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A critical occupational perspective on user engagement of older adults in an assisted living facility in technology research over three years

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ABSTRACT
Digital assistive technology has potential for supporting older adults who depend upon community healthcare services. To boost the efficiency of those services, technological devices are often installed for care recipients as part of governed practice. However, the varying adoption of technology risks widening the digital divide. In response, the Assisted Living project engaged older adults in co-creating knowledge about users' needs, to guide the development of technological solutions designed to support everyday living. This study sought to investigate how eight older adults in an assisted living facility in Norway, aged 81–92 years, evaluated user inclusion in a 3-year technology-oriented research project. Individual interviews, dialogue cafés, interventions with environmental sensors, and a final focus group discussion constituted sites for co-creation of knowledge. Participants' answers to standardised questionnaires and statements during dialogue café meetings were collated into tables and the focus group discussion was thematically analyzed, with three themes identified: motivation for project engagement, experiencing and understanding participation in the project, and mixed feelings towards environmental sensors at home. The project revealed that older adults with impairments could nevertheless meaningfully contribute opinions about their needs. Applying a critical occupational perspective raised awareness regarding sociocultural assumptions about older adults in assisted living as frail and unable to participate, which may reinforce ageist and ableist stereotypes, as well as promote occupational injustice.

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Occupational science; Assistive technology; Community health care; Occupational justice; Technology imperative; User participation

In the past decade, assistive technology has been expected to support older adults at home, facilitate their independent living and safety, and contribute to their ageing in place (Gramstad et al., 2014; Thordardottir et al., 2019). However, older adults tend to adopt new technology slowly, which risks exacerbating the potentially serious social problem known as the *digital divide* (van Dijk, 2006). After all, some older adults gladly incorporate technology into their daily lives, whereas others hesitate or even refuse to do so, which reflects trends among people in general (Rogers, 2003). There are several reasons for late adoption of technology (Satariano et al., 2014), including technology illiteracy, poor user-friendliness of devices, lack of human support and training, and economic circumstances (Lee & Coughlin, 2015; Peek et al., 2014). In many regions, the digital infrastructure, or lack thereof, can exacerbate the delay; for example, many places in Norway remain without 4G mobile service and even lack Internet connections, which

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necessarily excludes some people from benefitting from digital services (Aftenposten, 2018).

To address the challenge of Norway's ageing society, Norwegian health authorities have developed plans to integrate technology into community healthcare services as an expressed national aim, a desired change, and a governed action. Amongst the effects to date, positive results from feasibility trials for the Norwegian Programme on Assistive Technology (2013–2015) were put into practice in national recommendations for all municipalities regarding electronic medicine dispensers, global positioning systems for locating lost individuals, electronic door locks for visitors from home care services (Norwegian Directorate of Health, 2015), plus alarm systems and digital monitoring at night in nursing homes (Norwegian Directorate of Health, 2017).

In such efforts, if the chief reason for using technology in community healthcare services is financial savings, then individual human needs are liable to be neglected. Thus, the consequences care recipients may face once technology is implemented warrant sustained attention, as do their living conditions (Thygesen, 2019). Therefore, policy accommodating the *technological imperative*—that what can be realised with technology should be realised—may pose unwanted consequences for many older adults who depend upon community healthcare services. First, thorough consideration of users' needs and the individual tailoring of technology are seldom made (Holthe et al., 2020). Second, imposing technology as a condition for receiving community healthcare services may challenge power relations and autonomy. Third, the technology imperative may also create and reproduce social exclusion as well as widen the digital divide.

Although a wide range of technologies have been evaluated in homes with people with mild cognitive impairment or dementia, reports on the consequences of using such technologies in terms of quality of life, occupational performance, and human dignity have been scarce (Holthe, Halvorsrud, et al., 2018). In response, additional studies addressing user engagement and occupational engagement in the co-creation of knowledge are needed to clarify users' values and needs concerning technology. Thus, to learn how older adults in assisted living facilities may experience and interact with technology, we sought to elucidate what they thought about technology in general, whether they used technology daily, and what was important for them to have meaningful days in assisted living.

This paper addresses the call for methodological contributions to occupational science and focuses on a potential social problem of neglecting older adults in assistive living facilities as citizens with needs and opinions on digital technology as a means of support for everyday living; that is, "the various everyday activities people do as individuals, in families and within communities to occupy time and bring meaning and purpose to life" (Asaba et al., 2016, p. 1). A critical occupational perspective is applied to generate insights on the residents' daily living and their experiences with marginalization and occupational injustice within the context of an assisted living. A critical approach may explore dominant concepts and taken-for-granted ways of thinking, reveal social and political dimensions, examine socially ingrained values and beliefs, and reflect on how things could be otherwise (Teachman, personal communication, March 22, 2019). In practice, we followed the framework of Njelesani et al. (2013).

Older Adults' Participation in Technology Research and Development

In the past decade, user participation in research has increased (Romsland et al., 2019). Currently, Norwegian policy regarding research and innovation recommends engaging users in the co-creation of knowledge, and some research grants in Norway and many other countries even require user engagement. The philosophical perspective in this paper was to implement responsible research and innovation (RRI) in practice. One major methodological request for the Assisted Living Project (ALP) was the principle of inclusion, being one of the four RRI principles guiding our research. Inclusion is also a major concern in occupational science, based on the idea that social inclusion is both a process and an outcome for a person, group, community, organization, or population to participate in their society (Whiteford & Townsend, 2011). Social inclusion is closely related to human rights (Whiteford & Pereira, 2012).

We planned for a participatory approach by involving end users of the studied product or design in defining users' needs and challenges, prioritising their values and goals, elaborating solutions to their problems, making decisions about user requirements and, ultimately, implementing and practically using the product or design (Moser & Thygesen, 2019). In the research-related sense, *engagement* refers to a quality of users' experiences characterized in terms of challenges, positive effects, endurance, variety, novelty, interactivity, and perceived user control (O'Brien & Toms, 2008). User engagement thus implies a shift in the power relations between researchers and subjects. For older adults, that has meant no longer being viewed as passive receivers of services, care, and products but as citizens on equal terms with all other citizens and with personal needs, hopes, and goals, all of which are important factors to consider in planning future services (Royal Ministry of Finance, 2013). The view that a service user is actively involved in and an expert on their health and life is important for individuals' capacity to maintain or improve democratic rights, occupational justice, emancipation, and co-determination, as well as for adapting and enhancing health services to better address users' needs (Alm Andreassen, 2016; Askheim, 2016; Whiteford & Hocking, 2012).

User engagement is also recommended because users can contribute important expertise about theirs and other users' needs, especially concerning technology interfaces, which can, in turn, enhance technology's usability and acceptability (Holthe et al., 2018a; Lee & Coughlin, 2015; McCabe & Innes, 2013; Meiland et al., 2014). Hence, the shift in perception of older people as passive, frail recipients of care to operating as citizens and capable co-creators with expertise is even more evident. By extension, the shift aligns with the notion of occupational justice, which is underpinned by the idea that participating in various meaningful occupations matters to one's health. Thus, barriers to putting ideas into practice are considered to be forms of occupational injustice (Durocher et al., 2013).

Forms of user engagement

User participation can take three forms: user inclusion, user involvement, and user engagement. For this paper, we have used the term *user engagement*, which aligns with the terminology of occupational therapy, especially the term *occupational engagement* (Townsend & Polatajko, 2007; Whiteford & Hocking, 2012), meaning "to involve oneself or become occupied" and "to participate in occupation" (Houghton Mifflin Company, 2004, quoted in Townsend & Polatajko, 2007, p. 370). Although user engagement is an important strategy towards facilitating dialogue, reflexivity, and the co-creation of knowledge, it can cast users in different roles: as sources of data (i.e., informants), as partners with researchers, and as independent investigators in relation to researchers as mentors (Hulatt & Lowes, 2005). In our study, to ensure the co-creation of knowledge about diverse occupations over a 3-year period, as well as considering older adults as experts on their own lives, we conceived user engagement as a partnership (Clarke & Keady, 2002). Our decision follows the thinking of Askheim (2016), who has argued that co-creation entails engaging citizens in actively taking part in innovation processes aimed at creating new and improved solutions for society.

Context of the study

In consultation with the municipality's health authority, an assisted living facility with approximately 60 residents was selected as the project site. The ALP was designed to be an important contribution to both the innovation of technology in Norway, in line with the strategic priority in Innovation in Caring (Norwegian Ministry of Health and Care Services, 2011), and the enrichment of RRI in both concept and practice.

The assisted living facility included lifetime care dwellings for older adults not yet in need of nursing home placements but facing significant challenges in managing independent living in their own homes. The dwellings were physically adapted for older people and situated in connection to an activity centre, a canteen, and a reception area with staff. Qualified healthcare personnel were available around the clock. Residents could personally furnish their dwellings, paid rent, and purchased their meals in the canteen. All community home care services and services from allied health professionals (i.e.,

Table 1. Steps, content and findings of user engagement, 2016–2019

Research-based occupation and date	Content	Findings
Information meeting June 2016	All residents in the assisted living and their next of kin were invited to an information meeting	Approximately 30 residents, a few next of kin and a few staff members met
Individual questionnaires (survey) June 2016 onwards	Socio-demographic data Opinions on technologies with instruments (ALP group in 2015) RAND 12 – Health questionnaire (RAND Corporation, USA) MCFSI – The Mail-In Cognitive Function Screening Instrument, Norwegian version (Michelet et al., 2018) HADS – Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983)	Currently under analysis
Dialogue cafés 26.10.16 14.12.16 06.04.17	Three café meetings with 15-20 residents The first café sought to identify users' needs and challenges concerning daily living The second café discussed technological solutions following cartoon presentations of scenarios The residents' opinions created a basis for making prototypes that were presented and appraised in the third café	The residents were concerned about falling, starting fires, and burglars, and wanted reminders that could help them to live safely and independently The residents were particularly interested in technology that could provide help if they had fallen or verbal reminders if they had left the stove on or forgotten to turn off the coffee machine or left the apartment with the windows or balcony door open
Recruitment for the trial intervention 06.04.17	After the three dialogue cafés, the residents were invited to take part in an intervention study that involved testing environmental sensors at home (Appendix 1: refer to online supplementary material)	8 participants (2 men, 6 women) consented to participate in the trial. One withdrew from the focus group discussion and one withdrew from the final individual interview
Individual interviews June 2016 onwards	The eight residents were interviewed with two standardised scales: the Canadian Occupational Performance Measure (COPM; Law et al., 2014), and the Everyday Technology Use Questionnaire (ETUQ; Nygård, Rosenberg, & Kottorp, 2015)	COPM results: Indicated that the three most meaningful activities were getting around outside the assisted living facility, going for walks in the neighborhood or grocery store to run errands or visit family, a hairdresser or a general practitioner; reading; and socializing with family and friends outside the assisted living facility ETUQ results indicated the participants had and used a wide range of devices; most frequently used were the TV, rated as the most significant technology by four, and the mobile phone, which six had and two wanted
Feasibility study 21.06.17	The first feasibility deployment of sensors took place in one of the apartments	The Medical Research Council's (MRC) framework was used for the process evaluation Too few power outlets created problems with installation. Too many IP addresses competed, which caused lost connections with servers and created gateway errors. Some sensors tended to fall down due to their overly small frames on windowsills or uneven surfaces
Deployment of environmental sensors August 2017 onwards	The sensors were deployed in the seven other apartments following a contract with each participant regarding sensor installation (Appendix 2: refer to online supplementary material)	Difficulties in addition to the feasibility study were unreliable technology and poor wireless connections causing extreme delays in installing and configuring the sensors (i.e., server connection sometimes failed, components could not communicate with each other). After 2 months, all movement sensors were repositioned to cover the desired areas of the apartments. Loss of connection with the server and gateway errors required resetting the system and resulted in frequent visits by the researchers and engineers After 7-months the trial ended because the technology would not function as intended

(*Continued*)

Table 1. Continued.

Research-based occupation and date	Content	Findings
Focus group discussion 14.03. 2018	The eight residents were invited to a final focus group discussion. The interview guide is presented in Appendix 3 (refer to online supplementary material)	Seven residents took part in an audio-recorded discussion led by a primary researcher and a doctoral student (TH and ET)
Individual follow-up interviews after 36 months 03.06.19 05.06.19 06.06.19	Eight residents took part in individual interviews (the RAND-12, MCFSI and HADS and open-ended questions)	Data from the COPM, HADS, RAND-12 and MSCFI were compared with 2016 and 2017 data (Table 1). Results indicated the sample was highly stable both physically and cognitively over the 3-years

occupational therapists and physical therapists) that residents had applied for were provided free of charge.

This paper presents a sub-study of the ALP conducted during a 3-year process of user engagement in a series of research-based occupations. Specifically, this study asked the question: How did eight older adults in an assisted living facility experience participating in a 3-year project involving various research-based occupations and testing environmental sensors in their apartments for 7 months?

Method

Design

To gain in-depth knowledge about the residents' everyday living and possible challenges in the assisted living facility, we collected data on their experiences with the technology trial, their perceptions of user engagement during the project, and their engagement in different research-based occupations, including individual interviews, dialogue cafés, interventions with environmental sensors, observations and follow-up conversations, and focus group discussion (see Table 1).

Steps of the user engagement process

The ALP was approved by the Norwegian Centre for Research Data on 16 March 2016 (application no. 47996). Each participant received a written invitation to voluntarily engage in each research-based occupation, as detailed in Table 1, and each signed an informed consent before commencing participation Appendix 1: See online supplementary material). Data collection lasted from June 2016 until June 2019, and all personal data were anonymized to de-identify participants in line with the European Union's General Data Protection Regulation.

Description of the sensor technology deployed

The sensors deployed in the project were wirelessly connected to a computerised control box that transmitted signals to a secure server at a commercial partner. The plan was to integrate a push-button and loudspeaker by the entrance door to the system such that when the resident was ready to leave the apartment, they could push the button to receive an audio message (e.g., "The coffee machine is on" or "Everything is turned off. It is OK to leave the apartment"). We ultimately used three types of environmental sensors: movement sensors that registered when the resident entered or left different rooms, power effect sensors that registered power being used by the stove, coffee machine, TV or radio, and magnet sensors that registered whether doors/windows were open or closed. All sensors were connected to the push-button and loudspeaker, which issued an audio message if the button was activated. A written contract between the researcher and the residents specified what types of sensors each of them would have (Appendix 2: See online supplementary material). In the trial, the developed solution targeted alerting or reminding only the resident, not any external partner or housekeeper. The first author visited the participants several times during the intervention to accommodate the commercial partner responsible for installing the sensors, the control box, and connection to a secure server.

Description of participants

The inclusion criteria were being a resident in the assisted living facility; 65 years of age or

Table 2. Overview of participants' self-rated health status

Participant Age in years in 2017	RAND-12 (1–5) Self-rated health	Self-rated cognitive functioning (MCFSI)	HADS Anxiety	HADS Depression
A 85	Good	3.5	0	6
B 80s	Very good	4.5	2	3
C 92	Very good	4	1	0
D 82	Fairly good	2	1	0
E 86	Good	1	0	0
F 88	Poor	3.5	3	0
G 81	Good	3.5	1	6
H 88	Fairly good	6	3	0

RAND-12: 1 = *excellent*, 2 = *very good*, 3 = *good*, 4 = *fairly good*, 5 = *poor*
MCFSI: 1 = *yes*, 0.5 = *maybe*, 0 = *no*. According to a Norwegian validation study, the limit for recommending an assessment of cognitive functioning is 5 for self-scored responses and 7 for scores given by next of kin.
HADS: The instrument has scores for each item under Anxiety (A) and Depression (D) respectively. Number of scores: 0–7 = *normal* (no anxiety/depression), 8–10 = *borderline abnormal* (i.e., borderline case), 11–21 = *abnormal* (i.e., case).

older; and able to see, hear, and follow a conversation. As researchers, we sought knowledge about everyday living in assisted living and believed that by exploring the everyday lives of individuals we could understand how macro-level policy affected a group of residents, and vice versa. In other words, we used the home as the starting point for research on society (Gullestad, 1989).

Our sample consisted of eight older adults aged between 81 and 92 years. All were mobile, although half used mobility aids. Participants had resided at the assisted living facility from 6 months to 16 years. The participants' self-rated scores (baseline data from 2016) on the RAND-12 (RAND Corporation, 2019), MCFSI (Michelet et al., 2018; Walsh et al., 2006) and HADS (Zigmond & Snaith, 1983) can be found in Table 2.

Data analysis

The principal unit of analysis was the research-based occupation of engaging with seven participants in a focus group discussion on 14 March 2018, focused on the residents' opinions about participating in a 3-year technology-oriented research project. The interview guide is presented in Appendix 3 (see online supplementary material). Other analyses were also performed for the research occupations: a process evaluation of the feasibility study (Holthe, Casagrande, et al., 2018), an inductive thematic analysis of the dialogue cafés (Lund et al., in progress), and a descriptive analysis of the individual interviews and questionnaire responses (Halvorsrud et al., in progress).

Analysis of the focus group discussion

The analysis of the focus group transcript, consisting of 78 pages, was a data-driven, inductive thematic meaning condensation (Braun & Clarke, 2006). All three authors read the transcript several times to gain an overview of its content, after which each manually coded the transcript independently before reconvening to discuss the codes and emerging themes. After the meeting, the codes agreed upon were merged into the same document, with different colours to highlight relationships between the codes and themes. Examples of the analysis process appear in Table 3.

Table 3. Example of inductive thematic meaning condensation

Quotation	Interpretation	Sub-theme	Overarching theme
"*I think that this [project] is a nice initiative, that it takes what can be positive for older adults seriously. Because it focuses on older adults and what can benefit them, they won't be forgotten so much*"	Taking part in a project that can improve the lives of other older adults is important and meaningful, especially because older adults represent a marginalized group that may be overlooked	Older adults appreciate engaging in projects	Motivation for project engagement
"*The one [sensor] under my bed was disturbing. It blinked when I got out of bed to go to the toilet. It came on all of the time*"	The movement sensor interfered with normal habits, and the participant did not like the light blinking all of the time	Technology as an occasional burden	Mixed feelings towards environmental sensors at home

Findings

From the focus group discussion, we elaborated three themes with sub-themes: 1) motivation for project engagement with the sub-themes openness to learning new things, preparing for own old-age, participation for others' benefit, and appreciating being treated as a citizen; 2) experiencing and understanding participation in the project with the sub-themes difficulty explaining the project to others, treatment as guinea pigs versus co-researchers, and commitment and feeling of responsibility; and 3) mixed feelings towards environmental sensors at home with the sub-themes using technology for hope and goals, technology as an occasional burden, and failure of technology. The findings are supported by illustrative participant quotes which were translated from Norwegian to English by the first author. The accuracy of the translations were checked by the second and third authors and modified as agreed by all authors.

Motivation for project participation and engagement

The residents had different reasons for wanting to participate in the project with environmental sensors. One said, "*We [other residents and I] are happy about all of the research that's done. Doing research is good!*" (P1) Most participants agreed that they were curious about the project (P2, P4, P5, P6, P7), and one commented that it would have been strange to have not accepted the invitation to participate (P3).

Openness to learning new things

The participants typically distinguished old technology—familiar devices such as TVs and telephones—from new technology such as the tablet that they were offered as part of the assisted living facility's routine for providing information to residents. Many participants reported finding it difficult to learn how to use the tablet:

> *Yes, I think everything's new. We [older adults such as myself] have lived through all of the old, and it's gone now … Everything with technology is new, yet we live on. So, we can't stand still. We have to learn what's new. That's important, I think.* (P7)

Other participants wanted to learn to operate new technology but admitted struggling to do so: "*It isn't easy to get older and to adapt to all of these computer things. … It took me quite some time before I learned how to use it [the tablet]*" (P1).

Preparing for own old-age

In the focus group discussion, it became clear that all participants agreed that they did not currently need environmental technology or any other assistive technology. Nevertheless, they were interested in learning about supportive devices and potential solutions to their possible future needs: "*Even if I don't have needs and don't need it [technology] now, the years go by, and a person gets more impaired*" (P7); to which another participant added, "*That's just how it is. The day will come!*" (P6). Yet another elaborated that:

> *I don't need it [technology] now, because I'm 82 years old. However, it's important to be acquainted with such things and to learn how they work. And to be prepared, because in 10 years' time, things may get turned around, and I may really need it [technology], so it's important to learn how it works.* (P7)

Notably, all of the participants perceived the environmental technology as more appropriate for someone older and frailer than them, but that they expected to become frailer with age.

Participation for others' benefit

In line with preparing for possible future needs, several participants mentioned the value of doing good for others:

> *Perhaps a person has something to contribute, because he or she has lived for many, many years and has some experience. If that can contribute to developing new possibilities for others, then it'll be nice [for them] … and for oneself as well that he or she can be useful for something.* (P2)

Appreciating being treated as a citizen

The participants agreed that they appreciated being invited to the project and asked their opinions on technology and everyday living:

> *I think that this [project] is a nice initiative, that it takes what can be positive for older adults seriously. Because it focuses on older adults and what can benefit them, they won't be forgotten so much.* (P2)

Another commented, "*I think that we [older adults such as myself] are being taken into consideration. Older adults who manage on their own are easily forgotten*" (P6). To that, another participant added, "*The goals of your project are nice, and your approach is very good. That's important. Plus, you show that you respect older adults*" (P5).

Experiencing and understanding participation in the project

Difficulty explaining the project to others

Some participants expressed knowing too little about the project, that they could not recall what they had read on the information letter and consent forms, and that they were largely unable to explain the project's purpose and methods. Several participants agreed that the project was complicated, and highlighted that words and expressions used in reference to the project were difficult to understand. One participant had even tried and failed to explain the project to a friend. None had explained the project and participating in it to their next of kin; neither had their next of kin asked them about the environmental sensors or the project. Nevertheless, all had been intrigued by the invitation to participate and were curious to learn more: "*Most of us [older adults at the facility] wondered what you [the researchers] were up to, so curiosity led us to show up at the meetings, right?*" (P4).

Treatment as guinea pigs versus co-researchers

The invitation to participate cast the older adults in the role of co-researchers in a project about technology in assisted living. However, the participants perceived the term *co-researcher* to be flattering, even overly solemn, and joked about it. When one asked, "*Is that the politically correct name for a guinea pig nowadays?*" (P4) another responded with laughter, "*Yes, that's the word I've used when talking about the project!*" (P7). Another resident considered herself and the other participants to be the objects of the study, not active researchers. Nevertheless, they all seemed to identify with the term *co-researcher* and found that it elevated their status: "*I'd rather be a co-researcher than an old hag!*" (P6).

Commitment and feeling of responsibility

Participating in a project for nearly 3 years can be assumed to require sustained interest and endurance, especially when it involves frequent visits to one's residence from engineers and researchers. However, the participants seemed to agree that having guests was a pleasure: "*Getting a visitor? All of them [researchers and engineers] were so nice!*" (P6). The participants were also permitted to call an engineer or researcher if they had any questions, if anything was wrong with the equipment, or if they needed to reschedule an appointment.

The participants agreed that they liked engaging in meetings and being part of a discussion group: "*I find it nice to be in a group where everyone can talk, and everybody can have their say*" (P6). To that, others added, "*Then we have to use our brains and not just sit still and drink coffee*" (P7) and "*It's a change from our somewhat dull old-age lives!*" (P5).

Mixed feelings towards environmental sensors at home

Technology installation requires time

Although installing the environmental sensors in each apartment took approximately 2 hours, none of the participants complained about it. As one commented, she and the other residents "*are used to the fact, through the years, that repairs and things need to be done and that people enter apartments to do work. They're not burglars!*" (P1). Another added, "*When something has to be done [fixed in the apartment], we're used to tolerating some noise*" (P2).

Technology as an occasional burden

The movement detecting sensors resembled golf balls and were mounted on the walls in all rooms of the apartment and under the bed. They

Table 4. Framework for the critical occupational perspective (Njelesani et al., 2013, p. 213)

What are the relevant sociocultural structures and processes that may mediate and constrain participants' perspectives?*
Which occupations are seen as being preferable? How are they discussed or represented in the data?*
What appears to be understood as the preferred way to engage in occupations?
What assumptions underpin the ongoing valorisation of some occupations and the rejection of others?
What power relations are at play?*
Whose interests do the occupations serve?*
Who is privileged as participants in the occupations?

flashed every time a movement was detected. The participants reacted differently to the blinking. Some were disturbed, especially at night: "*The one [sensor] under my bed was disturbing. It blinked when I got out of bed to go to the toilet. It came on all of the time*" (P7). Some did not notice the blinking, whereas another reported that the blinking was reassuring: "*Then I know that it works!*" (P1). When we offered to disable the blinking, most participants accepted; whereas the two who declined explained that the blinking signified the technology's sound functioning.

Failure of technology

Although the sensors and associated wireless network system had been tested in the engineers' laboratory and in private homes, they malfunctioned in the assisted living facility due to the building's old construction with thick brick walls and poor Wi-Fi readiness. Such failures of technology necessitated frequent visits from the engineers to reconfigure the sensors and resolve gateway errors with the local server. The participants seemed to agree that the problems were minor: "*Nothing's perfect! … I realize that the technology has to be adapted and experimented with*" (P5). Another had hoped for the successful installation of a remote light switch but was disappointed when the engineer failed to make this work. On the whole, the residents agreed that interacting with technology demands patience and that they would consider using the technology in the future but were currently in no hurry to embrace it.

Discussion

User engagement in research has become an important strategy; however, there is the risk that older adults in assisted living facilities will be excluded from participating in research-based occupations due to ageist attitudes and occupational injustice. Because that risk constitutes a social problem that demands attention, we strove to engage the residents as partners in our research project.

Our research question for the focus group discussion was: How did older adults in assisted living experience participating in a 3-year project involving different research-based occupations and a trial with environmental sensors in their homes? User engagement experience is discussed first. Thereafter, to gain a broader understanding of our findings in response to that question, we applied a critical occupational perspective in viewing our results according to the framework of Njelesani et al. (2013) (Table 4) and selected four of the framework's questions, marked with an asterix in the table (Njelesani et al., 2013). To conclude, we discuss the importance of building a social relationship during participatory research.

The user engagement experience

Eight of the participants engaged in several research occupations during the 3-year study period. Although we, as researchers, perceived them as co-researchers, they argued that the term *co-researcher* was flattering and even overly solemn; they considered themselves to be participants in a project without any particular responsibilities. It remains questionable whether they would have formed a different impression of their role had the technology functioned as intended, which would have granted them access to unique experiences and likely empowered them in their role.

Another question is whether we succeeded in engaging the participants as partners or co-researchers or whether they became additional sources of data and justification for our goal of studying user engagement. The latter possibility

has been described as *tokenistic user involvement* (Romsland et al., 2019), meaning that research participants have no real influence because their abilities are underestimated, their tasks condescending, or their different backgrounds responsible for a lack of mutual understanding (Morrison & Dearden, 2013). The opposite of tokenistic user engagement is *meaningful engagement*, which refers to participants' contributions that are made valid and understandable (Morrison & Dearden, 2013; Romsland et al., 2019). Extended over 3-years, user engagement and reciprocal communication can be understood to constitute user engagement for the co-creation of knowledge (Askheim, 2016).

In our study, which was guided by RRI principles (Norwegian Research Council, 2015), we strove to facilitate dialogue and co-creation of knowledge by engaging users in a focus group discussion and other research-based occupations. The participants agreed that research is generally important, were pleased with not being overlooked as a social group, and appreciated being able to contribute knowledge about their lived experiences for others' benefit. Thus, participating in the project generally seemed meaningful to them.

Applying a critical occupational perspective

Anchored in occupational science, an occupational perspective maintains that all humans are occupational beings, and that health and well-being as broad concepts closely relate to occupation and participation (Whiteford & Hocking, 2012). A critical occupational perspective may shed light on how occupations are understood, which occupations are selected, who is engaged, and what characterizes the contexts of those occupations (Njelesani et al., 2013). It focuses on the ways in which social power relations form and perpetuate occupational inequalities and injustices, along with how they are socially and politically (re)produced (Laliberte Rudman, 2018). By asking critical questions about the data generated, we challenged certain assumptions, hegemonic practices, and ways in which power relations influence the co-creation of knowledge.

Relevant sociocultural structures concerning assisted living residents and project participation

Regarding the study's context, assisted living facilities are places for living between a private home and a nursing home for older adults who have become frail and need safety, social inclusion, and home care services. The hegemonic sociocultural environment of the facility resembled the sociocultural structure within nursing homes, with inherited assumptions about the roles and power relations of staff and residents. Sociocultural processes mediated everyday occupation and structure in the facility and residents were expected to adapt to and comply with the norms of assisted living culture.

The participants perceived themselves as autonomous citizens entitled to respect and dignity despite their impairments. Invariably, they continued to want to contribute to society. Self-management was the most crucial occupation for all of them, even though many needed practical help with showering, shopping, or using medical supports. That trend is evident in the residents' self-rated health and quality of life (see Table 2).

Several of the residents' quotes implied that they felt fit regardless of age and health conditions. One 82-year-old participant reported wanting to prepare for old age with the expectation that in 10 years' time "*things may get turned around, and I may really need it [technology]*"; therefore, she was motivated to learn about technology now. Many participants expressed striving to keep pace with modern times and wanting to learn how to operate new technology in order to participate in society. Such notions align with recent policies on ageing that have introduced terminology such as *healthy ageing* (World Health Organization, 2019), *productive ageing* (Laliberte Rudman, 2016) and *successful ageing* (Baltes & Baltes, 1993). Such policies belong to a new trend of thinking, embedded in neo-liberalism, which holds all citizens responsible for staying active and healthy, engaging in productive work (Laliberte Rudman, 2016), staying autonomous and empowered, and maintaining a positive sense of self (Baltes & Baltes, 1993).

Which occupations were seen as being preferable? How were they discussed or represented in the data?

Participating in research-based occupations seemed to be meaningful to the residents and thus preferred. One underscored that preference by saying, "*Being part of a group that discussed something important and getting to use our brains was far more stimulating than just sitting together drinking coffee*".

What power relations were at play?

Although researcher–participant relations may vary from project to project, we intended to engage the residents as users in different research-based occupations in response to the project agenda's needs and RRI principles (Norwegian Research Council, 2015). According to Farias et al. (2019), it is important to reflect on the power relations in a study before, during, and after it is conducted, and researchers should strive to facilitate user engagement throughout their studies.

The participants were important stakeholders throughout the project, albeit in varying relations of power with us as researchers. During recruitment, the residents exercised power by deciding whether and when to consent to participation. During the project itself, however, we exercised the most power by controlling the frequency of the occupations, which the residents usually accommodated. The power relations in the occupations also generally favored us as researchers.

Whose interests did the occupations serve?

The research-based occupations foremost served us as researchers, for we needed data to document and explain our findings to the project's funders. Indeed, older adults often are marginalised and excluded from research and development projects due to presumptions that they are frail and cannot meaningfully participate in research (Morrison & Dearden, 2013). The older adults' participation in our study challenges those assumptions embedded in ageist and ableist rhetoric often hidden in society.

Social relations are more important than technology

The participants seemed to agree that the technological failures were a pity and that patience is typically required with technologies, which are generally perceived as being sophisticated, if not also complicated. Even so, the participants trusted that we would ultimately succeed in our work. The participants also appreciated being asked about their opinions and felt committed to continuing to participate in the project, even when the technology failed and required far more visits than planned. The latter was not a burden, as we had expected; on the contrary, the residents appreciated our visits, which they viewed as offering respite from their boredom. None of the participants withdrew from the project even if the technology failed. Their chief interest was forming social relations with us as researchers and, due to the malfunctioning of the technology, the engineers and researchers who often had to visit their apartments. Such visits became revitalising events during dull days or weeks at the assisted living facility.

Strengths and limitations

Despite having impairments, the participants in our 3-year longitudinal study were able to contribute their opinions and reflections about the various research-based occupations in which they engaged. Although user engagement in research can be time-consuming, our longitudinal design enabled us to communicate with the participants over time, which facilitated meaningful engagement and positive social relations. Such close relationships may face criticism for risking bias in the data; however, in participatory research, researchers have to be a part of the dialogue in order to enable an egalitarian co-creation of knowledge that reflects reality (Bakhtin, 1981), as well as taking a reciprocal exchange of assumptions and ideas into consideration (Frank, 2005).

Our study's limitations included that the technology failed, which required multiple visits and revisits to participants' apartments. Although we anticipated that such nuisances might become a burden for the residents, they were typically pleased to have visitors and expressed that they did not urgently need the

technology anyway. Another limitation was the small sample size of eight residents. This may be a consequence of the recruitment strategy, and the house-keepers' time and ability to identify residents and motivate volunteers for project participation.

Study implications and further research

Older adults in assisted living are important stakeholders in research concerning them as a user group. As a case in point, the residents were interested in learning about technology, what technology could become of interest to them later in the lives, and what technology might appeal to other older adults. Every citizen should be engaged in the process of implementing technology that is relevant in their life. It is important to assess personal preferences and needs as well as perform on-site acceptance tests before installing new technology, as revealed in our study. Furthermore, when technology is implemented, it is important that all stakeholders involved in the person's daily living—the head nurse, community healthcare workers, next of kin and even cleaning staff—know about the technology's existence in the apartment, its purposes, how it functions, and how it can be reset when necessary.

Technology has to inspire collaboration, safety, and coping as well as avoid creating digital gaps and unequal power relations. In that light, it indeed matters what terms and expressions are used if technology is to become familiar and incorporated into one's everyday life. Further research may consider the values of technology for the residents, to generate insights regarding usability and useworthiness of the technology (Krantz, 2012), as well as the participants' opinions on the activities in question as doable and doworthy (Krantz, 2012). However, since the technology in our study failed, we were never in a position to address these issues.

Conclusion

Older adults in assisted living facilities may easily be excluded from user engagement in service development and research-related occupations. The co-creation of knowledge in our sub-study of the ALP suggests that older adults in assisted living, despite being impaired in some way, were able to meaningfully contribute their opinions about their needs in relation to technology. The method of user engagement in our longitudinal study facilitated social relations, partnership over time, and the co-creation of new knowledge. Our findings imply that older adults should be recognized as important co-creative partners in future health research concerning any matter of interest to them. These findings contribute to occupational science by emphasizing social inclusion regardless of age and living arrangements, and safeguarding human rights and occupational justice. Applying a critical occupational perspective on the research raised awareness about sociocultural assumptions about older adults in assisted living as frail and unable to participate, which may reinforce ageist and ableist stereotypes, and foster occupational injustice.

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