**InterAttractive Social Robots:
Exploring the acceptance and attitude
towards social robot design in an
online scenario-based experiment.**

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Abstract

Objectives: Researchers testify that design is an important determinant for the acceptance and attitude of social robots. However, only a few studies looked into the acceptance and attitude towards social robot design in different application domains. This study has two major purposes: (1) to explore the acceptance and attitude towards social robot design in different application domains, (2) to explore the requirements for social robots in different application domains.

Method: The study is conducted in the form of an online scenario-based experiment among over-50s. The participants were randomly assigned to one of the three conditions: (1) a social robot for companionship, (2) a social robot to monitor the health condition, and (3) a social robot offering assistance with simple tasks. Respondents indicated their requirements for a social robot by answering an open question. Furthermore, they rated the degree of autonomy they allow a robot to have and closeness between them and a robot in the given condition. Finally, the respondents rated their acceptance and attitude towards a human-like, animal-like and machine-like robot type in the given condition.

Results: The results indicate that more emphasis is placed on design than functional requirements in the companionship condition. In terms of closeness, the participants are willing to spend more time with a robot in the companionship condition. Furthermore, males allow a higher autonomy of social robots than females, especially in the monitoring and companionship condition. Additionally, social influence is an important determinant for the acceptance of the machine-like and animal-like robot type in the monitoring condition. Nevertheless, closeness between humans and robots is positively associated to acceptance and attitude, something which is most apparent for the human and animal-like robot type. Finally, the enjoyment and attraction to a machine-like robot type rises for males in the companionship condition and for females in the monitoring and assistance condition.

Conclusion: In conclusion, different application domains ask for different needs and design considerations. The findings and implications help designers to better adapt social robot design in different application domains to the preferences of potential users in the future.

Keywords: acceptance, attitude, social robot design, scenario-based experiment

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1. Introduction

One of the most remarkable gains in the 20th century is the increase of life expectancy. According to Christensen, Doblhammer, Rau and Vaupel (2009) there is a gain of life expectancy of 30 years in Western Europe, the United States, Canada, Australia and New Zealand, and even larger gains in Japan. This gain in life expectancy has given rise to a steep increase of the number of elderly through the entire world. Taking a look at the Netherlands, the Centraal Bureau voor de Statistiek (2018) expects to reach an amount of 18 million people in 2029. Almost a quarter of the population will then be 65 years or older. Besides, from 2025 the group of people over 80 years will increase considerably, called a double ageing process. The increase of life expectancy is expected to continue through the 21st century, this is not without consequences.

The ongoing process of ageing creates a pressure on the healthcare costs. According to Hartholt et al. (2012) the costs of long-term care at home and in nursing homes are one of the largest age-related costs. Furthermore, there is not only an increase in governments spendings on healthcare, but also in pensions since there are more people reaching the retirement age (Maresova, Mohelská, & Kuca, 2015). Another consequence of the ongoing process of ageing, is the labor shortage in the healthcare sector due to an increased demand of nurses (Oulton, 2006). Additionally, the nursing homes have long waiting lists and the demands for staying at nursing homes become quite severe (Kemenade, Konijn, & Hoorn, 2015). These consequences make the ongoing process of ageing a serious problem.

Literature has examined the importance of social robots in the ongoing process of ageing. According to researchers, designers, engineers and other experts in literature robots enable elderly to live independently in their home for a longer period of time by taking over some tasks (Flandorfer, 2012). However, the literature mentions different concerns regarding the acceptance and attitude toward social robots among elderly. Frennert and Östlund (2014) identified several matters of concern, including robot aesthetics. Robot aesthetics means the pleasant or positive appearance of a robot (Frennert et al., 2014). Previous studies already measured the acceptance of social robots' appearances, however they ignored the application domains in which social robots can be used (Leite, Martinho, & Paiva, 2013).

Many studies suggest a consistency between a robot's appearance and its application domain to enhance the acceptance and attitude, since the robots design depends on the situation in which the robot will be used (Li, Rau, & Li, 2010). For example, an animal-like robot type is often used in application domains for entertainment or company, while a machine-like robot is more credible seen as a security guard for safety. According to Austerman et al. (2010) people draw conclusions about what a robot can do based on the appearance and see other application domains if a robot looks different. When people see other application domains than the robot is designed for, this might affect their acceptance and attitude towards social robot design (Austerman et al., 2010). Therefore, this research will explore the acceptance and attitude towards social robot design across different application domains. Additionally, not only the design of social robots might influence the acceptance and attitude of people across different application domains, but also the autonomy of social robots and the relationship between robots and humans. For example, people who allow a robot with a high level of autonomy and want to have a close relationship with a social robot might accept social robots' sooner than people who are not willing to form a relationship with a robot or do not allow the robot to have any autonomy. Furthermore, for the explorative purpose of the study, gender is taken into account to explore whether females and males differ in their preferences for social robot design. Finally, this paper contributes to the theory by making a distinction in social robot design across different application domains for elderly, which is previously ignored in the literature. Furthermore, the practical relevance of the study is that it helps designers to better adapt social robot design to different application domains which might enhance the use of social robots and to deal with the double ageing process in the future.

The first section of this report describes the evolution, different types of social robots, the appearance, acceptance, attitude, autonomy and closeness between humans and robots. The second section explains the method, including the research design, sample, procedure and measurements. Subsequently, the third section shows the results. Besides the main findings in the discussion, potential limitations of the study, practical implications and suggestions for further research will be described.

2. Theoretical framework

2.1 Evolution and definition

In recent years, increasingly attention has been paid to the interaction between robot and human. Not only in literature, but also companies and the popular news media pay attention to this topic (Hagis, 2003). Robots started to become popular during the late 1950s and early 1960s within the automotive industry. The first robots, called industrial robots (Hagis, 2003), were employed to help operators. Those industrial robots consisted of a simple design, like arms and hands and no human-like appearance. After the industrial robots, service robots were developed (Dario, Guglielmelli, & Laschi, 2001). The service robots must work into environments in which humans can be present, the problem of safe human-robot interaction arises here (Dario et al., 2001). To guarantee a safe interaction between humans and robots while working together, human-friendly robots were developed.

The final step in this evolution of robotics are social robots with a greater capacity to interact with human beings, particularly developed for assistance to disabled people and elderly (Garrell & Sanfeliu, 2012). Bartneck and Forlizz (2004) propose the following definition for social robots: "an autonomous or semi-autonomous robot that interacts and communicates with humans by following the behavioural norms expected by the people with whom the robot is intended to interact" (p. 592). The term "communication and interaction with humans" is the main point of attention here, since robots that interact with other robots would not be considered as a social robot.

2.3 Types of social robots

Studies in social robotics for elderly feature different robot types. Those different types of social robots have different functions. Broekens, Heerink and Rosendal (2009) make a distinction between service and companion type robots. The main functionalities of service type robots are related to the support of daily activities to enable elderly to live independently at home for a longer period of time (Broekens et al., 2009). Lohse, Hegel and Wrede (2008) describe service type robots as robots for everyday tasks. Typical tasks of those robots are vacuum cleaning, ironing clothes and fetch-and-carry tasks. Furthermore, Kemenade et al. (2015) make a distinction between assistive and monitoring robots in service type robots. Assistive robots support elderly and caregivers in their daily tasks such

as lifting objects, cleaning or feeding. Those assistive robots require more flexibility, from simple tasks as reading the news till feeding or washing elderly (Lohse et al., 2008). Monitoring robots observe and supervise the health condition of elderly (Kemenade et al., 2015). For example, those robots can remind elderly about taking their medicine. Finally, companionship robots are designed for affective bonding, interpersonal communication and entertainment (Kemenade et al., 2015). Social functions implemented in those robots aim at psychological well-being (Broekens et al., 2009). Those robots do not perform a specific task, but focus on interesting interactions with the users to offer the user company, such as playing games or dancing (Lohse et al., 2008). This division in social robot types helps the current study to get an understanding of the different application domains in which social robots can be used among elderly.

2.4 Appearance of social robots

Scholars suggest that consistency between a robot's appearance and the application domain in which a social robot is used will increase acceptance (Li et al., 2010). A classification of the appearance of social robots can be made based on Fong et al.'s robot morphology. According to Fong, Nourbakhsh and Dautenhahn (2003) the appearance of robots can be classified into three types: anthropomorphic (human-like), zoomorphic (animal-like) and functional robots (neither human-like or animal-like).

2.4.1 Anthropomorphic robots

According to Sabanovic, Michalowski and Simmons (2006) a common theme in discussions of social robot design refers to the human-like characteristics and skills. Human-like refers to the concept of anthropomorphism. Duffy (2003) defines anthropomorphism as "the tendency to attribute human characteristics to inanimate objects, animals and others with a view to helping rationalise their actions" (p. 180). This basically means the attribution of human-like features in the design of social robots. The aim of anthropomorphic features is to make interaction with a social robot more intuitive, pleasant and easy (Duffy, 2003). For example, anthropomorphic features in design are a head with eyes or a mouth that may facilitate social interaction.

According to Fink (2012) anthropomorphic design characteristics or human-like features can increase robots' familiarity and enhance people's acceptance of robots. Robots with a human-like appearance create a stronger sense of social presence than robots whose form is purely functional (Castro-González, Admoni, & Scassellati, 2016). Since the social presence is stronger for human-like robots, it is expected that these robots play an important role to combat loneliness and are applicable in the application domain of companionship. Furthermore, an important humanoid feature is facial expression. According to Lohse et al. (2008) a robot with an expressive face indicating attention and imitating the face of a user makes a robot more attractive to interact with. An example is the Care-O-bot as shown in table 1, this robot shows his facial expression on a virtual display. Also, faces with large eyes and small chins in proportion to the rest of the face, called baby faces, are perceived as honest, kind, naïve and warm, like the social robot Pepper as shown in table 1 (Lohse et al., 2008). Besides, people rather have a discrete and small human-like robot, like the Nao robot as shown in table 1 (Wu, Fassert, & Rigaud, 2012). In general, anthropomorphic robots in the healthcare sector seem to be very promising, since these robots are able to increase patients' compliance through gestures, speech and facial expression (Lee, Kim, Kim, & Kwon, 2017). There are many anthropomorphic robots developed. Given the wide range of human-like robots, this study focuses on the humanoid social robots often used in healthcare among seniors as shown in table 1.

Table 1. Anthropomorphic robots.

Human-like robots	Functions	Design characteristics
NAO (Tan et al., 2018).	Used in the healthcare sector to welcome, inform and entertain. It can walk, dance, speak, recognize faces and objects and detect human emotions.	- Height: 58 cm - Weight: 5.4 kg - Head including facial expression. - Body: pelvis, arms, hands, and legs. - Neutral colour.

Pepper (Tan et al., 2018).	Intended to make people enjoy life, facilitate relationships and connect people with the outside world. Able to engage with people through conversation and a touch screen, recognizes faces and human emotions.	- Height: 120 cm - Weight: 28 kg - Head including facial expression. - Body: wheels, arms, tablet. - Neutral colour.
Care-O-bot (Hans, Graf, & Schraft, 2002).	Actively support elderly in domestic environments. Lifting objects up, detect emergencies and contact help when necessary. Convey information through a touchscreen, body gestures, sounds, text-to-speech and a laser point embedded in its arm.	- Height: 158 cm - Weight: 140 kg - Body: 360 degree rotations of head with tablet and torso, pivot points on its neck and hips, arms and wheels to move. - Neutral colour.

2.4.2 Zoomorphic robots

Zoomorphic robots are primarily used by elderly who became lonely and need company (Tzafestas, 2015). Those robots are animal-shaped in their appearance and have limited human-like characteristics such as arms and legs as shown in table 2. Zoomorphic robots are often perceived as cute, charming and funny and evoke positive emotions (Wu et al., 2012). Furthermore, previous studies argue that zoomorphic robots are especially suitable for social interaction with humans (Li et al., 2010). Reasons for using animal-like robots in social interaction are the cuddly and attractive appearances, familiarity with human-pet relationships or just loving animals in general (de Graaf & Allouch, 2015). According to Preuβ and Legal (2017) people with cognitive disabilities especially benefit from the animal-like robots. This because animals are symbols of one's independence, give content to their life and reduce feelings of loneliness and stress (Preuβ, 2017). Therefore, it is expected that those robots are applicable in the case of companionship where people suffer from loneliness and are looking for social interaction. Table 2 shows the animal-like robots used in the current study.

Table 2. Zoomorphic robots.

Animal-like robots	Functions	Design characteristics
Nabaztag (Klamer & Allouch, 2010).	Wi-Fi enabled robot connected to the internet to process specific services such as weather forecasts, read owners e-mails/messages, alarm clock, local speed recognition and ear communication.	- Height 23 cm - Weight: 1 kg - Body: resembles a rabbit with flapping ears and coloured LEDs on the stomach. - Neutral colour.
ICat (Broekens et al., 2009).	An animated user-interface robot with personality, offering companionship and assistance (e.g. gaming, checking/reading e-mails, or turn on the lights). Generate facial expressions, recognizes faces and objects.	- Height: 38 cm - Body: resembles a cat with multi-colour LED light, touch sensors, a moveable head, eyebrows, eyes, eyelids and mouth. - Colour: yellow.
Aibo (Broekens et al., 2009).	Entertainment robot, enhances the quality of life and reduces stress. It can walk, play, responds to commands and uses cameras and facial recognition to interact with persons.	- Height: 29.6 cm - Weight: 1.5 kg - Body: resembles a puppy with touch sensors, a moveable tail, head and four legs. - Neutral colour.

2.4.3 Functional robots

The functional robots are called the machine-like robots, they have a more service-oriented purpose (Khosla & Chu, 2013). Those robots are similar to assistive robots to support elderly and caregivers in their daily tasks (Kemenade et al., 2015). In the literature there is little attention paid to the appearance of functional robots, since the main focus is that they should work and prevent users from getting harmed. According to Wu et al. (2012) the most important thing is that a robot is able to fulfil tasks. The designs are often very simple because of the practical purpose as shown in table 3. However, a study among children found that functional robots without facial features are considered to be friendlier than the

humanoid robots with facial features, while robots with facial features looked more intelligent (Li et al., 2010). This shows that the design of functional robots does play a role. Therefore, the current study explores the human-like, animal-like as well as the machine-like social robot appearance across different application domains. Finally, as a response to the increase in the number of elderly, many functional robots are developed that are able to take over some activities of caregivers. Table 3 shows the robots used in the current study.

Table 3. Functional robots.

Machine-like robots	*Functions*	*Design characteristics*
Hobbit (Fischinger et al., 2016).	Care robot supporting independent living. Provides assistance in emergencies, brings objects, reminders, guide exercises and offers entertainment.	- Height: 130 cm - Body: machine-like appearance with an arm, tablet and head with eyes. - Neutral colour.
Giraff (González-Jiménez, Glindo, & Ruiz-Sarmiento, 2012).	Telepresence robot enabling people to be virtually present in a remote place. Improving quality of life at a safe manner (e.g. video calling, detect emergencies and monitors the health condition).	- Weight: 14 kg - Body: a moveable tablet with a human-sized height, speaker and sensors to detect the environment.
MobiNa (Fischinger et al., 2016).	Interactive service robot capable of independent navigation. Robot aiming at performing fallen person detection in case of emergencies, allows skype conversations or serves as a reminder to take medication.	- Body: small vacuum-sized robot with a tablet, speakers and microphones. - Neutral colour.

2.4 Acceptance and attitude

Acceptance focuses on the users' perceptions of adopting a technological innovation and predicts and explains whether people use a new technology (Venkatesh, Thon and Xu, 2012). The most widely used theoretical model in studies about technology acceptance is the one from Davis in 1968, called the Technology Acceptance Model (TAM) as shown in appendix I. This model states that perceived usefulness and perceived ease of use determine the intention to use technology (Heerink, Kröse, Evers, & Wielinga, 2010). In 2003 a new model was presented, called the Unified Theory of Acceptance and the Use of Technology (UTAUT) as reported in appendix I. This model incorporated all relevant factors and added moderating variables such as gender, age and experience (Heerink, 2010). What becomes clear from the literature using these models is that in the case of elderly utilitarian and hedonic factors play an important role in acceptance (Klamer et al., 2010). Furthermore, gender plays an essential role. In general, it has been found that males tend to have a higher level of technology acceptance than females (Zhang, Nyheim, & Matilla, 2014). Zhang et al. (2014) argue that females feel more anxious and less enjoyment in using technology. Another factor that the literature suggests is trust. Individuals who trust a technology rate the acceptance of that technology higher (Eiser, Miles, & Frewer, 2006).

However, many studies show that the TAM and UTAUT model needed adaptation in the context of social robots. Therefore, Heerink et al. (2010) proposed the Almere model, developed to evaluate people's attitude towards technology in the context of social robots. Xu et al. (2014) adapted this model as a quantitative measure of user acceptance and divided the model into four categories: general attitudes, instrumental, emotional and social aspect. The scale is used in the study of Xu et al. (2014) to investigate the effect of scenario media on user attitudes towards robots. In the current study, the scale is used to assess people's acceptance and attitude towards the human-like, animal-like and machine-like robot type across the different application domains. It is expected that the emotional and social aspect of the Almere model is an important determinant for the acceptance and attitude towards a human-like appearance in the application domain of companionship. This because human-like appearances are perceived as more competent and trusted and create a strong sense of social presence, which is favourable when elderly feel lonely and need company (Gong, 2008; Castro-González et al., 2016). Finally, the instrumental aspect, which refers to the usefulness and ease of use, is expected to be important for machine-like

robots, since the main purpose of these robots is to take over tasks elderly are unable to perform themselves. (Wu et al., 2012).

2.5 Closeness between humans and robots

A well-established relationship could result in psychological attachment to a robot and will enhance acceptance (de Graaf et al., 2015). Kirby, Forlizzi and Simmons (2010) believe that people have the tendency to form social relationships with robots the same way as they do with humans. Prior work found evidence that children treat social robots as social agents (Westlund, Park, Williams, & Breazeal, 2018). When children are given time to develop relationships with social robots, children display social behaviour such as mirroring emotions, affection and disclosing information. Robots become children's friends. However, according to de Graaf, Allouch and Klamer (2015) people respond to robots in two ways: either people love and nurture social robots, or people see social robots simply as machines. When people love and nurture social robots, they start to build relationships with them and are more likely to interact.

The Unidimensional Relationship Closeness Scale (URCS) assess relationships between persons, but is also used in the context of social robots (Dibble, Levine, & Park, 2011). It is a self-report questionnaire that individuals complete while keeping a relational other in mind. The degree of closeness depends on the emotional, cognitive and behavioural bond (Dibble et al., 2011). The scale is used in the current study to explore the relationship between humans and robots in different application domains and if this is positive associated to the acceptance and attitude of different types of social robot design. According to Kirby et al. (2010) the situation where a person find himself in has a strong impact on how that person interacts with others. Therefore, it is expected that people form different relationships depending on the situation. For example, when you feel lonely and need company it seems important to create a close relationship with a robot. This close relationship can create different preferences for social robot design. Elderly might prefer a human or animal-like robot type because of the higher social presence which makes you feel less lonely and gives you the feeling to become close with the robot. Finally, males and females differ in terms of closeness between humans and robots. According to de Graaf et al. (2013) females are more willing to create a close relationship with a robot because of

their taking care character. Therefore, it is expected that females create stronger relationships with social robots than males.

2.6 Autonomy of a social robot

Autonomy is a vital requirement for a successful and acceptable social robot. According to Beer, Fisk and Rogers (2014) autonomy is defined as: "the extent to which a robot can sense, plan and act in its environment with the intent of reaching some task-specific goal without external control" (p. 77). Varying degrees in autonomy have been applied in previous studies. According to Beer, Prakash, Mitzner and Rogers (2011) it is critical that the level of autonomy meets the expectations of the user. If a required level of autonomy is not met for the task, the robot may be seen as useless and will not be accepted.

Rau, Li and Liu (2013) developed a scale to measure the autonomy of robots based on the human-computer interaction scale by Sheridan and Verplanck (1978). Sheridan et al. (1978) used the scale in the past to measure the autonomy of computers. Rau et al. (2013) changed it to a scale applicable in the context of social robots. The scale categorizes the robots' autonomy levels, from manual control, to a shared control with human initiative, to full autonomy. The scale is used in the current study to explore the degree of autonomy participants allow robots to have in the different application domains and if this is associated to the acceptance and attitude towards social robot design. According to Mohammad and Nishida-Sumi (2009) a social robot is unacceptable when it fails to achieve the tasks for which it is designed. For example, in the application domain of assistance, where elderly cannot perform daily tasks by themselves anymore, a certain degree of autonomy from robots is necessary. Therefore, it is expected that the participants accept a high degree of autonomy from robots in this situation. Furthermore, people have a certain appearance in mind when they think about what a robot can do (Austerman et al., 2010). When the expected autonomy does not match with the appearance of the robot people had in mind, the design of the social robot might not be accepted. For example, when a high degree of autonomy is allowed, elderly might prefer an autonomous and strong machine-like robot instead of an animal-like robot that looks cute and charming, but not autonomous. Finally, it is expected that males and females differ in autonomy for social robots. According to de Graaf et al. (2013) males perceive social robots as autonomous persons, therefore it is expected that males allow more autonomy from social robots than females.

3. Methodology

3.1 Pre-study

To identify which social robots and application domains will be used in the scenario-based experiment a pre-study was conducted. The pre-study consisted of an online survey among 15 participants (N = 15) and was divided into two parts. First of all, a video was shown to the participants to get familiar with the popular social robots. The video showed 9 social robots as reported in the theoretical framework. After the video, the online survey started. The first part of the survey consisted of open associations meaning that the participants had to describe the scenarios in which they will use each social robot based on the appearance. Since some participants had difficulties with assigning scenarios to the social robots, due to a low level of awareness or knowledge about the functions of social robots, the researcher provided some guidance in the beginning of the study.

Table 4 summarizes the most common scenarios for each social robot mentioned in the survey labelled to companionship, assistance and monitoring. The results show that human-like robots are suitable in many different scenarios, whether the animal-like robots are favourable in the case of companionship and the machine-like robots in the case of assistance or monitoring. Furthermore, the participants assigned multiple tasks to the robots. The tasks will be used in the main study to define concrete situations.

Table 4. Summary of the scenarios for each social robot appearance.

Robots	Scenarios	Labels
NAO	To talk to, playing games, household tasks, walking, lifting objects, exercising, buddy, listen to music	Assistance, monitoring, companionship
Pepper	Buddy, to talk to, playing games, walking, doing grocery, advice, reading the news, information, contact family, lifting objects, reminders	Assistance, monitoring, companionship
Care-O-bot	Household tasks, reminders medicines or appointments, lifting objects	Assistance, monitoring
Nabaztag	To talk to, keeping me up-to-date about mails or the weather, alarm clock, reminders, playing games	Monitoring, companionship
ICat	Playing games, nothing else because of the creepy appearance according to the participants	Companionship
Aibo	To feel less lonely, buddy, to play with, walking	Companionship

	Hobbit	Bringing medicine and grocery, information, calling for help, household tasks, lifting objects, to talk to	Assistance, monitoring, companionship
	Giraff	To communicate or call with relatives, appointments at home, exercising, fall detection, showing the news or e-mails, reminders of daily exercising	Assistance, monitoring
	MobiNa	Fall detection, reminders, video calling	Assistance, monitoring

The second part of the survey consisted of a ranking of statements related to the appearance of social robots on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The respondents had to answer to which extent they agree or disagree to statements such as the robot looks complex, simple, cheap, pleasurable to use and easy to use based on the appearance of the robot. These statements are based on the most relevant appearance items of the UTAUT and TAM model determining the acceptance of technology. Furthermore, the statements are short and simple, since the participants are not familiar with social robots. Table 5 shows the results. Social robots with the highest mean scores on acceptance per category are NAO (M = 15.32), Nabaztag (M = 19.25) and the Giraff (M = 16.34). These three types of social robots are used in the main study to assess the acceptance and attitude across different application domains.

Table 5. Descriptive statistics: Acceptance.

	Human-like			**Animal-like**			**Machine-like**		
	NAO	Pepper	Care-O-bot	Nabaztag	Icat	Aibo	Hobbit	Giraff	MobiNa
Robot looks complex	2.87	2.73	3.33	2.4	2.53	2.6	3.47	2.67	2.93
Robot looks simple	2.8	3	2.4	4.87	4.4	3.73	2.87	3.53	3.2
Robot looks cheap	2.47	1.6	1.6	4.2	4.4	2.67	2.67	3.47	2.07
Robot looks easy to use	3.80	3.87	3.3	4.21	3.87	4.07	2.47	3.47	3.13
Robot looks pleasurable to use	3.47	4.07	3.57	3.57	2	4.33	2.13	3.2	3.07
Total	**15.32**	15.27	14.02	**19.25**	17.2	13.06	11.14	**16.34**	14.4

3.2 Scenario-based experiment

The main study consisted of an online scenario-based experiment in which the participants had to imagine themselves in a situation common for elderly. The purpose of the scenario-based experiment is to explore which social robot design is most acceptable across the different application domains. According to Bengtsson and Bosch (2000) a scenario-based experiment should define very concrete situations. The scenarios are based on the literature and pre-study and labelled to companionship, monitoring and assistance as reported in table 6. All participants were randomly assigned to one of the conditions before answering the questions, called a between-subject design.

Table 6. Scenario-based experiment.

Conditions	Imagine yourself in the following situation..
1 Companionship	You are living alone and barely receive visitors since your family and friends are living far away. Furthermore, social activities are forbidden because of Covid-19 and you belong to a vulnerable group to get infected. You feel sad because of loneliness and you are looking for company. Therefore, you will buy a social robot to play games with and to talk to.
2 Monitoring	You suffer from mild dementia. This means you start to forget small things such as your medicines, appointments and daily exercises. Furthermore, your family is worried. Therefore, you are looking for a supervisor that monitors your health condition and send reminders. To fulfil your needs, you will buy a social robot.
3 Assistance	You are visually impaired and unstable. Because of your limitations, you are afraid to live independently at home. Your limitations make simple tasks difficult and increase the risk of falling. Therefore, you will buy a social robot for fall detection and to assist you with simple tasks such as reading the news or checking your e-mails.

3.3 Population

A Dutch sample was asked to voluntarily participate in the online scenario-based experiment. The sample consisted of people above the age of 50 since people had to imagine themselves in a scenario common for elderly. A total of 78 people, 26 participants in each scenario, completed the experiment. Most participants were between the 50 and 59 years old and had a low experience with social robots. Furthermore, the participants

consisted of slightly more women than men. The demographics of the participants are reported in Appendix II.

3.4 Procedure

Before the study took place, the purpose of the study was explained and the participants had to sign an online informed consent. The informed consent states that participation is voluntary and anonymous. Furthermore, the participants had the possibility to withdraw from the experiment at any time.

The main study was divided into multiple parts. First of all, the participants got randomly assigned to one of the three scenarios (companionship, monitoring or assistance). The participants had to imagine themselves in the given scenario and kept this in mind during the experiment. Secondly, the participants saw a video with images of functions of the human-like, animal-like and machine-like social robot and pictures of interactions between humans and these robots. The video served as an introduction to the topic. Thirdly, the participants had to answer an open question in which they were able to come up with qualities they found important when they would buy a social robot in the given scenario.

After the open question, the participants ranked several statements related to closeness between humans and robots and the level of autonomy they allow a social robot to have in the given scenario. Finally, the participants judged their acceptance and attitude towards the human-like, animal-like and machine-like robot based on the appearance. The participants had to rank to which extent they agreed or disagreed to statements on a 5-Point Likert Scale. The experiment ended with a small checklist of demographics indicating the gender, age and experience with social robotics.

3.5 Measures

Closeness

Participants first rated the relationship they would like to have with a social robot in the given scenario by indicating to what extent they agreed or disagreed with statements on the Unidimensional Relationship Closeness Scale (URCS) from Dibble et al. (2011). The scale consists of 12-items accompanied by a seven-step Likert-type response set (1 = strongly disagree, 7 = strongly agree). Closeness was measured by asking the participants to indicate

their agreement with statements such as *"I want to have a close relationship with a robot"* and *"I want to spend time with a robot"* (α = .93).

Autonomy

Secondly, participants rated two items related to the level of autonomy they allow a social social robot to have in the given scenario. Therefore, the autonomy scale from Rau et al. (2013) was used which describes the levels of autonomy in human-robot interaction and consists of a 10-point response set (1 = the robot should offer no assistance, 10 = the robot decides everything automatically, ignoring the human). For example: *"If you feel lonely, to what extent may the robot suggest activities automatically?''* and *"To what extent may the robot remind you at fixed times automatically?"* (α = .54).

Acceptance and attitude

Finally, the acceptance and attitude towards social robot design was measured using the Almere model (Xu et al., 2014). The Almere model includes 11-items indicating the acceptance and attitude of social robots on a 5-point Likert type response set (1= strongly disagree, 5 = strongly agree). The acceptance and attitude was measured by asking the participants to indicate their agreement with statements such as *"I feel attracted to the appearance of the robot"* and *"The robot's appearance frightens me"* (reverse coded). The same questions were asked for the human-like Nao robot (α = .82), animal-like Nabaztag robot (α = .89) and machine-like Giraff robot (α = .87).

4. Results

4.1 Quantitative results

To determine whether the participants produce a significant difference across the different application domains, a Univariate ANOVA is conducted. The independent variables are gender (1 = male, 2 = female) and type of scenario (1 = companionship, 2 = monitoring, 3 = assistance). Closeness, autonomy and acceptance are the dependent variables.

4.1.1 Closeness

First of all, it is measured if the participants are willing to form a relationship with a social robot in the given condition, independent of the type of social robot design. Starting out with closeness, a Univariate ANOVA with scenario and gender as independent variables and closeness as dependent variable yielded no significant main effect of type of scenario $F(2,72)$ = .65, p = .526. Furthermore, gender revealed no statistically significant effect on closeness $F(1,72)$ = .01, p = .937. Additionally, the interaction effect between type of scenario and gender on closeness revealed no statistically significant effect either $F(2,72)$ = .16, p = .854.

However, the results showed a significant effect of type of scenario on the item *"I want to spend time with a robot"* $F(2,72)$ = 5.3, p = .007. The results indicate that participants in the companionship condition (M = 4.88, SD = 1.42) were more willing to spend time with a robot, compared to the monitoring (M = 3.62, SD = 1.42) and assistance condition (M = 3.92, SD = 1.35) as shown in table 7.

Table 7. Descriptive statistics: *"I want to spend time with the robot."*

Scenario	Mean	Std. Deviation	N
Companionship	4.88	1.42	26
Monitoring	3.62	1.42	26
Assistance	3.92	1.35	26
Total	4.14	1.48	78

Note. Scores are rated on a 7-point Likert scale.

4.1.2 Autonomy

For the construct autonomy, type of scenario revealed no statistically significant effect $F(2,72)$ = .1.67, p = .195. Gender showed a marginally significant effect on autonomy $F(1,72)$ = 3.72, p = .058. The result indicates a higher autonomy score for social robots rated by males (M = 7.36, SD = 1.66) than females (M = 6.56, SD = 2.13) as reported in table 8. The

interaction effect of type of scenario and gender on autonomy revealed no statistically significant effect $F(2,72) = .11$, $p = .901$.

Due to a low construct validity, the main effect of type of scenario and gender on the separate items of autonomy are considered. The main effect of type of scenario on an automatic execution of tasks revealed a significant effect $F(2,72) = 8.73$, $p = .000$. The results indicate a higher score in the monitoring ($M = 8.23$, $SD = 1.99$) and companionship condition ($M = 7.27$, $SD = 2.49$) on a social robot automatic execution of tasks, compared to the assistance condition ($M = 5.85$, $SD = 2.54$). This indicates that the participants in the companionship condition prefer a robot that automatically talks and prefer to be reminded automatically in the monitoring condition, but do not value a robot that automatically performs simple daily tasks in the assistance condition. The main effect of gender on the expected automatic execution of tasks revealed a significant effect as well $F(1,72) = 8.37$, $p = .005$. This result indicates that males allow a social robot automatic execution of tasks easier than females in all conditions as reported in table 9.

Table 8. Descriptive statistics: Autonomy.

Gender	Mean	Std. Deviation	N
Male	7.36	1.66	36
Female	6.56	2.13	42
Total	4.14	1.48	78

Note. Scores are rated on the 10-point autonomy scale.

Table 9. Automatic execution of tasks.

Scenario		Mean	Std. Deviation	N
Companionship	Male	8	2.52	7
	Female	7	2.49	19
	Total	7.27	1.48	26
Monitoring	Male	8.71	1.2	14
	Female	7.67	2.57	12
	Total	8.23	1.99	26
Assistance	Male	6.93	2.31	15
	Female	4.36	2.11	11
	Total	5.85	2.54	26
Total	Male	7.83	2.1	36
	Female	6.50	2.71	42
	Total	7.12	2.52	78

Note. Scores are rated on the 10-point autonomy scale.

4.1.3 Acceptance and attitude

Next to the level of autonomy and closeness, the Univariate ANOVA showed if there was a significant main effect of type of scenario and gender or an interaction effect of type of scenario and gender on acceptance and attitude. The acceptance and attitude is measured based on the appearance of three social robots: Nao (human-like), Nabaztag (animal-like) and the Giraff robot (machine-like).

Human-like robot: Nao

Starting out with the Nao robot, the ANOVA revealed no statistically significant effect of type of scenario on acceptance, $F(2,72) = .03$, $p = .975$. The ANOVA neither revealed statistically significant effects of gender on acceptance, $F(1,72) = .08$, $p = .773$ or an interaction effect of type of scenario and gender on acceptance $F(2,72) = .02$, $p = .976$.

The results showed a statistically significant effect of type of scenario on the item *''I think my family would love to see me with the robot''* (social influence) $F(2,72) = 4.24$, $p = .018$. The results in table 10 indicate that the social influence is higher in the monitoring condition ($M = 3.50$, $SD = .86$), compared to the companionship ($M = 2.65$, $SD = 1.06$) and assistance condition ($M = 2.85$, $SD = 1.08$).

Table 10. Descriptive statistics: Social influence.

Robot design	Scenario	Mean	Std. Deviation	N
Nao	Companionship	2.65	1.06	26
	Monitoring	3.5	.86	26
	Assistance	2.85	1.08	26
	Total	3	1.06	78

Note. Scores are rated on a 5-point Likert scale.

Animal-like robot: Nabaztag

Similar results were found for the Nabaztag robot. The results showed no statistically significant effect of type of scenario on acceptance, $F(2,72) = .44$, $p = .646$. The results neither revealed statistically significant effects of gender on acceptance $F(1,72) = .92$, $p = .335$ or a significant interaction effect of type of scenario and gender on acceptance $F(2,72) = .03$, $p = .971$.

However, the results showed a statistically significant effect of type of scenario on the item *''I think my family would love to see me with the robot''* (social influence) $F(2,72) =$

3.98, *p* = .023. The results in table 11 indicate that the social influence is higher in the monitoring condition (*M* = 3.35, *SD* = .79), compared to the companionship (*M* = 2.62, *SD* = 1.13) and assistance condition (*M* = 2.65, *SD* = 1.13).

Table 11. Descriptive statistics: Social influence.

Robot design	Scenario	Mean	Std. Deviation	N
Nabaztag	Companionship	2.62	1.13	26
	Monitoring	3.35	.79	26
	Assistance	2.65	1.13	26
	Total	2.87	1.07	78

Note. Scores are rated on a 5-point Likert scale.

Machine-like robot: Giraff

Finally, the results showed no statistically significant main effect of type of scenario for the machine-like Giraff robot on acceptance, *F*(2,72) = .89, *p* = .413. The results neither revealed statistically significant effects of gender on acceptance *F*(1,72) = 1.66, *p* = .202 or a significant interaction effect between type of scenario and gender on acceptance *F*(2,72) = 1.59, *p* = .211.

However, the results showed a statistically significant interaction effect of type of scenario and gender on the item *"I feel attracted to the appearance of the robot"* (attitude) *F*(2,72) = 3.77, *p* = .028 as illustrated in figure 1. Inspection of the interaction plot shows that attraction to the human-like robot type rises for males in the companionship condition and for females in the assistance and monitoring condition.
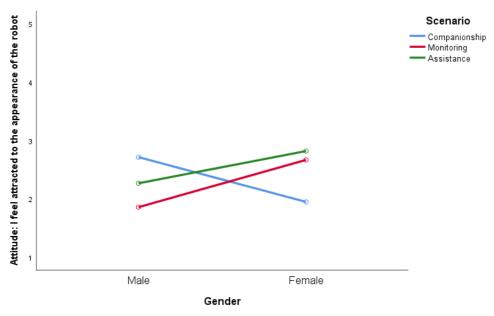

Figure 1. Interaction effect between gender and type of scenario on attitude.

Furthermore, the results showed a statistically significant interaction effect of type of scenario and gender on the item *"When I look at the robot, I get excited"* (enjoyment) $F(2,72) = 3.69$, $p = .030$ as illustrated in figure 2. Inspection of the interaction plot shows an increased enjoyment of the machine-like robot for males in the case of companionship, while females get more excited of the machine-like robot in the case of monitoring and assistance.
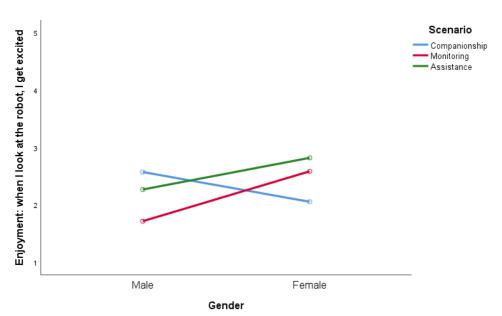

Figure 2. Interaction effect between gender and type of scenario on enjoyment.

4.1.4 Correlation between autonomy, closeness and acceptance

Correlation analyses were conducted to investigate relationships between the outcome measures. The correlations were examined using Spearman's correlation, the closer the correlation is to +1 the stronger the relationship. The significant Spearman correlation coefficient of .35 ($r = .35$; $p = .002$; $N = 78$) is considered as a low positive correlation between autonomy and the acceptance of the human-like Nao robot. Meaning that a high autonomy score is associated to a high level of acceptance for the Nao robot. The results showed a non-significant low positive relationship between autonomy and the acceptance of the animal-like Nabaztag robot ($r = .13$; $p = .269$; $N = 78$). The results also showed a non-significant low positive correlation between autonomy and the acceptance of the machine-like Giraff robot ($r = .09$; $p = .449$; $N = 78$).

Furthermore, it is analysed if there was a relationship between closeness and acceptance. The results showed a significant moderate positive correlation between

closeness and the acceptance of the human-like Nao robot (r = .65; p = .000; N = 78). Meaning that high levels of closeness are associated with high levels of acceptance for the Nao robot. The results also showed a significant moderate positive correlation between closeness and the acceptance of the animal-like Nabaztag robot (r = .54; p = .000; N = 78). Meaning that high levels of closeness are associated with high levels of acceptance for the Nabaztag robot. Finally, the results showed a significant low positive correlation between closeness and the acceptance of the machine-like Giraff robot (r = .42; p = .000; N = 78). Meaning that high levels of closeness are associated with high levels of acceptance for the Giraff robot. All correlations are reported in in Appendix III.

4.1 Qualitative results

Next to the ranking of statements, an open question identified the important requirements for buying a social robot in the different application domains. The results show that, regardless of the type of scenario, the most important requirement is that a robot should be easy to control (n = 13). Multiple participants mentioned: *"The most important thing is that the robot is easy to control."* Furthermore, the participants preferred a clear voice (n = 12), voice recognition (n = 11), and emotion recognition (n = 10).

The results in the different scenarios showed that in the companionship condition, the importance of colours (n = 2) to emotion recognition is added. For example, one of the participants mentioned: *"I wish the robot shows emotions through colours."* Furthermore, they mentioned the importance of a small (n = 3), human-like (n = 2) and friendly robot (n = 3) who should be their buddy (n = 3)*.* They mentioned: *"The robot should be my buddy and small with a human-like friendly face."* In the monitoring condition, participants favoured robots with camera's (n = 2), a friendly voice (n = 3), sympathy (n = 2), non-compulsory (n = 2), and human-like (n = 3). The participants stated: *"The robot should observe me through camera's"* and *"The robot should not force me, instead the robot should be positive, showing sympathy and talk to me with a friendly voice."* Finally, in the assistance condition, a strong robot (n = 2), a strong communicator (n = 3), and a robot with detection sensors (n = 3) is preferable. The participants mentioned: *"I am looking for a strong robot with excellent communication skills to show me the way"* and *"It is important that the robot has detection sensors to provide warnings."*

To summarize, these results indicate that, depending on the type of scenario, similarities as well as differences in the requirements were found. As reported in table 13, requirements as a non-compulsory robot and sympathy play only a role in the case of monitoring, whether a small robot is only mentioned in the case of companionship. Additionally, the importance of a strong robot is only mentioned in the assistance condition. Furthermore, there is some overlap in the reported requirements, but some of them prevail above others. For example, a clear voice plays a large role in the monitoring condition (n= 7), compared to the assistance (n = 3) and companionship condition (n = 2). However, emotion recognition is more important in the case of companionship (n = 4) and monitoring (n = 4), compared to the assistance condition (n = 2). Finally, the participants place more emphasis on functional requirements than design requirements with an exception for the companionship condition. Here design requirements such as colours, a small robot and human-like features got more attention in relation to the other conditions.

Table 13. Reported requirements.

Reported requirements	Companionship		Monitoring		Assistance		Total
	Frequency	%	Frequency	%	Frequency	%	
Easy to control	4	15.4	5	19.2	4	11.5	13
Clear voice	2	11.5	7	26.9	3	11.5	12
Voice recognition	5	19.2	4	15.4	2	7.7	11
Emotion recognition	4	15.4	4	15.4	2	7.7	10
Camera's			2	7.7	4	15.4	6
Friendly voice	2	7.7	3	11.5	1	3.8	6
Human-like	2	7.7	3	11.5	1	3.8	6
Strong communicator	1	3.8	1	3.8	3	11.5	5
Friendly look	3	11.5			2	7.7	5
Colours	2	7.7	1	3.8	1	3.8	4
Detection sensors			1	3.8	3	11.5	4
Buddy	3	11.5	1	3.8			4
Small robot	3	7.7					3
Non-compulsory			2	7.7			2
Sympathy			2	7.7			2
Strong robot					2	7.7	2

5. Discussion

5.1 Main findings

The aim of the study was to explore the acceptance and attitude towards social robot design and to explore the requirements for social robots across the different application domains. This study evaluated three different conditions in which social robots can be used among seniors: companionship, monitoring and assistance. The results yield some intriguing insights into the variables of closeness, autonomy and acceptance by gender and across the different application domains. First of all, the results of the present research show that males allow a social robot to have more autonomy than females, especially in the monitoring and companionship condition. Earlier studies mentioned that males show less anxiety towards new technology, which might explain why males allow more autonomy than females (Zhang et al., 2014). However, it was expected that a high degree of automatic execution of tasks was allowed in the case of assistance, in which robots take over tasks elderly are unable to perform themselves. The contrary results perhaps indicate that humans want to try to perform the tasks by themselves in the first place. The reason for this might be that elderly want to stay independent and are not used to handle tasks over to technology. Future research should further investigate if this independency and unfamiliarity with technology might play a role for autonomy in the assistance condition.

Secondly, the results show that people are willing to spend more time with a robot in the companionship condition, compared to the monitoring and assistance condition. This is confirmed in the qualitative part of the study. The participants asked here for a buddy to spend their time with. Besides, the literature mentioned the importance of social robots to combat loneliness and to fulfil the need for companionship (Kemenade et al., 2015). The results also show that participants think that their family prefer to see them with the machine-like or human-like robot type in the case of monitoring. Perhaps these results indicate that machine-like and human-like robots fulfil the need for safety and control according to the family. Future research should further investigate the role of safety and control in human-robot interaction.

Furthermore, the enjoyment and attraction to the machine-like robot appearance rises for males in the companionship condition and for females in the monitoring and assistance condition. Perhaps these results indicate that males are fine with a very simplistic

social robot design as the Giraff robot in the companionship condition and that females are looking for a more extravagant design. Earlier findings showed that robots are often perceived as masculine and that males prefer simple images implying action and representing male characteristics, whether females prefer more detailed images including colours and female characteristics (Eyssel & Hegel, 2012; Jacobsdóttir & Krey, 1993). This might explain why males tend to accept this simple design in the companionship condition easier than females. Furthermore, females are fine with this simple design in the monitoring and companionship condition. The purpose of social robots in these conditions is more practical, compared to the companionship condition where more social interaction is required. The practical purpose might explain why this simple design for females is sufficient in the case of assistance and monitoring. Future research should further investigate if colours, details and female characteristics can enhance the attraction and enjoyment of females to social robots in the companionship condition.

Additionally, the findings suggest that closeness between humans and robots is important for ensuring acceptance, something which is most apparent for the human-like and animal-like robot type. This is in line with the study of de Graaf et al. (2015) mentioning that people who are willing to form a relationship with a robot are more likely to interact. Also earlier findings showed that the human-like and animal-like robots create a strong sense of social presence and trust (Gong, 2008). This might explain the preference for these robot types, since trust is seen as an important determinant in relationships.

Finally, in the qualitative part of the study, the participants indicated the requirements for social robots across the different application domains. Previous studies already detected the importance of a robot that is easy to control and use (de Graaf et al., 2013). This study confirms the ease of use in all three conditions. Differences were also found across the different application domains. Participants place more emphasis on design requirements than functional requirements in the companionship condition, compared to the monitoring and assistance condition. Furthermore, the participants favoured a robot with positivity and sympathy in the monitoring condition, a small robot in the companionship condition and a strong robot in the assistance condition. Perhaps this might suggest that a positive robot in the case of monitoring, a small robot in the case of companionship and a strong robot in the case of assistance enhance people's acceptance to use social robots in daily life. The study of Gamliel and Peer (2006) already demonstrated

that positivity evokes favourable associations, this might apply to humans and their attitude towards social robots as well. Furthermore, Lohse et al. (2008) mentioned that small robots are perceived as honest, kind, naïve and warm, which might explain the preference for a small robot in the companionship condition. The preference of a strong robot in the assistance condition is not examined before, however it might be that strong robots appear to be more trustworthy to rely on. Future studies should further investigate why strong robots are more positively evaluated.

5.2 Limitations

Several limitations of the study deserve attention as well. First of all, the online experiment makes it difficult for the participants to judge their level of acceptance and attitude towards social robot design solely on pictures. Additionally, the knowledge and experience of social robots among the participants was relatively low. To reduce this problem, an introduction video was made to make people more familiar with the topic.

Secondly, the written requirements for social robots provided by the participants in the open question were often short. The results presented do not generate insights as why preferences for social robot design varied across the different application domains. Therefore, future interviews could explain the reasons for particular design choices. Besides, it might be interesting to explore the opinion of the family as well since the participants thought that family prefer to see them with a social robot. Qualitative interviews with both group of stakeholders, elderly and family, make it possible to compare the results.

Another shortcoming is the poor Cronbach's Alpha for autonomy influencing the reliability of the study. Due to a low construct validity, the main effect and interaction effect of type of scenario and gender on the separate items of autonomy were also considered.

Finally, the mean scores on the items for acceptance and attitude were often rated between 2 and 3 on a 5-point Likert scale, with an exception for social influence. Meaning that the participants do not reject social robots, but are also not very likely to interact with social robots across the different application domains. This might have to do with the online method, unfamiliarity and visual exposure to robots instead of real interactions which makes it difficult to judge the acceptance and attitude.

5.3 Practical implications

Several practical implications can be formulated to help designer to better adapt social robot design in different application domains to the preferences of users and to help healthcare professionals to leave a part of their job over to social robots. First of all, males allow a social robot to have more autonomy than females, especially in the monitoring and companionship condition. Therefore, healthcare professionals might implement autonomous social robots to offer males company or to monitor their health condition without their supervision, which creates more time for other tasks. Furthermore, designers play an important role in the companionship condition, since more emphasis is placed on design requirements than functional requirements. Designers should consider that males and females have different preferences. Females prefer a more extravagant design in the companionship condition. For example, adding colours and considering a friendly-look of the robot as indicated in the qualitative part of the study. Additionally, the healthcare professionals should look for robots with an extravagant design to create acceptance by their female patients in the case of companionship. Finally, to push the use of social robots' forward, designers and healthcare professionals should be aware of these different preferences for social robot design across the different application domains.

5.4 Conclusion

To conclude, different application domains ask for different design considerations. Most participants place more emphasis on design requirements than functional requirements in the case of companionship. Furthermore, there are different preferences for a human-like, animal-like and machine-like robot type by gender and across the different application domains. Nevertheless, creating close relationships between users and robots could enhance the acceptance and attitude towards social robots, especially for the human and animal-like robot type. However, more understanding is needed about the reasoning for particular design choices by different stakeholders. Broadening this understanding could be used to increase the acceptance and attitude towards social robot design and to deal with the double ageing process in the future.

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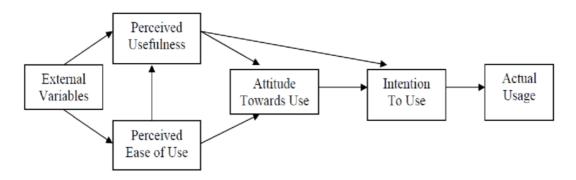
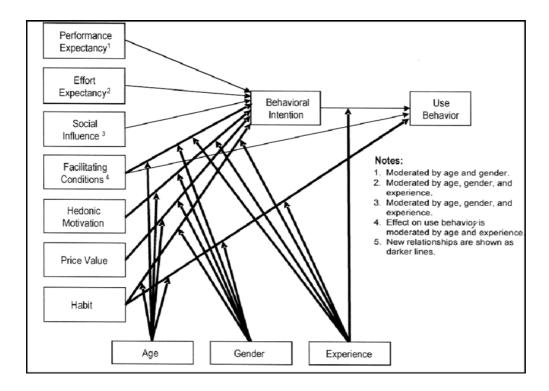*Figure 1*. Technology Acceptance Model (Davis, 1968).

Figure 2. Unified Theory of Acceptance and Use of Technology (Venkatesch et al., 2012).

Appendix II – Demographics participants

Table 1. Demographics.

	Condition		N	%
Gender	Companionship	Male	7	26.9
		Female	19	73.1
	Monitoring	Male	14	53.8
		Female	12	46.2
	Assistance	Male	15	57.7
		Female	11	42.3
	Total	Male	36	46.2
		Female	42	53.8
Age	Companionship	50-59	19	73.1
		60-69	4	15.4
		70+	3	11.5
	Monitoring	50-59	19	73.1
		60-69	4	15.4
		70+	3	11.5
	Assistance	50-59	18	69.2
		60-69	5	19.2
		70+	3	11.5
	Total	50-59	56	71.8
		60-69	13	16.7
		70+	9	11.5
Experience	Companionship	Low	17	65.4
		Middle	7	26.9
		High	2	7.7
	Monitoring	Low	20	76.9
		Middle	6	23.1
	Assistance	Low	24	92.3
		Middle	2	7.7
	Total	Low	61	78.2
		Middle	15	19.2
		High	2	2.6

Table 2. Spearman correlation between autonomy and acceptance.

Variable	*r*	*P*-value
Acceptance human-like robot Nao	.35	.002
Acceptance animal-like robot Nabaztag	.13	.269
Acceptance machine-like robot Giraff	.09	.449

Table 3. Spearman correlation between closeness and acceptance.

Variable	*r*	*P*-value
Acceptance human-like robot Nao	.65	.000
Acceptance animal-like robot Nabaztag	.54	.000
Acceptance machine-like robot Giraff	.42	.000