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The entwinement of policy, design and care scripts: Providing alternative choice-dependency situations with care robots

Niels Christian Mossfeldt Nickelsen[1] | **Johan Simonsen Abildgaard**[2,3]

[1]School of Education, Aarhus University, Copenhagen, Denmark

[2]The National Research Centre for the Working Environment, Copenhagen, Denmark

[3]Department of Organization, Copenhagen Business School, Frederiksberg, Denmark

Correspondence
Niels Christian Mossfeldt Nickelsen, Aarhus University, School of Education, Tuborgvej 164, NV 2450 Copenhagen, Denmark.
Email: ncmn@dpu.dk

Abstract

The use of robots to assist feeding has become important for people with an impaired arm function. Yet, despite large-scale dissemination strategies, it has proven difficult to sustain the use of this technology. This ethnographic study draws on the script approach to discuss the use of robots to assist feeding. The empirical work was done at locations in Denmark and Sweden. Drawing on document studies, interviews, observation of meals and video footage, we discuss (1) policy strategies promoting ideas such as self-reliance; (2) design visions promoting ideas such as empowerment; (3) and three scripts of care: (a) the script of choice, (b) the script of eating alone and (c) the script of eating together. We argue that scripts entwine and give rise to and prevent the use of robots. The study contributes to the script literature and the care robot literature by substantiating that care robots may generate choice-dependency situations for users. Rather than the somewhat overflowing 'self-reliance' and 'empowerment', alternative configurations of choice and dependency emerge, in which some situations fit users better than others. We conclude that although sustaining the use of feeding robots is difficult, in some cases, useful choices arise for both end-users and care providers.

KEYWORDS
care robots, care work, disability, feeding technology, script literature, values

INTRODUCTION

Caring for vulnerable groups constitutes a pressing societal challenge, which is used to legitimise investments in care robots and other advanced health-care technology. According to the Danish government, investments in care robots address key demographic challenges, promote self-reliance among vulnerable groups, support a flexible working environment for care providers and reduce costs (Digitaliseringsstyrelsen, 2016). In this study, we follow an advanced feeding technology from its inclusion in government strategies, to the visions and scripts of the design process and to the care for end-users with reduced arm function (Cresswell et al., 2010). In the field studied, this technology is called 'feeding robot'. As there is no universal agreement on the term care robot, when we use this notion, we mean an advanced technology used to assist persons living with disabilities or other vulnerabilities and their care providers with simple daily care tasks, while still retaining some degree of integrity (Sharkey, 2014; Vallès-Peris & Domènech, 2020; Wynsberghe, 2015). Having the feeding robot as a focal point throughout the article, we explore these research questions: (1) 'how do policy, design and care scripts affect each other and the use in different care contexts of a robot introduced to support vulnerable people?', (2) 'how does the robot affect the users' choices and dependencies?'. The use of feeding robots in care for people living with disabilities involves complex, mutual relations and negotiations between policymakers, designers and users (end-users and care providers). In order to study these relations, we draw on the script approach to unravel what emerges when innovation policy meets people who develop technology and people who live with disabilities.

In spite of sustained endorsement by government agencies, it has proven difficult to recruit suitable end-users and ensure sound use of care robots (Kommunernes Landsforening, 2010, 2018). There seems to be growing evidence that the use of care robots by end-users and care providers can be messy and uncertain, in ways often unanticipated by policymakers and technology developers (Lupton, 2014). As in other examples of the adoption of care robots addressed in the literature, collaboration between policymakers, designers and users seems to be limited (Šabanović, 2010). There appear to be notoriously conflicting values at play which may limit the potential benefit of care robots (Frennert & Östlund, 2014). We discuss a case study regarding the implementation of the Swedish care robot and assistive feeding technology known as Bestic,[1] which is manufactured and distributed by Camanio Care in Stockholm.

Clarke & Star argue that 'social worlds' comprise shared discursive spaces, shared commitment to action and shared infrastructure (2008). We draw on this tenet to contribute to a more conceptual outline of the relationships between the scripts of policy, design and care. While the aim of policymakers and designers is to promote self-reliance and empowerment, it seems to be the case that care robots (re)configure care by providing alternative choice-dependency situations where some of these situations work better than others for end-users and care providers. Rather than realising bioethical principles, we argue that care robots enable humble but important choices. Understanding emerging choice-dependency situations is important to learn what care robots can do in care not only for vulnerable people, but also for care providers.

APPROACH AND THEORETICAL FOUNDATION

In his thesis on the policy of care robots in Europe, Lipp sketches the history and biopolitics of care robots. By drawing on the Foucauldian notion of 'apparatus', he captures the wide range of material and discursive practices that currently lie at the core of innovation policy for senior citizens and people living with disability and chronic illnesses (2019). Apparatuses involve the manipulation of relations, either developing them in a particular direction, blocking them, stabilising them or utilising them (Foucault, 2014). The apparatus, according to Foucault, is always inscribed in a play of power and constitutes strategies of relations supporting and supported by certain sorts of knowledge. Whereas an 'apparatus of security' seeks to regulate and manage vulnerable individuals, an 'apparatus of innovation' seeks to redesign welfare states and care relations, according to imperatives of activity and autonomy through advanced technology. Lipp introduces the notion of 'apparatus of innovation' to argue that the urgency in innovation policy attached to connecting vulnerable individuals with care robots has to do with new forces and relations instituting an alliance between policymakers and technology developers. According to Lipp, this marks a transformation of discursive register in the direction of an opportunist economy in which demographic changes and vulnerable individuals are not seen solely as something to care for, but also as an object and opportunity for economic growth (Lipp, 2019 p. 57). In this sense, we see a new alliance arising between policymakers and technology developers, underlining that the current push for robots among vulnerable people connects not only to the demographic challenges and recruitment problems experienced in health care, but also to a completely new situation where vulnerable people appear as a core target group for technological innovation.

Neven and Peine (2017) argue that there are three problems with what they call the care-technology discourse: (1) it legitimises investment in technology in general and thus provides limited scope for distinguishing between useful and useless technologies, (2) it presupposes a negative understanding of vulnerabilities, which contrasts with the positive view of their lives held by many people with disabilities, which in turn presents challenges in terms of adopting technologies, and (3) it generates a moral focus that makes it difficult for critics to speak up. Hence, the care-technology discourse embraces a strong rhetorical device that risks hampering the provision of adequate health-care technology for vulnerable individuals (2017 p. 1). Neven & Peine's analysis is relevant here because their research untangles specific and testable concerns within the realm of implementing robots to support vulnerable people.

The policy-level initiatives regarding robots in health care are indeed strong drivers for its implementation, but a crucial aspect of making implementation of robots viable and sustainable is its value and use in practice (Pols et al., 2019). Although policy, design and care can be seen as different social worlds, we argue for including all three in the discussion to provide a comprehensive perspective on the role of scripts when implementing care robots. We draw in particular on the script literature used in health care (Carboni et al., 2022; Oudshoorn, 2020) to shed light on how policy and design visions affect care relations and vice versa. In the script literature, a technology is normative by design and thus influences relations among users. 'The de-scription of a technological object' involves following the use of a technological object into the user world (Akrich, 1992). A key tenet is that there are links between 'the in-scription process', where ideas about the user and expectations are inscribed into the technology, and 'the de-scription process', where the technology is used, perhaps in surprising ways, compared to its intended applications.

The script literature examines how design choices influence the relations and values surrounding a technology. Fluid function involves the cooperation of all the humans and non-humans

required for the real-world use of an innovation (Akrich & Latour, 1992). Hence, the aim is to build an analytical path between the designers' visions and the users' appropriation of the technology in question (Berg, 1997). The normative content of an innovation can be identified by comparing what have been called 'embedded' and 'effective' scripts (Lehoux et al., 1999). An embedded script appears in the initial definition of how an innovation is supposed to work, whereas effective scripts appear when the innovation is taken up by users. Effective scripts thus constitute the appropriation of the technology by users. That is, the work users have to do to make the technology work in their context. The concepts of embedded/effective scripts are helpful when discussing the policy, design and care worlds of innovation. By paying close attention to embedded scripts, we can identify the technology's inherent normative capacity and discuss its appropriateness in use. This enables us to analyse embedded scripts (visions derived from the policy and design processes) and compare them to effective scripts (appropriation in settings of use). Strong visions among policymakers and designers about empowering users may not be realised in the care world, for instance due to certain care values, physical arrangements or the lack of resources.

The script literature is useful for investigating alignment, misunderstandings and friction between various participants in the development and appropriation phases of innovation. The fundamental questions are as follows: 'what visions and intentions are embedded in a particular technology?', 'how do users embrace the technology?', 'how do real-world applications match or differ from intended use?' and 'what amount of tinkering is necessary to appropriate the technology?' (Berg & Timmermans, 2000; Winance, 2019). We follow a feeding robot's journey from policymakers' strategies over designers' drawing boards and to users' tinkering in an activity centre and in two care homes. The innovativeness of this approach lies in the examination of the life of care robots across multiple worlds. Thus, we explore the mutuality between policy, design and care and the alternative choice-dependency situations this give rise to in care for people living with disabilities.

METHODS

We started by assessing reports by Local Government Denmark (LGDK) (Kommunernes Landsforening, 2018) and the Digitisation Agency (Digitaliseringsstyrelsen, 2016), and by scrutinising the political programme presented by the former Danish government (Den Danske Regering, 2011). We assessed various policy papers and technical papers relating to health-care technology (Gaedt, 2013; Sundhedsministeriet, 2019).

The first author conducted the empirical work. Apart from a policymaker, two designers and a sales agent, the informants comprise two end-users living with cerebral palsy, four care providers at two residential care homes and five care providers at an activity centre (see Table 1. List of interviews). All the care providers have formal qualifications as social educators. 12 semi-structured interviews were carried out. In addition, a total of 9 h of observation focusing on meals and the contexts of meals were conducted in the care institutions.

All the meals observed were with Tonni, a 27-year-old resident at a care home and user of an activity centre. The first was lunch at the activity centre 1 day when the users were busy holding a concert. The second was dinner and took place in one of the care homes one evening. The third was in the activity centre and consisted of manual feeding because Tonni had forgotten to bring his robot that day. This combination of meals and situations proved to be interesting. Advance permission was obtained to take photographs and make video recordings. The video footage

TABLE 1 List of interviews

No.	Interviewee(s)	Date	Length
1	Head of section of welfare technology, LGDK	01.15.2018	90 min
2	Sales agent in Denmark	01.17.2018	120 min
3	CEO, technology development company	03.05.2018	30 min
4	Development engineer, technology development company	03.05.2018	90 min
5	Head of welfare technology, municipality	03.10.2018	60 min
6	Tonni and head of welfare technology, municipality	04.13.2018	45 min
7	Care provider 1, 2, 3, 4 in Tonni's activity centre	04.15.2018	60 min
8	Care provider 1 in Tonni's care home	04.21.2018	45 min
9	Care provider 2 in Tonni's care home	04.21.2018	45 min
10	Tanja and care provider in activity centre	05.03.2018	45 min
11	Care provider 1 in Tanja's care home	05.10.2018	45 min
12	Care provider 2 in Tanja's care home	05.10.2018	45 min

provided important documentation of human–robotic interaction and the performance of care providers during meals. This contributed significantly to the development of the argument concerning new choice-dependency situations.

Two interview guides were followed: one for policy agents and designers, and one for end-users and care providers. Most interviews were carried out in Danish (English quotations are our translation). The design interviews were in English. The interviews were all recorded and lasted 30–120 min (see Table 1 list of interviews).

A research assistant transcribed them verbatim. They were coded using a read/re-read and highlighter approach. We analysed the material with the research questions and the notions of embedded and effective scripts in mind.

Before the data collection at the care institutions, the head of welfare technology in the participating municipality gave research ethical approval. In addition, all the informants signed a statement of consent that emphasised their right to withdraw their data at any time, and confirmed that the data would be shredded when the project ends. All names are pseudonyms.

ANALYSIS

First, we examine the Danish government's welfare technology strategy. Second, we scrutinise the designers' visions regarding the use of assistive feeding technology. Third, we study the appropriation of the feeding robot in care and discuss how its use is affected by (and affects) the scripts of policy and design. At last, we discuss what the conflicts among scripts enact and how this affects choice-dependency situations for users.

The scripts embedded in policy

In Denmark, the promotion of welfare technologies started after the 2011 parliamentary election. The government coalition agreement 'A united Denmark' included the statement:

> We will work for.... ambitious and binding goals, which commit regions and hospitals to use welfare technology services on a large scale
>
> (Den Danske Regering, 2011 p. 44 our translation).

Welfare technologies were mentioned five times, even emphasising that they are an important Danish export.

In the wake of this, LGDK launched an initiative to increase the use of welfare technologies in social work and ensure the implementation of the best technological solutions. This led to the launch of a joint municipal plan for disseminating mature welfare technology solutions as part of a cost reduction plan. LGDK's social policy proposal, 'Invest before it happens' (Kommunernes Landsforening, 2013), stated that municipal efforts must be based on individuals' own resources and active participation, and on supporting people's self-reliance. Not long after this, the Danish government published an ambitious digitisation strategy (Digitaliseringsstyrelsen, 2016) outlining the high-profile national implementation of welfare technology (p. 28). From 2014 to 2018, four mandated welfare technologies were rolled out on a national scale (feeding robots being one of them) to support self-reliance among end-users, a flexible working environment for care providers and cost reduction.

As a follow-up to the 2013 strategy, LGDK published annual figures that measured the implementation of the four prioritised welfare technologies (Kommunernes Landsforening, 2018). In 2018, LGDK stated that the municipalities had achieved the planned savings. The head of the LGDK welfare technology department explains:

> After four years of implementation, the municipalities have achieved the planned financial savings. Now, our focus is on supporting the municipalities' further implementation of the most robust technologies
>
> (interview 1).

Here, we see that investments are legitimised by promising savings, and experts and advisors focus on these technologies with great interest, not least because this trope provides jobs for researchers, engineers and consultants. It also gives the government (a coalition led by the Social Democratic party) the opportunity to emphasise that they support vulnerable individuals. Care robots now seem to become an increasingly acceptable answer among policymakers to the needs of end-users and care providers. Ultimately, as Neven and Peine (2017) state, this care-technology discourse promotes a new view of disability, where vulnerable individuals are to some extent made accountable for their own lives. In the context of a policy that presents disability as a burden, technology now seems to be a moral obligation. Neven and Peine state:

> In turn, from a neo-liberal (care) perspective, innovation is the ideal solution, as it does not require (costly) social interventions, but instead may be marketed
>
> (2017 p. 9).

The care-technology discourse is evident in various policy papers as part of a strategic move towards unleashing health-care services with advanced technologies being launched on a free market characterised by limited regulation and control. This is unique in relation to, for example, the regulation of the pharmaceutical market (Kidholm et al., 2017). This commodification of robots seems to fit well with Lipp's ideas of the rise of an apparatus of innovation (2019).

Although the care-technology trope as such assembles many voices, the debate seems to be dominated by either nightmarish dystopias (Pols & Moser, 2009) or the promise of robots as companions for vulnerable persons (Treusch, 2020). The former view has been called 'humanist', because it argues that care should remain an essentially human activity with qualities specific to humans. The latter has been called 'solutionist', as it reflects the assertion that any problem can be met with a technological solution (Lipp, 2019, pp. 25–28). Whereas the solutionist narrative paints a heroic picture of care robots solving the impending crises of welfare states, the humanist position criticises the care ethics implicit in care robots.

We see this, for example, in our care provider informants' views of the feeding robot as an object that 'individualises the meal' and is 'not applicable in a home' (interviews 8, 9, 12). We will return to this below.

To policymakers, care robots seem to offer a range of attractive solutions because they are expected to narrow the widening gap between a growing population living with disabilities, chronic illnesses and dementia and the limited human and financial capacity of the welfare state (Grobbel et al., 2019; Hagendorff, 2020). These discourses and sentiments towards care robots are inscribed in policies as shown above as embedded scripts for specific developments and uses of advanced technology in care.

The scripts embedded in design

We will now take a closer look at the normative scripts that underpin feeding robot design. We will then discuss the effective scripts of care and then the relations and mutuality between the scripts of policy, design and care.

The design process was initiated when the development engineer met an affluent economist (not the CEO) who himself suffered from post-polio syndrome. For some years, he had dreamt of creating a solution to help himself eat. The economist had the necessary financial resources, and the engineer was looking for a job. In 2004, they started designing the first version of the robot. In the following, we refer to the interviews with the CEO and the development engineer at the technology development company in Stockholm. These interviews focus on the design visions and what they believe hampers the smooth introduction and use of the robot (see Figures 1-3).

They started at hospitals by consulting patients with amputated arms. Subsequently, they collaborated with a group of design students at Stockholm University who were working with the robot as part of their Master's thesis. The first version was created with a five-button control panel to activate the spoon. Arrows and coloured buttons indicated the direction and speed controls for the robotic arm. However, this version appeared to be a poor fit with the capabilities of many potential end-users. The designers changed the control panel to a single button and pre-set programmes. This made the robot more usable. During the preparatory set-up, an expert adjusts the device with regard to its exact position and how far the arm swings out. According to the development engineer, once it is set up to suit the person in question, no further adjustments are necessary. However, as we will show, adjustments and tinkering continue to be necessary.

The CEO and the development engineer made four claims about the design visions that underlie the feeding robot and are the core of the scripts they work to build into its functioning, (1) empowerment, (2) usability, (3) changes in meal routines and (4) education.

Firstly, according to the CEO, empowerment relates to the designers' belief that 'the end-user ought to control the decisions'. Empowerment is about respect, caution and security. The CEO elaborates:

> Being fed by a person may well feel more unethical than eating by yourself with an aid. The person coming to help may be anyone—someone who I do not know or who does not do things the way I like. End-users and care providers do not necessarily understand each other. To say that humans are ethical and machines are unethical is too black and white. Humans do not necessarily provide good care. One can seriously question the extent of human empathy
>
> (interview 3).

Here, the CEO indicates that robots may be a more compassionate solution than a non-empathetic human being. According to the CEO, there are limits to human empathy, and she argues that a robotic replacement may in fact prove to be the most appropriate solution for end-users. Secondly,

FIGURE 1 Boy (not Tonni) eating with the robot

FIGURE 2 The robot with mounted spoon

FIGURE 3 Robot, bag and full equipment

according to the development engineer, usability had high priority throughout the design process. A meal is not simply about eating, nor is it only about moving food from plate to palate. Instead:

> Meals take place in a particular cultural setting of which we have a variety of expectations. Among other things, meals are important social events related to a sense of community, togetherness and conversation. For almost every celebration, we have a meal. We want the end-user to be part of that. So the robot should not stand out too much. In order to be used it must fit on the table, be silent, discreet and blend into the environment. It should not look too much like a robot
>
> (interview 4).

In order to help end-users to experience the social event of meals, the designers listened to a number of different motors, eventually deciding to use two small motors to make the robots as silent as possible. The fact that a robot is silent and discreet may be an important embedded script that, according to the development engineer, makes it usable in a dining room. This fits well with the home care providers' emphasis on meals as a matter of 'sitting down together' (we will return to this). However, despite this design vision, Tonni, as we will see, prefers to eat alone with the robot. Thus, it is unfortunate that during the design process, nobody considered that eating alone in a private room would be regarded as valuable. Nor did anybody consider that the robot needed to interact with joysticks, wheelchairs and dining tables. As we will discuss in the next section, such design oversights have far-reaching implications in care.

Thirdly, according to the development engineer, using feeding robots fundamentally changes what a meal is. She states that care providers ought to be prepared to transform meal routines and their ideas about meals. She explains:

> Financing and developing a robot is challenging and a long-term process. It takes time and effort to bring such a product to market. A feeding robot is not simply a commercial product, it is a new philosophy about what a meal is
>
> (interview 4).

According to the engineer, the robot has noticeable implications in the user world, inasmuch it provides a new way to eat and work. The care providers have to make sure the robot is correctly set-up, that it is charged and that the spoon, charger and bag are in place. The feeding robot introduces new ways of relating among end-users and care providers. According to the engineer, the use of the robot is often terminated because the care providers are unable to anticipate emerging care needs and develop relevant routines. The notion that 'the end-user ought to control the decisions' appears to be an important embedded design script. This becomes clear when the CEO says:

> Sometimes the users need to be more assertive, to say, 'I really want to use this device; please, could you help me?'
>
> (Interview 3).

Fourthly, the CEO and the engineer both suggest that care providers lack the necessary knowledge. They emphasise the need for training to help care providers address the challenges that emerge during meals involving robots. The engineer states:

> Because of a lack of knowledge, destructive myths circulate claiming that robots prioritise efficiency over quality, and instrumentality over empathy
>
> (interview 4).

Thus, the designers call for care provider training to develop adequate meal routines. The CEO continues:

> The feeding robot alone does not lead to improved quality or poorer quality; nor does it alone lead to increased or reduced staffing levels. The question is what you do with it, but there are often insufficient staff at breakfast, lunch and dinner. This is where the robot may or may not lead to improved quality
>
> (interview 3).

The designers see robots as a legitimate response to the problems arising in care owing to a lack of staff. This may position them as solutionists (Lipp, 2019, pp. 25–28). Among care providers in care homes however, robots are seen as tools of cost reduction, which risks leaving end-users isolated and without the necessary care. Thus, the designer's intention of an embedded script, 'end-users ought to decide', creates a number of controversies in the user world that we will discuss now.

Introducing feeding robots in disability care

We will now shift our focus from scripts embedded in policy and design to the scripts of using the robot in care. We have organised the analysis according to three effective scripts, which stand out clearly from our material (Lehoux et al., 1999): (1) the script of choice, (2) the script of eating alone and (3) the script of eating together. As mentioned earlier, effective scripts appear when the innovation is taken up by users and constitute the appropriation of the robot by its users.

Correspondingly, in the following, we focus on the work users have to do to make the robot function in the contexts of care.

The effective script of choice

Being able to choose how, and with whom one eats and being able to choose to eat with the help of a robot instead of being fed by a care provider seems to be core assets of feeding robots. These issues are indeed present in our data. The following examination of the script of choice is based on field notes during lunch at the activity centre:

> Nete (a care provider) starts by mounting a table on Tonni's wheelchair; then she unpacks the robot from Tonni's rucksack and places it on the table. Tonni has brought his lunch from home. Nete puts chicken and rice on the plate. Tonni is hungry; he quickly activates the blue panel on the table with his left elbow. The spoon immediately descends to collect food, but unfortunately shovels the food over the edge of the plate onto the table. With a spoon, Nete lifts the food back and adjusts the position of the robot. As Tonni continues to eat, the arm now swings out too far. The spoon pushes against his cheek, and although he bends his neck and tries to bite the food, Tonni has difficulty getting the spoon into his mouth. Again, Nete slightly adjusts the position of the robot. While Tonni eats, Nete sits nearby, with two colleagues (Helge and June). In fact, the care providers are eating lunch and having a meeting at the same time. Before the robot was used, one of the care providers would have to feed Tonni, so they could never hold meetings at the same time. Now, one of them only has to monitor him, and help now and then. Thus, to some extent the robot provides additional flexibility. As Helge (a care provider) states, "If the robot makes a difference to Tonni, its fine. It doesn't make much of a difference to us". However, June interrupts and emphasises that she is fond of the robot. She explains that the robot not only takes care of Tonni, but also her. "Hand-feeding another person can be exhausting"', she explains.

As we see in the end of the field note, the script of choice not only relates to Tonni being able to choose an alternative eating partner (the robot), but the care providers do also have a choice between carrying out the exhaustive task of feeding and letting the robot do the primary part of the work. The script of choice puts the relation between care provider and recipient into perspective as it goes from being a necessity (Tonni previously had to have a care provider manually feed him) to a situation where he can choose whether he would prefer the robot over a care provider. The following is an excerpt from a group interview that was held later in the lunchroom. The excerpt emphasises the shaping of a hierarchy of preferred eating partners.

June: Tonni takes longer to eat when I feed him by hand. He talks more! When you feed him (looking at Helge), he eats quickly (laughter). He doesn't bother to listen to you (laughter).
Helge: Yes, we don't have such a nice time together as you.
June: There are things he likes to discuss with me while eating.
Nete: Tonni is fond of June. That's what we're trying to say (looking at the interviewer).
June: I am the best robot!

Nete: He would rather eat with June than with the robot. I come after the robot. Helge comes last (laughter) (interview 7).

While the field note reveals that a certain amount of adjustment is necessary before the robot functions properly, and that the result is increased flexibility for the care providers involved, the subsequent group interview excerpt shows the negotiations that take place between the care providers concerning Tonni's eating hierarchy. While the care providers discuss this humorously, it nevertheless helps us understand some of the subtleties involved in the use of the robot. Of all the care providers, Tonni prefers only June to the robot, and June even calls herself 'the best robot'. It appears that human assistance is compared with robot assistance, and we sense that the robot is an accepted feature of Tonni's life. If he cannot be fed by June, he uses the robot to avoid close encounters with Helge. Hence, he can make choices among eating partners. He can also for instance 'forget' the robot at home. The fact that he decides may well be an important reason why he cares so much about the robot and even gives it nicknames.

The robot helps Tonni to decide with whom he will be in close contact, and who he will keep at a distance. From an end-user perspective, this is a good thing. At the same time, the robot also offers the care providers some flexibility. Although the eating hierarchy may predate the use of the robot, the key point is that Tonni, thanks to the robot, now have more opportunities to make choices that fits him well. However still dependent, he can make choices.

The effective script of eating alone

We will now examine Tonni's desire to eat his dinner alone in his room at night. Tonni's primary interaction with his surroundings, apart from having care providers help him, involves the use of a control box and a joystick mounted on his wheelchair. These allow him to open and close his bedroom door, control the curtains in his room, and even operate the cooker hood in the kitchen. He uses the joystick and control box to operate his phone, listen to music and watch films. 'Technology gives me independence', he says (interview 6).

In the evening, Tonni loves to eat alone in his room with the robot while watching films. The care provider needs to remove the joystick from Tonni's wheelchair to attach the eating surface, which effectively prevents Tonni from interacting with his environment. The care provider attaches the robot with a Velcro strap so it does not topple or move, serves the food and starts a film and leaves. Tonni now eats alone, which is something he enjoys; however, the only thing he can control is the robot arm. Tonni explains that he is afraid of choking on his food. If that were to happen, he could not alert the care providers. It is probable that no one would notice, because the care providers are busy in the kitchen and dining room during mealtimes. If he wants to change the film, he has to wait for help (notes from meal observation).

This somewhat awkward meal with robot and films in Tonni's room, and his fear of suffocating, suggest that the robot demands a technologically rich and highly organised environment to work well (Floridi, 1999; Lipp, 2019 p. 73). Although the designers, as mentioned, indeed considered usability during the development process, it appears that no one predicted that individual dining in a private room would result in end-users missing the bustle of care providers in the dining room. This omission and script seriously restricts the use of the robot in the care home. The implicated and infuriating situation between choice and dependency perhaps satisfies Tonni's desire to eat alone, but undoubtedly also complicates the collected dining situation in the care home. The care providers say that they cannot take responsibility for Tonni eating with the robot

in the room if they are not four at work. They have just been told that although they are four now, they cannot expect this in the future. Thus, they believe there is a direct link between the robot and savings.

The effective script of eating together

Although the robot is used to support Tonni's desire to eat in his room, the care providers at the care home are in fact reluctant to support this wish, because it clashes both with the care providers' opportunities to supervise the meals and with the care home's ideas of what good care is. We found interesting contrasts between the use of the robot in care homes and in the activity centre, respectively. The activity centre seems to welcome the robot, as long as it frees up time for musical activities, whereas the care homes as mentioned were reluctant. 'The care home is a home. This implies certain values related to the robot', as one care provider explains (interview 8). Another care provider continues:

> We think it's important to do the things that you normally do at home. When we eat, we sit and are together. We are a home. Some specific values exist
>
> (interview 9).

The care providers emphasise the importance of having meals together. As such, the robot reveals a controversy between Tonni, who wants to eat alone in his room, and adherence in the care home to the script of eating together.

Tanja had far more trouble using the robot than Tonni and stopped using it after 5 months. It was difficult for the care providers to make Tanja sit close enough to the table. They had to unmount the footrests of her wheelchair at the beginning of every meal and reinstall them afterwards. Consequently, Tanja had trouble keeping her balance during meals, which is essential when using the feeding robot. The occupational therapist was involved and tried a number of options. She made drawings and templates to show exactly where Tanja ought to sit in relation to the table and the robot. After some time, Tania began to experience neck-pain, likely due to a strained eating position. One day, the robot fell on the floor, broke down and sent to Sweden for repair. In fact, it never came back. In the meantime, Tanja ate with the care providers. The care providers at the home institution decided to abandon the robot. The contact person explained:

When the robot broke down it was as if Tanja came back to the table and had social contact with the group again. It was as if Tanja, due to the robot and table arrangement, came at a distance from the group. She was in a way sitting at the end of the table all by herself. She had come too far away and this made the contact difficult. I think she missed contact.

As an observer, one might suspect that Tanja is not as keen on abandoning the robot. This is, however, a bit unclear since Tanja is not very articulate. Nevertheless, the contact person enacts the effective script of eating together, which means sitting together (not too far apart) and being in contact. Like Tonni, Tanja ate well with the robot at the activity centre. However, at Tanja's care home, the robot was abandoned because the table arrangement distanced her from the other residents. At Tonni's care home, he could not be supervised when eating in his own room, the educators moreover believe that it works against their care values to eat alone in your room. These care home examples seem to indicate that the care providers face a technology that they find incongruent with care values and the script of eating together.

DISCUSSION—IMPLICATIONS OF SCRIPTS FOR POLICY, DESIGN AND CARE

In line with Neven and Peine (2017), our point of departure is that the care-technology trope is increasingly prominent in policy discussions. Caring for vulnerable people is a pressing societal challenge, which is currently resolved via substantial investments in care-technology. Lipp argues that we see an apparatus of innovation (2019) where vulnerable people are made the objects of technological innovation. Through a cross-domain examination of scripts and relations between key worlds in the care robot arena, we contribute specificity in relation to what makes an apparatus of innovation. We have illuminated the entwinement of scripts from policy, design and care. That is, how embedded and effective scripts influence each other and (re)configure care for vulnerable persons and ultimately the welfare state. While policymakers focus on bioethical principles such as self-reliance and flexibility, designers focus on empowerment and usability. The use of feeding robots in care institutions involves three effective scripts, the script of choice, the script of eating alone and the script of eating together. The entwinement of these scripts elucidates the controversies that both promote and hamper use of feeding robots.

In some cases, feeding robots provides users with new opportunities. We understand this as the making of alternative choice-dependency situations. For instance, both Tonni and his eating partners have the option to apply the robot or not. That is, the robot provides options that were not available before. If Tonni uses the robot for his meals, he has slightly more control and the care provider does not have to spend energy on feeding him manually. However, as we have seen, Tonni's care home is not designed to accommodate care robots. To make the robot work, the care providers need to dismantle Tonni's joystick. As a result, Tonni can only eat; he cannot choose to watch another film, open his door or listen to music. This lack of technological integration in the care home works against the policy and design scripts of self-reliance and empowerment. Due to the robot, Tonni can in fact eat in his room, but he remains dependent on support.

Eating with robots has different implications in different care contexts. While the care providers at the activity centre integrate the robot into their shared lunchbreak humorously, the care providers at the care home question the value of the robot. The activity centre, as the name suggests, focuses on offering activities to users. The use of robots, in this context, means that they no longer need to feed end-users by hand. They may instead focus on their primary function of organising learning activities. In contrast, the care providers at the care homes see themselves as offering a home for the residents, a place of empathy and togetherness. Apart from practical problems related to remoteness and table arrangements during robot meals, the idea of home seems to impose limits on the use of the robot. The home care providers talk about the robot primarily as an instrument for cost reduction.

Developing and using care robots involves complex mutual influences between policy, design and care. Our discussion suggests that innovation policy and design visions are currently involved in transformation of care—and the other way round that the practical challenges of using robots in care transform policy and design. The fact that it proved difficult to recruit the required number of suitable users for the feeding robot, for instance, has led to termination of the recently firm dissemination policy (Kommunernes Landsforening, 2018). In this connection, Nickelsen(2019) discusses the case of implementation of feeding robots in Denmark as a crumbling story. In the wake of the firm dissemination policy, this termination came as a surprise because LGDK had convinced all Danish municipalities to buy a great number of feeding robots each. Thus, practical challenges in use as well as recruitment problems are currently impacting policymaking. This also implicates design. First, the designers of the robot had to redesign the activation panel because the many colours, buttons and arrows excluded many end-users. To

improve dissemination and usability further, the designers are now working on adding voice recognition and they are planning a chopsticks version of the robot.

Thus, this cross-domain discussion of the mutuality between three worlds in the care robot arena illustrates the implicated controversies between policy, design and care that we foresee are (re)configuring care for people living with disabilities.

Alternative dependency situations and choices

Gradually, there is evidence indicating that care robots will be used in the complex, long-term reconfiguration of the welfare state and its health-care services (Bedaf et al., 2019; Hagendorff, 2020; Hargadon & Bechky, 2006; Yew, 2020). This makes sense in light of the notion of 'apparatus of innovation'; vulnerable people are made the objects of policy ambitions attached to innovation and large-scale investments in technology. We have identified a certain amount of incoherence regarding this endeavour between (1) embedded scripts of self-reliance and flexibility emphasised by government agencies, (2) embedded scripts of empowerment and usability underscored by designers and (3) effective scripts of choice, eating alone and eating together in care. In relation to this, we have discussed scripts in relation to de facto use of robots in different institutional environments—in an activity centre and in two care homes, respectively.

It has been suggested that good lives with advanced technologies are outcomes of good passages and assemblages (Moser & Law, 1999). Our study sheds light on the difficulties of establishing good passages and assemblages with care robots. Science and technology studies have shown that technological devices that are eventually standardised end up as locally adopted solutions (Berg & Timmermans, 2000). Even though the introduction of care robots relieves care providers of physically strenuous tasks, it also generates new tasks, dilemmas and opportunities. The eating hierarchy and the desire and obstacles to eat alone discussed above offer compelling examples of new situations in relation to choice and dependencies for both end-users and care providers. The eating hierarchy example suggests a practice where, as the design CEO eloquently states, 'Robots can be a more adequate solution than a non-empathetic human can' (interview 3). While both examples also illustrate that the end-users continue to be dependent, the dependency, however, assumes new forms and provides new options to choose from. These examples indicate that choice-dependency situations appear while implementing care robots. This implies that the existing boundaries in the provision of care services are being (re)configured with care robots.

Based on our empirical material and the subsequent interpretation, we feel the need to emphasise that care robots do not make the end-users self-reliant, nor do they make care providers obsolete. Instead, robots co-create alternative arrangements of relations between end-users care providers and tools. They are in other words involved in new choice-dependency situations. As a result, end-users and care providers are occasioned to choose between different dependency relations, some of which work better for them than others (López Gómez, 2015). Our discussion and examples show that the introduction of a feeding robot gives rise to some degree of freedom of choice, for example linked to whom you eat with and where you want to eat.

CONCLUSION

We have discussed how policy and design scripts on the one hand impinge on care provided by a robot for people with little or no function in their arms, and we have discussed how scripts of care on the other hand impinge on the use of the robot. Our focus has been to clarify the relations

among scripts and what this enacts. As part of this, we have argued that the use of the robot not only modifies care, but also bounces back and impinges policymaking and design visions.

By discussing our empirical material with the notions of 'apparatus of innovation' (Lipp, 2019) and 'the care-technology discourse' (Neven & Peine, 2017) as well as the notions of 'embedded and effective scripts' (Lehoux et al., 1999), we argue that feeding robots are involved in assembling care for vulnerable groups in new ways leading to alternative choice-dependency situations for users.

We find it far too optimistic to claim that robots create self-reliance, provide empowerment or give the users the opportunity to decide for themselves. On the other hand, it would be ignorant to conclude that robots have no effect whatsoever. Our study illuminates noticeable discrepancies between the embedded plans of policymakers and designers regarding the use of robots, and the effective use of robots in different care contexts. We argue that end-users (such as Tonni) may apply feeding robots to maintain their dignity by making choices in certain situations. Care robots facilitate new choice-dependency situation, where end-users and care providers can choose between different dependencies, some of which suit them better than others. While the policy script of self-reliance raises high expectations about what robots can do, feeding robots are in fact designed to help end-users to eat with supervision—not alone. The term 'robot' brings to mind grandiose automations. What we are dealing with, is a tool that may relieve care providers a bit and offers end-users modest choices. As we have seen, the robot is not compatible with other crucial technology. If that was the case, it could potentially provide users with increased agency. We have discussed that Tonni can now choose who he wants to eat with, he can avoid certain care providers and he can eat in dining rooms with others or in his room alone (although this has costs). The cross-domain discussion expands the existing knowledge by providing specific examples of how policy, design and care scripts imply both collaboration and resistance in various contexts of care; how these scripts are mutually entwined and that robots may provide new and useful choice-dependency situations in care.

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AUTHOR CONTRIBUTIONS

Niels Christian Mossfeldt Nickelsen: Conceptualization (lead); data curation (lead); formal analysis (equal); funding acquisition (lead); investigation (lead); methodology (lead); project administration (lead); resources (lead); software (equal); supervision (equal); validation (equal); visualization (equal); writing – original draft (lead); writing – review and editing (equal). **Johan Simonsen Abildgaard:** Conceptualization (supporting); data curation (supporting); formal analysis (equal); funding acquisition (supporting); investigation (supporting); methodology (equal); resources (equal); software (supporting); supervision (equal); validation (equal); visualization (equal); writing – original draft (supporting); writing – review and editing (equal).

ORCID

Niels Christian Mossfeldt Nickelsen https://orcid.org/0000-0002-9907-1161

ENDNOTE

[1] There are several variants of feeding robots on the market. We have chosen this one because it is the most used in Denmark. We have no interests in either promoting or preventing the spread of this particular robot.

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