

*Research Article*

# **Introducing Social Robots in Swedish Dementia Care: Exploring the Interaction between Care Workers, Residents, and Robotic Cats**

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## **Abstract**

Social robots are discussed as a solution to new societal challenges connected to the ageing population and increasingly demanding care apparatus. Previous research about social robots in health care has been criticized for being either technophobic or technophilic: overly optimistic concerning the possibility of new technology, or pessimistic about the risk that robotization of care will entail a dehumanization of patients. Contributing with a social perspective to the research about the use of social robots in care settings, the article explores the interaction between care workers, residents, and robotic cats in dementia care facilities. The research design consists of a mixed-methods approach: Qualitative interviews with care workers and quantitative observations of residents' response to the robot. The findings from the interviews and observations indicate a connection between the performative role of the care workers and the response of the residents when using the robotic cat. From the perspective of symbolic interactionism, the findings are discussed in relation to meaning-making practices of care workers and how they construct the interaction with the residents in new ways, using the social robot as either tools or substitutes for interpersonal contact.

Keywords: Social Robots, Care Workers, Residents, Dementia Care, Mixed-methods, Symbolic Interactionism.

## **1. Introduction**

A wave of innovative robotics is emerging in response to new societal challenges associated with an aging population and an increasingly resource intensive health care. There are many different types of robots, with different applications, but it is the social robots that raise the most complex issues as they are integrated into the core of a caring relationship between caregivers and care recipients. Social robots aim to offer companionship and contribute to increased interaction and feelings of security (SMER, 2014); they are usually designed to resemble animals and built to sound and move the patient into activities, such as stroking and talking to the robot. Previous research on robotics in health care is usually conducted in two contexts with different point of departures: the technical sciences and the caring sciences (Kachouie, Sedighadeli, Khosla & Chu, 2014). Research in technical sciences has argued that the development of robots has the potential to fulfill important functions for more cost-effective care with good quality (Borenstein, 2010). This area of research focuses on engineering and programming, i.e. technical innovations regarding physical and digital solutions, such as design and bodily functions, mobility, interactive interfaces, emotional expressions, and artificial senses (Royakkers & van Est, 2016:10ff). From the perspective of caring sciences, there are concerns that robots may cause dehumanized care when they risk strengthening the social isolation of older people, replacing human care providers, and thus reducing interpersonal contact and empathic relationships for patients (Vandemeulebroucke, Dierckx de Casterlé & Gastmans, 2018). For example, a robot could be used as an excuse to leave a patient without human cohabitation for longer periods of time (Sharkey, 2014), used as substitution to social

contact and empathic relationship (Sparrow, 2002).

Despite identified risks, there are also positive examples that social robots can be used to strengthen social relationships. Social robots may be used in social, supportive, and therapeutically purposes in health care (Dautenhahn et al., 2005). For example, some researchers argue that social robots in care can help increase communication between patients and care workers, as well as between patients (Kachouie et al., 2014; Lorenz, 2019; Moyle et al., 2017; & Yumakulov, 2014). Nurses and other care workers are of particular interest in such research; as utilizers of the robots in their daily care of the users (Salzmann-Erikson & Eriksson, 2016). Of special interest to this study are the different ways care workers make use of the social robot in interaction. Some researchers, such as Moyle, Bramble, Jones, and Murfield (2016) shows that the practice of care workers, using social robots, may influence the patients' engagement, mood, and comfort. Other researchers have observed how care workers develop different practices and performative actions in their use of social robots in the daily care of the residents. Pfandenbauer and Dukat (2015:401) study how care workers deployed the robotic seal PARO according to two different strategies. The care worker can act either as a participant in the interaction with the resident, or as an observer of the residents' interaction with the robot.

Contributing with a performative dimension to the research about social robotic in health care, this article aims to explore the interaction between care workers, residents, and robotic cats. More specifically, how care workers construct care situations with the help of social robots in different ways, in interaction with residents in dementia care; and how residents respond in terms of well-being. The study asks two research questions:

*How do the care workers use the robotic cat in the care of the residents?*

*How do the resident's respond to the use of the robotic cat?*

In order to conceptualize the interaction between care worker, resident, and robot, I will adopt the theory of symbolic interactionism, which is presented in the next section. The research design is explorative in character and intends to include the perspectives of both care workers and residents using a mixed-method approach, consisting of qualitative interviews with the care workers and quantitative observations of the resident's well-being. The methodological section accounts for the participants, research design, and the collection of data. Thereafter, the empirical findings will be presented consisting of a detailed analysis of the qualitative and the quantitative data. Finally, the findings will be discussed in relation to the theoretical perspective.

### **Theory: Symbolic Interactionism**

People behave toward objects according to the meanings the objects have for different purposes; such purposes – and meanings – are created in social interaction and individuals learn meanings through a dynamic and interpretive process, which is applied to everything encountered during the experience of living (Blumer, 1969). Of relevance for this study, symbolic interactionism considers the ways that meaning of – and relationships with – objects, such as social robots, rely on practical purposes related to each interaction. Mead (2002/1932) put forth the idea of the significance of bodily and symbolical interactions with non-human objects for the development of self and identity. For instance, he showed the central role of material objects in the constitution and maintenance of social identities as a stable and familiar environment through the tactile acts of touching and grasping (McCarthy, 1984). Driving his intersubjectivist analysis deep into primary socialization, Mead connected the constitution of the object with the material constitution of the individual's own body (Joas, 1980:153). As the key concept in Mead's theory, role taking refers to the human ability to identify oneself with the action or response of "others", which is to put oneself in the situations of others, trying to look at the world from their perspective. Mead (1972/1938:152) states about the relation to material objects: "Through taking this attitude of the object, such as that of resistance, the organism is in the way of calling out its own further response to the object and thus becomes an object". It is

evident that, as Joas (1980:156) underlines, “commerce with things, too, like social intercourse is dependent on anticipatory role-taking” which “enables us to adjust in advance our own behavior to the expected behavior of whatever that is confronting us, and so to deal with things in a considered and planned manner.”

It should also be stated that Mead distinguishes between taking the role of “concrete”, or “particular”, other, and the “generalized other” (Mead, 1967/1934:152ff). While the attitude of the generalized other is the abstract attitude of the whole community (e.g. involving traditions, norms, and values of the society), the attitude of the concrete other is the attitude of a singular and particular other – a particular individual or material object which is part of a community but at the same time holds unique attitudes and values in relation to the actor. All material objects that is familiar to me is the vessels of both generalized (collective) and particular (individual) attitudes. Expressed in line with the object of study in this article, the robotic cat is filled with both collective and individual meanings – it is both a robotic cat and my robotic cat. My cat is unique to me because it is filled with, and reflects, my memories, experiences, emotions, and moral ideals.

The idea of the attitude of the concrete other can be seen in the light of how other scholars have discussed the attachment to specific objects, e.g. Csikszentmihalyi and Rochberg-Halton (1981) speak of “valued material possessions”, and Belk (1988) of “loved objects”.

The common denominator of all these formulations is that they emphasize “the idea that object preference is built up after purchase through a dialectic process in which meaning and affect are transferred between individuals and objects over time” (Wallendorf & Arnould, 1988:543). From an interactionistic perspective, social robots can be understood as potential “companion objects” (Persson, 2013; van Oost & Reed, 2011), that is, material objects that are acted upon as objects of personal importance and value to the actor (Meister, 2014). As will be shown in the empirical section, social robots may even be given personal nicknames, as part of the construction and representation of the relationship between resident and the robotic cat (Persson, 2013). The nickname can also be seen as a significant symbol of the attachment to previously owned biological cats. In this regard the robotic cat is acted upon as stand-in of the biological cat. Whether the nickname represents the biologic or the robotic cat, the resident acts upon the robot as an object with personal values and sentiments attached to it (Nørskov, 2014). Drawing upon the theoretical concepts of symbolic interactionism I will examine the interplay between actors and objects in order to understand how meaning is created through, and attributed to, the interaction between care workers and robotic cats.

## **2. Methods**

### **Participants: Care Workers, Residents, and Robotic Cats**

Before the study started, a meeting was held at each dementia care unit, involving the care workers and managers. The researcher provided the care workers with information about the study and of the use of the robotic cat. Informed consent was obtained from the participating care workers before any interview was conducted. Also, informed consent was obtained from the residents and their relatives (or legal guardian) before the residents were included in the study. No names or personal data, such as date of birth, of the residents, or care giving personnel, were recorded in order to protect the identity of the participants. The study was approved by the Regional Ethical Board in Uppsala, Sweden (2012/098).

### **The Robotic Cat**

The social robot used in this study is JustoCat®, which is an interactive robotic pet developed by a Swedish company. Running on a battery and sensitive to touch, the robot purrs and meows when patted. The size, weight, and warmth from the battery are intended to simulate a biological cat body. The construction of JustoCat follows Swedish hygiene routines required in nursing homes and hospital settings (e.g., easy-to-change fur facilitating personalized use, washable fur).

**The Care Workers**

All of the participating care workers were female. Most of them worked as assistant nurses, providing bedside care, which involve a variety of routines of daily care, such as helping the residents to dress, eat, and bath, but also to be engaged in social intercourse and participate in private and group activities. Only two of the participating care workers were certified nurses, and as such they were also allowed to execute more advanced care, such as administrate medicine to residents. The care workers were responsible for their residents, i.e. each resident was assigned to a specific care worker. Furthermore, all of the participating care workers had extensive experience from working in dementia care. The average amount of working experience among the care workers was seven years (between four and 16 years). Before the study started, the participating care workers were instructed of how to use the robotic cat in interaction with the residents. The instructions included best practice tips of how to use the robot in interaction with the residents, such as starting to use the robot oneself and showing the resident how to hold it, and how to stroke it in order to make it purr and meow. The care workers were told to be sensitive to the residents’ reactions to the robotic cat, and never force the robot on the resident if they showed any sign of discomfort.

**The Residents**

Dementia is a syndrome, usually of a chronic or progressive nature, caused by a variety of brain illnesses that affect memory, thinking, behavior, and ability to perform everyday activities. The syndrome involves various challenging behaviors, such as agitation, wandering, and aggression, also described as Behavioral and Psychological Symptoms of Dementia (BPSD) (Cohen-Mansfield, 1986).

Persons with dementia are likely to develop altered communication, feelings of isolation, and depression (Yeager & Hyer, 2008). The decision to choose which residents would be involved in the study was left to the care workers and managers based on their familiarity with and knowledge about the residents. The criterion was that the participating residents should have mid- to late-stage dementia. Nearly all of the participating residents were female (17 female and three male), and of the age between 71 and 91 years old (mean age 82). In all cases, the residents gave assent to their participation in the study, and a letter of consent was signed by a relative or legal representative, of each resident before the study started.

**Research Design**

With the aim to explore the care workers’ experiences as well as the care receivers’ response, this study adopts a mixed-methods design, which consists of a qualitative interview study including care workers, and a quantitative single-case study (Kazdin, 1982), including observations of residents’ behavior and well-being. In order to ensure that any novel effect of the robot was reduced, the study lasted 20 weeks in total, which is illustrated in Table 1.

Table 1. Study design illustrating scheme of interviews and observations.

	Week																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Interviews: Staff			X								X									X
Observations: Users	X3	X3	X3			X3				X3				X3				X3		X3

Interviews with the residents were considered (Hellström, Nolan, Nordenfelt & Lundh, 2007). However, being in a moderate or severe state of dementia can be confusing and scary, and some care workers were reluctant to let me interview the residents and risk adding to their symptoms. Therefore, it was decided that the interviewing researcher would interview the care workers and from them retain relevant information about the residents’ response to the robot.

## Interviews

Qualitative semi-structured group interviews (Merton, Fiske & Kendall, 1990/1956; Silverman, 1997) were conducted with the participating care workers. All of the participating care workers at each unit were interviewed at the same time for practical reasons. The interviews were prompted with pre-specified topics, and open-ended questions allowing the discussion to evolve around these open-ended questions, facilitating interaction among the participants (Stewart & Shamdasani, 1990). As illustrated in Table 1, the interviews with the care workers were held at the beginning of the study – before the robotic cat was introduced to the residents – to collect initial thoughts about using the robotic cat in interaction with the residents. A second round of interviews was held halfway into the study, to follow up questions or problems that may have arisen. The third, and final, round of interviews was conducted in the end of the study to round up and collect the care workers' experiences of using the robotic cat, as well as the residents' responses to the robot. The interviews lasted about one hour and took place in the participants' workplace, both for practical reasons and because the participants are likely to feel comfortable and relaxed in their familiar work setting (Hammersley & Atkinson, 1983).

The interpretation process was started by listening to the recorded interviews and transcribing them. Thereafter, the transcriptions were read several times within an extended time frame and took note of illustrative quotes, as well as deleted all words that detract from the key idea of each sentence or group of sentences uttered by the respondent, in order to discern the essential features of the text. The interpretation of the transcripts was influenced by the theoretical concepts from previous research about the interaction between caregiver and care receiver. Special attention was given to how care workers talk about their interaction with the resident using the robotic cat, how they construct situations that make sense to them and the residents, and how the care workers, as well as residents, attach value and meaning to the robot. All quotes have been translated by the researcher from Swedish to English.

## Observations

In addition to the interviews with the care workers, observations of the residents' behavior and well-being were made, according to a single-case study (Kazdin, 1982). The observations included two quantitative instruments, which have been psychometrically studied with overall good results (Falk, Persson & Wijk, 2007).

The first instrument is the Cohen Mansfield Agitation Inventory, or CMAI (Cohen-Mansfield, 1986, 1991; Finkel, Lyons & Anderson, 1992), which is used to measure the occurrence of abnormal verbal, vocal, or motor activities (the BPSDs). The instrument includes 29 items on a seven-answer option scale concerning aggressive physical, non-physical and verbal behavior administered by caregivers who were quite familiar with the residents. The summarized scores range between 29 and 103, where higher scores indicate higher frequency of agitation. The second instrument used is the Quality of Life in Late-Stage Dementia scale, or QUALID (Weiner et al., 2000), which is used to measure observed well-being and quality of life. The instrument includes 11 items on a five-answer option scale to be administered by someone who is quite familiar with the residents' general behavior. Higher scores indicate lower quality of life (range 11-59). In this study, the observations were conducted by the care workers who participated in the study and who were chiefly responsible for the participating residents. The care workers were familiar with the residents' behavior and were considered the best observers using the two instruments. In total, 24 observations of QUALID and CMAI were made for each resident over 20 weeks. The observations started with a three-week baseline without the robot, followed by the introduction of the robotic cat. The same instruments had been successfully tested in a previous pilot study involving the robotic cat (Gustafsson, Svanberg & Müllersdorf, 2015).

## Missing Data

Initially, the study consisted of 30 robotic cats, which were matched with 30 residents in

ten different dementia care units. However, data could only be collected from 20 residents and 20 care workers in eight care units. There are several reasons for the missing data. During the study, a few of the residents' symptoms worsened and the robotic cat was removed. In addition, three of the participating residents died during the study. Organizational changes and the transfer of some care workers to another care facility also created unforeseen problems.

### **3. Findings**

The empirical findings will be presented following the two research questions: How the care workers use the robotic cat, and how the residents respond to the robotic cat. The first question will be discussed with the help of the interview data, and the second question with the observation data. In the third subsection the interview and observation data will be analyzed in comparison.

#### **The Care Workers' Use of the Robotic Cat**

Once the robotic cat was introduced, the participating residents had free access to it, except when it needed to be charged (often during the night) or when the care workers saw a need to take it away. The care workers did have wide discretion to organize the decisions in practice. In this section, I will present the findings from the interviews: Care workers social practices and the different ways they use the social robot to engage in interaction with the residents. The empirical data will be presented according to the two roles of care workers that have been identified in previous research (Persson, 2015; Pfandenhauer & Dukat, 2015; van Oost & Reed, 2011); care workers may act either as participant in the interaction with the resident and robot, or as observer of the residents' use of the robot.

#### **The Participating Role**

In the role of acting as participant, care workers use the robot as a tool for interaction and communication with the resident (Pfandenhauer & Dukat, 2015:401). The general attitude among many of the care workers was that the robotic cat provided them with opportunities to talk and interact with the residents. As one care worker (9) said: "It becomes a nice moment of togetherness, where a resident talk with a staff member about the pets she has had.". Some of the care workers explained that the robotic cat evoked good memories for the resident about previously owned cats, and that the residents called the robotic cats by their previous pets' names, for example "Trulsan" (care worker 5), "Lisen" (care worker 15), "Sotis" (care worker 10), and "Misse" (care worker 19). One resident had owned many previous cats, and the care worker (9) informed me that the resident called the robotic cat by different nicknames, and attached different stories to each of those nicknames. "Really", the care worker says: "I learned a lot of new stuff about [the resident] that I didn't know before she started to use the cat. With help of the cat we talked about her life, the places and houses she had lived, and people she had known".

Not only did the care workers use the robot as a tool to recall memories, but also as a tool to break repetitive communication, which may be a symptom of the illness. For example, one care worker (6) informs that she used to take forth the robot and talk about it in situations when the resident got stuck in monotonous conversation about the bus that never arrives. This way, the care worker could help the resident to break the repetitive chain of thoughts by starting a new conversation.

Although much of the interviews revolve around various ways of using the robotic cat as tool to enrich communication between care worker and resident, the interviews also reveal a more corporeal aspect of the interaction with the robot. The technical construction of the robotic cat evokes bodily action, such as touching, stroking, and hugging. As some care workers found out, the robot may also evoke an interest to move about. A few of the residents, at different care units, started to take the robotic cat out on walks, within the perimeter of the care unit. One resident got really attached to the robotic cat and the care worker (12) explained that the resident "use the cat as a pet, taking care of it, feeding it, and taking it out on walks so it may

pee and poop". The care worker encouraged this behavior since the resident was getting good exercise walking with the cat lying on the walker, so the care worker bought a nice leash for the cat, and later also a bowl of water for the cat. In this case, it is obvious that the care worker actively participated in the interaction between the resident and robot, instead of simply leaving the resident alone with the robot.

The robotic cat was mainly for individual use, in the resident's private room, but the robot could also be used in spontaneous group sessions in the joint day room, together with other residents. As such, the robot was used as a tool to stimulate action and promote social intercourse in groups of people (Gustafsson, Svanberg & Müllersdorf, 2015). One of the care workers (7) informs that: "The resident took the robot cat with her and let the other residents touch and stroke it, and it became a topic of conversation between them – telling each other stories about cats that they have had before. They found a connection through the cat.". Care worker (19) tell similar story about "her" resident: "the cat invites to conversations between residents who otherwise do not talk to each other that much". In situations such as these, the care workers may act as participant in the group interaction but can also choose to take a more passive role as observer, and let the residents interact themselves with help of the robotic cat. However, acting in such way may lead to unforeseen problems, for example when "the cat may sometimes lead to jealousy between residents" (care worker 13). Those situations would demand the care worker to act and take the robot back into the private room of the resident.

### **The Observing Role**

The care workers may also act according to the role as observer of the residents' use of the robot (Pfandenhauer & Dukat, 2015:401). Contrary to the role as participant, active in the interaction with resident and robot, the role as observant is characterized by social distance, by being a passive listener and bystander. As one who do not engage in interaction with the resident, but merely observe the residents' use of the robotic cat. In the role as observer, the care workers used the robot as a tool to create comfort and calm for the residents. Most care workers tell me when interviewed, about how the residents enjoy the cats' purring and breathing when holding it. "The body contact with cat creates a nice and pleasant feeling for [the resident]", as one care worker (1) says. The care workers often told me that the preferred way of using the cat was for the resident to have it in their lap – stroking and patting the robot – which created a relaxing situation. "It makes her calm and happy", as one care worker says (11). Another care worker (16) explains that "the resident has the robot cat in her lap, stroking it, when she sits in front of the TV at night. It helps her feel less alone.". The robotic cat is, in this way, used as an object for keeping the resident company, i.e. as a companion object (Persson, 2013; van Oost & Reed, 2011).

The robot was also used more actively by the care workers, as a comforting companion to calm the residents when anxious and to divert, and help reduce, challenging behaviors due to the illness (BPSDs). For example, one care worker (18) informed me that the resident – who otherwise suffered from destructive thoughts – become calm and peaceful when snuggling with the cat. Therefore, the care worker made sure that the resident had access to the cat in potentially stressful situations, such as when she needed to be moved in and out of the wheelchair. With the robotic cat in the resident's lap, such physical actions became less stressful for the resident (and for the care worker). Another resident liked to have the robotic cat with her in bed when going to sleep, as it helped her relax. The care worker (20) adapted to the resident's need and began to charge it during the daytime instead of at night.

As stated before, the robotic cat was mainly for individual use in the resident's private room, however, the robot could also be used in spontaneous group sessions in the joint day room, together with other residents. Most of the time, used in this way, the robot promotes social intercourse in groups of people, but at certain times the care workers would also use the robot as a tool to calm down, divert, and manage the stress level among the residents in the group.

As illustrated in one care workers' (3) story about the Lucia parade when all the residents were gathered in the joint day room to listen to Christmas songs, and "her" resident was anxious and could not sit still and relax. The resident walked around and disturbed the other residents, making them nervous and restless too. In order to calm down the whole situation, the care worker got up, fetched the robotic cat, and gave it to the resident, and with the cat in her lap, the resident could finally relax; and the singing could continue.

### The Residents' Response to the Use of the Robotic Cat

Having accounted for the care workers' roles and social practices, I now turn to the responses of the residents and to the quantitative data. Observations were conducted during the first three weeks of the study in order to establish a baseline. The rest of the observations were divided into two parts: Before and after the second round of interviews, i.e. halfway into the study. The categorization of data was done in order to be able to see differences over time, but also to be able to ignore any individual, temporary, fluctuations that may occur in the residents' illness and behavior. The findings from the observations are presented in Table 2 according to three stages of the study: Baseline (week 1-3), first half of the study (week 4-11), and second half of the study (week 12-20).

Occurrence of abnormal verbal, vocal, or motor activities caused by confusion were measured using the instrument CMAI and showed a positive development for 11 residents (4-7, 9-10, 12-15, 19), and a neutral or negative development for nine residents (1-3, 8, 11, 16-18, 20). Positive and negative development is defined as a (positive or negative) change in observed mean values. In other words, it does not matter if the residents initially scored high or low on the measured scales, the important thing is to observe any potential changes in their behavior and well-being. Furthermore, quality of life was assessed with the instrument QUALID and showed a positive development for 11 residents (4-10, 12, 14-15, 19), and a neutral or negative development were identified for eight residents (1-3, 11, 13, 16-18, 20).

Table 2. The results (m=mean value) of CMAI and QUALID for the residents per unit. Positive developments are shaded.

Unit	Resident/ Care worker	Role of care worker	CMAI			QUALID		
			m= w 1-3	m= w 4-11	m= w 12-20	m= w 1-3	m= w 4-11	m= w 12-20
1	7	P	51	49	45	19	18	18
	8	P	90	92	96	37	33	31
2	11	O	91	93	96	35	35	36
	9	P	54	53	52	26	27	24
	10	P	71	69	66	22	20	19
	12	P	34	32	32	15	13	12
3	13	P	31	30	29	13	14	16
	14	P	30	28	28	18	14	14
4	19	P	56	54	53	28	26	26
	18	O	58	60	63	19	21	23
5	20	O	63	65	69	30	31	31
	3	O	38	38	42	24	27	28
6	1	O	94	95	95	35	37	38
	2	O	74	75	76	28	28	28
7	5	P	34	31	30	16	13	12
	6	P	54	52	51	25	23	23
8	4	P	40	40	39	21	21	20
	17	O	84	85	87	37	39	40

	16	O	85	86	86	38	39	39
	15	P	40	38	37	19	17	16

Ten residents showed positive results of both CMAI and QUALID: 4-7, 9-10, 12, 14-15 and 19. For these residents, the introduction and use of the robotic cat corresponds with signs of improved quality of life and a decrease in challenging behavior. Two respondents showed mixed results between CMAI and QUALID: 8 and 13. These results are difficult to interpret. Residents 13 showed only minor changes of both positive and negative character. However, resident 8 showed severe fluctuations, regarding both negative effects on challenging behavior and positive effects on quality of life. Finally, eight residents showed a negative development regarding both instruments: 1-3, 11, 16-18 and 20. For these residents the introduction and use of the robotic cat corresponded with a decrease in quality of life and an increase in challenging behavior. Having said this, it should be noted that there might be a number of reasons for the changes in the residents' well-being: The illness may have gotten worse, or the medication can have been changed. The methodology is explorative, and its' strength lies not in the single-case study (Kazdin, 1982) alone, but rather in the possibility to compare the qualitative and quantitative findings.

### Comparing Qualitative and Quantitative Data

Having presented the findings from the interviews and observations separately, I will next review them together by focusing on the relation between the care workers' use of the robotic cats and the residents' response to the robotic cat.

The roles as participant and observer may be adopted by the same care worker at different situations in relation to the resident. While one situation may require the care worker to calm down the resident, with the help of the robot, another situation may urge the care worker to engage in communication with the resident using the robot. Listening to the care workers, I understand that they occasionally shifted between the roles of being a participant or observer in relation to the residents. However, in the interviews the care workers were more or less inclined to talk about their use of the robotic cat in line with either one role or the other. Their stories reflect personal preferences to use the robotic cat in certain ways.

Some care workers seem to prefer to use the robot to communicate and interact with the resident, and other care workers seem to be inclined to use it to comfort the resident and to keep company without the interference of others.

I have in the qualitative findings section used illustrative examples from the care workers' stories to highlight the two roles. For clarification and overview, I have marked (in Table 2) which of the care workers that tend to express their use of the robot as either participant or observer. The care workers (4-10, 12-15, 19) at units 1, 2, 3, 4 and 7, generally expressed interacting activities that they were engaged in together with the resident and robot. Overall, the care workers from these units took active part in the introduction of the robot; they showed interest and were eager to discuss questions regarding best practices, or problems, with the researchers. In particular, the care workers at unit 2 showed the most enthusiasm and engagement in the use of the robotic cat. They are the only care unit who ask for an extra robot so they could have four residents included in the study, as seen in Table 2. Furthermore, they created routines and schedules for when they should do the observations, which they had posted on the wall in the staff room.

By comparing the care workers expressed preferences regarding use of the social robots and role in the caring relationship, with the observed responses of the residents, it is possible to see a connection. In most cases where the residents showed positive response to the robotic cat, they belonged to the care units in which the care workers participated in the interaction with the residents and robots in the most active way, i.e., mainly acted in the role of a participant. More specifically, care units 1, 2, 3, 4 and 7, mark those with the best observed health outcomes for the residents, and those units in which the interviewed care workers expressed the most interactive ways of working with the robots. In the other units (5, 6, 8) the interviewed care

workers (1-3, 11, 16-18, 20) expressed different preferences and usage of the robotic cat. The care workers at these units seemed to prefer to let the resident interact with the robotic cat on their own, and generally act as observant without engaging in interaction with the robot. Some care workers at these units, according to themselves, left the robotic cat to the residents, and let them do whatever they wanted with it for longer periods. It is also the care units 5, 6, and 8, that mark those with the poorest outcomes for the residents.

Care unit 4 is an interesting example of both negative and positive results. Two of the care workers never finished their observations and showed signs of disinterest in the robot in the end of the study. The only completed study at the care unit was one with a good outcome for the resident. I understand this as an effect of the personal interest and motivation of one particular care worker (19), who was interested to assess whether or not the robotic cat could be of potential use in the care of her own mother (who had dementia).

#### **4. Discussion**

It is important to stress that the social robot is not merely a technical device that is used in the same way by everyone. People behave toward objects according to the meanings the objects have for them, and such meanings are created by social interaction among people (Blumer, 1969). The social robot can be understood as a vessel, or facilitator of actions; a technical tool that is used in both activating and pacifying ways in the caring relationship between the care worker and resident. According to Mead (2002/1932:140ff), a thing with an “outside” is a thing that responds with its material surface and material properties towards the actions of the individual. The “outside” of the robot is understood as the technical features and design of the robot. An object with an “inside” is on the other hand an object that the individual does not need to see or put his hands on in order to know and predict how it will respond to different actions. The “inside” of the robot is here understood as the personal values, sentiments, and meanings that the users fill the robots with. An obvious example of meaning-making practices is the nicknaming of the robots. When giving the robot a nickname the robot is filled with personal meanings, such as memories and emotional experiences. Robot nicknames are both shared within a group, and sometimes kept secret from others. These symbolical actions signify the existence of both inclusive (mediating) and exclusive (private) relationships with the robot.

The interplay of actions between the care worker and resident towards the robot form and define the role of the object. If acted upon in an active way, as part of a triadic relationship, the role of the robot will be that of an “activator”, i.e. as an object that evokes and stimulates action, such as walking and interacting among the participants. If acted upon in a more passive way, as part of a dyadic relationship, the role of the robot will be that of a “pacifier”, i.e. as an object that reflects and arouses calming actions, such as patting and stroking, among the residents. Clearly, the role of the care worker – as participant and observer – goes hand in hand with the role of the robot – as pacifier and activator. If acted upon in an active way, by the care worker in interaction with the resident, the robot will be given an active role and thereby stimulate to action. And vice versa, acted upon in a passive way the robot will be given a passive role, and as such inspire to rest. It is apparent that the care workers in the study took different approach toward the robotic cat and choose to act toward the residents and the robots in different ways. Ideally, the care workers may adopt and switch between the two roles of being a participant or observer in different situations – knowing for example when the resident needs to be left alone and when to be encouraged to interact and communicate. Recognizing the value of both roles in the care workers daily care of the residents, I want, however, to stress the importance of the active role of the care worker as a participant in the interaction between resident and robot.

As shown in the findings section, the best health outcome (regarding challenging behavior and quality of life) among the residents is observed in those cases where the care workers expressed greatest engagement in interaction with the resident and robot. In contrast,

the care workers who expressed least engagement and who preferred to act in a more passive role, as observers of the interaction between resident and robot, were the ones that reported the poorest responses regarding challenging behavior and quality of life. Although the residents in this study may have enjoyed the use of the robotic cat on their own (in private), they may have enjoyed the interaction with the care workers even more. The function and benefit of the robotic cat may not only be depending on the technological features of the robot, but also on the “inside”, the meaning and role of the robot that is constructed in the care workers’ practices and their interaction with the residents. By following this interactionistic line of thought, it is possible to understand why a more active role of care workers, and robots, also generates more positive response and observed well-being among the residents. The more active the care workers are in interaction with the residents – by taking time to sit down and talk to the resident – the more positive response of the residents may be evoked. As seen in the findings section, there are situations in which the care workers may need to use the robot to divert negative behavior of the resident, i.e. use the robot constructively in a passive manner. However, if the care workers use the robot this way too often, it may risk pacifying the resident, and be turned into a substitute for interpersonal contact instead of being a tool for social interaction.

## 5. Conclusion

Contributing with a social perspective to the research field of social robots in health care, the article explores the interaction between care workers, residents and robotic cats in dementia care facilities. Previous research in the technical sciences tends to focus on the robot, and research in the caring sciences tends to focus on the dyad of robot and resident/patient. This study adds an understanding of the significance of social context and interplay between the triad of care worker, robot, and resident/patient.

The findings indicate a connection between the performative role of the care workers – acting as either participant or observer – and the response of the residents using the robotic cat. Using symbolic interactionism as theoretical framework, the findings have been discussed in relation to meaning-making practices of care workers and how they construct the interaction with the residents in different ways, using the social robot as either tools or substitutes for interpersonal contact. The general ambition when introducing social robots to dementia care residents is to help and be of benefit to the resident. However, if different use of the robot may generate different behavior and response, as argued in this article, the performative perspective – “the doing” – must be emphasized in future studies in order to better understand the social and institutional requirements needed when using social robots in dementia care.

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