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Tailoring to support digital technology-mediated occupational engagement for older adults – a multiple case study

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ABSTRACT

Background: With the evolution of contemporary occupations mediated by digital technologies (DTs), there is a need for occupational therapists to develop and structure knowledge on how to support older adults' engagement in occupations and social participation in a digitalised society.

Objective: The objective of this study is to explore how tailoring to support older adults' engagement in DT-mediated occupations could be schematised.

Material and methods: The study employed a multiple case study methodology. There were nine cases, with each case involving an older adult undergoing a collaborative process to support engagement in DT-mediated occupations. The collaborative process was initiated through questionnaires, observations, and dialogues. Meetings and tailoring strategies were documented in fieldnotes and memos on tailoring, respectively. Semi-structured interviews concluded data collection. Cross-case synthesis was used in data analysis.

Results: The result is a proposed scheme for tailoring to support older adults' engagement in digital technology-mediated occupations, wherein strategies undertaken in the collaborative processes were synthesised and described.

Conclusion and significance: The proposed scheme for tailoring could contribute to occupational therapists' knowledge on how to support older adults' engagement in contemporary occupations. Testing the model in various practice settings is recommended in order to enhance occupational therapy practice.

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Introduction

Digitalisation is both an opportunity and a challenge for individuals, communities, and societies. Through the integration of digital technologies into many services in society [1,2], digitalisation can provide possibilities for citizens to achieve good and equitable health and welfare, as well as, independence and participation in community living [3]. In this paper, *digital technology* (DT) refers to digital infrastructure, tools, and media that can be used or applied in various life areas. Examples include 'personal computers, smartphones, and computer tablets – including applications that accompany these devices – combined with the internet and the World Wide Web' [4, p. 315]. There is potential in DT use to reduce feelings of loneliness and improve social connectedness, self-esteem, and quality of life among older people [5–8]. However, there is also a risk for adverse outcomes resulting from persistent DT use [9], as well as, a risk for feeling lonely or excluded due to lack of access or infrequent DT use [10–12]. Infrequent or non-use of DT is more common among older adults [13], which reduces their opportunities to achieve good health and participation in a digitalised society. Thus, older adults need to be supported in more frequent DT use in order to minimise their risk of loneliness and social exclusion and to augment their opportunities for health and participation.

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Supplemental data for this article can be accessed here.

DTs have influenced, and with concurrent rapid technological development, continue to change how people engage in occupations [4,14,15]. Many social activities and errands are now initiated, planned and performed through or with DTs [16]. DTs have likewise affected social roles, e.g. children becoming technology experts for older people, older adults maintaining their role as grandparents online [17,18]. Consequently, occupational therapists, whose duty is to promote health by supporting people's engagement in occupations that they need, want, or are expected to do in accordance to the roles that they assume [19,20], face new practice concerns [21,22].

These concerns include possible unfamiliarity with technologies, uncertainty on how to make adaptations, and the lack of guidelines and routines, in addition to issues relating to professional ethics, privacy, and data security [22,23]. It has therefore been recommended that occupational therapists should strive to constantly enhance their digital competence [22,24], a competence expected of registered occupational therapists in several countries including Sweden [25–27]. Digital competence refers to technical skills necessary to use digital tools and services, as well as, knowledge and skills to find, analyse, critically evaluate, and create information in various media and contexts [28]. Occupational therapists have suggested ways to improve digital competence, such as exploring and engaging in online activities [29], participating in professional competence development networks or fora [22,29], and observing technology use in occupations [30]. It was even proposed that occupational therapists should do critical reviews of technologies that affect their practice and work with other professionals to develop inclusive technologies [30].

Acquiring knowledge and skills that comprise digital competence includes examining knowledge from existing literature. Studies on promoting internet-based social occupations among older adults [31,32] suggest that interventions should be based on the person's interests and needs, and that adequate time and support should be provided in order for the person to set and achieve personal goals. Additionally, it is essential for older persons to find meaning and perceive the environment as supportive to engage in internet-based social occupations [31]. In another study with adult clients with spinal cord injuries [24], occupational therapists implemented compensatory, acquisitive, and educational strategies to facilitate occupational performance involving smart mobile devices. Examples of compensation were alternative access or input devices, environmental modifications, splinting, and customisation of apps. Skill acquisition included providing regular opportunities for practice, while education dealt with providing clients and their families information about using traditional assistive devices with smart technologies and customising own devices.

Despite this knowledge, there is still a dearth of published material on how occupational therapists can support older adults' engagement in DT-mediated occupations. Older adults' needs, experiences of DT use, and contexts are varied [31]. Thus, it is imperative to develop knowledge about implementing supports that are tailored to each older adult, particularly his or her needs, interests, preferences, abilities, and contexts [32,33]. In this study, *tailoring* pertains to the application of individualised strategies to identify needs for support, as well as, to provide support by enhancing abilities and modifying the occupation or environment. As tailoring supports can be so diverse and complex, there is a need to organise the knowledge in a schematic arrangement. Therefore, the objective of this study is to explore how tailoring to support older adults' engagement in DT-mediated occupations could be schematised.

Materials and methods

Case study methodology [34] was chosen as it allowed for exploration of the process of tailoring to support engagement in DT-mediated occupations as a contemporary phenomenon within a context (*case*). The method is appropriate when the phenomenon cannot be clearly delineated from its context [34], just as it was in this study. A multiple-case design was used, i.e. several cases were included in the study, in order to explore the replicability or uniqueness of each case. As this study dealt with tailoring, an adaptive design was necessary to modify the study plan based on new discoveries during data gathering. The study included nine distinct cases, with each case involving one participant who underwent his or her own collaborative process.

Participants

To be included in the study, older persons should be at least 70 years old, living in the community, and willing to be in periodic contact with researchers for approximately a period of four to six months. They should have no severe language impairment that could hinder communication. The study sought individuals with interest in developing social activities supported by DT, although knowledge of DT was not required, as explicitly stated in information materials and during information meetings. Access to digital devices in one's home was also not required.

Recruitment was conducted in two municipalities in Northern Sweden, each having a municipal broadband network. In the first municipality, information meetings with municipal home care service providers were held to identify potential participants living within their areas of responsibility. Home care service providers acquired expressions of interest from their clients before introducing them to the researchers. In the second municipality, an information meeting with older adults living in a private retirement community was held. Persons who were interested filled in their telephone numbers on a Request More Information form. Interested older adults were provided information individually and given reasonable time to consider and discuss their eventual participation with family or a trusted individual.

In total, three male and six female participants, aged 74–95 years (median = 84 years) participated in the study for a period of 20–26 weeks (Table 1). All participants, two from the first municipality and seven from the second municipality, lived in rented apartments with broadband Internet connection. Seven persons were living alone and either widowed, widowered, or divorced, while two persons lived together as a married couple. All had access to various services, including home care, in their respective urban communities, but information about which services they retained was not gathered. Reported use of DTs ranged from never to daily (Table 2). Among nine participants who underwent the collaborative process, only eight were able to participate in the final interview.

Collaborative process

The collaborative process followed a general structure – assessment and planning, intervention, and follow-up – to pursue participant-determined occupation-based goals involving DTs. Meetings with participants were held in their homes. Home visits ranged between six and nine times after informed consent was acquired. Tailoring was mainly conducted during the intervention and follow-up phases. Participants were encouraged to involve their significant others in the collaborative process, mainly to act as practice partners while they engaged in occupations. Interactions with family members or service providers were done as part of the tailoring with permission from participants. There was no prior professional relationship between the researchers and the participants. Data was collected throughout the collaborative process.

DTs, in the form of a tablet and mobile Internet (4G), were available for loan to participants. The only cost involved in the loan of the DTs was the additional cost of electricity when charging the device at home. Participants who already had access to technologies from home preferred to use their own digital devices and Internet subscription, even after receiving information about the technologies that could be borrowed.

The multidisciplinary research team, who all had experience on research about older adults and technology, contributed with different but relevant perspectives – caring sciences, computer science, gerontology, human-computer interaction, occupational science, and occupational therapy – in order to deal with various issues that emerged during the collaborative process. The first author had the main

Table 1. Demographic background about the participants.

Participant	Age	Gender	Living situation	With children living in same municipality	With children living in other municipalities	Occupational field before retirement[a]
Alba	95	Female	Widowed	No	Yes	Service, care and shop sales worker
Brit	84	Female	Widowed	Yes	No	Elementary occupation
Cara	75	Female	Widowed	Yes	No	Occupation requiring advanced level of higher education
Dave	86	Male	Widowered	Yes	No	Occupation requiring higher education qualifications or equivalent
Ella	77	Female	Married	Yes	Yes	Occupation requiring higher education qualifications or equivalent
Fred	81	Male	Married	Yes	Yes	Service, care and shop sales worker
Gret	88	Female	Widowed	Yes	Yes	Manager
Heid	74	Female	Divorced	Yes	No	Occupation requiring higher education qualifications or equivalent
Ismo	84	Male	Widowered	Yes	Yes	Occupation requiring advanced level of higher education

[a]Classification based on Swedish Standard Classification of Occupation 2012 (Available from https://www.scb.se/en/finding-statistics/statistics-by-subject-area/other/other/other-publications-non-statistical/pong/publications/swedish-standard-classification-of-occupations-2012/).

Table 2. Participants' reported frequency of their use of technologies they reported to have access to at home.

Participant	Laptop computer	Tablet/handheld computer	Printer	Mobile telephone	Smart telephone	Internet
Alba				Seldom		
Brit				Seldom		
Cara	Sometimes	Often	Sometimes		Often	Often
Dave	Sometimes		Sometimes	Often		Sometimes
Ella	Often	Often	Sometimes	Often		Often
Fred	Sometimes	Never	Never	Often		Seldom
Gret		Often		Often		Often
Heid	Sometimes	Often		Often		Sometimes
Ismo				Often		

Note that responses on frequency of Internet use sometimes did not match frequency of use of laptop computer or smart mobile devices.

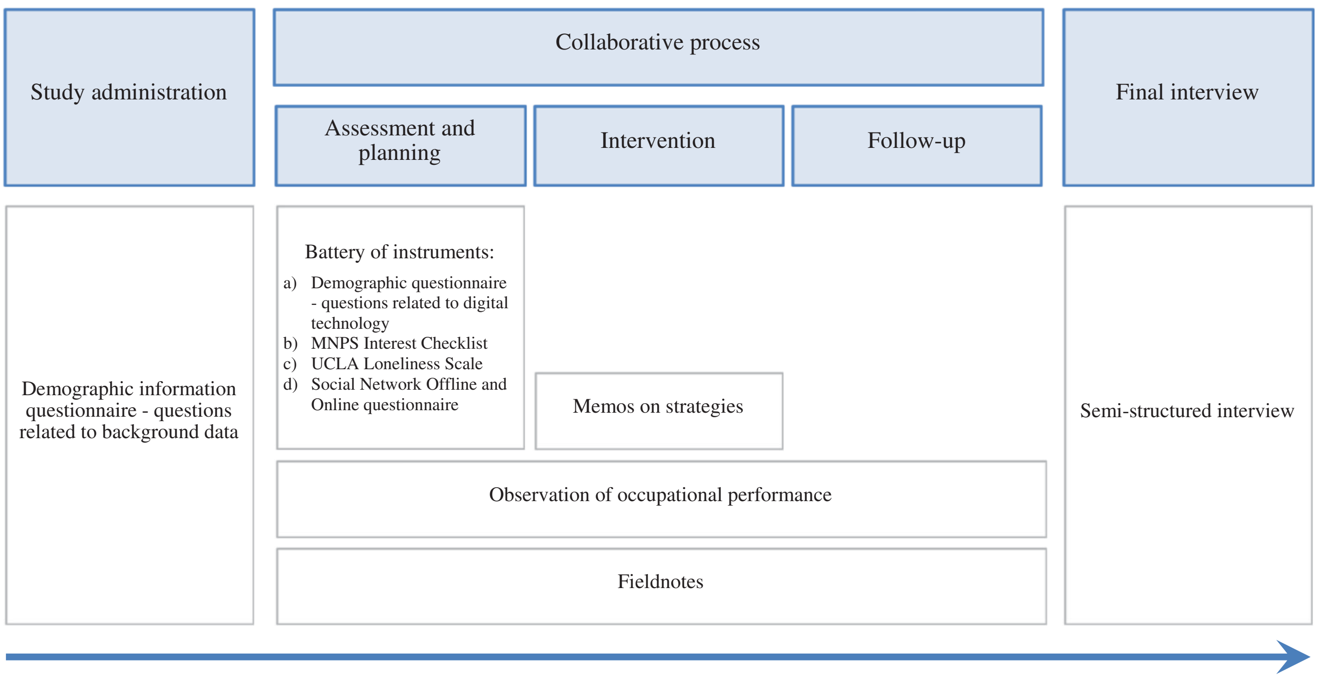

Figure 1. Instruments and methods (clear boxes) used in data collection within the study (shaded boxes).

responsibility for collecting data and conducting the collaborative process. All authors participated in the tailoring through planning and discussing intervention strategies, as well as, discussions on issues that emerged, like communication, ethical questions, and technical concerns.

Data gathering

Data gathering is illustrated in Figure 1. The study began with structured interviews guided by a battery of instruments. The battery included: (a) a questionnaire on demographic information and participants' access to and use of DTs; (b) the MNPS Interest Checklist [35–37]; (c) the UCLA Loneliness Scale [38,39]; and (d) the Social Network Offline & Online questionnaire [40]. All instruments were in Swedish. Instrument (a) was based on a questionnaire previously used in other studies [4,41] and revised by the research team for this study's objective. Responses on instrument (a) were used for reporting the participants' demographics (Table 1) and their background on access to and use of DTs (Table 2). Instrument (a) also included questions about which DTs were important for them and which DTs they would like to try using. These questions were used to assist in identifying occupations that participants could perform and subsequently in determining goals. Instrument (b) was used in the study to aid in identification of occupations that participants might want to focus on during the collaborative process. In instrument (b), participants reported how interested they were in each activity on the list, as well as, whether they performed the activity, wanted to

Table 3. Examples of patterns within cases.

Tailoring events	Patterns in strategies used
Exploring usefulness of DTs	Discussed participant's interests; searched for resources or information related to interests; used interests as keywords; described the steps in simple language while they were being done
Demonstrating how to search for information	Showed and described what was done on the screen; used simple language; encouraged participant to interact with screen; discussed information in relation to interests
Customising screen settings based on visual preferences	Increased the pointer/cursor size; increased text size; simplified the background (i.e. chose plain background or hid irrelevant apps)
Simplifying steps	Moved frequently used apps on home screen; created shortcuts or 'favorites' list
Supporting navigation in app with video-on-demand services	Gave written explanation for remote control buttons; discussed which buttons are essential in activity and what they are for; used simple language; used the long/broad paper metaphor; practiced together
Practicing a new activity	Provided verbal reminders or visual cues; gave positive feedback; discussed performance after each practice; tapered cues over time

perform the activity, and considered the activity important for their wellbeing. An example item on the list was watching television (TV), which all participants reported to perform. Instrument (c) included 20 statements used to measure subjective feelings of loneliness and social isolation, while instrument (d) was designed to describe one's social network both online and offline. Instruments (c) and (d) were used as tools in dialogue to assist in identification of goals.

Observation as a method was intended to provide information about how participants with previous experiences with DT engaged in DT-mediated occupations; qualitative findings from which were used in identifying goals and guiding tailoring. The occupations observed were determined in a dialogue based on their responses on technology-related questions in instrument (a). Observations were also used during intervention and follow-up to determine need for modifying strategies or for additional support in participants' performances of their chosen DT-mediated occupations. Information collected during observations were documented in fieldnotes.

A fieldnotes form, developed and pilot-tested by the research team, was used to document meetings with the participants. Fieldnotes information gathered after each meeting included purpose of the meeting, physical setting, interactions between people present, actions undertaken by the researcher, observations, responses from the participant, and reflections about the meeting. Additionally, memos on tailoring were used to document preparation of strategies.

Final semi-structured interviews were conducted to investigate participants' perceptions and experiences on achieving personal goals and participating in the collaborative process. A recapitulation of what occurred during meetings was provided to render the collaborative process accurately and to encourage each participant to discuss his or her views regarding the various steps and tailoring strategies taken. All participants declined being audio-recorded. Note-taking was done instead.

Data analysis

Data analysis was guided by methods and techniques described by Yin [34]. First, data gathered from each participant were chronologically ordered and used to create a diagram. The initial diagram from each case was thereafter examined with focus on actions undertaken by the researcher, observations, and responses from the participant. The examination involved a search for patterns, insights, or points of interest, which resulted in the creation of another diagram. A pattern could be a set of strategies done together or in sequence (Table 3). Points of interest could be goals, activities, strategies, or other things worthwhile to note in relation to the study objective (Supplementary Appendix 1). Creating diagrams was an iterative process, going back and forth through the data initially gathered. The diagrams, together with a timeline for the collaborative process, responses on instruments, and the final interview notes, then made up each case description.

A cross-case synthesis [34] was then done to compare and combine within-case patterns and points of interests across the nine cases. Besides analysing the case descriptions, the raw data was also reviewed to examine cases in their entirety in the synthesis. As none of the cases were identical, patterns and points of interest were compared based on dimensions such as frequency of DT use, goals set, and participants' accounts of practice between visits. The chronological ordering of synthesised data was ascertained to create a schematic arrangement of the findings. All authors contributed to data analysis through iterative discussions.

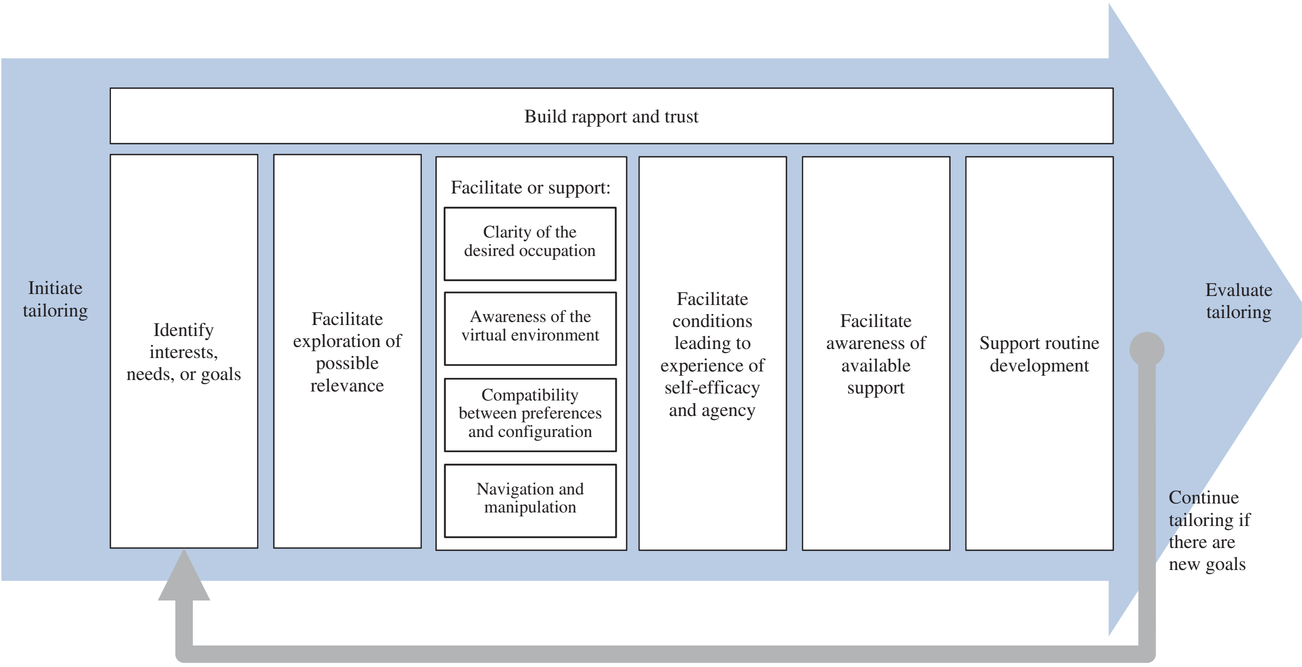

Figure 2. A proposed scheme for tailoring to support older adults' engagement in digital technology-mediated occupations.

Ethical considerations

Ethical approval was granted by the Regional Ethical Review Board in Umeå, Sweden (Dnr 2017/50-31). To avoid observing sensitive information, a clear protocol to exclude occupations that dealt with managing finances and to look away when the participant entered personal identity numbers or a password on a device was followed during the entire collaborative process. Personal devices were not examined for content. No information was gathered directly from the participants' families or home care staff, in order to limit the scope of each case. Furthermore, home care service providers are bound by the duty of confidentiality according to the Swedish Patient Safety Act (2010:659).

Results

The findings were illustrated as a scheme for tailoring to support older adults' engagement in DT-mediated occupations (Figure 2). The scheme consisted of steps built from strategies used in the cases. The strategies were tailored to each participant based on knowledge – such as goals, experiences of DT use, and contexts – that gradually emerged during the collaborative process. Step descriptions based on findings of the cross-case synthesis are presented below.

Build rapport and trust

Building rapport and trust with participants was undertaken throughout the collaborative process. This entailed discussing their preferences, suggesting options, and carrying out their choices, for example, in changing visual settings and adding webpage bookmarks. For Brit, it meant suggesting DT use in a modest way (e.g. 'Shall we check the film together?') when she could not remember a step while knitting. With Ella, Gret, and Ismo, building rapport involved taking breaks from performing DT-mediated occupations and listening actively while they discussed things that were important to them. Ella perceived the importance of trust in the discussion on online safety and reliable sources of information. In the search for information, she explained,

> …Now I dare to search more, and I can ask stupid questions. (Ella, in the final interview)

Identify interests, needs, or goals

The participant's needs, interests, or goals were identified in the beginning of the collaborative process. Few participants knew precisely which support they needed or which goals they wished to achieve. Dialogues proceeding from observations of DT-mediated occupational performances assisted in identifying supports that were needed. Dialogues based on questions from instrument (a) – *Which DT do you consider as important? Which DTs would you like to try out?* – and one's interests from instrument (b) prompted an identification of interests and goals in some cases:

> I explained that the next step is to identify activities that they want or need do. They should not think about computer activities, only daily activities. They had difficulty naming activities so I introduced the Interest Checklist and started with the activities there. (Fieldnotes from a meeting with Ella and Fred)

Identified goals varied and included desired engagement in leisure occupations like knitting and watching sports, as well as, specific DT-mediated occupations like reading news online, watching television programs-on-demand, and organising albums with digital photos.

Facilitate exploration of possible relevance

Possibilities for participants to apply DT to their identified interests, needs, or goals were explored. For participants who never or seldom used DTs, demonstrations on how DT could support desired occupations were conducted. For instance, a demonstration on how to search for information involved using digital tools while simultaneously talking through the steps taken, encouraging the participants to directly interact with digital tools, and discussing the information found in relation to the participant's interests. Brit, who wanted to knit with one hand, was presented an online instructional film and written instructions on how to use a ring loom. The online instructions were viewed and discussed before performing knitting on a real loom. Alba, who was interested in watching sports, took part in searching for and viewing old videos of football and figure skating from Swedish television archives. Cara, Dave, and Ella, who used DTs in varying frequencies and were interested in cultural and learning activities, were introduced to local websites that provided information about their interests. Searching for an instructional film about knitting and information about cultural activities was done before meeting respective participants, while sports videos were searched on an online search engine as part of the dialogue with the participant about specific sports. Participants expressed appreciation for the exploration of possibilities:

> Good that I got to know that technology can be used for different things … to know different possibilities that one could choose. (Gret, in the final interview)

Facilitate or support:

The support needed to engage in desired occupations differed between the cases. Some participants were given clarifications or reminders about what the activity entailed and which digital tools could be used. With other participants, explaining the extent of the virtual environment[1] was done in order for them to gain an understanding where relevant information, tools, and commands could be located. Others needed help to adjust the virtual and/or physical environment and to simplify the occupation itself. In some cases, support was provided to move within the virtual environment and to use the tools and commands within that environment. Thus this step in the scheme focussed on supporting or facilitating one or a combination of these four aspects. Strategies to support one aspect could lap over another aspect.

Clarity of the desired occupation

Some participants were observed to hesitate in touching the tablet screen or touchpad, showing some difficulty to initiate the activity. Conversely, other participants were observed to click reflexively on links, subsequently opening pages or windows without the information that they desired, and then discontinuing respective activities. To make occupational engagement manageable, participants were encouraged to set boundaries for the occupation they desired to engage in. To exemplify, Alba and Brit agreed to performing only one DT-mediated occupation in earlier meetings. Besides information about the current time and weather, only the app needed for their respective occupations was put on display on the home screen of the tablet on loan. In another case, Fred was encouraged to focus on reading online newspapers. For this occupation, the creation of his own user account on laptop computer he shared with his wife was discussed, agreed upon, and carried out. Fred was also assisted in saving his favoured news website on the bookmarks bar of the web browser on his user account. Focussing on one occupation at a time was perceived as positive:

> It felt positive to learn this (reading online newspapers) … I can manage without instructions … I don't need to check my e-mail because it is rare that I get an e-mail. (Fred, in the final interview)

Awareness of the virtual environment

Several participants expressed not finding the information they desired. Hence, it was clarified to participants that the virtual environment extended beyond what was visible on the screen. This was exemplified in different ways in the cases, such as: the window with information was bigger than the display screen; there were several windows open with one window hiding the others; irrelevant information such as advertisements overlaid the desired information; and the information was stored in another file. To make locating virtual objects[2] easier, participants were made aware that desired information could be hidden. With Brit, Dave, Fred, and Gret, one strategy used was to describe a web browser using a long/broad paper metaphor (i.e. 'Imagine that the information is on a long paper and only part of this paper is shown on the screen…') and subsequently explain what scroll bars are for. In Gret's case, it was also explained that full-display advertisement could cover the information she requested and that she had to look for a command to close the advertisement or a link to change the page. With Cara, a discussion supported with simple drawings on storing image files was used as a strategy.

> I asked her about the photo organization on One Drive. She explained that there were two places where she organized her photos – folders on "Documents" and albums on "Photos". We discussed that it might be important to choose one place to put the photos in. She chose Albums. (Fieldnotes from a meeting with Cara)

Compatibility between preferences and configuration

Several participants reported not being able to see the pointer or read the text. Others found the information too much or the DT too complicated. For the DT to become more accessible and perceptible, modifications to the physical and virtual environments were done. Various visual configurations were tried out with Alba, Brit, Fred, and Heid based on their preferences. Adjustments to display settings included increased pointer size, increased text size, higher contrast, and simple background. Reconfiguring contrast settings was also demonstrated to Fred and Ella, in case Fred would need to further adjust visual settings. Moreover, Fred trained to use zooming options to enlarge or reduce the size of texts and images. For new users like Alba and Brit, accessibility settings were configured in advance and modified together with the participant after introduction to the technology. For Alba, the tablet was set up within reach on a table, with extra legroom for her immobilised and extended leg, and with access to an electric supply. To simplify an activity, reducing steps was done by creating shortcuts (Alba, Brit, Fred, Gret), setting the automatic sleep display function instead of turning off the tablet (Alba, Brit), and removing the login step (Alba, Brit, Fred).

> It is good that Fred doesn't need to log in. Logging in was a hinder. (Ella, in a joint final interview with spouses Ella and Fred)

Navigation and manipulation

To make the DT more useable for their desired occupations, participants trained how to navigate in a virtual environment and select virtual objects. For participants who were observed to have difficulty with manipulating the pointer or selecting objects on the screen, a strategy was to discuss using a mouse instead of a touchpad (Heid), using a stylus instead of fingers (Gret), or changing styli (Cara). Other strategies included providing opportunities for practice, encouraging, giving feedback, and reflecting and discussing one's performance (Fred, Gret, Ismo). Identifying which cues (e.g. verbal, visual) worked best for each participant (Ella, Fred, Gret, Ismo) was done through observations or by asking directly. This was necessary in developing paper-based instructions that were used for practice together and alone. Instructions were in the form of drawings with explanations for buttons on remote controls (Gret, Ismo), keyboards (Dave, Fred), or mobile phone (Ismo); as well as, step-by-step instructions with both words and icons (Ismo).

> I brought adjusted instructions for the remote control for managing SVT Play. Now there are two alternatives for finding and starting programs. The turning on and turning off the Play services are the same. Two columns for the instructions - one is going through the Search function; the other goes through the options that Play services automatically updates based on the person's viewing options. He was glad to receive the printed instructions and practiced several times. In some steps (starting with menu button, using the arrows, closing with exit button), he didn't really need to read the instructions before pressing on the buttons. He looked at the instructions to stop/pause the program (stop button) and to remember sequencing when searching for a program. He was satisfied with the printed instructions. (Fieldnotes from a meeting with Ismo)

Facilitate conditions leading to experience of self-efficacy and agency

In order for participants to experience a sense of being able to do their desired occupations successfully and/or to do something intentionally to affect successful performance, many dialogues were conducted. In the cases of Cara, Dave, Ella, Fred, Gret, and Ismo, alternative actions or solutions discussed so that they could make informed choices related to their desired occupations. Dialogues also included discussing which strategies provided did they prefer or worked better for them, e.g. which instructions fit better to what Ismo wanted to do and which device was easier to use when Cara organised her photos. Dialogues about using reliable sources of information were also held with Ella and Fred. A frequently-used strategy with Cara, Dave, Fred, and Heid was encouraging them while they practiced performing an activity. Cues and guidance provided to Fred, Gret, and Ismo during practices were tapered over time. It was revealed that discussions and practice helped in initiating performance.

> Participation [in the study] was stimulating … helped to get me started … I don't like to do practical things, so it was good to get going … It was good to be able to ask questions, like *Are there other things I need to think of?*, and someone to discuss with … Through the [study] I feel that I can manage technology and that it is no big deal. (Cara, in the final interview)

Facilitate awareness of available support

To encourage continued engagement in DT-mediated occupations, discussions about available support were initiated. For example, the local library staff was enlisted to inform Alba about digital library services, and a computer expert was consulted to answer Cara's questions about online data storage. Information about a website with experienced older users in Sweden and troubleshooting fora was also provided to Cara and Ella. In addition, an online user manual and help options was introduced to Dave. This introduction included simplifying and contextualising the instructions, and going through the steps together. The OT also discussed with Fred and Ella about support from family and paid professionals.

> I think it is wonderful that our son can take over our computer remotely [if we need help]. (Fred, in the final interview)

Support routine development

To promote repeated performance of newly-explored activities, participants were encouraged to involve significant others, for example, to take photos of each other during visits (Brit) or call each other using videoconferencing tools (Alba). For participants who loaned devices, access to digital technologies were discussed and planned. To promote regular engagement in DT-mediated occupations, participants, like Cara, Ella, Fred, Gret, and Ismo, were encouraged to continue practicing their desired occupations alone. During follow-up visits, participants were encouraged to reflect on and discuss their performances. Cara reported that since she began organising photos, she had started using the computer again, updated the Microsoft Office package to use OneDrive, and had become more structured. Fred who read news online and Ismo who watched TV programs-on-demand reported practicing often and were eager to show how they performed and to discuss how their engagement has affected their daily life.

> It has been worthwhile for me … increased my quality of life … To be able to listen and watch on SVT Play and see films have helped me find a way to continue living … So much one could discover … I can watch the news whenever. (Ismo, in the final interview)

Discussion

This study focuses on addressing the need to organise knowledge about tailoring to support older adults' engagement in DT-mediated occupations in a schematic arrangement. The schematisation itself involved an iterative ordering and visual representation of data; a recursive process of searching for, comparing, and combining patterns and points of interests; and discussions within the research team. Through a multiple case study methodology with cross-case synthesis, a scheme for tailoring supports was built up. Two steps in this scheme coincided with stages in existing occupational therapy practice models. *Build rapport and trust* is a familiar concept within the Canadian Practice Process Framework (CPPF) [42], therapeutic modes in the Intentional Relationship Model [43], Occupational Therapy Intervention Process Model [44], and the Occupational Therapy Practice Framework (OTPF) [45]. *Identify interests, needs, or goals*, though more focussed in the scheme due to the study objective, resembled the evaluation phase in OTPF [45], and the *Assess/evaluate* and *Agree on objectives and plan* in the CPPF [42]. Both steps were also discussed by Larsson et al. [40]. They stressed on the importance of the close collaborative partnership between the older adults and occupational therapist to achieve changes in occupational performance. They also noted that goal-setting took time and that older adults should be given time to identify and if necessary to modify goals.

The scheme also revisited concepts related to occupational therapy, such as the concept of *relevance*. *Relevance* refers to the congruity between the person's goals, needs, or values and perceived usefulness [45]. Perceived usefulness, a term also employed in technology acceptance models [46,47], pertains to the degree to which a person believes that using a particular DT would improve an aspect of his/her life. Technology perceived to be useful is more likely to be accepted and used [46]. Thus, a person who finds DTs relevant to his/her interests, needs, and goals would be more likely to engage in particular DT-mediated occupations. Finding relevance could be viewed as a step to support older adults to derive purpose or meaning in DT-mediated occupations. *Purpose* refers to an individual's goal or intention for doing something, while *meaning* relates to the value or sense the individual makes of his/her doing [44,48,49]. Other concepts were *self-efficacy* and *agency*. *Self-efficacy* is the sense of being able to do a desired DT-mediated occupation successfully [46,47]. It is a foundation of *agency*, which is refers to acts done intentionally to effect one's engagement [50]. *Self-efficacy* is a significant factor in technology acceptance among older adults and is positively related to perceived ease of use, perceived usefulness, and usage behaviour [46]. A person who experiences a sense of being able to successfully perform a DT-mediated occupation through intentional actions would be more likely to repeat performance of that DT-mediated occupation. Self-efficacy and agency can be further enhanced through awareness of available support and routine development. Guidance and support from other people have also been considered as a facilitating condition to older adults' engagement in DT-mediated occupations [46]. Though older adults have identified need for support, they have expressed a preference for support outside their immediate social network [31]. Additionally, regular opportunities for practice could contribute to older adults' successful performance of desired occupations.

Furthermore, the scheme highlighted supporting essential aspects in DT use – *clarity of the desired occupation*, *awareness of the virtual environment*, *compatibility between preferences and configuration*, and *navigation and manipulation*. Apps on digital devices could afford a person to perform unrelated tasks in a short amount of time [4]. Thus, setting and clarifying its scope would make performance of the desired DT-mediated occupation manageable. This may be particularly helpful for persons who perform several DT-mediated activities simultaneously, without break, or without purpose, which may lead to feeling overwhelmed, stressed, or dissatisfied. The second aspect, having awareness of the virtual environment, was important in locating relevant objects within the DT. In a traditional occupation such as cooking, this would correspond to a client's awareness of cupboards and drawers in the kitchen where tools and food could be found. Thirdly, *compatibility* dealt with the degree to which the DT is perceived as consistent with the older adult's needs and preferences [47]. Adjusting the environment to fit the individual's current perceptual, cognitive, and movement-related functions and/or motor and process skills would allow a DT to be more accessible and easier to understand. Verdonck and Maye [24] suggested similar smart device customisations such as using in-built accessibility features and display fewer icons on screen. Likewise, they reported about teaching their clients to configure their own devices [24]. Improving access to and within a device is important as accessibility has been regarded as a facilitating condition for older adults to use DTs [46]. Lastly, *navigation and manipulation* dealt with moving within the virtual space, as well as selecting and using objects within that space. Persons who perceive that a DT is easy to use is more likely to use it [46,47]. In some cases, written instructions were provided and found helpful for navigating and selecting icons. Some of the strategies in the cases have been described in other studies, such as recommending a hand stylus as an alternative method of input [24]. 'Handouts' or written/printed information were noted to be valuable in learning [51].

It has been recommended that a revision of existing practice models within occupational therapy need to be undertaken to include digital technology concerns [21]. From this study's findings, long-time concepts in occupational therapy (e.g. building rapport [42–45], setting goals [42,45], finding relevance [45], providing conditions that support self-efficacy and agency [50], developing routines [45,49]) are just as relevant today in supporting engagement in DT-mediated occupations as they were in supporting engagement in traditional occupations. Nevertheless, it would be interesting to further explore how self-efficacy and agency are embodied among older adults while participating in a society characterised by rapid technological developments. Moreover, intervention strategies such as dialogues, demonstration, practice, encouragement, instructions and cues, simplifying occupations, and adapting the environment are likewise relevant to support DT-mediated occupational engagement. It is, however, necessary for occupational therapists to better understand the environment, specifically digital products and services, in order to choose appropriate intervention strategies. This study reiterates the relevance of earlier recommendations [22,24,29,30] to develop occupational therapists' digital competence.

Furthermore, by holding dialogues about goals and alternative solutions that supported older adults to make informed choices related to their desired occupations, a collaborative approach was used in tailoring. Tailoring also meant that the interventions implemented were individualised to fit the participant's needs and context. Considering this, there is a congruence between the scheme for tailoring supports and a client-centred practice. Client-centred practice has been described as using clients' experiences and knowledge as an ingress to interventions, creating supporting and collaborative relationships with clients, and helping them to make decisions about their occupational needs [52,53].

During the collaborative process, no specific question about a participant's health condition was asked, besides the general question 'How are you today?' at the beginning of meetings. Although some participants divulged health information (e.g. diagnoses) freely in the dialogues, this information was not documented unless it changed planned actions within the collaborative process. The motive for this was that the focus of the tailoring was their engagement in occupations, not their health states. In retrospective, this choice was also congruent with a client-centred approach, in which the focus of interventions should be the client's occupational needs and not his or her diagnoses [53].

One of the methodological challenges was the recruitment of older adults to participate in the study, which it is quite common in research with older adults [54]. The original plan to engage older adults living in either urban or rural communities and receiving home care services was later modified to include older adults living in retirement communities. In addition, the study was intended for older adults who were 'interested in developing social activities supported by DT'. Most goals formulated by the participants did not involve activities that had social interaction as a focus (Supplementary Appendix 1). Having an adaptive study design facilitated the participants' choice of occupations that mattered to them, social or otherwise.

Due to difficulties in recruitment, Yin's [34] recommendation to conduct a pilot case study was not done. Instead, a pilot test of the instruments, and not of an entire case study, was performed. Another challenge was that the phenomenon and its context could not be clearly delineated. Case study is considered an appropriate methodology in such research situations [34]. Nevertheless, some elements in the context, such as the authors' backgrounds, were described in this study to provide insight on how these elements could have influenced the collaborative process and the resulting scheme.

Still another challenge was to ensure a sufficient quality of the research. As recommended strategies to deal with construct validity [34], multiple sources of data should be used and key informants should review a draft of the case study report. Though there was a sufficient amount of data sources, it would have been better with an audio-recording of the final interview so that a deeper analysis of that data could have been possible. It would also have been desirable to involve older adults in the choice of instruments and intended outcome measures for the study. Participants' responses in the final interview reflected how they experienced the collaborative process and how they have decided to continue with their DT-mediated occupations, rather than how engagement in DT-mediated occupations has reduced loneliness and improved their social networks based on initial intended measures from two instruments. On a positive note, providing participants an account of the individual collaborative process and an opportunity to discuss their respective processes during the final interview contributed to construct validity.

As an outcome of a multiple case study research, the scheme is not generalisable to a population, but it can be generalisable to a proposition according to Yin [34]. Hence, the proposed scheme should be tested further in various practice settings, such as the home, community, or clinics. Replication studies could also provide insight on the external validity of this study. It would be critical to build a multidisciplinary research team that can provide various alternatives to deal with occupational or tailoring challenges that can emerge during the process. Collaborating with professionals from other disciplines can also improve one's knowledge about DTs, as well as, broaden one's perspectives on issues like communication and professional ethics. If it was found to fit practice in a setting, the scheme would augment the knowledge on how occupational therapists could support clients in their engagement in DT-related occupations and participation in a digitalised society.

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Notes

1. *Virtual environment* in this paper refers to a representation of a space accessible through a graphic interface (e.g. screen) that is relevant to the performance of a DT-mediated occupation. This term was chosen instead of *digital environment*. *Digital environment* would refer to a broader area that includes integrated systems or networks of digital devices, apps, the World Wide Web, servers, and other digital resources.
2. *Virtual objects* in this paper refers to a representation of objects, such as information, tools, and commands, within the virtual environment accessible through a graphic interface (e.g. screen) that is relevant to the performance of a DT-mediated occupation.

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