The behavioral outcomes of a technology-supported leisure activity in people with dementia

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Abstract.

BACKGROUND: This paper presents the results of an evaluation of a technology-supported leisure game for people with dementia in relation to the stimulation of social behavior.

OBJECTIVE: In this study we explore the additional impact of technology-supported leisure activities on behavioral outcomes of people with dementia in a nursing home and daycare setting in comparison to a traditional leisure activity. The technology-supported game aims to stimulate social behavior and interaction among participants via its design features, including a TV, radio, telephone and treasure box.

METHODS: A mixed-method research design was applied. Observations of participants (\(n=10\), multiple rounds of observations), were conducted using the Oshkosh Social Behavior Coding scale. The bootstrapping method was used for statistical analysis, differentiating for different subgroups of participants. In addition, interviews with the activity facilitators were conducted.

RESULTS: Social behavior was found to occur more often than non-social behavior during the sessions, in particular, due to commenting during the game. Participants with a low MMSE score, scored higher for non-social and non-verbal behavior. Female participants scored higher for social behavior than males. Activity facilitators stated that the technology-supported leisure activity helps them with their professional tasks.

CONCLUSION: A technology-supported game can stimulate communication and social behavior among players with dementia. Moreover, it helps activity facilitators in making activities more person-centered.

Keywords: Technology, reminiscence, nursing home, behavioral outcomes, Alzheimer

1. Introduction

Worldwide, there were an estimated 35.6 million people with dementia (PwD) in 2010, and this number is foreseen to increase substantially [1]. There is a widespread recognition that innovative approaches are required to address the shifting needs of PwD [2], including opportunities to socialize, engage in activities and to achieve a sense of social integration [3]. Innovative approaches should also deal with the differences between male and female PwD [4] or the phase of dementia, such as in relation the Mini Mental State Examination (MMSE) [5].

Several studies describe PwD have a need for company, daytime activities, self-worth, expression of thoughts, social contact and a sense of belonging. Meaningful leisure activities can support PwD in these basic needs, which are specifically related to improv-
ing physical function, reducing depression and changing behavioral symptoms [6–9]. In long-term care, recreation may improve one’s quality of life, as PwD express happiness and have their eyes opened more often during recreation activities in comparison to other times of the day [10]. Leisure should create opportunities to have fun, make a difference, seek freedom, ‘be with’, ‘be me’, find balance, grow and develop [11]. In another study recreation time for PwD in a nursing home scores significantly higher in positive affect than ordinary time [10].

Reminiscence therapy is frequently applied with PwD; it involves the conversation about past activities whereby photographs, familiar items, music, movies are used. In a systematical review of studies related to reminiscence therapy the results show positive results for cognition, mood and general behavior [12].

Numerous leisure activities are based on traditional means, such as board games. Innovative approaches based on modern technology could also be used for leisure activities. A small number of studies on the use of technology used to stimulate social behavior showed positive results including more active role-taking and positive engagement of PwD [13,14]. Overall, little is known about the use of technology in leisure activities for PwD. The aim of this study is to explore the impact of technology-supported leisure activities on the well-being of PwD and the work of activity facilitators who serve as facilitators during activities.

This study evaluates a technology-supported leisure activity called the Chitchatters game (CC) [15] in order to get an insight into the use of technology in leisure activities. Such technology-supported leisure activities are hypothesized to be more effective compared to traditional activity sessions because of the possibility to create person-centered care, make the activity more interactive and be supportive for activity facilitators. Because the purpose of the CC is to stimulate social behavior, which is shown to increase the well-being of PwD, this study focuses on the behavioral outcomes of the participants.

The research questions for this study were:
- What are the differences in behavioral outcomes between leisure games that do or do not use technology (CC versus a control, i.e., Question Game)?
- Which types of behavior occur during a CC session, and what are the differences in social behavior differentiated for MMSE and gender?
- What are the experiences of activity facilitators with the CC in relation to their professional tasks, its usability, and the (observed) behavioral outcomes seen in PwD?

2. Methods

In this section, the intervention, the design and setting, the participants, the research instruments and the data analysis are described.

2.1. Intervention description

2.1.1. The Chitchatters

The Chitchatters is a technology-based leisure activity developed for PwD by two industrial designers from Delft University of Technology, The Netherlands [15]. The technology itself includes four interactive objects: a television, a radio, a telephone and a treasure box (Fig. 1). Each of these objects triggers memories in its own specific way: the television shows videos, the radio plays music, the telephone tells poems or songs, and the treasure boxes reveals objects chosen as a source for reminiscence and promote tactile stimulation. The CC requires the participants to play while seated in a circle, in which the participants are surrounded by the objects. The activity facilitator, who is the facilitator of the game, sits in this circle, too. The facilitator assigns an object using a remote control, and a lamp placed aside the object is then turned on. The participant with dementia then needs to activate or manipulate this object. These actions include pushing the television button, turning on the radio’s volume, answering the phone, and opening the treasure box. After these actions, the object’s content is revealed. The designers delivered the content (movies, music, and children’s songs) used in this study in collaboration with the facilitators. The Regional Historical Center Eindhoven (Regionaal Historisch Centrum Eindhoven), The Netherlands, provided additional movies related to the region of this study.

After the participants have watched, listened to or touched the fragments or objects (for example, a TV fragment and an object from the treasure box), they are reminded of something from their own past. This, in turn, should make them come up with a personal story or anecdote related to this fragment or object from the CC. This story or anecdote then activates the other participants carrying out the activity, which is supposed to start a conversation and interaction between the PwD themselves and with the activity facilitator [15].

The objects of the CC have an old-fashioned look, in order to create a familiar “look-and-feel” for the players. The CC can be made person-centered by selecting a specific category in the software to show, for example, all fragments about ice-skating. After the se-

N. Nijhof et al. / The behavioral outcomes of a technology-supported leisure activity in people with dementia
lection of a specific category or timeframe in the software (made with the remote control by the facilitator), the objects (TV, radio, telephone) download the content from that category or timeframe.

2.1.2. The question game

The Question Game (QG) was used as a non-technological comparison activity or control (Fig. 2). The QG is a board activity carried out on a table. A player is asked to throw a color dice. The color matches with a category on a question card, such as proverbs, songs, language, nature and an ‘all sorts’ category. The activity facilitator reads the question out loud to the whole group, but the participant who threw the dice may answer the question first. If the participant does not know the answer, the others are allowed to help. The answers should trigger the thrower’s memory and invite other players to start telling stories, as well [16].

Both the purpose and the way of playing the QG is similar to the CC. It is based on the use of one’s
long-term memory, trying to trigger the individual’s and group’s memories, applying reminiscence therapy in a group with members who are seated in a circle, requiring an initial physical activity (throwing the dice for the QG or turning on the television for the CC), and the assistance of one or two activity facilitators. The QG also differs from the CC. During a CC session, every participant is free to respond, whereas for the QG, just one participant is supposed to respond. Moreover, the CC can be customized to one’s personal context, which is not possible for the QG.

The nursing home manager and activity facilitators selected the QG as a control activity for this study. The principal researcher asked them for an activity with similar aims as those of the CC: stimulating social behavior and interaction.

2.2. Study design

A mixed-method design, combining qualitative methods with quantitative methods, was applied [17–21]. The methods include observations during the sessions of both activities using the Oshkosh Social Behavior Coding (OSBC) scale [22,23] in order to answer the research questions related to the occurrence and differences (MMSE, female/male and CC/QG). In addition, semi-structured interviews with the activity facilitators were conducted in order to get insight in the research questions related to supportiveness and ease of use for the facilitator and behavioral outcomes and ease of use for the players with dementia.

Participants played the game two times each, so four play rounds were conducted with every participant. One participant played the activities three times (she missed one of the QG activity because of an appointment with her physician). One participant played the CC and QG only once instead of twice (due to another appointment during the second session). So the total set of data was set on 40 (10 participants played the activities four times). Because of the fact that several participants did not complete all sessions, a set of 37 observations was collected.

Two researchers observed the participants during the activities. These researchers were not participating in the activity itself. In the morning, the CC and in the afternoon the QG were each played for 45 minutes. One group of participants with more severe dementia played both of the activities for 25 minutes. The observations were carried out twice in a two-month period (October and November 2009). A total of 16 activity sessions were conducted for four groups in total. Group sizes ranged from three to eight participants assisted by one or two activity facilitators. These activity facilitators were familiar to the participants. The sessions were conducted in nursing home De Landrijt in Eindhoven, The Netherlands. In this nursing home, certain facilitators were linked to specific groups. If there were only 2 participants in one group, two groups were playing together, so there were two facilitators steering the group activities.

2.3. Study participants

The study participants comprised both PwD and activity facilitators.
A total of 21 out of 196 PwD residing in the nursing home or visiting the day-care centre were selected to participate in the study because of their capability to play both activities (this judgment was made by the head of the activity facilitators). A total of ten persons were observed (because of the possibility to observe only three or four persons at a time by the researchers). A responsible relative agreed for the participants to participate in the study (informed consent). In total, five participants from the day-care group and five participants residing in the nursing home participated in this study.

The participants were aged between 52 and 86, with a mean of 69 years old. There were six females and four males. The participants’ MMSE scores [5] were established by activity facilitators trained to do such evaluations. The MMSE of participants differed from 3 to 28, with a mean of 18, with two missing scores (because it was too confronting for these participants to conduct the MMSE test or because they were not able to answer the questions because of an impaired speech). In the analysis, these missing scores were treated as low MMSE scores. There were six low MMSE scores (15 or lower) and four high MMSE scores (16 or higher).

The five participating activity facilitators were all female. Their ages ranged from 22 years to 42 years with a mean of 27 years. Their education was mid-level for social workers, with a specialization in geriatric care. All the facilitators working in the nursing home participated in this study. Both the manager and the activity facilitators consented to their participation in the research and the videotaping.

2.4. Research instruments

2.4.1. Behavioral observations

The Oshkosh Social Behavior Coding (OSBC) scale was used for the research question related to the occurrence and differences in behavioral outcomes. The scale includes both verbal and non-verbal, social and non-social behavior, which are divided in 21 items [22, 23]. During the observations, the researchers scored how often a participant expressed a certain type of behavior, for instance, smiling or gesturing. The OSBC is a valid and practical tool for measuring behavioral outcomes for PwD [22, 23]. The original lists of items of the OSBC scale were translated into Dutch by one of the authors and translated back by another author for reasons of validity. The scale was further modified to enable the monitoring of multiple participants simultaneously:

- A number of items were left out because they did not occur while playing the two activities or they were obsolete given the goals of the study. The scores left out were: “greetings, please, thank you, requests, praise, empathy, interruptions, demands, arguing, frowning, physically assisting another, receiving or offering object, touching, fighting, repetitive speech, fidgeting, directed mobility, self-injurious”. The omissions do not affect the validity of the scale, or the way the results of this study can be used.
- The item “answering” was split into yes/no answers, sentence answers, and story answer (which could be a personal story or anecdote). This allowed for a more specific scoring of how participants responded.
- The item “singing” was seen as non-social behavior by the OSBC, but in this specific game “singing” was a social activity, because singing was stimulated by both of the games to do together with the group members.
- The item “complaints” was seen as social behavior by the OSBC, but in this specific game “complaints” were a non-social activity, because the complaints had a negative overtone.
- The item “smiling” was separated in laughing out loud and smiling (just by moving the mouth), because there is a difference in intensity of laughing, when it is done out loud or just by moving the mouth. In Dutch, smiling and laughing are similar words.

Finally, the following constructs and items remained:

- Social verbal: comments, yes/no responses, sentence answers, story answers, questions, joking, singing.
- Social non-verbal: laughing, smiling, gesturing.
- Non-social verbal: complaints, screaming, talking to self.
- Non-social non-verbal: observing/listening, sitting alone/not observing, sleeping, leaving an activity, wandering and handling object.

The activity sessions were videotaped for confirmation if there was any uncertainty about the behavioral coding.

2.4.2. Interviews

A total of five activity facilitators were interviewed about the CC after the first activity session. The interviews were used as an in-depth method to complement the observational data. Each interview session
Table 1
Occurrence of social and non-social behavior during the Chitchatters game expressed in mean and SD

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chitchatters (CC) (N = 18, 100 bootstrap samples)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>------</td>
<td>-----</td>
<td>------</td>
</tr>
<tr>
<td>Social verbal behavior</td>
<td>5.09</td>
<td>3.31</td>
</tr>
<tr>
<td>Social non-verbal behavior</td>
<td>0.25</td>
<td>1.98</td>
</tr>
<tr>
<td>Non-social verbal behavior</td>
<td>0.78</td>
<td>1.41</td>
</tr>
<tr>
<td>Non-social non-verbal behavior</td>
<td>0.61</td>
<td>0.93</td>
</tr>
<tr>
<td>Items from social verbal behavior construct</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comments</td>
<td>14.22</td>
<td>14.67</td>
</tr>
<tr>
<td>Yes/no responses</td>
<td>7.75</td>
<td>5.63</td>
</tr>
<tr>
<td>Sentence responses</td>
<td>4.13</td>
<td>3.85</td>
</tr>
<tr>
<td>Story responses</td>
<td>2.85</td>
<td>3.76</td>
</tr>
<tr>
<td>Asking questions</td>
<td>1.57</td>
<td>1.72</td>
</tr>
<tr>
<td>Joking</td>
<td>1.72</td>
<td>2.54</td>
</tr>
<tr>
<td>Singing</td>
<td>2.23</td>
<td>1.90</td>
</tr>
<tr>
<td>Items from social non-verbal behavior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laughing</td>
<td>4.94</td>
<td>4.02</td>
</tr>
<tr>
<td>Smiling</td>
<td>3.75</td>
<td>3.75</td>
</tr>
<tr>
<td>Gesturing</td>
<td>0.90</td>
<td>1.15</td>
</tr>
<tr>
<td>Items from non-social non-verbal behavior construct</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observing/listening</td>
<td>0.70</td>
<td>1.25</td>
</tr>
<tr>
<td>Sitting alone/not observing</td>
<td>0.39</td>
<td>0.93</td>
</tr>
<tr>
<td>Sleeping</td>
<td>0.38</td>
<td>0.96</td>
</tr>
<tr>
<td>Wandering</td>
<td>0.68</td>
<td>1.74</td>
</tr>
<tr>
<td>Leaving an activity</td>
<td>0.25</td>
<td>0.50</td>
</tr>
<tr>
<td>Handling objects</td>
<td>1.55</td>
<td>1.06</td>
</tr>
<tr>
<td>Items from non-social verbal behavior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complaints (negative)</td>
<td>0.32</td>
<td>0.74</td>
</tr>
<tr>
<td>Screaming/yelling</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Talking to self</td>
<td>2.86</td>
<td>5.88</td>
</tr>
</tbody>
</table>

2.5. Data analysis

2.5.1. Behavioral observations

The collected observation data of the QG for the two games played by the same person were used in the same group of data for the analysis, because the participants played the game on a weekly basis. Differences between the scores of the two games were expected to be minimal. For the CC sessions, a t-test was carried out between the first and second sessions in order to exclude any significant differences. As there were no significant differences, all the data were processed in a grouped manner for the analysis in SPSS 18.0.

A t-test was first conducted for the differences between the behavioral scores found during the CC and the QG sessions. After the initial data analysis, a secondary analysis was made between behavioral scores of participants with low and high MMSE scores, and between behavioral scores of female and male participants.

In order to deal with limitations of the small study sample, bootstrapping was applied for the data analysis. Bootstrapping was developed by Efron in 1979 [26] and has proven to be valid for any kind of data, random and non-random data [27]. Bootstrapping has been widely used in applied statistics [28]. It has the advantage that it can also be used for uncommon statistical distributions, especially non-normal distributions as well as the possibility to work with small sample sizes [29]. The data of this observational study which are independent and identically distributes, was used as a “surrogate population”, for the intention of approximating the sampling distribution of a statistic [30]. The randomly selected raw data from the first round
Table 2
Comparison for the Chitchatters between low and high MMSE score

<table>
<thead>
<tr>
<th>Constructs and items</th>
<th>MMSE high (16 or higher)</th>
<th>MMSE low (15 or lower)</th>
<th>p-value (average from 100 bootstrap samples)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(N = 8; 100 bootstrapping samples)</td>
<td>(N = 11; 100 bootstrapping samples)</td>
<td></td>
</tr>
<tr>
<td>Social verbal behavior</td>
<td>5.19 (2.68)</td>
<td>4.90 (3.55)</td>
<td>0.48</td>
</tr>
<tr>
<td>Social non-verbal behavior</td>
<td>2.88 (1.58)</td>
<td>3.39 (2.14)</td>
<td>0.45</td>
</tr>
<tr>
<td>Non-social verbal behavior</td>
<td>0.17 (0.30)</td>
<td>1.21 (1.78)</td>
<td>0.15</td>
</tr>
<tr>
<td>Non-social non-verbal behavior</td>
<td>0.31 (0.38)</td>
<td>0.78 (1.05)</td>
<td>0.29</td>
</tr>
<tr>
<td>Observing</td>
<td>0 (0)</td>
<td>1.20 (1.49)</td>
<td>0.04*</td>
</tr>
</tbody>
</table>

Note *p < 0.05, **p < 0.01, ***p < 0.001.

is used for replacement by a computer program [30] Bootstrapping generates samples from the original, observed data, whereby the original characteristics of this data are used. The study sample comprises ten PwD, and data of all ten were put in a basket. From these ten participants, one person was drawn randomly, and data for that person was recorded. After recording, this person is placed back in the basket. Thereafter, another random draw is made, and this is actually sampling with replacement. This bootstrap sampling was repeated one hundred times. From a sample you can only get one statistic, for example, the mean. The confidence intervals of this mean or distribution of this mean are not known. Bootstrapped samples give more details on the distribution of this mean, or probability of this mean [31]. In this study, the original data was used to aggregate 100 samples from a small sample of ten, via an equation that translates the data into: means, standard deviations, and, for differences between two groups, the p-value.

For all the data sets, both of the QG and the CC, low and high MMSE and male or female the resampling was done a 100 times using Microsoft Excel 2010 [31], whereby separate comparisons of QG and the CC, low and high MMSE scores, and gender were made. The average mean and SD were separately calculated for all the scores. A set of t-tests were conducted between the CC and QG, MMSE scores and gender, whereby the p-value was determined.

2.5.2. Interviews

A coding scheme was used for the analysis of the interviews. The transcripts were read several times in their entirety to capture the experiences of the activity facilitators to aid in the coding scheme.

3. Results

In this section the results for the observational study and the interviews with the activity facilitators are described.

3.1. Observations

3.1.1. Occurrence of social behavior: CC

Table 1 shows the occurrence of the different social and non-social behaviors during the CC sessions. The mean stands for the mean of the number of times a person expressed a certain behavioral component. The means of social behaviors are higher (so higher frequencies of this kind of behavior) than that of non-social behaviors during a session of the CC (Table 1). The five highest ranking behaviors are “comments, yes/no responses, laughing, sentence responses and smiling”, which are all types of social behavior. Overall, participants made a lot of comments during the game, which is positive as they are actively involved in the game. These results show high standard deviations for the occurrence of “comments” and “talking to oneself”.

In the following section the differentiated (MMSE, gender) results of the observational study are described, as well as the comparison between the CC and the QG activities. The scores for (non-)social and (non-)verbal behavior are given for all constructs. Only the significantly different scores are provided.

3.1.2. Occurrence of social behavior: MMSE

A significant difference was found between “observing” among participants with a low and high MMSE score (Table 2). Participants with a high MMSE score tend to observe more often, such as watching the television or listening to the song of the radio. Some of the standard deviations are relatively high, including that for observing. Overall, it can be seen that the participants with a low MMSE scored higher for non-social and non-verbal behavior.

3.1.3. Occurrence of social behavior: Gender

A difference between female and male participants was seen for “answers in yes or no” (Table 3). Females more often gave “answers with yes or no” than males do. Overall, females scored higher for social behavior than males.
Table 3
Comparison for the Chitchatters between female and male

<table>
<thead>
<tr>
<th>Constructs and items</th>
<th>Female (n = 11; 100 bootstrapping samples)</th>
<th>Male (n = 8; 100 bootstrapping samples)</th>
<th>p-value (average from 100 bootstrapping samples)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td></td>
</tr>
<tr>
<td>Social verbal behavior</td>
<td>5.68 (3.29)</td>
<td>4.26 (2.86)</td>
<td>0.38</td>
</tr>
<tr>
<td>Social non-verbal behavior</td>
<td>3.86 (1.90)</td>
<td>2.33 (1.52)</td>
<td>0.17</td>
</tr>
<tr>
<td>Non-social verbal behavior</td>
<td>0.18 (0.32)</td>
<td>1.53 (1.97)</td>
<td>0.14</td>
</tr>
<tr>
<td>Non-social non-verbal behavior</td>
<td>0.24 (0.33)</td>
<td>0.99 (1.11)</td>
<td>0.21</td>
</tr>
<tr>
<td>Answer in yes or no</td>
<td>10.31 (6.06)</td>
<td>4.18 (2.90)</td>
<td>0.03*</td>
</tr>
</tbody>
</table>

Note *p < 0.05, **p < 0.01, ***p < 0.001.

Table 4
Comparison of Chitchatters (CC) and Question Game (QG)

<table>
<thead>
<tr>
<th>Constructs and items</th>
<th>Chitchatters (CC) (N = 18 100 bootstrap samples)</th>
<th>Question game (QG) (N = 19 100 bootstrap samples)</th>
<th>p-value (average from 100 bootstrap samples)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td></td>
</tr>
<tr>
<td>Social verbal behavior</td>
<td>5.09 (3.31)</td>
<td>7.41 (4.03)</td>
<td>0.15</td>
</tr>
<tr>
<td>Social non-verbal behavior</td>
<td>3.25 (1.98)</td>
<td>4.00 (2.35)</td>
<td>0.38</td>
</tr>
<tr>
<td>Non-social verbal behavior</td>
<td>0.78 (1.41)</td>
<td>1.48 (2.32)</td>
<td>0.33</td>
</tr>
<tr>
<td>Non-social non-verbal behavior</td>
<td>0.61 (0.93)</td>
<td>0.32 (0.62)</td>
<td>0.33</td>
</tr>
<tr>
<td>Answer in sentences</td>
<td>4.13 (3.85)</td>
<td>11.63 (7.36)</td>
<td>0.00***</td>
</tr>
<tr>
<td>Handling objects</td>
<td>1.55 (1.06)</td>
<td>7.57 (4.31)</td>
<td>0.00***</td>
</tr>
</tbody>
</table>

Note *p < 0.05, **p < 0.01, ***p < 0.001.

3.1.4. Occurrence of social behavior: Differences between CC and QG

There is only a difference in relation to the components “answer in sentences” and “handling objects” (Table 4). For the QG, people responded more in sentences and handled an object (dice) more often. The standard deviation for the component “answer in sentences” for the QG is high as well.

3.2. Interviews

3.2.1. The use of the CC in the daily work of activity facilitators

All facilitators suggested that the CC supports them with their professional tasks. It is a very easy way to come up with a topic and to discuss it with the group members. The younger facilitators, in particular, have difficulties in finding a topic that suits the people they work with. The creation of person-centered activities is hard for them to do. It is suggested to have some kind of instructional leaflet with a description of the fragments, so the facilitators know exactly what a particular song or video sample (that they don’t know) is about. The facilitators also find it nice to play a different kind of activity than the usual, more traditional, activities.

3.2.2. Easy to use by activity facilitators

In general, the facilitators find the CC easy to use, but they were not familiar with CC at the start of the study and only had access to a paper manual. Some facilitators mention that it is practical to turn on the CC a few minutes before playing the activity (idle mode), so the technology starts up immediately when the group is ready to play. Facilitators, who lack sufficient experience with computers, find the CC harder to use. Facilitators mention that it is confusing that they have to direct the remote control towards the television (the television stand contains the receiver), also when they want to switch the light of the radio, telephone, or treasure box. This is not intuitive.

3.2.3. Social behavior of players with dementia

All five facilitators stated that the CC stimulates social behavior of the players based on their own observations. Participants with dementia see or hear things, which is a trigger for their memory. They then come up with stories from their own past. The facilitators say that the CC gives more triggers than controls as the QG. The facilitators specifically stressed that the CC makes participants go into a specific topic more deeply than when involved in other activities, because the CC triggers memories and people come up with a story. All the facilitators mentioned that the objects give a trigger but that the conversation needs to be initiated by a facilitator most of the time, because people do not start talking by themselves. One of the facilitators assisting the group of participants with more severe dementia said that responding to each other’s stories is still
difficult for the participants, because of the progressed memory loss. The facilitators identified the television as the main trigger for social behavior, as it is a visual tool.

3.2.4. Easy to use for players with dementia

Not all the participants easily understood how the CC worked. The main complication was how to use the different objects. In the view of all the facilitators, the lamp that switches on is not noticed by the participants. The facilitators think it is also because the light is a white light, which goes unnoticed in a day-lit room. The movies, songs and lyrics are recognized most often by the participants aged 70 years and over. For the younger participants the content is not always recognizable. The telephone was not considered to be sufficiently user-friendly. The participants pick up the phone when it rings and say their name, but the phone instantly starts playing a lyric. This is confusing for most of the participants.

4. Discussion

Previous work has shown the positive results of leisure, recreation or reminiscence therapy for PwD. A few studies used some sort of technology, either in the field of dementia care [32–37] or in the field of leisure in particular [13,14,38]. A study exploring the use of technology to stimulate social contact showed more active role-taking and positive engagement in PwD. A multimedia system used for reminiscence therapy, which used photographs, music and video clips, showed more engagement in PwD than during the traditional reminiscence therapy [13].

The results of this study indicate that the CC leads to a higher occurrence of social behavior instead of non-social behavior. The highest occurrences are seen for “comments, yes/no responses, laughing, sentence response and smiling”. This means that the CC could stimulate communication and empathy. This social behavior is an indicator of improved well-being. The CC makes people comment to what they see and hear from the objects, which can be seen in the high frequency of comments during the play of the activity. In relation to the behavior during the CC sessions, the results for the low and high MMSE scores corresponded to the symptoms of a person seen in a certain stage of dementia. Participants with a low MMSE score tend to be somewhat less active and are more frequently observing than people with a higher MMSE score.

When looking at gender, the behavior corresponded with the characteristics of the male and female participants [4]. Females more frequently engage in social contact and giving answers than male participants do. Some of the persons playing the game give a lot of comments in comparison with the other players, which generates high standard deviations of the observational scores. In general, there are large differences in the behavior of PwD. Some people are really quiet, while others are talking all the time.

A large difference between leisure activities that either do or do not use technology was not seen in this study. The differences, which can be seen for the components “answer in sentences” and “handling an object”, are more outspoken for the QG due to the character of the game. During the QG, players have to throw a dice several times, which explains the higher score for handling an object. Moreover, players have to give sentence answers to questions of the QG. During the CC sessions, the emphasis is on evoking memories and stories. Although this was observed during the study, there were no significant differences with the QG. Both leisure activities lead to the occurrence of social behavior, which could be related to the well-being of PwD.

The activity facilitators think that the CC can be a supportive tool, and they provided several suggestions how to improve its design and implementation. One suggestion was to make the content more applicable for participants younger than 65 years, for instance, by changing the music fragments. In addition, the younger activity facilitators indicated that additional information about the content would help them in facilitating conversation, because they do not know much about the content themselves. The fragments are older than the facilitator themselves, which makes it harder to start a conversation with the players and keep it going. The facilitators would like to have other types of content, for example, about nature and animals. Proactive facilitators are a necessity to induce social behavior. With more relevant and recognizable content, people may not need full support and might start talking more on their own.

While the findings of this study support much of what is already known in the literature, this study is also unique in its focus on leisure. This study shows the increased occurrence of social behavior during a specific leisure activity. The findings of this study have implications for both practice and further research. The limitations of this study were that a comparison of the CC to another more traditional activity is difficult to achieve. There are some relevant differences between
how the various activities are played and between the various features. The OSBC scale allows only for the detailed study of the occurrence of social and non-social behavior. It could be worth investigating if the CC stimulates social interaction as well. This could be different for leisure activities where there is a possibility to create person-centered activities and more interactive triggers. More specifically, the amount of time and the way participants communicate, such as whether a person talks to another person and for what amount of time, should be investigated, as well if players respond to each other’s questions. Another limitation is the statistical method bootstrapping, which gives a first impression of the effects. It is hard to observe large groups of PwD simultaneously, because the care and activities delivered to PwD is increasingly small-scaled. Bootstrapping is increasingly used in healthcare research in the last few years, for instance, for constructing confidence intervals for treatment differences, cost-effectiveness analysis in RCTs, and assessing provider performance for providers with small numbers of observed events [39–43]. The value of bootstrapping in healthcare research is growing, as it can be supplementary to the conventional statistical thinking [44]. Nevertheless, due to the small sample of participants in this study, the outcomes may be less reliable. So this research should be considered exploratory.

Overall, no large differences were observed in the occurrence of behavioral outcomes components between the CC and the QG. The CC does create and stimulate social behavior. The CC shows more active behavior by players with high MMSE scores and by females. The use of technology in leisure activities can stimulate social behavior. It could be worth investigating if the CC shows more active behavior than the QG. The CC stimulates social interaction as well. This could give a first impression of the effects. It is hard to observe large groups of PwD simultaneously, because the care and activities delivered to PwD is increasingly small-scaled. Bootstrapping is increasingly used in healthcare research in the last few years, for instance, for constructing confidence intervals for treatment differences, cost-effectiveness analysis in RCTs, and assessing provider performance for providers with small numbers of observed events [39–43]. The value of bootstrapping in healthcare research is growing, as it can be supplementary to the conventional statistical thinking [44]. Nevertheless, due to the small sample of participants in this study, the outcomes may be less reliable. So this research should be considered exploratory.

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Roles of the researchers

NN was the principal investigator of this study, and responsible for the field testing, methodology, analytics of results and writing of the manuscript. JH was the second researcher involved in the field testing; he helped with the methodology, analysis of results and writing of the manuscript. HR helped with the training of the CC and added content to the system. JGP helped with the analysis of the results and writing of the manuscript.

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