Tablet computer-supported conversation between people with dementia and their carers: technology as interactional focus

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Abstract

The purpose of the study is to explore when and how technology becomes a topic in interactions involving people with dementia and their carers. Three dyads of older women with dementia and their carers participated in the study. The dyads interacted in the home environments of the persons with dementia using tablet computers and two web-based applications with generic pictures, videos, and music files (CIRCA) and personalized pictures and films (CIRCUS). The data included twenty-one video-recorded interactions. Topical episode analysis and transcripts of interaction were used to analyze and exemplify when and how technology was talked about in the dyads. The dyads were engaged in exploring the tablets, and six common ways of making technology a topic of conversation were identified: talk about tech problems, commenting actions, expressing uncertainty in navigation, instructing and explaining, expressing surprise, and talk about technical development. The dyads explored the tablets in ways that were reflected in the content of their conversations. If people with dementia and their carers should benefit from today's technology, such as there is evidence for the interactions examined in this study, their homes and daily environments must be equipped with sufficient internet access and technical support.

Keywords Digital communication · Tablet computer · Dementia · Interaction · Technology · Conversational topic

1 Introduction

This study focuses on the use of digital communication support in interaction with people who have dementia. Dementia is an overall term used for a number of neurodegenerative diseases usually characterized by cognitive disabilities caused by brain damage (i.e. the death of brain cells in different parts of the brain). Alzheimer's disease (AD), which accounts for at least half of the dementia cases [1], is generally considered as a substantial risk to healthy aging people at their later stage of life. Healthy modern lifestyle and the provision of healthcare have ensured a boost in life expectancy and a rise in the number of people above the age of 65 who are at risk of developing some type of dementia. It is estimated worldwide that after the age of 65 there is a sharp increase in the incidence of dementia to the extent that almost one in four of those over 85 has developed some kind of dementia disease [1]. A drastic growth in the number of people diagnosed with dementia is thereby expected in the coming decades [2]. This calls for innovative and available solutions focusing on social interaction and independent living and health [3, 4]. Digitalization, e-inclusion and new communication technology may offer great possibilities for participation and involvement in own health care and should be a right also for people with disability and those who care for them [5, 6].

While dementia is primarily associated with memory deficits, communication with others and participation in social activities have been reported as areas where people diagnosed with dementia and their significant others experience challenges [7, 8]. As a dementia disease progresses, abilities to initiate and maintain interactions with other people tend to gradually decline, resulting in diminishing social contacts and increased social isolation [9, 10]. Loneliness and social

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isolation affect quality of life and may be significant problems for people living with dementia [11].

The communicative functions in need of support in dementia are mainly related to aspects such as the ability to keep track of conversational topics, to initiate new topics and the remembering of recent events [12, 13]. As pointed out by Bourgeois and Hickey [14], the goal of intervention is primarily to maintain functional communication and to improve quality of life. The use of communication support in terms of pictures, communication books and personal photo albums has been shown to have positive effects on both understanding and expressive abilities of people with dementia, also at a late stage of the disease [7, 15–19]. In the last decades, the field of communication support has expanded rapidly with the development of mobile technology such as smartphones and tablet computers, with a wide range of application programs (apps) utilized to support communication [20, 21]. Multimedia systems can encompass a large content in terms of, for example, pictures and video clips which can also be personalized according to culture, language and other individual needs [22]. In relation to dementia, multimedia systems have been argued to provide "a richness of interaction that is particularly appropriate for those elderly people with diminishing sensory and intellectual capabilities" and "provide a livelier and more engaging activity for people who struggle with spontaneous interactions" [12, p. 122]. In comparison with traditional communication support, communication activities based on a multimedia system include more initiatives and choices made by people with dementia, more often contain a joint attention by the interlocutors and are also argued to be more enjoyable for both people with dementia and caregivers [13, 23, 24]. In a recent study, we have suggested that digital communication support might increase the time people living with dementia and their conversational partners interact [25]. Using recordings of interaction between a woman diagnosed with dementia and her husband, we showed that the mean length of conversations increased from approximately 6 min to almost 18 min when digital communication support in terms of an individualized communication application with personal pictures in a tablet was used.

There are also other factors that should be taken into consideration in relation to the use of technology for people with dementia; in a study by Jiancaro et al. [26], it was demonstrated that cost, learnability, self-confidence (during use) and usability were deemed very important. In another study [27], possible difficulties to operate computers were tackled by using a spoken natural language interface that allowed the participants with dementia to interact with the cognitive stimulation software in the same way as they would interact with a human caregiver. The interface was evaluated in a pilot study, and the feedback was very positive. Touchscreens are intuitive by nature and afford physical touch [28].

Moreover, the use of touchscreen technologies eliminates the need for external pointing devices, such as a computer mouse, which in turn reduces the cognitive load associated with hand–eye coordination [29]. To further facilitate the use of touchscreen devices for people with dementia, it has been recommended to use applications with a simple and clear interface where graphics and interactive elements are of a size large enough to account for both visual impairment and less precise motor control [24, 29].

While the use of communication support in general— and digital communication support in particular—has been argued to facilitate social interaction and increase conversational time for people with dementia [24, 25], the experience is that when external communication support is involved the actual device and the way it is used may become a focus of the conversation [30, 31]. In our own study [25] of conversations between a woman diagnosed with dementia and her husband, where digital support was used, we showed that almost half of the time was spent talking about the communication support application or the tablet per se. In other words, the interlocutors spent a considerable amount of time discussing the actual device designed to support conversation [25]. These results raise questions about the qualitative and contextual aspects of conversations involving digital communication support and to what extent the increased conversational time actually comprise meaningful social activities for people living with dementia. Qualitative analyses of conversations involving people with dementia and digital communication support are lacking, which makes it difficult to evaluate the significance of such interventions. Further analyses of technology as a conversational topic in interaction could increase the understanding of how digital communication support influence conversations involving people with dementia.

The purpose of the present study is to contribute to the understanding of how digital communication support influences interactions involving people with dementia. We explore when and how technology becomes a conversational topic for people with dementia and their carers and relate the topic to different aspects of the interactional context and use. Different ways of talking about the communication support, including the degree of involvement of the persons with dementia, were identified, analyzed and exemplified through excerpts of interaction and were discussed along with clinical implications.

2 Methods

2.1 Ethical considerations

Data were collected within the project INdependent LIving support Functions for the Elderly, IN LIFE. IN LIFE was

financed and carried out within the EU Research and Innovation programme Horizon 2020 [32]. The project held different work packages, and one focused on interaction of older people with dementia. This work package was run by the Swedish partners Dart—Centre for augmentative and alternative communication and assistive technology at Sahlgrenska University Hospital and CEDER—Center for dementia research at Linköping University. The sub-project constituting the interaction work package was vetted and received approval by the regional ethical review board (2015/162-31). Data analysis and the writing of this paper were done within the project "Life with dementia: communication, relations and cognition," vetted and approved by the regional ethical review board (2017/469-31).

All participants were given information regarding the present study both verbally, presented in person by the research assistants, and through written text supported by pictures. The participants were ensured that they could withdraw their participation at any time without having to state any particular reason and that no consequences would follow from their withdrawal. The data collection was permitted by the participants through written consent.

2.2 Participants

Three dyads of women with dementia and paid carers participated in the study. The three women with dementia were over 65 years old and lived in care homes. Great care has been taken to ensure anonymity. No tests were used to assess speech, language and communication or cognition, and the researchers did not consult medical records. The women lived in homes that had accepted to participate in the study and were introduced to the research assistants by the staff working in the homes. The women have been given the assumed names Ada, Isa and Liv in the text. The three
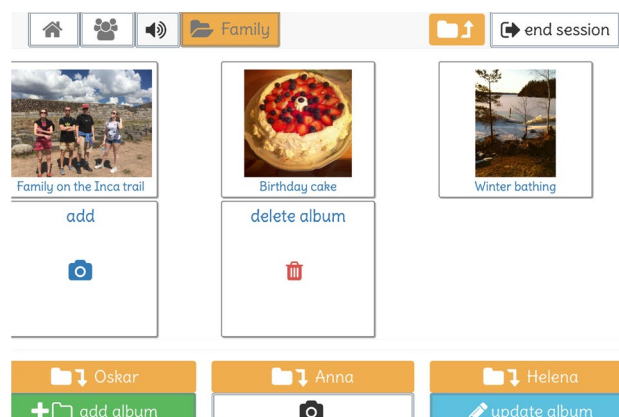

**Fig. 2** A screenshot exemplifying the content of CIRCUS

carers were younger and middle-aged women. Swedish was the first language of all participants. Using a tablet in interaction was a novel situation for the dyads.

2.3 Material

Two readymade and earlier tested applications called CIRCA and CIRCUS were used in the study; that is, user testing and design were not purposes of the study. CIRCA [13, 23] is a web-based application developed from a previous version for stand-alone devices. CIRCA has access to a large database of generic pictures, videos and music files belonging to different categories that appear randomly on the tablet computer screen (Fig. 1). CIRCA was adapted to Swedish within the IN LIFE project, and the Swedish version was used in this study.

CIRCUS [33] has a personalized content with pictures and videos from a specific individual's past and current everyday life (Fig. 2). For Ada and Isa, a mutual CIRCUS

Fig. 1 A screenshot exemplifying the content of CIRCA
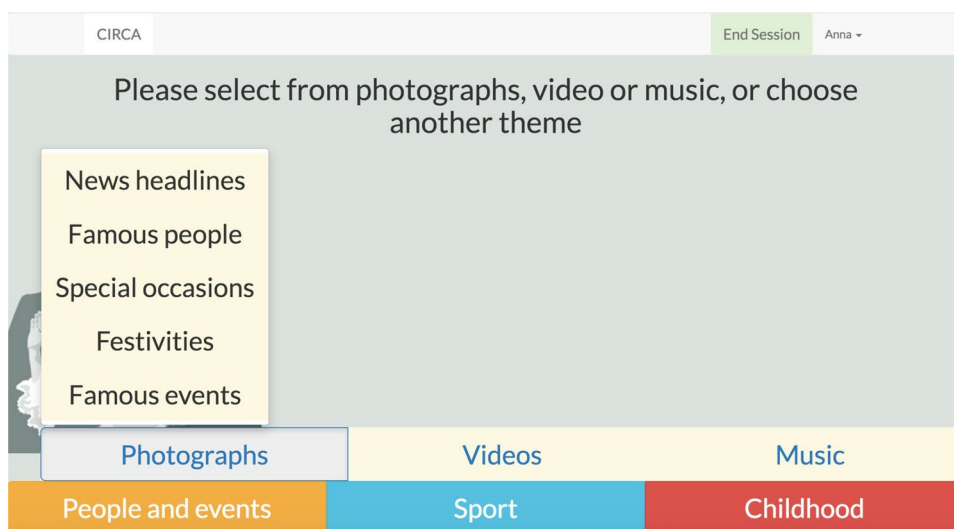
application was created comprising three albums with 48 pictures depicting common activities in the care home. In addition, Ada and Isa had one personal album each, containing personal pictures from their own photo albums, which were incorporated within the common CIRCUS application. For Liv, a personal application in CIRCUS was created comprising photos from her own photo albums.

Both applications work similarly to a digital photo album, where users can navigate between topics by touching photos or headings. In Fig. 1, by touching, for example, the heading "Famous people," a collection of photos displaying famous people would appear on the screen. In Fig. 2, the sub-album "Family" has been chosen and the users now have the choice of looking at pictures from the Inca trail, birthday cakes or winter bathing.

2.4 Data collection

Data included twenty-one recorded films of three dyads of persons with dementia and carers using tablet computers and the two different applications CIRCA (twelve recordings) and CIRCUS (nine recordings). The recordings were of varying length. The shortest recording was 6 min and 7 s, and the longest recording was 22 min and 48 s (Table 1).

The recording took place in the departments/rooms of each participant at times chosen by the participating carers and identified as the most appropriate for practical purposes. The carers got basic instructions on how to use the tablet and the two different applications, though no specific instructions were given regarding how to make conversation around the applications. As the main purpose of both CIRCA and CIRCUS is to support social conversation, there were no specific communication tasks assigned to the dyads. Instead, the dyads were instructed to use the applications in a way that suited their current interest and conversational needs. The dyads jointly chose from the pictures and topics available in the applications, even though the carers usually took on the main responsibility for handling the tablet computer.

2.5 Analysis

First, the researchers looked at the twenty-one recordings together. Two main conversational topics were identified: talk relating to the pictures, films and music of the applications, and talk relating to the technology and the device. Second, the recordings were divided among the researchers and transcribed and analyzed individually using topical episode analysis [31, 34]. The purpose was to identify all sequences within the interactions in which the tablet and its functions per se were focused and forming unities, by speech or physical actions, by the dyads. A topical episode was defined as an interaction segment involving at least three consecutive contributions around the same main theme, that

Table 1 Number and length of recordings with CIRCA and CIRCUS for the three dyads

CIRCA			CIRCUS		
	Length of recording (min:sec)	Participants		Length of recording (min:sec)	Participants
1	11:34	Carer and Ada	1	13:06	Carer and Ada
2	12:09	Carer and Ada	2	14:15	Carer and Ada
3	13:15	Carer and Ada	3	14:14	Carer and Ada
4	11:27	Carer and Ada	4	12:47	Carer and Ada
5	12:09	Carer and Ada	5	11:14	Carer and Ada
6	15:41	Carer and Liv	6	16:43	Carer and Isa
7	12:22	Carer and Isa	7	14:05	Carer and Isa
8	13:33	Carer and Isa	8	17:43	Carer and Isa
9	12:54	Carer and Isa	9	17:02	Carer and Isa
10	06:07	Carer and Isa			
11	22:48	Carer and Isa			
12	21:16	Carer and Isa			

is, technology [35]. Topical episode analysis concerns how talk is made coherent through the participants' drawing on different contextual resources such as background knowledge and artifacts and thus was considered relevant for the present analysis, albeit only instances of "talk about technology" were examined. The main focus for the current study is the various ways talk about technology becomes a conversational topic and in what situations, and therefore, an analytical method appropriate for both longer and shorter sequences of talk was needed. Moreover, the analysis needed to be able to take into account various contextual factors other than turns at talk. As the unit of analysis in topical episode analysis is a sequence (episode) rather than an utterance, and since the unit "episode" is of mid-range size (larger than a turn but smaller than a conversation), this method of analysis was suitable for the present data. Third, the researchers met and went through all the identified episodes of "technology talk" using transcripts and recordings to reach a consensus about which episodes to include in the data. The researchers agreed on most but not all episodes. The episodes which the researchers did not agree upon as clearly belonging to the category "technology talk" were omitted and not further treated. All episodes included in the final collection were

hence approved by all researchers. Fourth, using transcripts and recordings the researchers collaborated in grouping the remaining episodes according to a more specific content. A preliminary coding resulted in twelve types of topical episodes. These, in turn, were restructured and condensed into six separate but not mutually exclusive types of episodes. The episodes represent the most common and typical ways of talking about technology in the recorded interactions. The episodes are presented along with their main characteristics and, in order to get a more detailed understanding of their place in the conversations, are analyzed sequentially following the basic features of interaction analysis [36].

3 Results

The episodes are presented in Table 2 as well as in relation to the interaction contexts within which they occurred.

3.1 Talk about tech problems

Talk about tech problems reflects the fact that the tablet does not behave as expected. Engaging in conversation by means of using a tablet is a new activity for the dyads. Yet, they all have expectations regarding functionality, and when the tablet does not behave as expected, this is recurrently topicalized. The loading of content and the time it takes for selected pictures to occur on the screen, as well as for how long pictures are displayed on the screen, are common conversational topics. There are examples of pictures being presented both too slowly and too quickly (i.e. for a too short time). Slowness is more common though both variants exist and are featured in excerpt 1. Ada and the carer sit beside each other by the corner of a table. The tablet is in front of Ada and handled by the carer a bit from the side.

Ada and the carer have talked for almost 10 min and have had several problems with loading content when the carer tries to get some pictures to show. In line 4, the carer says: h*mm it will probably show there soon*, referring to the slowness and her selection of a picture in line 1. In lines 5 and 8, Ada responds by noticing that her sons were shown on the screen (line 5) and by commenting the speed of the presentation: *though it went by so quickly* (line 8). In line 10, the carer acknowledges Ada's comment and again refers to the slowness: *yes (1.7) no it was just as slow now I think*.

Excerpt 1: Soon and quickly.

Table 2 Main features of the six types of topical episodes that were identified in the data

	Topical episodes	Main features
1.	Talk about tech problems	The tablet does not behave as expected The loading and display of pictures are too slow or too fast The result is "waiting time" and abandonment of topics during interaction The carers inform the persons with dementia
2.	Commenting actions	Concerns the dyads' own handling of the tablet The dyads explore content and functions and strive for continuation of the activity Finding optimal volume and size of pictures is important
3.	Expressing uncertainty in navigation	The dyads do not know how to handle the tablet The dyads do not know what will happen They talk about pictures while trying to understand how the application is organized
4.	Instructing and explaining	The dyads' clarify how the tablet works and should be used The carers attempt to get the persons with dementia more involved Functions as introductions to the activity
5.	Expressing surprise	Oral reactions to unexpected events
6.	Talk about technical development	Reflects an interest in the state and development of technology Notices the possibilities of the tablet Fascination, insecurity, joy and enthusiasm Indicates an interest and understanding of the tablet by persons with dementia

1	Carer:	we'll see if it's possible to access the other (.) photos a
2		a bit better now (10.8) ((carer taps on the tablet repeatedly))
3	Ada:	yes look at this
4	Carer:	mm it will probably show [there soon
5	Ada:	[yes that was .hh my boys
6		[a ((a phone is ringing))
7	Carer:	=yea
8	Ada:	(1.2) [though it went by so quickly =
9		[((a ringtone sounds))
10	Carer:	=yes (1.7) [no it was just as slow now I think ((carer taps
11		on the tablet repeatedly))
12		[((a ringtone sounds))

In this and several other sequences, the selected items take a considerable time to load, and the dyads therefore have to wait for the pictures/videos/songs to display on the screen. When this happens, it is almost always commented, mainly by the carers. The comments often include an explaining component informing the person with dementia about the process (in this case: *it will probably show there soon*). As for the opposite, when pictures are flicking by too quickly, this is commented on both by carers and, as in excerpt 1, users with dementia.

3.2 Commenting actions

The second type of episode mainly concerns the dyads' own handling of the tablet. The dyads explore the content and functions of the tablet and comment on their own handling of it. The comments in this category mainly refer to the functionality of the tablet and to the continuation of the activity. The dyads strive for the best possible function regarding, for example, the size of the pictures and thus adjust the tablet accordingly while, at the same time, orienting towards maintaining the activity. An example is given in excerpt 2 where Ada and the carer, sitting by the table, are looking at pictures of a social gathering.

Excerpt 2: Zooming.

1	Carer:	mt (0.9) m (1.6) ((carer taps on the tablet repeatedly))
2		and (0.9) here we're having fika
3		(5.0) ((Ada leans in towards the tablet whilst adjusting her
4		glasses, carer glances at Ada))
5	Ada:	yea I thought I would see
6	Carer:	yea
7	Ada:	someone I'd recognize [I don't
8	Carer:	[((carer drags her fingers across the
9		screen)) I'll zoom in a bit then you'll see (2.3) ((carer turns her
10		gaze towards Ada))
11	Ada:	no ((Ada shakes her head slightly)) I can't sa[y
12	Carer:	[no
13		(3.0) ((carer taps repeatedly on the tablet))
14	Carer:	there was no celebrity there

Ada has problems recognizing the people in the pictures, and the carer supports Ada by increasing the size of the picture and comments on her own action by saying *I'll zoom in a bit then you'll see* (lines 8–10). The conversation in excerpt 3 exemplifies actions and comments focusing on the activity. Isa sits in a chair and the carer on a stool on her left side.

The carer holds the tablet between them and Isa looks at it with her hands folded on her stomach.

Excerpt 3: Let's see.

1	Isa:	there's [gunnar and I ((looks at carer)) when he gradua[ted
2	Carer:	[m ((continuously tapping on the tablet)) [m
3		(1.6) now let's see (1.3) what else we've got then you have to
4		go backwards
5	Isa:	straight on (1.0)
6	Carer:	and then you can (0.9) ((drags her hand across the screen))
7		go backwards again
8	Isa:	.yes and there we see that eh all sisters have both baby eh
9		middle ((looks at carer)) and big sister

The carer selects different items on the screen, by tapping and dragging with her finger, and comments her own actions: *now let's see (1.3) what else we've got then you have to go backwards* (lines 3–4) and *and then you can (0.9) go backwards again* (lines 6–7). Both these examples illustrate how the participants topicalize various aspects of using the tablet's different functions (zooming, navigating, increasing sound volume, etc.), also in cases where the application works as expected.

3.3 Expressing uncertainty in navigation

The third episode type is labeled "expressing uncertainty in navigation" and reflects the fact that the dyads do not know how to handle the tablet. All the dyads display uncertainty regarding navigation of the application. Both carers and persons with dementia express uncertainty about how to handle the tablet and what to find "around the corner." The dyads explore the tablet by selecting different pictures and these explorations are also reflected in their talk. Excerpt 4 originates from a conversation between Liv and her carer.

The carer sits on the short side of the bed and Liv sits in a chair on the carer's right side. The carer holds the tablet between the two of them and they talk and comment the pictures while trying to understand how the application is organized. The talk in lines 1 through 8 is typical for this conversation between Liv and her carer as they explore and navigate around in the application. Liv is reciting a psalm (line 1) and the carer comments this and a picture on the screen—*the priest is singing marianne* (line 2). She then tries to find something more to look at and talk about: *now we'll see if we can find anything more (.) nope* (line 5).

Excerpt 4: Anything more?

1	Liv:	not a mere day ((recites a part of a psalm))
2	Carer:	the priest is singing marianne ((comments the picture and Liv's reciting))
3		(5.1) ((carer handles the tablet and repeatedly taps the top
4		right hand corner of the screen))
5	Carer:	now we'll see if we can find anything more (.) nope (1.8) ((taps the
6		top right hand corner once more then her hand hoovers back and
7		forth across the screen)) eh: ((taps the screen)) let's see the house there
8	Liv:	(3.0) now there were no more pictures there

The explorations are either successful, meaning the dyads find the picture, song or movie they are looking for, or anything else that is interesting enough to talk about, or, as is the case in excerpt 4, unsuccessful, which is demonstrated by the *nope* in line 5 and the *now there were no more pictures there* in line 8. Unsuccessful moves typically make the dyads try new ways, that is, tap other pictures.

In excerpt 5, the carer and Liv are sitting on the bed (carer) and in a chair (Liv). The carer holds the tablet between them. Liv has one hand on her knitting, and one hand on the chair. She looks at the tablet. The carer is very active as she both looks at and taps the screen while saying *you press on them you just press* (line 2) and *like that I think then anything could appear* (line 3).

Excerpt 5: You press!

1	Carer:	what should we take ((her hand swiftly hoovers back and forth across
2		the screen)) you press on them you just press ((carer taps
3		on the tablet)) like that I think then anything could appear
4		the herring sandwich is next up
5	Liv:	m ((carer taps on the tablet)
6	Carer:	I don't know if we are on the right one now maybe we aren't

3.4 Instructing and explaining

The carers often explain how the tablet works and instruct both themselves and the persons with dementia in how to use it. Hence, there is a topical episode called "instructing and explaining." Some explanations are introductions to the activity. These include descriptions of the application and the tablet as well as motives for using it. The aim of most instructions and explanations seems to be to get the person with dementia more involved. The carers explain how and what to do as well as possible consequences of these actions.

In line 2, the first *you* is the second person pronoun *du* in Swedish, the second *you* is the indefinite Swedish pronoun *man*. This, and the insecurity expressed in lines 3 and 6, reflects the novelty of the situation and the fact that not only the person with dementia but also the carer and the dyad as such is in need of an increased understanding of how and what to do when using the tablet.

3.5 Expressing surprise

Sometimes unexpected things happen when the dyads are using the tablet, as if it was living a life of its own, and the dyads react to this by expressing surprise. The surprise is connected to the fact that the tablet seems to be interacting and actually responding to what they do with it, but also to the fact that it sometimes behaves in totally unpredictable ways. Unforeseen things just happen, as in excerpt 6.

Excerpt 6: Whoops.

1	Ada:	((leans in towards the tablet)) am I holding (0.3) no I
2		am not
3	Carer:	mt no
4	Ada:	ah I thought that [((Ada taps on the tablet))
5	Carer:	[whoops
6	Ada:	((laughs))
7	Carer:	now it went away ((carer taps repeatedly on the tablet))

Ada and the carer are sitting by the table as before. Ada is looking at a picture of herself. She taps the tablet and the picture disappears (lines 4–7). The carer reacts by saying *whoops* (line 5) and Ada comments (inaudible) and laughs (line 6), evidently enjoying the situation.

3.6 Talk about technical development

The last type of topical episode reflects the dyads' fascination by and interest in the development and state of technology and is labeled accordingly, "talk about technical development." The dyads are amazed by the possibilities of the tablet. They express fascination by focusing the tablet itself, which is immediately present, but also take a wider perspective by, for example, making comparisons with the past and asking if and how "this thing" can be bought. In excerpt 7, Ada and the carer sit by the table with the tablet in front of Ada, the carer looks at it a little from the side.

Excerpt 7: Things of today.

1	Ada:	and that's my childhood [home
2	Carer:	[m: ((carer taps on the tablet and a
3		synthesized voice says family home)) m (1.1) small korsber[g
4	Ada:	[m=
5	Carer:	=yea (0.8)
6	Ada:	imagine the things that exist today (0.4) if one says ((carer
7		looks at Ada)) like (0.3) if one would compare (0.9) with how it was ((Ada
8		looks at carer)) when I was a child
9	Carer:	m
10	Ada:	then these things didn't exist
11	Carer:	no
12	Ada:	possi[bilities
13	Carer:	[exactly

They are looking at pictures from Ada's childhood as Ada starts talking about the things that exist today (line 6: *imagine the things that exist today (0.4) if one says*) in comparison (line 7: *like (0.3) if one would compare (0.9) with how it was*) to before (line 8: *when I was a child*) when there were no such things as tablets (line 10: *then these things didn't exist*). The carer responds (line 11) and the sequence is rounded up by Ada and the carer who notify and confirm the possibilities (lines 12–13).

Sometimes there is an element of insecurity, mixed with joy and enthusiasm, in how the persons with dementia approach and talk about the tablet. This is especially evident when they talk about how the pictures got into the tablet, rather than about what they show, as is the case in excerpt 8.

Excerpt 8: The entire photo book.

1	Carer:	((taps on the tablet)) let's see (1.5)
2	Isa:	((looks at carer)) they've taken my entire photo [book
3	Carer:	[ah it's there
4		again (0.4)
5	Isa:	yes but it was also [funny
6	Carer:	[yes

The sequence in excerpt 8 occurs towards the end of an almost 20 min long conversation. Isa and the carer sit beside each other. The carer holds the tablet between them and they have talked engaged about different pictures for 15 min when Isa all of a sudden, line 2, states *they've taken my entire photo book*, referring to the pictures in the tablet and whoever put them in there. Apart from showing an interest in the tablet and its construction this contribution by Isa indicates that she has an understanding of its content.

4 Discussion, implications and limitations

Ekström et al. [25] showed that in tablet-supported conversations between a woman with dementia and her husband, quite some time of the talk concerned the tablet per se. Similarly, the current study shows that when dyads of older people with dementia and carers interact by means of using a tablet, parts of their conversations concern the actual device and different aspects related to its function and use. We have demonstrated that talk about technology is a conversational topic in its own right. It is a varied topic reflecting both obstacles and the dyads investigative management of the digital communication support. The interactional analysis of topical episodes highlights different aspects of the use as well as of the usefulness of the tablets.

The most common way of referring to technology verbally in the present interactions is when there are technical problems associated with loading. Internet access and appropriate bandwidth are a prerequisite for online digital communication support to work and the houses where the present interactions take place are not sufficiently adapted in this regard. It may take a long time for pictures to appear or they will not appear at all, which results in waiting time and abandoning of conversational projects by the dyads. It happens that the items selected on the tablet are presented too fast. This problem also relates to loading and internet access. As was shown in excerpt 1, both the persons with dementia and the carers attend to such technical problems. Considering the social goal of the interaction and the fact that the carers may not have very much time per week for individual meetings with the people they care for, optimal functioning of technology and successful communication is important. Technical problems could have a negative impact on the dyads' motivation for further use of digital communication support and other digital services that are important for independent living and participation in today's society [3, 4, 6]. Technology is important for the health care, safety and self-determination of older people [5]. Hence, positive experiences of technology are important, in particular for those who already may have problems with access due to cognitive difficulties. We will discuss the role of design later.

Using the tablet is a new and uncommon activity in the sense that the dyads are unfamiliar with the device and the applications. Furthermore, conversing by means of using digital communication support is out of the ordinary. Both aspects are reflected in the dyads' physical actions and talk. Talk relating to uncertainty in navigation, comments to actions and instructions and explanations share a trait of mutual exploration which is positive and similar to the dyads' talk about the pictures of family members, songs etcetera. We cannot tell the exact reasons for these explorations but many relate to a lack of understanding. They all seem to be aiming at a greater understanding at some level, and they certainly are shared communicative projects. The dyads' main goal in interaction seems to

be to have a good social time together and the way they collaborate in understanding how the tablet works, and in manipulating and trying to increase its functionality, does not mainly stand out as a problem but also seems to be positive from a social perspective. The dyads communicate about the fact that the tablet—a third unknown part of the interaction—acts differently and in ways they do not know beforehand. This is not necessarily wrong; however, it seems to contribute to the co-construction of the activity [37]. In fact, the novelty of the situation to both interlocutors seems to stimulate equality and engagement within the dyads [24]. This is an interesting and relevant finding suggesting that although training in using tablets is important [16], being novice together may also have its advantages. Finding conversational topics and staying on track as well as loneliness and social isolation are common problems for people living with dementia and their partners [11–13]. Thus, identifying activities and circumstances that stimulate communication is important. In light of this, the finding that collaborative exploration of things that are unknown, including tablet computers but perhaps also other objects, can have positive effects on communication, is important.

The way Ada, Liv and Isa react to and express surprise and joy when unpredictable things happen with the tablet is interesting and indicates that they are appreciating the situation and are capable of interacting with new technology. There are also several examples in the data, two of them are presented in excerpts 7 and 8, of the women expressing interest and wonder in the tablets and the content of the applications. They notice and are fascinated by the possibilities of new technology and are somehow expressing an understanding, wish and readiness for use. In all respects, and even though problems have been detected, the present study of language and interaction confirms the possibilities with digital communication support in promoting the well-being of people living with dementia and their partners [24].

Another positive finding of this study is that there is little reference to cognitive ability in the dyads. Communication partners' reference to cognitive ability in people with disability has been problematized in studies of other types of aided interactions [38]. In the present study, the carers help and support the women with dementia, as in excerpt 2 where the carer is zooming in order for Ada to see the picture better. There are also examples of mitigation, as in excerpt 5 where the carer first instructs Liv to press, then becomes more general in her instruction about pressing, as if comprising both of them in the instruction. The communication is respectful.

4.1 Limitations

The data included twenty-one films of authentic tablet-supported interaction recorded in the homes of people with dementia. In this sense, the study is unique. However, only three dyads of older women with dementia and carers were involved and only two different applications were used. Hence, the findings are examples of digitally supported communication involving people with dementia but cannot be generalized to the larger population of people with dementia and carers or to other types of communication support. A detailed interaction and topical episode analysis was carried out, and assessment of inter-rater agreement was not a part of the methodology. Instead, individual and group analysis as well as consensus discussions were used. Episodes that the researchers did not agree upon were not included in the final analysis. The different ways of talking about technology that have been exemplified in this study are not mutually exclusive but rather overlap. Although the coding and analysis were performed with great detail, the decision of phenomena to highlight was in the hands of the analysts. There may very well be other ways in which technology is made relevant in the present data than those that have been presented in this study.

4.2 Clinical implications and future research

The findings of this study suggest that there are significant possibilities for technology in the daily lives of people with dementia and those who care for them. The present dyads can use new technology in terms of a tablet with a web-based application in order to support communication. They manage using such a device, show a sincere interest in its content and functions and seem to have enjoyable social conversations. The collaboration and shared exploration of the tablet as well as the problems the dyads face are relevant aspects of their interactions. An important finding with clear clinical implications concerns the amount of technical obstacles and the effects these have on language and conversation. Policy makers, directors and others in charge need to acknowledge that a tablet in itself is not enough. Successful implementation and use of technology depend on the technical prerequisites. Care homes for people with disability such as dementia need to be equipped so that the internet can be easily accessed and used.

Although user testing and design were not specific aims of the study, the findings from the present study have implications for future developmental work and design. The study acknowledges that the design of the application matters [24]. Two different types of applications were used in this study: a Swedish version of CIRCA [13, 23] including generic pictures, songs and films and CIRCUS [33] which

was individually tailored with private pictures for each of the three women. The purpose was not to compare the two applications although we can conclude, from studying interaction, language and use of both that appearance and organization of content matters. Both CIRCA and CIRCUS are designed for people with cognitive difficulties associated with dementia and yet they are not self-evident and without hinder. The fact that there are no given start and end points but instead many different possibilities of ways to go and things to do, as is the case with CIRCUS in particular, seems to be inspiring and to stimulate interaction. However, as has also been shown, there are moments of considerable uncertainty where some kind of response from the system could have helped. For example, a clear signal telling the user that pictures are loading and how the loading process proceeds could have been useful. Also, from a social interaction point of view, multilayers of pictures, as is common in dynamically organized displays, are not efficient if most of the time is spent waiting for the pictures to show. Supposedly, several pictures of smaller size displayed at the same time would lead to easier and quicker access to different conversational topics for the dyads.

Reports focusing communication support in dementia are scarce. Future research should focus on different kinds of support for people with dementia and different conversational partners in a variety of daily environments and activities. Studies examining the effects of different designs and organization of dynamic displays in interactions involving people with dementia are welcome.

Compliance with ethical standards

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