different experiences of research phenomenon. In this approach, aiming to understand the chosen phenomenon or matter via the way how other people think or how they experience it, as well as identifying the context are particularly important. (Saaranen-Kauppinen & Puusniekka 2006.)

Methodology to analyse the data is naturalistic, non-participatory observation. Naturalistic observation means there is no intervention by the researcher, but as a rule the informants should have given their consent joining to the research. (CIRT n.d.; Saaranen-Kauppinen & Puusniekka 2006). In the non-participatory observation, the researcher is an external observer and the method is suitable for example observing video material (Tuomi & Sarajärvi 2018, 94).

Observations were collected in written format for thematic analysis and to be classified by making use of adapted NARS and RAS models (tables 3 and 4) as well as formats of acceptance (table 5).

Original data – questionnaires and video recordings – were collected in Finnish language translated for this report in English.

4.1 Sample

The sample consists seven people in total, and the research was conducted in two phases. In August 2018, seven participants joined to the research by replying the questions in the questionnaires and joined to the video recordings made by Wellbeing Enhancing Technology research team of Satakunta University of Applied Sciences (SAMK) in Finland. In June 2019, the same survey was repeated for four people, who had already joined to the first round

of research. Participants were chosen to the second round with the help of the nursing staff, based on their assessment about the first-round participants who might be interested and willing to join, also considering their memory operation. It is not clear if all the first round participants would still be living in the same elderly care home, thus basically available for the second round or if someone of the first-round participants had explicitly expressed that they are not available or interested to join to the second round of the experiment.

The average age of the respondents was 71 in the first round and 73 in the second round. The age difference between youngest and oldest participant was 17 years.

In total, data which was used to this research consists of eleven questionnaires (n=11) and 14 video clips. Duration of videos varied from about 1:30 minutes to 4:00 minutes of continuous video and the longest recorded interaction was spilt to three videos duration about of 2:10, 0:25 and 1:40 minutes.

According to the Ethical principles of research in the humanities and social and behavioural sciences area regarding principle two ‘Avoiding harm’ it is fundamentally important that any of the research methods or conclusions derived from the material are not anyhow harmful for the respondents. (Finnish National Board on Research Integrity TENK n.d.) For example, it must be ensured that any such information which could potentially unveil any such personal information which could be connected to the respondent, should not be published.

Due to small sample and in order to protect participants’ identity, all references to the data in this chapter are noted in a gender-neutral way by using the ‘singular they’ instead of using personal pronouns ‘he’ or ‘she’ (American Psychology Association 2019). The person identifiers were not used in this report to avoid person profiling that could make the participants recognizable. Should the direct citations be used, the original comment in Finnish is included in square brackets. Nevertheless, once the direct quotes are used in this

paper, it is only mentioned if that piece of data is either from questionnaire or from a video, and whether it was related to the first or second round.

4.2 Observed factors

The observations were classified by using adapted NARS (Negative Attitudes and Anxiety toward Robots) and RAS (Robot Anxiety Scale) which are psychological models developed by Nomura, Kanda, Suzuki & Kato to measure negative attitudes and anxiety towards the robots. Table 1 illustrates the model of NARS and RAS. (Nomura, Kanda, Suzuki & Kato 2008, 442-444).

Purpose of using to this framework was to a have a way to classify different expressions with what type of attitude the expressions reflect. NARS and RAS models were not applied further in this study.

Table 1. NARS and RAS. Table source: Prediction of Human Behavior in Human–Robot Interaction Using Psychological Scales for Anxiety and Negative Attitudes Toward Robots Tatsuya Nomura, Member, IEEE, Takayuki Kanda, Member, IEEE, Tomohiro Suzuki, and Kensuke Kato.

Negative Attitudes toward Robots Scale (NARS)

Subscale	Item
S1: Negative Attitude toward Interaction with Robots	I would feel uneasy if I was given a job where I had to use robots.
	The word "robot" means nothing to me.
	I would feel nervous operating a robot in front of other people.
	I would hate the idea that robots or artificial intelligences were making judgments about things.
	I would feel very nervous just standing in front of a robot.
	I would feel paranoid talking with a robot.
S2: Negative Attitude toward Social Influence of Robots	I would feel uneasy if robots really had emotions.
	Something bad might happen if robots developed into living beings.
	I feel that if I depend on robots too much, something bad might happen.
	I am concerned that robots would be a bad influence on children.
	I feel that in the future society will be dominated by robots.
S3: Negative Attitude toward Emotional Interactions with Robots	I would feel relaxed talking with robots.*
	If robots had emotions, I would be able to make friends with them.*
	I feel comforted being with robots that have emotions.*

(*Reverse Coded Item)

Robot Anxiety Scale (RAS)

Subscale	Item
S1: Anxiety toward Communication Capability of Robots	Whether the robot might talk about irrelevant things in the middle of a conversation.
	Whether the robot might not be flexible in following the direction of our conversation.
	Whether the robot might not understand difficult conversation topics.
S2: Anxiety toward Behavioral Characteristics of Robots	What kind of movements the robot will make.
	What the robot is going to do.
	How strong the robot is.
	How fast the robot will move.
S3: Anxiety toward Discourse with Robots	How I should talk to the robot.
	How I should respond when the robot talks to me.
	Whether the robot will understand what I am talking about.
	Whether I will understand what the robot is talking about.

NARS and RAS models were modified in such way that the subscale has modified from negative to neutral and the statements were changed in open format. Table 2 gives an example of the adjustment:

Table 2. Example of adjusted NARS

(original NARS)	**Statement**
Negative attitude towards interaction with the robots	I would feel very nervous just standing in front of a robot.

(applied)	**Statement**
Attitude towards interaction with a robot	Expression what kind of feelings appear just standing in front of a robot

Tables 3 and 4 illustrate more in details how the NARS and RAS factors have been adapted to be used as a general base to observe and collect expressions in six categories regarding:

- interaction with robot;
- social influence with robot;
- emotional interaction with the robot;
- communication capability of robot;
- behavioural characteristics, and
- discourse with robot.

Table 3. Adapted NARS

Attitude towards interaction with a robot	• Expressions when having a task where had to use robots • Expressions what a word “robot” means to the respondent • Expressions when operating with the robot in front of other people • Expressions of ideas that robot or AI were making judgements about things • Expression what kind of feelings appear just standing in front of a robot • Expressions when talking with the robot
Attitude towards social influence of a robot	• Expressions related the idea if robot really had emotions • Expressions what might happen if robot developed into living beings • Expressions regarding the dependency towards the robots • Expressions regarding the influence of robotics to children • Expressions regarding the future role of robotics in the society
Attitude towards emotional interaction with a robot	• Expressions when talking to robots • Expressions regarding relationship to the robots if they had emotions • Expressions regarding the overall idea of robots having emotions

Table 4. Adapted RAS

Attitude towards communication capability of a robot	• Expressions if the robot talks about irrelevant things in the middle of conversation • Expressions toward robot's flexibility in following the directions of conversation • Expressions whether the robot understands difficult conversation topics
Attitude towards behavioural characteristics of a robot	• Expressions towards what kind of movements robot will make • Expressions what the robot is going to do • Expressions regarding how strong the robot is • Expressions regarding how fast the robot will move
Attitude towards discourse with a robot	• Expressions respondent thinks how should talk to the robot • How should respond when the robot talks to him/her • Expressions whether the robot will understand what respondent say • Expressions whether the respondent understands what the robots says

In addition to classifying the observations with above mentioned classification, also expressions regarding acceptance were collected with following factors (table 5):

Table 5 Formats of acceptance

Attitudinal acceptance	• Positive expressions (written, verbal, non-verbal) how positively or confidently person thinks about the technology. • Negative expressions (written, verbal, non-verbal) how positively or confidently person thinks about the technology.
Intentional acceptance	• Willingness/ ideas to use robotics • Reluctancy to use robotics
Behavioural acceptance	• Interaction with the robot

4.3 Preparations

Planning of this study was started in early Spring 2019. First-round video material and the questionnaires became available for this research in May 2019 and the second-round material one month after.

At first the data was briefly browsed through by the author of this report, in order to get an overview if the planned methods seem to be suitable to be used with the data. Based on the preliminary analysis, any such reason did not arise why this data could not be used for this research purpose.

It was noticed about the video material that due to partly imperfect loudness level of spoken interaction all speech was not possible to transcript to the text, and some of the interactions contained only a very little spoken interaction. Therefore, the videos were decided to be observed as a whole containing social cues, such as spoken words, human gestures and tone of voice of participating person, either only some of these, or all together depending on the situation, without making separate transcript of the spoken content.

4.4 Systematic analysis

In the questionnaires each respondent was given running identifier A1-A7 which was noted down in the questionnaires during the first and second rounds. Corresponding numbering was used also during the second round and those participants who joined to the both rounds had same identifier both times.

At first, contents of the questionnaires were added to the Microsoft Excel table (table 6). The table was collected to each person containing all their replies to the questionnaires both rounds. The “Year” and “Age” fields was used to harmonise the information regarding age or year of birth which was noted to

the respondent. The table helps to collect numeric figures, such as if the age or gender makes difference to the replies.

Table 6. Example of content template of questionnaire per person

Person	Year	Age	Gender	1 . How do you feel?	Frustrated/Irritated/Negative/	Neutral	Happy/Pleasant/Positive	I do not know	Grade	Free comments
				2. The communcation with the robot was...	Disgusting	OK	Pleasant / Fluent	I do not know	Grade	Free comments
				3. I am interested in this robot	This robot is not interesting to me	A little	This robot is interesting	I do not know	Grade	Free comments
				4. How likely you would discuss with this robot if it would stay here?	Not at all	I could try again	I would like to discuss many times	I do not know	Grade	Free comments
										Personal average

After this all data was collected to the one table per question (table 7). The average grade was calculated per question, as based on if interaction was considered positive/neutral (no ‘negative’ or ‘I do not know’-replies were given, therefore those options were excluded from the table) as well as per gender, and females were marked with a dot pattern to the table.

Table 7. Example of content template of questionnaire per question

Person	Year	Age	Gender	1 . How do you feel?	Frustrated/Irritated/Negative/	Neutral	Happy/Pleasant/Positive	I do not know	Grade	Free comments
A1										
A2										
A3										
A4										
A5										
A6										
A7										
	Noted age/year	Calculated age/year	F							average all
			M							average positive
										average neutral
										average F
										average M

Observations from the video material were placed to the Microsoft Excel table which is composed by using adapted NARS and RAS classification (table 8). Positive-neutral-negative classification was used to keep track of the social cues, not to judge whether the respondent behaviour was anyhow good or bad, expected or unexpected or that some reactions are more appreciated than any other. The differences of natural characters were also considered; for example that some people are more social and communicative than the others, and positive-neutral-negative classification was rather used to scale social cues in terms of each participants and to respect their natural character, not to compare them.

When analysing the video material, the respondents were given the running identifier 1-7 in the first round and this numbering was mapped with the relevant person also in the second round.

Table 8. Empty table for classifying expressions per person

Duration of the video mm:ss		Respondent N		
		Positive	Neutral	Negative
Interaction with a robot	Expressions when having a task where had to use robots			
	Expressions what robot means to the respondent			
	Expressions when operating with the robot in front of other people			
	Expressions of ideas that robot or AI were making judgements about things			
	Expression what kind of feelings appear just standing in front of a robot			
	Expressions when talking with the robot			
		Positive	Neutral	Negative
Social Influence of robots	Expressions related the idea if robot really had emotions			
	Expressions what might happen if robot developed into living beings.			
	Expressions regarding the dependency towards the robots			
	Expressions regarding the influence of robotics to children			
	Expressions regarding the future role of robotics in the society			
		Positive	Neutral	Negative
Emotional interactions with a robot	Expressions when talking to robots			
	Expressions regarding relationship to the robots if they had emotions.			
	Expressions regarding the overall idea of robots having emotions			
		Positive	Neutral	Negative
Communication capability of a robot	Expressions if the robot talks about irrelevant things in the middle of conversation			
	Expressions toward robot's flexibility in following the directions of conversation			
	Expressions whether the robot understands difficult conversation topics			
		Positive	Neutral	Negative
Behavioural characteristics of a robo	Expressions towards what kind of movements robot will make			
	Expressions what the robot is going to do			
	Expressions regarding how strong the robot is			
	Expressions regarding how fast the robot will move			
		Positive	Neutral	Negative
Discourse with a robots	Expressions respondent things how should to talk to the robot			
	How should respond when the robot talks to him/her			
	Expressions whether the robot will understand what respondent say			
	Expressions whether the respondent understands what the robot says			

After this, the collected information was merged to the table containing all data from all respondents based on the category for example interaction and all its' sub-categories (table 9).

Table 9. Snippet of table template for classifying per category.

Interaction with a robot			
A1	Positive	Neutral	Negative
Expressions when having a task where had to use robots			
Expressions what robot means to the respondent			
Expressions when operating with the robot in front of other people			
Expressions of ideas that robot or AI were making judgements about things.			
Expression what kind of feelings appear just standing in front of a robot			
Expressions when talking with the robot			
A2	Positive	Neutral	Negative
Expressions when having a task where had to use robots			
Expressions what robot means to the respondent			
Expressions when operating with the robot in front of other people			
Expressions of ideas that robot or AI were making judgements about things.			
Expression what kind of feelings appear just standing in front of a robot			
Expressions when talking with the robot			
A3	Positive	Neutral	Negative
Expressions when having a task where had to use robots			
Expressions what robot means to the respondent			
Expressions when operating with the robot in front of other people			
Expressions of ideas that robot or AI were making judgements about things.			
Expression what kind of feelings appear just standing in front of a robot			
Expressions when talking with the robot			

Eventually new columns were built to extend above-mentioned tables. Each comment or observation noted on the table were gone through with the questions:

- Can this expression be interpreted to have connection to safety? [Yes/No]
- Can this expression be interpreted to have connection to meaningful life? [Yes/No]
- Can this expression be interpreted to have connection to values or valuable life? [Yes/No]

On a same table all noted comments or expressions were classified based on if the comment or observation can be thought to reflect attitudinal, intentional or behavioural acceptance. Each comment or observation noted on the table were gone through one more time and asked the acceptance related questions:

- Does this expression reflect how positively or confidently person thinks about the technology? [Yes/No]
- Does this expression reflect the plans to use or act with the technology? [Yes/No]

- Does this expression reflect how person eventually acts or uses the technology? [Yes/No]

Eventually, the difference was not made between first- and second-round data, because it turned out that all the respondents of the second-round did not remember the first meeting with the robot. Therefore, it was impossible anyhow to know what was the factor that made potential difference to the participants' attitude or replies as there was ten months difference between collecting the first and second round questionnaires and video shootings.

5 RESULTS

This chapter introduces the overall impression and the results based on the adapted NARS and RAS classification. The source of the data is indicated by referring either in clear words or by using following indicators:

- Questionnaire data, first round: [Q1]
- Video data, first round [V1]
- Questionnaire data, second round [Q2]
- Video data, second round [V2]

5.1 General impression of the HRI

The first impression when orienting to the video material [V1 & V2] was that the participants seemed to have, comparing to each other's, very different yet curious and sincere attitude towards the robot and they seemed to express their feelings naturally, all in their own personal ways. Despite of the closer look of the videos, this touching impression remained strong all the time.

Based on the video data [V1 & V2], the functionality of Pepper robot was not fully convincing, and it seemed that for example there is still plenty of room in improving the basic functionalities regarding natural interaction. During the second round the functionalities of the robot seemed more reliable, but there was not much interaction between the robot and a person, but it was more like a monologue of a robot. Instead, the first round was clearly more interactive and in all the first-round videos some of the questions or instructions had to be repeated several times to the robot. This was not only because of the robot's capacity, but it may have happened because there were some slight background sounds in the surroundings.

However, robot's functionality was not a main thing to be observed, though it drew some attention, and thus took some floor from the other observations. It seemed well justified to make this experiment in the natural environment where

are also normal sounds of living and the experiment in the laboratory circumstances would not have been natural to the respondents and this experiment setup reflects also robot's real-life capacity. This is also in line of the European Civil Law rules of robotics, that acknowledges the importance of testing in the real-life situations in order to identify potential risks and developing the innovations further than experimental research (European Parliament 2017, Chapter 23). Based on the interaction on the videos, it is difficult to place robot's level of autonomy to Sheridan's scale, even if it is rather likely that ideally the robot pursues to somewhat high-level and supervisory controlled autonomy, but this time robot's technical capacity did not allow to reach the desired level. On the other hand, apparently its most advanced feature; emotion detection was not made use in this experiment and therefore it is possible that in this case robot's limitations comparing to its capacity were highlighted.

In the both video shooting rounds the other participants of the experiment, some elderly persons that were just spectators and some care staff were in the same room and they all had a chance to follow the experiment should they found it interesting. Also, the researchers were visible on the videos, either operating the robot, giving advices or suggestions to the participants on what kind of things they could say or do. The technical lead of the robot was under control of the researches all the time and there was no need for the participants to operate technically with it. Overall impression was that the situation was made safe for the participants and researchers' calm and friendly attitude towards the participants was able to foster the cosy atmosphere in the video shooting situation.

5.2 Interaction with robot

Interaction with the robot was examined via the aspects that the respondents' expressed

- when having a task where had to use robots;

- what a word “robot” means to the respondent;
- when operating with the robot in front of other people;
- ideas that robot or AI were making judgements about things;
- what kind of feelings appear just standing in front of a robot, and;
- when talking with the robot.

Respondents expressed varying first impression [V1] and interest towards the robot. In the beginning of the first-round videos five respondents started spontaneously to act and speak naturally and they did not seem to express prejudices to the robot, whereas two respondents remained quiet and they needed more encouragement to start interaction. General impression of the videos [V1] was that women seemed to be focusing a bit more to the robot’s habitus and they looked at Pepper’s face, but men seemed to pay more attention to the tablet on robot’s chest.

One respondent [V1] started to act lively with the robot by waving their hand and greeting the robot by speaking in friendly and informal way. After this the persons introduced themselves and pointed out themselves [“*me*”] with a finger. The non-verbal communication style seemed very similarly primitive than when there is no common language or when speaking for example to a young child that cannot assumedly understand what is said. Similar type of body language was expressed also by three other participants [V1] whose style of speaking seemed even more paternal/maternal. One of the participants [V1] asked robot’s age, which told it is four years old. Considering the 120 cm height of Pepper-robot, which corresponds the average size of six years old child (in Finland), it is possible that hearing the robot’s young age increased impression that they were interacting with a child.

In the questionnaire the respondents evaluated their feeling after the meeting with the robot [Q1]. One of them was happy for their own contribution by saying *“I reacted well”* [“*Hyvin reagoin”*], which makes wonder if this person found the meeting with Pepper exiting experience or if person felt stress on how to act with the robot. One respondent told [Q1] that they felt timid, as it was a first

meeting with the robot and another one said their being astonished when saw the robot arriving, but eventually found that the meeting was "*nice*" ["*ihan kiva oli*"]. Two respondents estimated [Q1] that the robot was interesting, but another also added that the robot appears to be "*Still quite new*" ["*Aika uusi vielä*"]. Assumingly this comment referred more to robot's incomplete capacity to follow the instructions than that the robot is brand new.

In the second round of questionnaire, two of the respondents mentioned that they were not sure or did not remember if they had met earlier this robot. Very interestingly, two other respondents brought spontaneously up [Q2] the differences on communicating with the robot or with a human. Their impression was that elderly people may be afraid of other people, but they might talk to robot as it might be easier to open one's heart to robot than to another person. They thought that everyone does not like to share their matters with other people, but they might find safe to talk to the robot. Another person mentioned [Q2] as well that aged person might find easier to talk to the robot, in case they are shy with the other people. These comments were not explained more in details, but potentially these thoughts could have a connection to an idea that the robot does not have judgement. Any references what kind of impressions a word 'robot' provoked did not show up.

Four out of seven respondents estimated their feeling after the first meeting [Q1] with a robot as 'Happy/pleasant/positive' (smiling emoticon was noted in the form) and three of them evaluated their feeling as 'neutral' (neutral emoticon in the form). The average of all grades for the first question 'How do you feel' was 8. The average of positive answers was 8.5 and the average of neutral answers was 7.3. The average of all replies among the women was 8.7 and among the men the average was 7.5.

On the second- round there was less respondents and three of them used the numerical scale, therefore the comparison in the figure 2 is only directional. Corresponding figures to first questionnaire question [Q2] were 8.8 of all

replies which was also average of the positive replies. The average of replies given by women was 9 and for men the average was 8.5.

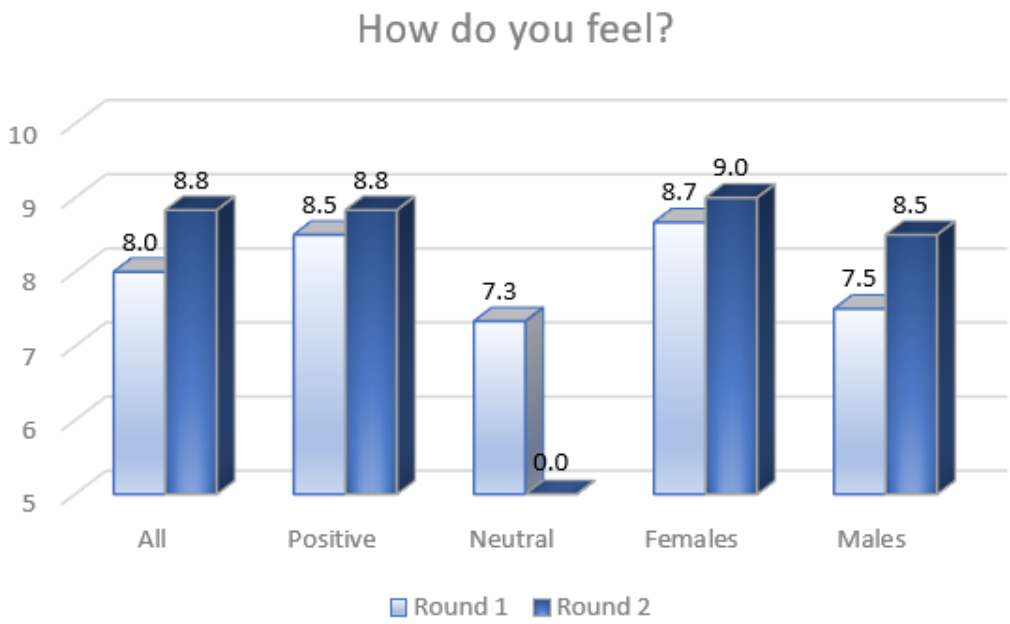

Figure 2. Survey question 1. How do you feel?

According to Pepper's manufacturer the robot has high level of acceptance for the users which was visible in this study as well. It seemed that that for the participants was easy to start interacting with the robot. However, the level of interest did not necessarily remain on the same level until the end of the situation, but interest was slightly decreasing towards to the end. In these situations, persons did not actively try to end the interaction, but once it was over, they hurried to give a floor the next participant without a delay or hoping if situation continues.

5.3 Social influence of robots

Social influence of the robots was seen via the standpoints of participants' expressions regarding

- the idea if robot really had emotions;
- what might happen if robot developed into living beings;

- the dependency towards the robots and
- the influence of robotics to children, as well as
- the future role of robotics in the society.

No such references to the social influence was expressed neither in the videos nor in the questionnaires if the robots were already considered to be or forecasted to be developed as a living being. One person [Q1] estimated that "…*some sociality could be taugh*t" ["…*jotain sosiaalisuutta voisi opettaa*"] to the robot. However, based on the data, it is not clear how the responded understood what it means to teach the robot; if they referred to improving program code, if they referred to self-evolving machine learning process or that they believed that the robot has a natural capacity to learn things.

The future role of the robots was estimated to be useful on teaching children [Q1] as well as [Q2] in the hospitals and in the industrial environments. One respondent mentioned [Q2] particularly interesting the opportunities in the industry carrying out tasks in productions or in the organization. On a general level and without giving more precise justification, it was noticed by one person [Q1] that the robots actually are already being used in many purposes.

One of the participants pointed out in the questionnaire [Q1] the social gap which the robot could fill by evaluating that it would be possible to teach to the social skills to the robots. As an example of the social skills [Q1] was given situations where the robot could discuss about everyday situations, like if it is a good idea to go out, considering the weather. Another example was given by the same person who mentioned that it would be useful just discussing what colour of clothes would be nice to wear. This wish appeared also to meet the intentions of the research group and based on the program code, the robot was already programmed to discuss of common everyday topics, such as weather. However, the idea to discuss about the weather was extended by the respondent with a proposal that could be bring value of the discussion, i.e. the robot could propose adequate clothing corresponding to the weather.

On a second round [Q2] it was mentioned that robots provoked also to think on a general level what kind of things can be done by benefiting the robots. It was estimated that the robots will serve the people in the future, and that Finland will not be lagging behind [the other countries] in terms of the robotics.

5.4 Emotional interactions with robot

Emotional interaction was examined via participants expressions

- when talking to robots;
- regarding relationship to the robots if they had emotions, and;
- the overall idea of robots having emotions.

One respondent [Q1] mentioned that either they or robot is leaving today. It was not clear from the participant's comment and from explaining notes which the assisting person had noted down related to this comment, if the person referred to the robot leaving or that they mistakenly believed that they were going to leave from the care home. Despite there was not further clarification what this comment meant, the overall evaluation given by this person was very positive (average of all questions was 10) and free comments were given as well. Therefore, one interpretation to this comment can be that it had a slight tone of regret and the person was feeling sorry that the connection with the robot had to remain short. On the other hand, the comment might reflect also completely opposite thoughts, as this same person commented on "*I reacted well*" *["Hyvin reagoin"*] to the [Q1] question about how the communication with the robot was. As the person evaluates their own behaviour in the situation, instead of saying something about robot or the communication, these comments make slight question to the positive evaluation and if it is possible that the person was feeling some stress in the situation and was just glad that the interaction was short with the robot.

Another person was convinced [Q1] that out of curiosity, they would talk again with the robot if the robot would come back. Two respondents mentioned [Q2]

that some people might be afraid of talking to the other people, but they might find easier to talk with the robot.

5.5 Communication capability of robot

Communication capability was examined via participants expressions:

- if the robot talks about irrelevant things in the middle of conversation;
- robot's flexibility in following the directions of conversation, and;
- whether the robot understands difficult conversation topics.

With many cases it seemed [V1] that the robot could not hear well or was not able to interpret what the respondents were trying to say, as instructions to the robot had to be repeated several times. This issue seems mutual and one of the respondent [V1] explicitly mentions that it is difficult to hear what the robot says due to the background sound, even if on the video the sounds from the background appeared not to be loud but the sounds were rather silent speaking behind the respondent.

Asynchronous communication provoked some confusion time to time [V1], and it happened several times that the robot did not reply at all or replied "*Hello*" ["*Moi"*] when it was asked something else, such as "*How are you*?" ["*Mitä kuuluu?*"] or "*Where do you live*?" ["*Missä asut*?"]. When one person proposed to shake a hand with the robot [V1], Pepper's behaviour was not quite what was expected, but still semi-logical in that sense that instead of shaking hands, Pepper replied "*Hello!*" ["*Moi!"*]. Most likely this was just a coincidence that robot's reply was greeting when a person proposed to shake hands.

The respondents reacted differently for these unclear situations that happened all of them, and five of them [V1] repeated patiently their question to the robot, but one participant seemed uncomfortable in the situation when robot's behaviour was not logical to them. Since from the beginning [V1], it seemed that one of persons was quite shy with their interaction with the robot and

Pepper's illogical behaviour did not seem to manage to break the ice. Another person [V1] started interacting actively and self-initially, but when the robot did not reply to repeated questions, this person started to look uncomfortable; they squeezed their eyes closed and had some sort of slight gurn on their face. Eventually this person seemed to be confused in such way that they did not fully seem to understand the instructions given to them. This person did not participate to the second round but based on the second-round videos that were captured of the other participants, this person was still an observer during the second round.

One participant [V1] introduced themselves and asked from the robot what its name is. When Pepper replied and told its name, person said "aha" and based on this reaction, it is not completely clear if the person was able to hear and understand what the robot's name was.

In the second video shooting round the discussion was less interactive and the robot mainly told the pre-recorded story to the person concerned, and therefore similar irrational situations did not happen. However, during the second round of videos, one of the respondents commented on that the story which robot told was not accurate and it contained mistakes. Similar comment was given also in the second-round questionnaire by another person. It was not clear if these persons understood the source of the mistakes and that the story was a recording, collected in real life about the details they had told themselves and apparently there had been some misunderstandings while noting down these details or implementing the information to the program code.

One respondent said [Q1] that they do not even expect that robot should have much skills, but it would be enough if the robot could at least nod its head and be present, whereas another respondent told that they liked [Q1] when Pepper replied to their questions. Third respondent noted [Q2] that the robot seems not understand everything that it is said to it, but nevertheless they estimated the that the robot at least tried.

5.6 Behavioral characteristics of robot

Behavioural characteristics of the robot was examined via expressions towards

- what kind of movements robot will make;
- what the robot is going to do;
- how strong the robot is, and;
- how fast the robot will move.

One respondent mentioned [V1] that "*It was precise, and the robot was looking straight on*" ["*Tarkkaa oli ja robotti katsoi päin*"]. Another participant commented on the reactions of robot "The eyes become round" ["*Pyöreeks tuli silmät*."] assumedly in the situation when Pepper was listening, and when the robot's eyes should indicate that by turning in blue.

When prompted by the researcher, one person [V1] asked from the robot "*Shall we dance*?" ["*Tanssitaanko*?"]. Robot started moving its upper body and this seemed capturing the person's interest. The person was smiling friendly but seemed a bit unsure how to act in this situation and if the dance was intended to be interactive. The slight confusion seems understandable as the question was "shall *we* dance" ["*Tanssitaanko*?"] not that only the robot was prompted to dance. As result of that the robot started a modern-looking choreography that was not any commonly known dance, and which seemed a bit difficult to follow, despite that the robot was moving its hands rather slowly. However, when the robot was moving its upper limbs, person started spontaneously to mirror robot's movements and the person did not seem confused when the robot unexpectedly said "*Hello*!" ["*Moi*!"] in the middle of the dance. Anyway, this appointment with the robot seemed to be successful in the sense that the respondent seemed interested in the robot and spontaneously tried to follow robot's dance. Because some reason, this respondent was not participant in the second round, even if they seemed to be one of the best oriented persons in the first round.

Otherwise, the physical interaction remained minor, except that participants, when prompted by the researcher [V1] tried to propose shaking hand with the robot. Shaking hand did not seem to happen very smoothly with any of the participants and the trajectory of the robot's hand was limited. Two of the participants [V1] seemed to paying attention more to the tablet on a robot's chest, but any of them did not try to touch the tablet.

The first and second video shooting rounds are recorded from slightly different angle, so is not possible exactly to estimate how far the persons were from the robot and if the distance remains the same during the both rounds. However, the participants seemed to be sitting about the same distance that they assumable would sit with a small size person that would be standing in front of them and there seemed not to be anything exceptional looking on the communication distance. Four of the participants [V1] and three [V2] were leaning forward to the robot and one of them [V1] leaned forward particularly much. Therefore, the impression was that the participants were not at least afraid that the robot would do any sudden movements. Also, those who rather sat straight or leaned backwards, it seemed more like their natural way of sitting and that it was not their attempt to have more distance to the robot.

5.7 Discourse with robot

Discourse with the robot was examined via expressions;

- that the respondent thinks how should talk to the robot;
- how should respond when the robot talks to him/her;
- whether the robot will understand what respondent says, and;
- whether the respondent understands what the robots says.

The interaction, including the spoken communication on the videos [V1] reminded an interaction between an adult and a child in three of the cases. With six of the participants it seemed that the robot was not able to hear or interpret given instructions very well, the respondents had to repeat their

sayings several times [V1] and eventually the articulation of the participants turned highlighted slow and clear. Conversely to this [Q2] one respondent pointed out that the robot spoke too quickly and did not leave opportunity to respond by a person. This same person also mentioned [V2] that the story was very well told, but that the details were not fully correct.

One person seemed delighted [V2] when the robot mentioned about their previous hobbies and interests and the person commented on the spot that "*See, it really knows something about me!*" ["*Kato, kyllä se tietää minusta jotakin*!"] but in the very next sentence that the robot told, this same person corrected the wrong fact in the robot's story. This slight mistake or that the robot continued speaking while the person made the comment, did not make person get irritated. The situation got humorous tone when the robot told about person's family situation and right after this the researcher asked if the story sound familiar to them. The person had a charming smile on their face, and they confirmed spontaneously that "Indeed, I have met opposite gender!" ["*Kyllä vastakkaista sukupuolta on tavattu*!"]. It is not clear base on the data [Q2] if this person remembered that they had told themselves the details to the story that robot told, but at least they did not remember clearly if they had met the robot earlier. However, this person appeared to particularly impressed and glad that the robot knew so much about their life.

5.8 Acceptance

Acceptance was classified for attitudinal, intentional, or behavioural acceptance. The questionnaire's questions/statements including school grading scale were suitable to be used for examining respondents' acceptance on a general level. The questions were:

- What kind of feeling do you have?
- In my opinion, communication with the robot was…
- I am interested in this robot.

The overall impression of the respondents that are numbered with a running identifier 1-7 is illustrated in the figure 3. In this figure all available gradings 4-10 from the questionnaires were calculated per each respondent for all questions and for both rounds. Despite that there were four participants on the second round, only three participants have used the numerical grading in the questionnaire. Women are indicated in the lighter colour and for both of them, the second round made slight decrease for their overall grading. Instead, the increase of grading on the second round was notable higher with one male participant.

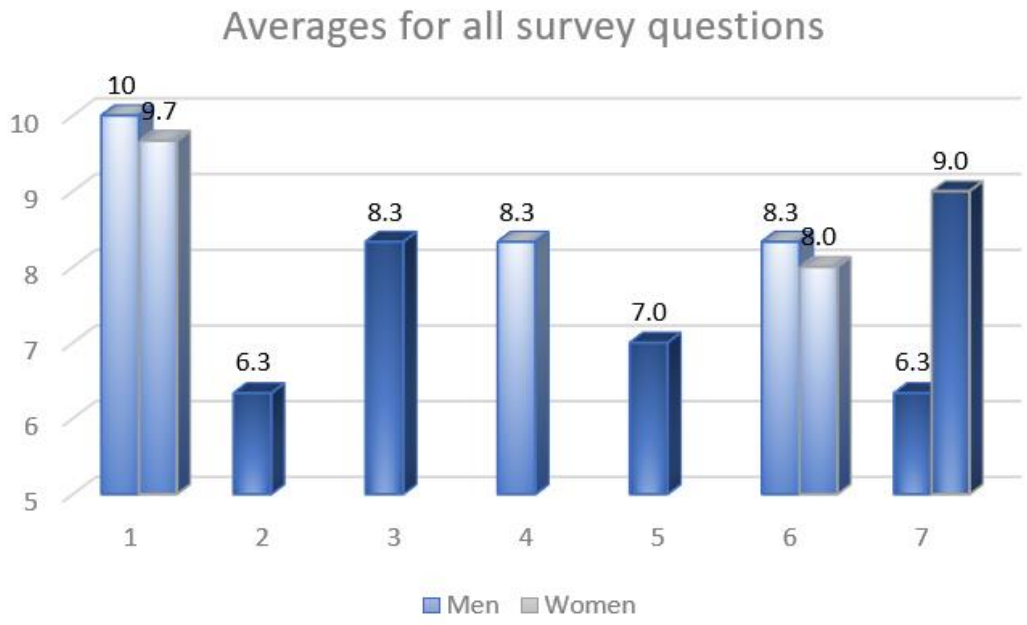

Figure 3 Averages from all survey questions

In the questionnaires, female respondents seemed to have slightly more positive stance of the robots. Nevertheless, the male participants have given slightly more free comments on the questionnaires and on the videos the overall impression was that men seemed to show more interest towards the robot. It is difficult to say if this is otherwise gender related difference or does it rather reflect for example participants' earlier professional or educational background. These professional or educational backgrounds were not asked in the survey but based on what was mentioned on the videos at least two male participants had somewhat technical professional background.

Attitudinal acceptance was more visible in the questionnaires and especially the free comments, where the one of the participants [Q1] estimated that the robots "…are already being used in many places" ["…*käytetään jo vaikka missä*"] and single participants estimated that there could be useful use cases with the education, elderly people, industry or in the organizations. One wish was to get the robot as a company if it could be able to play all kind of games, and another person told that the robot "Helps focusing mind somewhere else" ["*Saa ajatukset muualle*"]. Anyone did not express that they would rather not accept robots to their life or some roles in the society.

Behavioral acceptance was expressed in the videos when all the participants started actively interacting with the robot, either by their own initiative or when prompted. Even if they were prompted, that seemed not to be linked their willingness to interact, but rather that they did not know what to say or how otherwise to interact with the robot. When the robot did not respond or act in a way it was expected; if it did not do anything or it the robot did or said something illogical, it reflected to the participant's intentional acceptance and in the first round of videos more than a half of participants expressed some signs that they lost their interest to the interaction with the robot. With two respondents [V1] there was a clear change from their curious attitude in the beginning transforming at first to the reserved and finally to uncomfortable looking appearance. The interaction situation was only a couple of minutes, so this reaction was assumedly related to the robot than persons normal tendency to maintain their interest in the different situations. With all the other participants it seemed also that their attitude in the beginning of the situation was more curious and positive than in the end of it, and any of the participants did not look disappointed when the situation was over.

During the second round of videos one respondent expressed more their willingness to interactively to discuss with a robot and they regretted that the robot spoke to fast.

6 CONCLUSIONS

One respondent mentioned in the second-round questionnaire that they did not remember if they had already previously communicated with Pepper-robot or not. Also, another person mentioned that they have not spoken with a robot before. However, it is not completely clear if the second person refers to time before this experiment situation, or if they cannot remember the first-round meeting with Pepper. It was not clear based on the data if it was confirmed from the respondents if they remembered the previous encountering with the robot, before collecting the second round of questionnaires and video shooting. Therefore, inversely, it remained unclear based on the data how many of the respondents remembered the previous meeting with the robot.

Even if the information from the questionnaires and videos was possible to be connected to the persons and thus to guess which ones of the them had memory issues, it would not have been possible to distinguish which ones of them could not remember previous meeting with the robot. This observation was also in line with the researcher's prior experience with the elderly persons having lower cognitive capacity and how hard it might be in the short-term communication to tell whether the person has memory issues or not.

Therefore, instead of the initial research question, if customization made difference to the respondent's attitude or behavior, it was more fruitful to examine second-round interactions with a robot just as a different type of experience and not to make conclusions based on the customization as such. Any such evidence was not present in the data which could confirm if customization made difference in opinions or behavior of the participants, and these two meetings with the robot were very different by their nature. There was also clearly less interaction on the second round when the robot was customized than during the first, more generic round. As consequence of this the robot also functioned second time clearly more accurately looking, when it just told the recorded story to the participant.

6.1 Safe, valuable and meaningful elements

Some safe, valuable and meaningful elements in the data was visible in all observed fields. In terms of safety and interaction, the participants did not explicitly mention anything special that their feeling of safety would be either increased or decreased, but based on their behavior in front of the robot and the camera, it seemed that they expressed rather their natural personality in the situation as they would probably behaved in similar way with another person. This assessment was based on that the other participants sat in a row behind the person who was interacting with the robot in their turns and the others had a chance to follow also other participants interacting with the robot. When observing participants waiting for their turn, their appearance seemed to be very similar than while they were interacting with the robot themselves. The experiment setup and that the participants were not alone in the situation, was well justified to make the participants to feel safe with the other people when interacting with the robot. On the other hand, it might be possible that once the participants saw how the others were behaving during the experiment, this might have made them to adjust own behavior according to the majority.

In terms of interaction and meaningfulness, expressions regarding the joy of communicating with the robot was expressed via the smiles and laughter in the situations when the robot replied - logically or even illogically - to interlocutor's instructions or questions, and in such situation when the participant was considering what sort of joke they would like to tell. Eventually, even if one person did not come up with an idea which joke to tell, but despite of that, they still seemed to be delighted of the given opportunity itself to share something positive with a counterpart.

Discussion with the robot offered an opportunity to the participants to tell the robot about their prior life and on the second round also to listen what robot was able to tell about participant's life. In terms of meaningfulness, this provided an opportunity to a participant to become heard and also reflect their

own life when the robot told the recorded story. These discussions with the robot gave a chance to look back to the important things and milestones from their life; for example, remembering their prior hometown or occupation they had, or recalling their family events of people they had met. Without knowing these participant's personalities, it is difficult to say how easy for them is to share personal matters with the other persons, but quite often in the everyday life, it requires a bit more time to becoming acquainted with the other party or some personal compatibility to share personal things. This does not necessarily mean that people do not want share details from their private lives, but perhaps there is not suitable counterpart to do that. When these participants communicated with the robot, they did not seem expressing significant prejudice towards the robot, but instead some of them expressed for example nostalgia or justified pride regarding the events in their past life. As long as this kind of experience stay in psychologically sustainable field for the individual and not provoke fears, anxiety etc., these experiences can probably be seen meaningful for the elderly person's perspective to have a feeling that they were listened. Despite that it is slightly an illusion, it is not necessarily far away of watching TV or listening radio and when the audience is just sitting on their sofas, sometimes commenting on what they are seeing or hearing and with having a feeling that they are part of something. While communicating with the robot they were at least in the same time and space.

Regarding the Level of Autonomy, this data does not provide evidence, that the robot works currently in that LOA- level that the elderly person could operate without a presence of a person that is operating the robot. This means that at least this robot running this software would not be suitable to be used in their private homes, where the elderly people assumedly could benefit most about social interaction and where the robot could potentially increase elderly person's safety and valuable and meaningful experience should each individual agree this. Instead, the shared robot could be used in the care homes should the care givers master the robot's functionalities fluent enough, or if the robot had improved autonomy. Then again, the question is, if there is

already another human present in the situation, what kind of added value the robot can bring to the elderly person?

Even if paternal/maternal attitude was expressed towards the robot, there were also signs that Pepper was treated also as an equal interlocutor. It was expressed that talking to robot might be easier than to another human, should the person be shy with the other people. This is, however, two-fold matter, as telling the very personal or even confidential information to the robot, the feeling of safety may cause backfire if the data protection is inadequately handled. Full responsibility of the data protection lies on the service provider, as elderly person cannot be assumed to understand potential technical aspects of their data in case the robot is offered to them with support of the social- and health care professionals.

Without being a specialist in the field of programming and fully not understanding the code made for this purpose, it is difficult to say why Pepper did not work smoothly and why the communication problems happened; was it logical in terms of the program code, was it related to the capacity of the physical components, background noise or unprecise articulation. Whatever the reason was, the contrast between human participants and the robot grew wider during these unclear moments, as the participants tried their best to be able to adjust their behaviour according the situation, for example either by repeating their saying one more time but in more clear way or remaining quiet and waiting whereas the robot did not express any flexibility. It would not be very surprising if the participants have felt these unclear situations a bit unpleasant, especially if they all were not fully conscious that the counterparty was a human-made machine and its behaviour was based on the code that was programmed for it to follow.

The basic technical capacity seems to be a matter worth of mentioning, especially with the elderly people in order to stop the potentially useful communication to be dried up to the level that the robot or the interlocutor just cannot hear and thus understand each other. If this is the case, robots do not

give desired added value, no matter how fancy and useful the robot could theoretically be or how positive the person's attitude towards the robotics is.

Robot's insufficient hearing and participants' need of repeat instruction several times brough up an aspect of how the robot continued doing what it was doing in a stubborn way, despite that similar instructions were given many times to it. In this experiment any of the participants did not seem to have such memory issues that they had kept forgetting what they have just previously said or what has just been told to them. That is not, however, unusual for example with the persons suffering Alzheimer's and this sort of interaction may be trouble to the care givers' patience. Instead, as mentioned also by one respondent, robot is neutral. Therefore, one of the robot's strengths with the persons that have memory problems is that it never gets tired or bored to hear or to say same things over and over again.

Even if Pepper can interpret some basic emotions, at least currently any robot cannot feel empathy or other emotions. The positive reverse side of that is that the robot cannot not reflect its negative feelings to the counterparty either as the other people may do. This is not only that a person having memory issues would get tireless assistant to listen and reply, but a neutral robot could do it without expressing own feelings to a person and accidentally insulting person's human dignity or values by getting tired or frustrated to the constantly repeated matters. This point of view is valid also with the people who might find scary themselves that their memory no longer works as before, and they might feel that with the other people they are constantly under the evaluation. On the other hand, the downside could be that the robot might help a person to hide their memory or other issues that should be brought to the attention to the care staff in order to get the adequate care.

6.2 Reliability and validity

Considering that the research sample is composed by aged people who need assistance in their daily life, it is possible that any of the respondents might have memory related or other cognitive limitations, despite that if it was not explicitly mentioned. This might reflect that the respondent's replies are strongly related to the current time and situation or insufficient orientation, and therefore the results cannot be anyhow generalized.

The data in the questionnaire is noted down by the researchers and nursing staff, and therefore possible that it may also reflect the interpretation of the employee, and not only perception of the respondent. Nevertheless, this should not cause ethical conflict, as the assistance can be assumed to be done bona fide without intention to influence to the research results.

All the results in this study are based on interpretation of the data by the author of this report who was not present in the experiment situation. Therefore, it is possible that some elements that have been present and were visible in the real-life situation did not show up in the available research data. It means that this study provides a narrow snapshot of the experiment situation. Another interpreter that had been in place during the experiment situation or another researcher processing the asynchronous data with different orientation, might have been able to amend these results with the completely different dimensions.

The snippets of the data have been presented also in Finnish in this report, in the sake of transparency and to avoid any potential bias in the interpretations that the translations from Finnish to English may have caused.

7 DISCUSSION

Some of the participants brought up the built-in social nature of human essence and how the person can simultaneously be shy to interact with the other people but still be willing to interact with someone. This comment is in line with that the people appear to have a higher acceptance for robots once robots do not pursue with comparing a person, but instead of being side by side with the people (Kyrki 2015,3). On the other hand, it was mentioned the robot could be useful partner to discuss about everyday topics, such as how is the weather or what kind of clothes to wear. This makes to wonder if these replies were given just to reply something, or how lonely elderly people might feel themselves, if they really would be willing to discuss about the weather with a machine.

At least still now, robots are human-made machine, not naturally living creature that might be difficult for the elderly people fully to understand, especially if the human attributes, such as gender or age are defined for the robots. People may also have read sci-fi books or seen movies where the robot is able to perform like or even better than human. Therefore, instead of underlining robot's human features, cultivating such attitude among people that even if humanoid robot may have somewhat similar shape than a human, it is an instrument – different shape of computer - for designed purpose, could perhaps consequently increase the interest, dispel possible fears, and help to use robotics in more natural way.

It appears that at least one of direction on developing social robotics with the elderly persons is not necessarily to focus what a human is, but instead added value could maybe be found from the perspective what a human is not. Despite that human can express emotions and be flexible in case needed, human is not tireless, not always available, and not constantly patient and all emotions human is able to express towards other people are not only positive. The idea is clear behind Ollila's (2019, 228) relevant rhetorical question, if all human

care takers can be seen having constantly the most ideal attitude towards their job.

In this experiment it was not visible at any stage that human attributes were given to the Pepper-robot, except the age of the robot was told to be four years. This also would leave freedom to the users to decide how they would like to define their companion. Interestingly, the manufacturer itself seems to consider Pepper as ‘him’ at least in the presentation text (SoftBank Robotics N.d.), which is a bit surprising, especially in these days when there is plenty of discussion about the gender neutrality in the language even among the people. Instead, like Ollila (2019, 251) wonders; could the robotics be used to challenge and fade away the existing stereotypes?

Robot’s technical capacity was not fully convincing yet, and it seems that some basic features, for example such as how the ‘hearing’ or ‘speaking’ would work accurately would still require some improvement. After the fully functioning features, would the robot demonstrate useful potential and be more interesting to the elderly people. Even if the purpose of this study was not to evaluate the capacity of the robot, in this level of functioning, it is a bit more challenging to see use cases which could bring socially added value for the elderly persons that are fully orientated without having memory issues. It seems that, at least this version of robot’s technical limitations will be reached fairly fast with the fully oriented people, which could probably also affect negatively their level of acceptance as well. When solutions to the technical challenges will be found and machine learning develops or if virtual assistants, would be developed one day for physical form of robot, that would make a significant leap to the robot’s use cases and to bring more added value to the services provided to the elderly people. Then the robots could truly compete with the much cheaper technologies, such as mobile devices, wearables, or other types of IoT-devices.

Once program code and physical technologies evolve, it appears that it is the in the closer horizon that those people that are having the memory issues

might benefit more of the social robots. If a person tends to repeat similar stories without expecting much feedback from the interlocutor, robot would be useful partner to discuss as it never gets irritated or frustrated on hearing same things again. Even if some robots like Paro have already being used successfully with the elderly persons having memory dysfunctions, most likely it is not a coincidence that the robot being used for supporting people with memory issues, replicate more like an animal than a human. An experience with humanoid robot might be different because of robot's partly humanlike appearance and potential uncanny valley effect. In the worst case, person with the memory issues may need to encounter and overcome new and frightening situation over and over again, in case they do not remember previous, harmless meetings with the robot and they need to repeatedly to be convinced that there is no need to be afraid.

A new perspective to the usage of robotics with elderly people appeared from the direction that is at the same time expected and unexpected, but nevertheless very unfortunate. COVID-19 outbreak hit to the countries around the globe during the spring 2020. The situation forced governments around the globe to order restrictions on free movement in order to ensure the critical functions in the society and sufficient resources of sanitary services. One of the most important goal of these restrictions was to protect the vulnerably people, elderly people being among this vulnerable population. At the time of writing this report, the available information is constantly updated and comparable information from the different countries is difficult to find. Despite that the virus appears to be contagious also in other age groups, for example the figures published by the Ministry of Health in Luxembourg (situation on 18.04.2020) show that the average age of the positive tested COVID-19 cases (N=3537) is 46 years and the median age of patients (N=72) that had passed away was 84,5 [Luxembourg Ministry of Health 2020].

This situation constructed whole new dimensions to the research question: 'How do the principles of safety, meaningfulness and valuable life are reflected in the elderly persons' humanoid robot interaction situations?' as well as the

definition what of safe, meaningful and valuable mean. When building the theory part of this report, such situation where another human is not necessarily the best or even safest option to accompany elderly person was not considered. That was very short-sighted in that sense, that COVID-19 situation brought whole new perspective to the interface on how the robotics could affect to safety, meaningfulness, and valuable life of elderly people.

The care staff, friends and relatives supporting elderly persons, living in a care home or still at their own home with the home care support do not want to end up a risk to their patients or beloved ones when visiting them, but with the enemies like the current virus this can be unfortunately the case. Therefore, the understanding in this study what is safe was too narrow and in the light of current situation, perhaps the robot can be seen even more safe than another human in terms other people being potential carriers of the dangerous diseases and should the elderly people be isolated, would that increase feeling of loneliness which can be assumed to weaken the feeling of meaningfulness.

It also turned out to be clear that ubiquitous technologies are perhaps widespread, but far away really being ‘everywhere’ yet and elderly people could benefit more about the technological solutions if/when the next major outbreak is there. This also puts a bit different light to individuals’ right to refuse of the care of robotics, because eventually this decision could expose their life in danger.

In the future, this research setup would provide deeper information of the individual experience if it would be amended with a questionnaire for understanding on how the participants themselves perceive the quality of life. In addition, two parallel video recording where the participants are interacting in the similar situation with another person and with a robot, would shed more light which parts of the participants’ expressions seem to be related particularly to the robot, or if the participant’s reactions reflect mostly their personal character in general in terms on social interaction. In this way they could also have they say which one, person or robot, they would prefer as their

interlocutor. Regarding the technology assisted social interaction would be interesting also to compare different types technologies, for example simple tablet and robot to see if the physical format of the robot can find making a difference of the individual feeling of the quality of life.

This kind of further research could also help to keep the future trends on development of social robotics in the elderly care at the right track – which should be pursuing to resolve issues elderly people have and not seeing them as a problem, or potentially by being lost in fascination about the new technologies.

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APPENDIX 1

Nimi:

Sukupuoli:

Ikä:

PVM:

1.	Millainen fiilis/miltä sinusta tuntuu?	Turhautunut, ärtynyt, negatiivinen ☹	Neutraali 😐	Iloinen, miellyttävä, positiivinen ☺	en osaa sanoa
Minkä kouluarvosanan antaisit fiiliksellesi? 4 5 6 7 8 9 10 Vapaat kommentit:					
2.	Kommunikointi robotin kanssa oli mielestäni	vastenmielistä ☹	ihan ok 😐	miellyttävää, luontevaa ☺	en osaa sanoa
Minkä kouluarvosanan antaisit robotin kanssa kommunikoinnista? 4 5 6 7 8 9 10 Vapaat kommentit:					
3.	Olen kiinnostunut tästä robotista?	Robotti ei kiinnosta ☹	Jonkin verran 😐	Robotti on mielenkiintoinen ☺	en osaa sanoa
Minkä kouluarvosanan antaisit robotille? 4 5 6 7 8 9 10 Vapaat kommentit:					
4.	Miten todennäköisesti keskustelisit robotin kanssa, jos se jäisi tänne?	En lainkaan ☹	Voisin koittaa uudelleen 😐	Keskustelisin useampaan kertaan ☺	en osaa sanoa
Vapaat kommentit:					

-Sana vapaa: mihin robottia voisi käyttää? Mitä toivoisit siihen lisää? Synnyttikö testaus jotakin ajatuksia robottien hyödyntämisestä?

TRANSLATED QUESTIONNAIRE APPENDIX 2

1. What kind of feeling do you have?

- Frustrated/ irritated/ negative
- Neutral
- Happy/ pleasant/ positive
- I cannot say

Which school grade [4-10] would you give to your feeling?

2. In my opinion, communication with the robot was…

- Disgusting
- OK
- Pleasant/ natural
- I cannot say

Which school grade [4-10] would you give for the communication with the robot?

3. I am interested in this robot

- Robot is not interesting to me
- A little
- Robot is interesting to me
- I cannot say

Which school grade [4-10] would you give to the robot?

4. How likely you think that you would discuss with the robot if it stayed here?

- Not at all
- I could try again
- Many times
- I cannot say

In the end of the form was a free comment field, with open questions;

- How robot could be used?
- How it could be improved?
- Did testing rise new ideas how robots could be more beneficial?