Received: 15 June 2023 | Accepted: 18 April 2024

DOI: 10.1111/1467-9566.13786

ORIGINAL ARTICLE

SOCIOLOGY OF HEALTH & ILLNESS

Making robots matter in dementia care: Conceptualising the triadic interaction between caregiver, resident and robot animal

Marcus Persson[1] | **Clara Iversen**[2] | **David Redmalm**[3]

[1]Department of Education and Sociology, Institution of Behavioral Sciences and Learning, Linköping University, Linköping, Sweden

[2]Department of Social Work, Uppsala University, Uppsala, Sweden

[3]School of Health, Care and Social Welfare, Division of Sociology, Mälardalen University, Västerås, Sweden

Correspondence
Marcus Persson.
Email: marcus.persson@liu.se

Funding information
Vetenskapsrådet, Grant/Award Number: 2019-02575

Abstract

While previous research studies have focused on either caregivers' or residents' perception and use of social robots, this article offers an empirical and theoretical examination of joint activities in triadic human–robot interaction. The symptomatology of dementia creates an asymmetrical relation wherein the impetus to employ a robot often originates from the caregiver. Drawing on field work and video recorded interactions in dementia care homes, the article investigates how caregivers draw on embodied resources to involve residents and robot animals in interaction. The analysis demonstrates how caregivers promote commitment and encounter resistance with residents. We draw on the theory of sociomaterial interactionism to study situated interaction between bodies in a meaning-generating process. By re-conceptualising the theoretical notions of manipulation and recruitment, the article offers an approach for studying orientations that distinguish between reciprocity of agential objects. We show that caregivers usually distinguish between interactions with people and machines by anticipating a specific response from the robots (manipulation), while they invite participation in a broader sense from

residents (recruitment). Social friction arises, however, if caregivers act upon the residents as embodied objects in manipulative ways.

KEYWORDS
caregivers, dementia care, embodied interaction, human-robot, manipulation, recruitment, residents, robot animals, triadic interaction

INTRODUCTION

Robot animals are robots that resemble living animals—such as cats, dogs and seals—and respond to human interplay (Eachus, 2001). In care for older people, robot animals are increasingly used to offer security and company and to facilitate social interaction with others (Abbott et al., 2019).

The potential utility of robotic animals has been explored as a promising intervention for groups experiencing challenges associated with memory loss and a diminished sense of self, such as individuals living with dementia (Hebesberger et al., 2017; Moyle et al., 2018). Moreover, this technology has been considered in addressing issues related to the construction and sustenance of social relationships for these individuals (Kachouie et al., 2014; Lorenz et al., 2019; Petersen et al., 2016). However, ethical questions have also been raised about the existence of robots in dementia care: using robots can be used in deceptive practices to mimic living animals and may position the cared for body as an object, threatening human dignity (Sharkey, 2014; Vandemeulebroucke et al., 2018).

In our previous studies (Persson et al., 2023, 2024; Redmalm et al., 2022), we have explored the dilemma of lying and deception in dementia care, demonstrating how the agency of robots can shift between being perceived as inanimate things or animate agents (Alač, 2016), particularly in specific situations like conversation or comfort. Delving deeper into the situated interaction, this article establishes the relationship between caregiver, resident and robot animal within an interactionist tradition (Mead, 1972/1938), focusing on the 'act' (Joas, 1996), where the agency of the participants emerges.

Studying the use of robotics in dementia care provides a means to explore how social agency unfolds between bodies (Lipp, 2023; Sabanović & Chang, 2016). An aspect often overlooked in social robotic studies is the impact of dementia on behaviour. The symptoms of the illness can make it challenging for individuals to spontaneously determine the right course of action or solve problems in various situations, often resulting in a lack of initiative (Hydén & Samuelsson, 2019). Instead, the impetus to use a robot often comes from the caregiver. Therefore, our specific focus is on the triadic interaction in which caregivers actively invite residents to engage with robots.

Drawing on an interactionistic understanding of the interplay between humans and robots, the present study offers an examination of how caregivers orient towards residents and robots in situations when inviting residents into interaction with robot animals. Following an ethnographic methodology of studying robots in care context (e.g. Lipp, 2023; Sabanović & Chang, 2016; Wright, 2018), this study is based on field work and video recorded interactions in

care homes. By offering empirical insights into robot interaction, we contribute with a conceptual understanding for studies of triadic human–robot interactions in dementia care.

After reviewing previous research studies on the utilisation of robot animals in dementia care, we introduce the perspective of sociomaterial interactionism, emphasising the action-oriented dialectics between humans and objects. In the methodological section, we outline our use of participatory observations, qualitative interviews, and video recordings to investigate the use of robots in dementia care homes. We describe our empirical findings in the succeeding section, in which we show how caregivers use bodily cues and rely on the robots' materiality to initiate interactions and encourage residents into committing to these interactions. We conclude that human–robot interaction in dementia care is a highly embodied practice that, when successful, draws on the robots' material resistance and allows for users' initiatives and eventual resistance. We also point to potentially problematic embodied manipulation practices—when caregivers physically 'stage' users as they would the robot animals.

STUDYING ROBOTS IN SOCIAL CONTEXT

Most research studies on robotic animals aim to identify the benefits of the robot animals through measuring, for example, quality of life and changes in behaviour in the user, that is, the people living with dementia (Abbott et al., 2019). Reductions in anxiety, agitation and vocalisation have frequently been noted by caregivers and family. For instance, caregivers believed that the robot animals brought comfort to the residents and described the 'soothing' and 'calming' influence of JustoCat and the robot seal Paro, particularly when residents were anxious or upset (Birks et al., 2016; Moyle et al., 2018; Robinson et al., 2016). Qualitative studies have also suggested that robot animals can reduce the loneliness experienced by some residents, and this is particularly relevant for those who spent more time by themselves (Birks et al., 2016; Gustafsson et al., 2015). Hand in hand with feelings of decreased loneliness, an increase of feelings of pleasure and joy for residents have been observed by the same researchers.[1]

While several studies in this way have shown benefits of the robots, such an approach tends to isolate the robots from the social setting in which they are used. The robots were developed to function as a technological aid in care, so a focus on benefits is a reasonable response to the robots intended use; however, such studies cannot account for the variety of outcomes when the same robot is used with different persons, in different contexts. To understand why the use of robots is successful in some cases and not in others, we also need to study how the robots are used in actual interaction. We thus follow Chevallier's (2022, p. 19) call for future research: 'robots in care needs to be further investigated [...] so as to focus not exclusively of the robot's autonomy, but also carers' agency'.

Several studies of robot animals have been conducted that recognises the robots' embeddedness in a care practice. In care settings, robot animals can be used as a medium for communication, social stimulation and entertainment (Birks et al., 2016). A robot seal was described as 'very convenient' and a 'wonderful support' (Moyle et al., 2018) when residents were agitated and challenging, and helped staff give 'good care' (Niemelä et al., 2016) to the residents. Robot animals provided residents with an opportunity to communicate and confide their thoughts, feelings and frustrations (Robinson et al., 2016). Observations of residents' interactions with the robot seal showed that it could act as a 'conversational partner' (Chang & Sabanovic, 2015). Pfadenhauer and Dukat (2015) have observed how caregivers can deploy the robot in interaction with patients according to two different strategies—for diversion and calming purposes, or for stimulation and

interaction. Acted upon as an 'activator', the robot animal can stimulate the user to engage in communication with others. Robotic animals can also be acted upon by caregivers as 'passivators' to create calm and divert negative behaviours (Persson, 2020).

Previous research studies show that social robots demand involvement from caregivers to engage users (Chevallier, 2022; Persson et al., 2023). For instance, the care staff may need to participate in conversations (Chang & Sabanovic, 2015), make the robot accessible at the right moment (Jung et al., 2017; Moyle et al., 2018) and 'stage' it by carrying it in a certain way, talking about it and sometimes physically guiding users in how to handle it (Pfadenhauer & Dukat, 2015). Correspondingly, previous studies often stress that robot animals are not for everyone, and that it is important for caregivers to target the 'right' users and to tailor the usage according to their individual preferences (Abbott et al., 2019). These studies show that robots need caregivers' presence to make them meaningful to users as 'companion objects' (Persson, 2020). They also show that the robots' 'affiliative affordances' (Jones, 2017, p. 571)—their sounds, movements and other traits—are often not enough to engage people into using them.

Despite a growing focus on the caregivers' role when using robots in care, there is no uniform meso-theory explaining the essential social aspects of joint activities in triadic human–robot interaction. Therefore, we will in the next section contribute with a theoretical conceptualisation that includes how caregivers' social actions and the materiality of the robots engage residents into interactions with the robots.

SOCIOMATERIAL INTERACTIONISM

Studying the use of robotics in dementia care offers a way to explore how agency is played out between bodies, in contrast to evaluation studies of robots' medical effects, often guided by individualist psychology and cognitive reductionism. Interdisciplinary posthumanist research (e.g. Alač, 2016; Hasse, 2018; Lipp, 2023) has drawn attention to the role of technology in shaping the interaction between humans and machines within caregiving contexts. For instance, DeFalco (2020, p. 51) stresses that 'care has always been posthuman, a vital, vibrant relationality produced by and through the constant flux of tools and technologies, behaviours, embodiments, economies and ecologies'. While recognising the agency of the robots, our study does not focus exclusively on their role and autonomy. Instead, we examine how caregivers facilitate triadic interactions involving residents and robots.

Taking the actions of the caregivers as a point of departure, we ground the study in the tradition of social theory. Specifically, we draw on the framework of sociomaterial interactionism which pays attention not only to the reciprocal response of human interaction but also the social significance of material feedback of robot transactions (Ashmore et al., 1994; Preda, 1999). The theory posits that reality is located not in the cognitive realm of the human mind, nor in the external world 'out there'. Rather, reality is located in the 'act' that involves both the ongoing perceptual relations that emerge between human consciousness and the surrounding social and material environment (Puddephatt, 2005, p. 364). Mutual understanding arises as individuals take on each other's roles and attitudes towards a phenomenon or an object (Joas, 1996). The social or shared meaning of an object only materialises when two or more individuals use it in a similar way and refer to it in a similar fashion, treating it as a 'significant symbol' (Mead, 1967, pp. 46, 71) in their communication. Communication through significant symbols, whether verbal or non-verbal gestures, creates a shared world of symbolic meanings (Ashmore et al., 1994; Lynch, 2009; Preda, 1999).

Focusing on the interaction between the material bodies of humans and robots, we find Mead's (1972/1938) notion of 'resistance' of particular interest. Resistance always involves a hindrance of habitual of action that forces the actor to stop, become attentive of the problem, and attempt to overcome the offered resistance (Mead, 1972/1938, p. 79). The offered resistance of the material object is, according to Pickering (1993), what constitutes its material agency, which is always situated within a space of human purposes, goals and plans. People must find ways to 'accommodate' and to work around the resistance offered by objects, and by doing so, establish 'cooperative relationships' (Mead, 1972/1938, p. 654) with material objects. Manipulation of objects are not simply a question of intentional functionality, but rather, a dialectic process in which the individual is attentive of the resistance of her own body (McCarthy, 1984) and of the boundaries between the bodily self and material objects in the environment (Rosenthal & Bourgeois, 1991). Thus, through manipulation we simultaneous define ourselves and the objects in our environment (Mead, 1972/1938, p. 152) and the agency of humans and objects emerges.

From an interactionist point of view, human reciprocity involves role taking, that is, attempts to interpret and anticipate the action of the other. In regard to material objects, users anticipate and adjust their actions in advance to the 'attitude' of the object (Mead, 1972/1938, p. 188). In a sense, the agency of a familiar object invites us to act upon it in certain ways. This is what Turkle (2007) means by 'evocative object'—a familiar object that calls forth responses and thereby invites the individual to think and act upon it in certain ways. Interpersonal interaction is often discussed in terms of mutual role-taking. However, this can be problematic in dementia care, due to the illness symptom and cognitive decline of the residents (Hydén et al., 2022).

To conceptualise the asymmetrical role-taking between caregiver and resident we will adopt the term 'recruitment' as a concept that encompasses the linguistic and embodied ways in which assistance may be requested or in which we come to perceive another's need and offer or volunteer assistance (Kendrick & Drew, 2016). Different types of interactional resources can be used to recruit participation, which corresponds to epistemic, emotional and deontic aspects of action (Stevanovic & Peräkylä, 2014). While epistemically oriented actions, such as questions about who knows what (e.g. 'Have you seen this dog?'), and emotionally oriented practice, such as assessments about experiences (e.g. 'His fur is so soft'), can draw attention to an object and create involvement, a key resource for participation is made up by deontic oriented actions, involving the aspect of power in interaction (e.g. the directive 'Come here!'). The interaction may, or may not, result in a common definition of the situation (Park & Burgess, 1921), which in our study involves caregivers' and residents' shared understanding of how the interaction with a robot animal should be performed.

Manipulation and recruitment both require humans' ability to put oneself in the position of others (taking the role of humans and objects), yet are distinctly different in their approach towards the other. Manipulating the resistance of the other is less open, in terms of acting on the other's responses, compared to the more dialectic character of recruiting the other into participating in interaction. In this article, we will employ manipulation and recruitment as analytical concepts without a predefined agent. By treating the two notions manipulation and recruitment as distinct orientations towards the other (human or robot) in interaction, we analyse how agency in the triadic human–robot interaction plays out in dementia care. As we will show in the empirical section, the two notions can help explain the mechanisms behind ethically problematic situations between caregiver, resident and robot animal.

FOCUSED ETHNOGRAPHY

To study caregivers' actions in relation to residents and robots, this article draws on qualitative data collected at five dementia care homes in Sweden. The participating facilities were selected due to their experience of using robots in the care work, and the study involves caregivers with experience of working with robot cats and dogs. The robots in the study are of the same brand and relatively inexpensive, designed to mimic real cats and dogs. They have pressure sensors under the fur, triggering both physical movement and sound. The cat can move its head and one front paw, it can lay down and it can meow and purr with sound and vibrations. The dog has a small internal motor imitating a heart, it can wag its tail and move its head and bark, triggered both by touch and sound, for example, when the user calls for it.

The fieldwork was conducted as a 'focused ethnography' (Knoblauch, 2005), which is characterised by relatively short-term field visits. The short duration of field visits is typically compensated for by the intensive use of audio–visual technologies of data collection and data-analysis, as was the case in the current study. Observations were conducted by one researcher at a time, and the duration spanned from a one-day visit to a small care home to a week-long visit to a larger care home. In total, the research team spent about 100 h at care homes. The role of the visiting researcher can be understood as 'participating observer' (Emerson et al., 2011), which means that the researcher followed the caregivers when they carried out their daily round of activities (Hammersley & Atkinson, 2007). Written informed consent was obtained from the participating caregivers and residents before any observations, video recordings and interviews were conducted. No names or personal data were recorded to protect the identity of the participants. When participants (both caregivers and residents) showed resistance to being recorded, we did not proceed with video recording. The study has been approved by the Ethical Board in Sweden (number 2020-04661).

Documentation from the participating observations was done through photos of the localities, audio-recorded conversations with caregivers and residents, and field notes consisting of rich descriptions of the environment, the people and the events that we encountered (Hammersley & Atkinson, 2007). The field notes contain words, quotes and sketches that the researcher jolted down while observing the environment. Audio-recorded conversations were conducted with 44 caregivers during the visits at the care homes (Merton et al., 1956/1990). The recorded conversations were transcribed verbatim and were read several times within an extended timeframe. Video recordings of five occasions, involving in total seven caregivers and 15 residents, were conducted in two of the care homes. The video recordings were transcribed using conversation analytic conventions (Jefferson, 2004) and multimodal CA conventions (Mondada, 2018). These transcription conventions focus on embodied and verbal details of interactions that are relevant for social actions, such as lexical choices, gaze, movement, overlap and stress.

Informed by an abductive logic (Timmermans & Tavory, 2012) we sought to collect and analyse data simultaneously, allowing analytic concerns generated by initial observation and interviews to guide the collection of new data (Charmaz, 2001). For instance, while writing descriptive field notes, we simultaneously drafted brief, analytically focused, writings to identify and explore initial theoretical directions and possibilities (cf. Emerson et al., 2011, p. 123). This analytical procedure have guided the theoretical operationalisation of the concepts of manipulation and recruitment, as well as the empirical categorisation (Braun & Clarke, 2006). Questions that were considered during the initial analysis focused on how the caregivers act in relation to the robot animals, and how they orient towards the residents, when attempting to initiate interaction between the residents and the robots. The findings are presented related to three

themes that show how (1) residents are encouraged to participate in interactions; (2) interactions are maintained and (3) residents are approached when they resist the use of robots.

EMPIRICAL ORIENTATIONS TO HUMANS AND ROBOTS

In the following, we demonstrate caregivers' orientations towards residents and robot animals with the help of the theoretical concepts manipulation and recruitment. We first look at different ways of initiating interaction between human and machine, then the resources to promote residents' (and caregivers') commitment to interact with robots, and finally, of how caregivers pursue involvement in face of residents' resistance.

Initiating involvement

When caregivers initiate interactions between residents and robots, they must engage with the agency of both robot and resident, so that the robot makes relevant responses from residents, and address the resident in ways that target them as responsible for responding to the robot.

After morning coffee, the resident Maria sits by the table in the dining room. Nina, a caregiver, goes into the TV room to fetch the robot cat. Re-entering the dinner room, she is fully visible to Maria. Nina carries the cat as you would a living cat, stroking it on the back while moving slowly towards Maria. The stroking activates the cat's sound protocol, and it meows several times as Nina continues to walk slowly towards Maria. In this sense, Nina makes sure she has Maria's attention before placing the cat in her lap. Maria's reaction is then immediately positive, welcoming the cat with a smiling face and happy voice (Home 2, visit 5, fieldnotes).

Carrying the robot in this specific way was a recurrent practice in the dementia care homes. The caregivers rested the robot along the forearm with the head nestling in the crook of the arm, carefully pressed against the chest (Figure 1). This carrying technique has been called 'the colic carry' (Pfadenhauer & Dukat, 2015) since it is a technique employed to provide relief to babies suffering from colic.

The material resistance of the robot (its weight and shape) affects the way the caregivers carry the robot. Of course, the caregiver can choose to carry the robot in other ways, for instance by the neck or tail. However, by carrying it in a way that renders it evocative in the eyes of the resident (Turkle, 2007): by orienting to its 'catness' in the way they carry the robot, the caregivers make relevant caring responses to a pet from residents. While carrying the robot, the caregiver must also overcome the technical resistance to get it to start responding. This is done by pressing the on–off switch underneath the robot (on its belly) and petting the pressure sensors located on the robots' back (to get it to make meowing sounds). So, while carrying the robot in the crock of one arm, the caregivers can activate the robot with the help of their other hand, and thereafter pet it. A second function of walking slowly is that it gives opportunities for residents to acknowledge the robot. Furthermore, the caregivers' petting of the robot cat shows an instructional example of what is expected of them, and how to perform this expected action, that is, putting oneself 'inside' of the object (Mead, 1972/1938, p. 110).

Pfadenhauer and Dukat (2015) calls this way of engaging users 'activation in passing'. But although this way of recruiting users is seemingly casual, at a closer look, it usually consists of a number of exchanges, as shown in the excerpt below, from a video recorded situation, between Lise (caregiver), Nora (resident) and a robot dog. In this example, the dog has previously not

FIGURE 1 The carrying technique 'the colic carry'.

produced the desired bark and the caregiver has investigated its 'stomach' to see whether it is on. After establishing that the technical conditions are right (phrased as 'He doesn't have any stomach problems', line 92) she puts the dog down on the table facing Nora and then greets 'him' with 'Hi', while petting his back[2]:

92 CAR: He doesn't have any stomach pro:blems.

93 CAR: H*i::, *

car *pets dog *

94 (.)

95 DOG: Woof [woof

96 RES: [N[OW!

97 CAR: [N*ow!

*Lifts dog towards nor-->

98 CAR: Now.

99 CAR: Loo^k! Are you [ready

nor ^receives dog-->

00 DOG: [Woof [woof

01 NOR: [Yes.^

-->^

Here, the two sequences of events—manipulation of the robot and recruitment of the resident's involvement—become clear: first the caregiver initiates a greeting sequence with the dog. The way in which this is sequentially placed, after establishing that the right conditions for a preferred response are established, distinguishes this greeting from a greeting directed at a living being; therefore, it can be understood as manipulation of an object, while this manipulation is enacted following interactional norms—orienting to the evocativeness of the object. The dog produces the preferred response, barking (line 95). Both the researcher (line 96) and the caregiver (line 97) assess this as a fitting response with 'Now', thereby orienting to its material resistance as having been overcome—the dog is now ready for the situation.

As soon as she has established that the dog responds correctly, the caregiver lifts the dog towards Nora, thus using movement to initiate a second sequence directed at Nora. Her turn is made up of two actions. First, the directive 'Look' calls attention to the dog (line 99). It does not prescribe a specific way of responding but makes relevant some kind of collusive response from Nora. Second, without awaiting response, she asks a yes/no question about Nora's preparedness to receive the dog (line 99). Notably, Nora has already initiated an aligning response to the directive with her movement, stretching her arms towards the dog (line 99). She then confirms verbally that she is ready (line 1). The directive thereby works to secure attention but does in this case not require a verbal response from Nora. The physical presence of the dog can, in this sense, be understood as downplaying the asymmetry otherwise invoked by a directive. The caregiver is reacting to the dog in interaction with Nora, and only implicitly tells Nora what to do.

In the two initial examples, we can thus see how caregivers initiate interactions with residents by activating the robots' sound and treating them as living beings. Embodied work is important: by activating the robots, the caregivers make relevant responses from the residents as well as justify their own following prompts. These include the caregivers' movements (moving themselves/the robot) towards the resident, verbal cues (directives, checking availability), and embodied instruction on how the residents can act towards the robots. Both robots and residents are treated as agents in this situation. But while certain responses are expected from the robots, the caregivers leave room for different kinds of participation from residents.

Recruiting residents to pet robots is performed in other ways too. Some caregivers use brushes for the robots' fur to spark the residents' interest. Interacting with the robotic object through another material object demands, following Mead (1972/1938, p. 68) that the resident first takes the role of the brush and then takes the role of the robot. It might seem unnecessarily complicated but can also be of help. By aligning with the perceived purpose of the brush (to brush), the act of brushing can take place out of embodied habit without reflexive thinking. Most interactions that we observe, however, is performed by using the hands. Not only is it easier to initiate an interaction without finding a brush first, but it also grants the tactile feeling of touching a soft and furry surface of the robot. In any case, we understand initiations of interactions with robots as manipulative evocations of their agency, while caregivers recruit residents' participation in ways that promote their discretion.

Promoting commitment

As we have already seen, material and symbolic practices are intertwined in the interactions between caregivers, residents and robots. For instance, when caregivers employ practices such

as activation in passing to recruit the resident's involvement, they often use verbal cues as well to attract the residents' attention, such as calling the residents' name and inviting emotional involvement. While recruiting residents' involvement is the first, and necessary, stage, it is also vital for caregivers to encourage the residents to keep the engagement in the ongoing interaction with the robot. In this section, we focus on how verbal and embodied resources are used to promote specific kinds of engagement in the interactions.

In the following example, a transcription of a video recorded interaction (Figure 2), we see Caroline (caregiver), Lisbet (resident), Maj (resident), and a robot cat. Lisbet is sitting by the dinner table as Caroline fetches the cat from behind her. She then moves into Lisbet's view, making the cat visible before placing the cat on the table:

03 CAR: Have you seen, Lisbet.
04 (0.4)
05 LIS: *Is it ¨alive? ¨
lis *stretches out, pets under ear-> l.11
lis ¨looks at car¨
06 (.)
07 LIS: N[o.
08 MAJ: [Is it the cat.
09 (.)
10 CAR: It is the cat.
11 LIS: It is so fi:::ne.* Yes::
lis ->*

FIGURE 2 Video excerpt with line-drawing: Caroline, Lisbet, Maj, and robot cat.

The question 'Have you seen, Lisbet' (line 3) targets Lisbet as the recipient of what the caregiver is doing. It can be heard as a preparation to handing Lisbet the robot by first checking that she is attentive and available. The stress on 'seen' also produces this as a remarkable observable. In this sense, the action draws on epistemics, treating Lisbet as unknowing; emotions, treating the observed as remarkable and deontics, recruiting involvement from Lisbet (Stevanovic & Peräkylä, 2014). Like with Maria and Nora, the caregiver does not prescribe a specific way of understanding and responding to the robot. Instead, she offers embodied instruction but allows for the resident's agency in how she should treat the robot. Notably, the caregiver, Caroline, does not verbally respond to Lisbet's question (line 5) about the cat's ontological status. However, by holding the cat so that Lisbet can investigate it (with gaze and touch), Caroline enables Lisbet to answer her own question (line 5, 7), thus treating her as the expert. The combination of movement, information and assessment enhances the presentation of the robot animals as something exciting for the residents to acknowledge and engage in.

A recurrent epistemic and emotional resource used by caregivers was to display surprise, wonder or astonishment as a response to the movement or sound of the robot cat. The following example (Figure 3) continues from the interaction with Lisbet and we see how the caregiver displays surprise in a way that serves to maintain Lisbet's involvement:

With the assessment (line 13), Lisbet is involving herself as a competent participant who can know and evaluate the object. The caregiver's response is embodied, making the cat more available to Lisbet. The cat then meows (line 15). Looking at Lisbet (line 15) and providing a sharp in-breath (line 16), the caregiver Caroline uses the meow as a resource to build connection with Lisbet. Interaction research has shown that by expressing surprise we treat something as unexpected, and by doing so, 'surprise acts function as a vehicle for other actions' (Wilkinson & Kitzinger, 2006, p. 174). Since robots do not act in unanticipated ways, the caregiver—an experienced user of the robot and not surprised by its sound and movement—act on their behalf trying to evoke the unpredictable nature of a living cat. In addition, surprise works to level the asymmetry between caregiver and caretaker: they are both positioned as new to the cat's behaviour. While Maj treats the cat's meow as routine by just repeating it (line 19), Lisbet aligns with the caregiver's action by herself providing 'Oh dear!', which also indicates unexpectedness. However, she focuses on the cat, looking at it more intensively (line 21), rather than responding to the caregiver's look.

Evaluative comments are another emotional resource used to support the residents' interaction with robotic animals, affiliating with the resident's stance towards the cat. Such comments can be performed with utterances as well as non-lexical sounds, as illustrated in the field note below from an observation involving Anna (resident) and Molly (caregiver) (Home 2, visit 5):

Anna: Oh, littledarling... oh dear! (Talking to the robot)
Molly: Yeah
Anna: Oh, little cat
Molly: Oh, yes.
Anna: You (addressing the robot cat) can lie with me and sleep tonight. He's so warm. But he lives here, right? It seems like he is always here.
Molly: Yes, he lives here.
Anna: Mm..

12 (1.7)
13 LIS: °It is y'know +really ^ fine.°
14 ^(1.4) ^ +
car ^puts cat in front of LIS^
15 CAT: Meo¨::w=
car ¨looks at LIS->
16 CAR: =.HHHo!
17 (.)
18 CAT: Me[o::o
19 MAJ: [Meow=meow
20 (0.5)
21 LIS: Oh *dear! *
lis *looks intensively at cat*
22 (0.7)

FIGURE 3 Video excerpt with line-drawing: Caroline, Lisbet, Maj, and robot cat.

While the resident talks cordially to the robot cat, the caregiver agrees with the resident's assessment—thereby treating the resident's display of emotion, and responses to the robot cat, as accurate (and shared) in this situation. In another situation, a resident (Ivy) becomes worried that the robot cat will pee on the table that it is laying on, and asks the caregiver (Rose): 'It does not pee inside, will it?' Rose assures Ivy: 'No. He does not pee inside. None of the cats do'. Ivy says 'okay' and continues to pet the robot. In situations such as these, the residents seek confirmation from the caregiver, asking if their understanding of the robot is correct. By verbal and embodied (e.g. nodding or patting the resident on the shoulder) confirmation, the caregiver reassures the resident that everything is in order—that the cat lives at the care home, and that it will not pee on the table—and to ensure that the resident carry-on interacting with the robot cat. We understand the confirming responses as a vital resource in the continuous interaction between the resident and the robot. Without confirmation, the residents can become uncertain of what the situation demands.

Thus, in this section, we have seen how caregivers promote commitment with emotional and epistemic resources: invoking interest and levelling asymmetries by themselves showing emotional involvement and offering both space for residents to explore and interact with robots and offering supportive contributions in residents' ongoing contacts with the robots.

Encountering resistance

In some situations, the caregivers' initial recruitment (as described above) is not sufficient to generate cooperation from residents. The circumstances can vary: the resident may be unwilling, disinterested, tired, distracted or have reduced physical capabilities, such as reduced hearing and vision. In such situations, the caregivers can pursue involvement with directives or use embodied resources to recruit residents in a more hands-on manner. Our next example, from an observation, shows how the caregiver (Bella) initially uses the resource of surprise and then goes on to more strongly encouraging the resident (Grace) to participate with a directive. Bella has just put the robot cat in front of Grace and stroked its back (Home, visit 5):

Robot cat: Meow!
Bella: Oh! Wow!
Robot cat: Meow!
Bella: Look Grace! Look, he is talking to you!
Grace: Well.. yes
Bella: He waves at you!
Grace: Mm..
Bella: Oh oh oh! Look, he's laying down on the stomach!

Bella initially expresses surprise in response to the cat's meow. Doing so, she physically manipulates the material resistance of the robot by petting it (which also functions as an embodied instruction to Grace to pet), to activate its protocols for movement and sound, which are then enhanced further by Bella's verbal actions. In this case, however, surprise does not engender Grace's participation. Bella then pursues a response with a directive, specifically addressing Grace as the recipient. In addition, Bella translates the robot's actions to Grace—'Look, he is talking to you'. The move from surprise to a directive works interactionally smooth as the directive in combination with a translation account for her surprise. Grace cooperates by answering but does not reciprocate Bella's emotional involvement. Bella then informs Grace about the cat's actions, making further participation from Grace relevant. The emotional aspects of responding to an animal robot, with delight and surprise, allows the caregiver to produce information and directives that avoid enforcing the asymmetry of caregiver and caretaker, thus leaving room for the resident's agency.

As a different response to the resistance provided by the residents, less open in terms of the residents' agency, caregivers took the robots' paw and touched the residents' arm or took the resident's hand to stroke the robot together. In these cases, the robots' physicality was thus employed as a resource to pursue involvement. In the excerpt from a video (Figure 4), this is what happens after the caregiver has failed to establish joint attention using other resources:

17 DOG: Woof!

18 CAR: °Look°

19 DOG: Woof!

20 CAR: +Look +

car +takes the resident's hand+

FIGURE 4 Video excerpt with line-drawing: Imar, Gunnar, and robot dog.

The caregiver Imar's touching the robot has produced the expected bark and movement, but this does not bring about involvement from Gunnar, the resident. Imar then upgrades his efforts to recruit involvement by producing the directive, 'look' with a soft voice (line 18). Thus, he uses several of the resources we have seen above, treating the robot's behaviour as noteworthy by providing his own reaction, at the same time directing Gunnar. The robot 'helps' by providing a bark (line 19), but Gunnar does still not acknowledge its presence. Imar then repeats the directive (line 20) and tries to move Gunnar's hand towards the robot. By placing the residents' hand on the robot, Imar forces the material resistance of the robot onto the resident, persuading Gunnar to take the role of the robot. In this 'forced role-taking', the attempt to physically engage Gunnar in interaction with the robot are upgrades of the previous failed efforts (manipulating the robot and providing a verbal directive). In this case, however, Gunnar resists both.

Despite all the above examples of successful initiations of interactions with the robots, it is important to recognise that recruitment sometimes fails. During our visits, we observed several situations in which the caregivers failed to initiate interaction between the resident and robot. For instance, at one home (Home 2, visit 3) the visiting researcher is sitting at a table together with one of the caregivers (Chloe) and one of the residents (Eve). The caregiver informs the researcher that Eve usually likes to interact with the robot cat. To demonstrate it, the caregiver goes to fetch a robot. On the way back, she walks up behind the resident and places the robot cat on the table in front of the resident. The caregiver pats it a few times on its back but has not

turned on it, so it does not do anything. Then she says to Eve: 'You can have it'. Eve answers: 'No, I don't want it'. The caregiver pushes it closer, saying: 'Sure you do, you like the cat, don't you?'. The caregiver walks away to help another resident, leaving the resident with the robot cat. Unlike the cases above, this caregiver does not use resources to evoke the residents' interest in it. Instead, she tries to persuade the resident to use the robot with the argument that the resident usually likes it—thus having decided in advance how the interaction should unfold. Without any attempts to repair the failed initiation of interaction with the robot, the caregiver leaves, and the robot is left untouched by Eve.

While caregivers may fail to draw on the necessary resources to engage residents in robot interaction (as above), they can also fail to initiate interaction by being too assertive. In another situation, (Home 2, visit 4) the caregiver (Olga) approaches a resident (Lucy) in a wheelchair to start interacting with the robot cat again. The caregiver puts the robot in Lucy's' lap and says: 'You can pat it like this'. But Lucy does not want too pat it: 'It's disgusting. It is!' The Olga tries again: 'He wants you to pat him' and pats the robot herself. But Lucy cries out: 'No!'. The caregiver takes away the robot, saying 'okay, okay', and leaves Lucy alone. Instead of drawing on interactional resources to evoke the residents' interest in the robot, the caregiver here tries to stage a situation without securing participation from the resident.

To sum up, caregivers' involvement in initiating and maintaining interactions with social robots and residents is important, and in many cases, we see them using communicative resources that enable residents' agency, by making relevant a variety of responses. This is different from how caregivers treat robots, from whom they expect and demand 'the right' response only. In situations where residents resist interacting with robots, caregivers upgraded embodied instruction and surprise to directives and sometimes to physically guiding residents, thereby limiting the number of possible responses. This could therefore be seen as staging a particular kind of interaction, rather than backing down from directives and accepting resistance.

DISCUSSION

In the empirical situations detailed above, we have observed how the agency of caregivers, residents, and robot animals, manifests in three distinct scenarios: when initiating robotic interaction, promoting resident commitment and when encountering resistance from the resident. Although agency is ascribed to all three agents in the triad, this article position the triadic human–robot interactions within the 'act' as the basic unit of analysis. By introducing an interactional element to the study of human–robot-interaction, our theoretical conceptualisation offers an approach to study how agency is invoked and manifested among the agential objects in a meaning-generating process. The aim is to cultivate a more nuanced understanding of the variations in actions undertaken by caregivers when employing robots in dementia care.

By adopting the theoretical concepts of manipulation and recruitment, we have elucidated how caregivers leverage different resources associated with robot animals to encourage engagement with residents in care homes. Typically, caregivers differentiate between interactions with people and machines by anticipating specific responses from the robots (manipulation), while broadly inviting participation from residents (recruitment). However, we have also observed examples of caregivers attempting to impose their anticipated responses onto the residents. The relevance of employing these concepts in the analysis of social robots in dementia care are multifaceted and revolves around ethical considerations.

Previous research (Chevallier, 2022, p. 20) has noted how caregivers' physically guided users into holding and petting a robot seal and concludes that 'successfully eliciting the act of petting from older adults resulted in more frequent and varied moves and cries from Paro that, in turn, aroused more vivid reactions from the elderly patients'. However, Chevallier also shows how pushy attempts to engage residents, including physical cues, can backfire and result in annoyance and anger. When relying on physical upgrading, it is not only the robotic animal that is manipulated and 'staged' (Chevallier, 2022) but the residents too, leaving little openness in the interaction. The caregivers' tangible attempt to enforce the residents to take the role of the robot can in such cases be interpreted as manipulation rather than recruitment.

Moreover, the evocative potential inherent in the robot's agency is downplayed; instead, when the caregiver guides the resident's hand onto the robot, the robot is emphasised as an inanimate object. Attempting to manipulate the bodily responses of other individuals, rather than recruiting participation from them, may be perceived and met with resistance, as it can be interpreted as pushy and discouraging collaboration.

The concept of manipulation is relevant for understanding situations in which the caregiver acts in a manner that diminishes the resident's agency as a person with a sense of self and integrity. Consequently, the manipulation of residents is closely intertwined with ethical dilemmas in dementia care, such as autonomy and dignity (Sharkey, 2014), as well as issues related to lying and deception (Vandemeulebroucke et al., 2018).

As we have seen above, caregivers make use of a variety of verbal cues to reinforce the embodied resources when orienting towards residents. For instance, when a caregiver informs a resident that 'He doesn't have any stomach problems', when in fact checking the power switch, or when a caregiver ascribes intentionality to a robot dog by saying: 'Look, he is talking to you'. Another example, found in previous research, is when a caregiver assigns a personal nickname to the robot animal to enhance its social agency in the eyes of the resident (Hebesberger et al., 2017; Moyle et al., 2018; Persson et al., 2023). The use of verbal resources, such as these, should not necessary be seen as part of a manipulative orientation towards the resident. Treating the robot as a living creature can also be part of a creative process of recruiting participation from the resident. The difference between the two concepts is found in the caregivers' responsive orientation to the resident. While the caregiver can orient towards the robot animal in a recruiting manner, as if it were a living creature, the robot's behaviour is predetermined and cannot offer the caregiver any social resistance. Thus, we understand the caregiver's orientation towards robots as living animals as a pretence to recruit their participation.

Pretending to recruit the robots' participation place the caregiver in an ethically complex situation, as it pertains to the principle of transparency in social robotics. While pretence and play may be acceptable forms of behaviour in the care of people in vulnerable positions, the situation can also quickly become manipulative if the caregiver attempts to push their perception of reality onto the resident without responsive openness or first having secured their participation in a joint activity of play. In specific situations, a manipulative approach from the caregiver becomes necessary to ensure proper care, such as when transferring a resident into or out of a wheelchair or assisting them during meals. However, ethical concerns can be mitigated by proactively involving and obtaining consent from the resident before the caregiver carries out the physical action. This approach emphasises that prioritising manipulation over recruitment by caregivers may contribute to the ethical issues identified in previous studies.

It is crucial to recognise that the analysis is grounded in the caregiver's orientation towards residents and robots. If the analysis had been approached from the resident's standpoint, the

narrative might have diverged somewhat. Due to the symptoms of the residents' illness, navigating reality can pose challenges, causing them to perceive robots as living animals (Persson et al., 2024). As a result, residents may orient themselves toward the robot, seeking to recruit its participation by drawing upon a broader array of resources. We have seen some indications of this above, for instance, when residents cheerfully greet the robot animal and start talking to it and patting it. However, one should be careful not to draw definitive conclusions about their perception of reality since it could also be signs of playfulness. This lack of a resident's perspective can be seen as a limitation of the study. It is, however, a well-recognised difficulty to interview people with dementia, both methodologically, regarding their cognitive decline, and ethically, regarding their vulnerable position. Although not feasible to explore within the confines of this study, the theoretical conceptualisation could serve as a foundation for future investigations in this regard.

Understanding human recruitment of robot participation may not necessarily be an issue for people experiencing difficulties in navigating reality. While the robot animal discussed in this article lacks the capacity to operate beyond the scope of human responses, it is conceivable that an autonomous robot with the ability to react unexpectedly to human actions could significantly influence how human actors engage with them. If a robot's behaviour became unpredictable, it would also be difficult to orient towards it according to a set of predefined responses. Instead, one may find it necessary to actively recruit its participation to involve it in interaction. Human recruitment of robot participation would then entail an orientation towards the robot using the same, or similar, epistemic, emotional and deontic resources employed in interpersonal interaction. As robots continue to evolve technically, incorporating advancements such as artificial intelligence engines, new forms of interactions are likely to emerge between humans and robots. The broader array of interactional resources humans needs to draw upon in their interactions with robots brings them closer to interpersonal interaction characterised by mutual responsiveness.

AUTHOR CONTRIBUTIONS

Marcus Persson: Conceptualization (lead); data curation (equal); formal analysis (lead); funding acquisition (lead); investigation (lead); methodology (equal); project administration (lead); resources (equal); software (equal); supervision (equal); validation (equal); visualization (equal); writing—original draft (lead); writing—review and editing (lead). **Clara Iversen**: Conceptualization (supporting); data curation (equal); formal analysis (equal); funding acquisition (supporting); investigation (equal); methodology (equal); project administration (supporting); resources (equal); software (equal); supervision (equal); validation (equal); visualization (equal); writing—original draft (equal); writing—review and editing (equal). **David Redmalm**: Conceptualization (supporting); data curation (equal); formal analysis (equal); funding acquisition (supporting); investigation (equal); methodology (equal); project administration (supporting); resources (equal); software (equal); supervision (equal); validation (supporting); visualization (equal); writing—original draft (equal); writing—review and editing (equal).

ACKNOWLEDGEMENTS

We would like to thank the two anonymous reviewers for their constructive comments. This work was supported by the Swedish Research Council under grant 2019-02575.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

ORCID

Marcus Persson https://orcid.org/0000-0003-2818-8001

ENDNOTES

[1] For a detailed account of potential outcomes, see the systematic review by Abbott et al. (2019).

[2] The excerpts are translated from Swedish to idiomatic English. The originals can be acquired upon request to the authors.

REFERENCES

Abbott, R., Orr, N., McGill, P., Whear, R., Bethel, A., Garside, R., Stein, K., & Thompson-Coon, J. (2019). How do "robopets" impact the health and well-being of residents in care homes? A systematic review of qualitative and quantitative evidence. *International Journal of Older People Nursing*, *14*(3), e12239. https://doi.org/10.1111/opn.12239

Alač, M. (2016). Social robots: Things or agents? *AI & Society*, *31*(4), 519–535. https://doi.org/10.1007/s00146-015-0631-6

Ashmore, M., Wooffitt, R., & Harding, S. (1994). Humans and others, agents and things. *American Behavioral Scientist*, *37*(6), 733–740. https://doi.org/10.1177/0002764294037006002

Birks, M., Bodak, M., Barlas, J., Harwood, J., & Pether, M. (2016). Robotic seals as therapeutic tools in an aged care facility: A qualitative study. *Journal of Aging Research*, *2016*, 8569602–8569607. https://doi.org/10.1155/2016/8569602

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Chang, W.-L., & Sabanovic, S. (2015). Interaction expands function: Social shaping of the therapeutic robot PARO in a nursing home. *Proceedings of the 2015 ACM/IEEE International Conference on Human-Robot Interaction*. Association for Computing Machinery.

Charmaz, K. (2001). Qualitative interviewing and grounded theory analysis. In J. Gubrium & J. Holstein (Eds.), *Handbook of interview research: Context and method* (pp. 675–694). Sage.

Chevallier, M. (2022). Staging Paro: The care of making robot(s) care. *Social Studies of Science*, *53*(5), 03063127221126148. https://doi.org/10.1177/03063127221126148

DeFalco, A. (2020). Towards a theory of posthuman care: Real humans and caring robots. *Body & Society*, *26*(3), 31–60. https://doi.org/10.1177/1357034X20917450

Eachus, P. (2001). Pets, people and robots: The role of companion animals and robopets in the promotion of health and wellbeing. *International Journal of Health Promotion and Education*, *39*(1), 7–13. https://doi.org/10.1080/14635240.2001.10806140

Emerson, R. M., Fretz, R. I., & Shaw, L. L. (2011). *Writing ethnographic fieldnotes* (2nd ed.). The University of Chicago Press.

Gustafsson, C., Svanberg, C., & Müllersdorf, M. (2015). Using a robotic cat in dementia care. A pilot study. *Journal of Gerontological Nursing*, *41*(10), 46–56. https://doi.org/10.3928/00989134-20150806-44

Hammersley, M., & Atkinson, P. (2007). *Ethnography: Principles in practice*. Routledge.

Hasse, C. (2018). How robots challenge institutional practices. *Learning, Culture and Social Interaction*, *26*, 100223. https://doi.org/10.1016/j.lcsi.2018.04.003

Hebesberger, D., Koertner, T., Gisinger, C., & Pripfl, J. (2017). A long-term autonomous robot at a care hospital: A mixed methods study on social acceptance and experiences of staff and older adults. *International Journal of Social Robotics*, *9*(3), 417–429. https://doi.org/10.1007/s12369-016-0391-6

Hydén, L.-C., Majlesi, A. R., & Ekström, A. (2022). Assisted eating in late-stage dementia: Intercorporeal interaction. *Journal of Aging Studies*, *61*, 101000. https://doi.org/10.1016/j.jaging.2022.101000

Hydén, L.-C., & Samuelsson, C. (2019). 'So they are not alive?': Dementia, reality disjunctions and conversational strategies. *Dementia*, *18*(7–8), 2662–2678. https://doi.org/10.1177/1471301217754012

Jefferson, G. (2004). Glossary of transcript symbols with an Introduction. In G. H. Lerner (Ed.), *Conversation analysis: Studies from the first generation* (pp. 13–23). John Benjamins.

Joas, H. (1996). *The creativity of action*. Polity Press.

Jones, R. (2017). What makes a robot 'social'? *Social Studies of Science*, *47*(4), 556–579. https://doi.org/10.1177/0306312717704722

Jung, M., van der Leij, L., & Kelders, S. (2017). An exploration of the benefits of an animal like robot companion with more advanced touch interaction capabilities for dementia care. *Frontiers in ICT*, *4*, 16. https://doi.org/10.3389/fict.2017.00016

Kachouie, R., Sedighadeli, S., Khosla, R., & Chu, M. T. (2014). Socially assistive robots in elderly care: A mixed-method systematic literature review. *International Journal of Human-Computer Interaction*, *30*(5), 369–393. https://doi.org/10.1080/10447318.2013.873278

Kendrick, K., & Drew, P. (2016). Recruitment: Offers, requests, and the organization of assistance in interaction. *Research on Language and Social Interaction*, *49*(1), 1–19. https://doi.org/10.1080/08351813.2016.1126436

Knoblauch, H. (2005). Focused ethnography. Forum qualitative Sozialforschung/forum. *Qualitative Social Research*, *6*(3), 44. Retrieved from http://nbnresolving.de/urn:nbn:de:0114-fqs0503440

Lipp, B. (2023). Caring for robots: How care comes to matter in human-machine interfacing. *Social Studies of Science*, *53*(5), 660–685. https://doi.org/10.1177/03063127221081446

Lorenz, K., Freddolino, P., Comas-Herrera, A., Knapp, M., & Damant, J. (2019). Technology-based tools and services for people with dementia and carers: Mapping technology onto the dementia care pathway. *Dementia*, *18*(2), 725–741. https://doi.org/10.1177/1471301217691617

Lynch, K. D. (2009). Objects, meanings, and role identities: The practices that establish association in the case of home-based employment. *Sociological Forum*, *24*(1), 76–103. https://doi.org/10.1111/j.1573-7861.2008.01087.x

McCarthy, D. (1984). Toward a sociology of the physical world: George Herbert Mead on physical objects. *Studies in Symbolic Interaction*, *5*, 105–121.

Mead, G. H. (1967). *Mind, self, and society: From the standpoint of a social behaviorist*. University of Chicago.

Mead, G. H. (1972/1938). *The philosophy of the act* (C. W. Morris, Ed.). The University of Chicago Press.

Merton, R., Fiske, M., & Kendall, P. (1956/1990). *The focused interview. A manual of problems and procedures*. The Free Press.

Mondada, L. (2018). Multiple temporalities of language and body in interaction: Challenges for transcribing multimodality. *Research on Language and Social Interaction*, *51*(1), 85–106. https://doi.org/10.1080/08351813.2018.1413878

Moyle, W., Bramble, M., Jones, C., & Murfield, J. (2018). Care staff perceptions of a social robot called Paro and a look-alike plush toy: A descriptive qualitative approach. *Aging & Mental Health*, *22*(3), 330–335. https://doi.org/10.1080/13607863.2016.1262820

Niemelä, M., Määttä, H., & Ylikauppila, M. (2016). Expectations and experiences of adopting robots in elderly care in Finland: Perspectives of caregivers and decision-makers. *Proceedings of the 4th International Conference on Serviceology, ICServ2016 Society for Serviciology*.

Park, R., & Burgess, E. (1921). *Introduction to the science of society*. University of Chicago Press.

Persson, M. (2020). Introducing social robots in Swedish dementia care: Exploring the interaction between care workers, residents, and robotic cats. *Journal of Sociology & Social Welfare*, *8*(1), 8–18. https://doi.org/10.15640/jssw.v8n1a1

Persson, M., Ferm, L., Redmalm, D., & Iversen, C. (2023). Working with robotic animals in dementia care: The significance of caregivers' competences. *Nordic Journal of Working Life Studies*, *13*(3), 49–69. https://doi.org/10.18291/njwls.136521

Persson, M., Thunman, E., Iversen, C., & Redmalm, D. (2024). Robotic misinformation in dementia care: Emotions as sense-making resources in residents' encounters with robot animals. *Frontiers in Sociology. Section: Sociology of Emotion*, *9*, 1354978. https://doi.org/10.3389/fsoc.2024.1354978

Petersen, S., Houston, S., Qin, H., Tague, C., & Studley, J. (2016). The utilization of robotic pets in dementia care. *Journal of Alzheimer's Disease*, *55*(2), 569–574. https://doi.org/10.3233/jad-160703

Pfadenhauer, M., & Dukat, C. (2015). Robot caregiver or robot-supported caregiving? *International Journal of Social Robotics*, *7*(3), 393–406. https://doi.org/10.1007/s12369-015-0284-0

Pickering, A. (1993). The mangle of practice: Agency and emergence in the sociology of science. *American Journal of Sociology*, *99*(3), 559–589. https://doi.org/10.1086/230316

Preda, A. (1999). The turn to things: Arguments for a sociological theory of things. *The Sociological Quarterly*, *40*(2), 347–366. https://doi.org/10.1111/j.1533-8525.1999.tb00552.x

Puddephatt, A. (2005). Mead has never been modern: Using Meadian theory to extend the constructionist study of technology. *Social Epistemology*, *19*(4), 357–380. https://doi.org/10.1080/02691720500145571

Redmalm, D., Persson, M., & Iversen, C. (2022). Robotic animals in dementia care: Conceptions of animality and humanity in care organizations. In L. Hamilton & L. Tallberg (Eds.), *The Oxford Handbook of Animal Organization Studies: A critical reader in ethics, business and society* (pp. 409–424). Oxford University Press.

Robinson, H., Broadbent, E., & MacDonald, B. (2016). Group sessions with Paro in a nursing home: Structure, observations, and interviews. *Australasian Journal on Ageing*, *35*(2), 106–112. https://doi.org/10.1111/ajag.12199

Rosenthal, S., & Bourgeois, P. (1991). *Mead and Merleau-Ponty: Toward a common vision*. State University of New York Press.

Sabanović, S., & Chang, W.-L. (2016). Socializing robots: Constructing robotic sociality in the design and use of the assistive robot PARO. *AI & Society*, *31*(4), 537–551. https://doi.org/10.1007/s00146-015-0636-1

Sharkey, A. (2014). Robots and human dignity: A consideration of the effect of robot care on dignity of older people. *Ethics and Information Technology*, *16*(1), 63–75. https://doi.org/10.1007/s10676-014-9338-5

Stevanovic, M., & Peräkylä, A. (2014). Three orders in the organization of human action: On the interface between knowledge, power, and emotion in interaction and social relations. *Language in Society*, *43*(2), 185–207. https://doi.org/10.1017/S0047404514000037

Timmermans, S., & Tavory, I. (2012). Theory construction in qualitative research: From grounded theory to abductive analysis. *Sociological Theory*, *30*(3), 167–186. https://doi.org/10.1177/0735275112457914

Turkle, S. (2007). *Evocative objects. Things we think with*. The MIT Press.

Vandemeulebroucke, T., Dietckx de Casterlé, B., & Gastman, C. (2018). The use of care robots in aged care: A systematic review of argument-based ethics literature. *Archives of Gerontology and Geriatrics*, *74*, 15–25. https://doi.org/10.1016/j.archger.2017.08.014

Wilkinson, S., & Kitzinger, C. (2006). Surprise as an interactional achievement: Reaction tokens in conversation. *Social Psychology Quarterly*, *69*(2), 150–182. https://doi.org/10.1177/019027250606900203

Wright, J. (2018). Tactile care, mechanical hugs: Japanese caregivers and robotic lifting devices. *Asian Anthropology*, *17*(1), 24–39. https://doi.org/10.1080/1683478X.2017.1406576

How to cite this article: Persson, M., Iversen, C., & Redmalm, D. (2024). Making robots matter in dementia care: Conceptualising the triadic interaction between caregiver, resident and robot animal. *Sociology of Health & Illness*, *46*(6), 1192–1211. https://doi.org/10.1111/1467-9566.13786