
Article:
Luyten, T., Braun, S., van Hooren, S. et al. (1 more author) (2018) How groups of nursing home residents respond to “the CRDL”: a pilot study. Journal of Enabling Technologies, 12 (4). pp. 145-154. ISSN 2398-6263

https://doi.org/10.1108/JET-05-2018-0025

How groups of nursing home residents respond to 'The CRDL': A pilot study

Abstract

Purpose

The aim of this study was to describe whether and how groups of nursing home residents respond to the interactive object 'the CRDL'. The CRDL can translate touches between people into sounds. It recognises the type of touch and adjusts the produced sound accordingly.

Design/Methodology/Approach

This was as an observational explorative study. Responses were coded and analysed using an existing theoretical framework.

Findings

The CRDL creates an atmosphere of playfulness and curiosity. It lowers the threshold to touch, provides an incentive to touch and encourages to experiment with different types of touches on arms and hands. The sounds the CRDL produces sometimes trigger memories and provide themes to start and support conversation. Involving a (large) group of nursing home residents to interact with the CRDL is challenging.

Research limitations/implications

To fully understand the potential of the CRDL, the following is suggested: (1) studying different group compositions and individual sessions; (2) exploring the effects of tailored content adjusted to individual preferences and/or stages of cognition; and (3) examining the effects of using the CRDL on the general wellbeing of nursing home residents.

Practical implications

The CRDL can help caregivers to use touch to make contact with groups of their residents. A session should be guided by an experienced caregiver. Some familiarisation and practice with the CRDL are recommended and a quiet environment is advised.

Originality/value

This paper demonstrates the potential of interactive objects, such as the CRDL, in the nursing home.

Introduction

A simple touch communicates a wealth of information. A mother caressing her newborn, the fingertips of a couple slightly touching or a pat on the back while shaking someone's hand. Touch is a language we

use instinctively. It is our most developed sense when we are born, and it is critical during the development of an infant (Field, 2014). Humans are unknowingly skilled in deciphering the information that is contained within a single touch. Touch influences our behaviour and registers in our brain, whether or not the touch itself can be remembered (Gallace and Spence, 2010, Lindgren et al., 2012). People are even able to explicitly identify emotions from the experience of being touched, without seeing the touch itself (Hertenstein et al., 2006).

In nursing homes, touch is part of daily life, and two types can be distinguished: physical and therapeutic touch. Therapeutic touch has the explicit intention to heal (Krieger, 1979). Physical touch is split into instrumental and expressive touch (Watson, 1975). An instrumental touch is deliberate and required for the task at hand. Helping a patient out of his/her wheelchair, for instance, is instrumental, whereas an expressive touch is often spontaneous and affective, such as an encouraging pat on the shoulder.

The effects of therapeutic touch on nursing home residents have been studied. Recent systematic reviews conclude there is insufficient evidence in favour of massage and touch interventions for long-term effects, but therapeutic touch interventions have proven to reduce restlessness and stress in nursing home residents during the intervention (Livingston et al., 2014, Hansen et al., 2006, Cai and Zhang, 2015, McFeeters et al., 2016, Wu et al., 2017). Touch is reciprocal: Nicholls et al. (2013) reported that seeing the person with dementia relaxed and content because of an everyday touch produced a similar impact on those close by.

When touch is put into practice, there are some considerations to take into account. The emotional bond between humans is key to where and how we want to be touched by someone (Suvilehto et al., 2015). Nonetheless, not everyone perceives a touch in the same way. The person being touched might experience it as a violation of personal boundaries. This depends on a multitude of factors including the relationship of both people and the context, such as the workplace culture. In a formal, more distant corporate culture, it might be considered inappropriate or be frowned upon for two people to touch while in some companies greeting each other with a hug is part of the daily ritual.

In the nursing home environment, some people might benefit from an increase in expressive touches and might even experience them as therapeutic. However, a safe context for both parties should be created for them to feel comfortable.

The CRDL (Figure 1), an interactive object that translates touch between two or multiple people into sound, could create a situation or context in which touch is considered part of the experience and feels safe and playful for all parties to participate. The CRDL can be used by a minimum of two and no maximum number of people simultaneously. It recognises the type of touch (e.g. tickling, holding, kneading, tapping or grabbing) and adjusts the produced sound accordingly. For instance, a gentle touch could trigger a bird singing while a firm grasp results in the sound of a rainstorm. Through CRDL, people can ‘play each other’ like a musical instrument. It makes touching the other person more inviting and playful. CRDL has no display. It produces only audible content.

** please insert: Figure 1: The interactive object ‘the CRDL’. **

Physically, the CRDL has an abstract, rounded form. On opposite sides of the object, there is a grey felt inlay shaped like a larger-than-life fingerprint. Two participants have to place one hand on such a felt 'pad' and simultaneously touch the other person's skin (e.g. hand, arm or shoulder). If more people are interacting, they all have to touch each other. This way they close an electric circuit and the speaker, located in the centre of the CRDL, produces a sound, influenced by the type of touch and the selected soundscape (e.g. nature, town, instrumental, animals and house-garden-kitchen sounds). To select a soundscape, the controls hidden in a side panel of the CRDL should be used.

Mergent, an architecture and product design firm located in the Netherlands, designed the CRDL to empower people who have trouble with communication and social interaction. People who live with dementia, autism or other cognitive limitations are invited to use the CRDL to communicate with their friends and family through touch, sound and play. The CRDL has been informally tested by Mergent. Sessions included people who live with (severe) dementia and a member of their family, caregivers or activity supervisors interacting one-on-one through the CRDL. Research on the CRDL in a group setting is lacking. Therefore, it is interesting to study **how groups of nursing home residents with dementia respond to the CRDL.**

1 Methods

This study was designed and carried out as an observational explorative study. It took place at a nursing home facility in the south of the Netherlands.

1.1 Study population

During the time of the study, 12 residents were living in a closed facility for people living with psychogeriatric disorders. All 12 experienced cognitive disabilities to such an extent that they were unable to live independently. The actual selection of participants was made by professional caregivers based on availability of the residents and their willingness to participate at that given moment. All residents were invited to try out the new device in the activity room. During the sessions, other residents and staff could freely walk in and out and participate.

1.2 Ethical considerations

The local ethics committee (METC Atrium, Orbis, Zuyd; 14-N-100) approved the research protocol. Because of the spontaneous selection and open character of the study design, no actual consent form was completed by the participants; thus, the study was given an exempt status. The ethical committee approved the way participants were selected and included. All residents, their legal representatives and the professional caregivers were informed about the study by means of an information letter two weeks prior to the study and could decline to participate by contacting the staff working on the reception desk or by

telling a member of staff. If participants wanted to exit during the study, they could do so by signalling the caregiver in charge.

1.3 Design

Nine of the 12 residents living in the closed ward participated in the study. Six participants attended more than one session. Two professional caregivers, one informal caregiver and two activity supervisors, all female, guided the sessions (Table 1).

In total, five sessions were held with a minimum duration of 16 minutes and a maximum duration of 44 minutes. This amounted to a total of two hours and 23 minutes of recorded video and 1,045 responses. The frequency of responses per session varied from 243 to 608 per hour. 59% of responses were initiated by a caregiver or activity supervisor (n=619) and 41% by a resident (n=426).

** Please insert: Table 1:
An overview of the sessions, including date, duration, participants and supervisors **

In each session, three or four of the 12 residents accepted the invitation of a caregiver or activity supervisor to participate. The CRDL was placed at the centre of a table and residents were initially seated within arm's reach of it and each other. The researchers were seated out of view in another room and were able to follow the session through a remote screen. A single video camera captured the participants' responses, which allowed repeated display (Figure 2). All visible and audible interactions recorded on video were transcribed and coded independently by two researchers (TL, GJ). The researchers consulted two other researchers (SB, SvH) in case of disagreement, to reach consensus.

The supervisors and activity supervisors received no instructions or protocol on how to guide the session. Some explanation about the functioning of the CRDL was provided by the researchers and a comprehensive manual, in the form of an A5 leaflet, was at the disposal of the caregiver or activity supervisor to refer to during the session. The CRDL was loaded with five soundscapes: sounds of nature, a town, animals, instruments and house-garden-kitchen sounds. One of five soundscapes could be selected at all times by the caregiver or activity supervisor. When the majority of residents started to lose interest and/or focus, the caregiver or activity supervisor could signal the researchers to end the session sooner than the maximum duration of 1 hour.

** Please insert: Figure 2: Overview of the position of CRDL, the camera and surroundings **

1.4 Data collection

A researcher was present in another room during each observation and followed the session through a remote screen. He/she interfered only when there was a malfunction of the CRDL or the recording equipment. In addition to the recording, field notes were taken.

1.5 Data analysis

A framework was used to structure the coded responses, which emerged from the results of a literature review on *Participant Responses to Physical, Open-ended Interactive Digital Artworks* (Luyten et al., 2017) and has previously been used to structure the responses of nursing home residents in relation to the interactive artwork VENSTER (Luyten et al., 2018) (Figure 3). The framework presents a structure in which the most common responses of people who interact with an open-ended interactive artwork (such as the CRDL) can be placed. The framework distinguishes between human-human and human-artwork responses, divided into verbal, physical and cognitive/emotional responses. In this study, cognitive/emotional responses were not noted. Interpretation of facial expressions or body language of the participants by the researcher and caregivers or activity supervisors has been attempted, but due to the complexity of some of the residents' cognitive condition, the disconnect between what is felt and communicated, combined with the absence of the voice of the residents themselves, it was decided to discard this category of responses. All coded responses were organised in mind maps, using MindManager (MindJet, 2018) to provide a general overview.

** Please insert: Figure 3: Overview of the coding framework **

1.6 Coding of responses

Responses were coded as 'human-artwork' when only one person was involved, and his/her response was directed towards the CRDL. Responses were coded as 'human-human' when two or more people were involved, and their responses were directed towards each other. When a response was individual, the coded name of the person was added; when two or more people were involved, all coded names were added, the initiator appearing first. If a person carried out two or more types of responses at the same time, the responses were recorded in all corresponding categories.

All understandable verbal feedback with reference to the CRDL, either directed towards the CRDL or to another person, was coded as '**verbal responses'** (e.g. a resident saying "that sounds like a train" to a caregiver). All distinguishable physical actions of any duration with reference to the CRDL, either directed towards the CRDL or to another person were coded as '**physical responses'** (e.g. A caregiver spinning the CRDL around its axis). All actions unrelated to the installation were coded as '**not important to this study'** and disregarded (e.g. conversation about pouring coffee).

Responses also were coded with the name of one or more corresponding categories of the aforementioned framework when they matched or alternatively got the label 'open' if this was not the case. Lastly, responses were openly coded, which led to the emergence of sub-categories through clustering similar responses which are specific to the CRDL. For instance, the category *Discussions about the (working of) the artwork* holds the subcategories *comment on the CRDL functioning* and *comment on the CRDL build/material*.

The data is presented in tables, showing absolute numbers. Categories and subcategories are arranged in descending order from most occurrence to least. Between brackets, two numbers show the number of responses initiated by a caregiver or activity supervisor and the number of responses initiated by a resident respectively.

2 Results

Most of the recorded responses were of **human-human** nature (62%, n=650), mostly initiated by caregivers or activity supervisors (n=434) (Table 2). Both *verbal* (n=401) and *physical* (n=252) responses were recorded. **Human-artwork** responses (38%, n=397) were nearly all *physical* in nature (n=368) and initiated more by residents (n=210).

** Please insert: Table 2: An overview of all responses **

2.1 Human-human responses (n=650)

3.1.1. Verbal responses (n=399)

Most **discussions** were **about (the workings of) the artwork** (n=222) (Table 3). Residents talked, asked questions (n=25) and supervisors (n=31) explained the *functioning and controls* (n=56) of the CRDL. The *sound and volume* were often a topic of conversation (n=48); while some couldn't hear the sounds, others thought they were too loud or annoying. The *sounds* the CRDL produces where *recognised, named or remembered* 42 times; residents identified the sound they recognised or remembered (n=12) and supervisors named sounds they heard out loud to start a conversation or redirect the attention to the CRDL (n=30). Some remarks were made and questions asked about the *purpose or concept of the CRDL* (n=33), largely by clients (n=25). *The build and material* of the CRDL got some attention as well (n=23); it was found to be an odd and interesting object of high quality and pleasant to the touch. Finally, caregivers and

activity supervisors *asked for the opinions* of others (n=11) while residents were mostly the ones who expressed them (n=6).

** Please insert: Table 3: Human-human responses **

Responses in the category **providing instructions/coaching** (n=131) were almost all carried out by caregivers or activity supervisors (n=124). They *encouraged interaction* (n=88) and *provided instructions* (n=36) on how to interact with the CRDL.
The **open category** holds *conversations* that were *triggered by* the sounds or interactions with the *CRDL* (n=32), mostly initiated by the caregivers or activity supervisors (n=25). One resident explicitly wanted to learn the name of the CRDL. *Negotiating turns* contains responses of residents ***asking* for clarity** or ***refusal* to interact** with the CRDL (n= 13). They did not want to exit the activity but would rather watch from a distance or pass the 'turn' to someone else.
No responses were noted in the category **work together (verbally).**

3.1.2. Physical responses (n=251)

Most of the physical human-human responses occurred in the category **interact together with/through the artwork** (n=206). Most of these responses consisted of people touching each other on the hand or underarm (n=150). There were instances of *regularly touching* or holding hands (n=63), *tapping* (n=46) and *stroking* (n=37) as well as four instances of *other means of touches* (predominantly firmly grasping). Most of the touches were initiated by supervisors (n=119). Residents and caregivers or activity supervisors also *smiled or looked amazed* at each other (n=52), largely initiated by residents (n=39). Four times, a caregiver or activity supervisor explicitly *looked or pointed at CRDL* (n=4).
The category **Imitating/trying out together** (n=45) was dominated by supervisors who *guided* the hands of residents *towards/correct position on CRDL* (n=44). One resident physically mimicked the actions of someone else (n=1).
The **open category** has one response of a resident carefully *looking at* the actions of other *people interacting with CRDL.*
No responses were recorded in the category ***democratic process/taking turns***. This emphasises that most interactions were actively curated by a caregiver or activity supervisor.

2.2 Human-artwork responses (n=395)

3.2.1. Physical responses (n=368)

Most human-artwork interactions towards the CRDL were physical of nature (n=368) (Table 4). This is of course closely linked to the nature of the object. The category **body movement/point/touch** holds 247 responses. When all touch-like responses are added together, they amount to 204 of all 395 human-artwork responses. Most of them initiated by residents (n=128) Most were *regular touches of the CRDL pad*

(n=139) followed by *touching* the *CRDL somewhere else* (n=35). The CRDL *pad* was also *tapped* (n=25) and stroked (n=5). Sometimes the CRDL was released quickly to try out whether the sound would stop (n=29). Finally, there were some gestures from a distance (n=7), mostly to point out the correct spot (pad) to touch the CRDL (n=4).

** Please insert: Table 4: Human-artwork responses **

The category **respond according to affordance** (n=60) described responses that were evoked because of the way the CRDL looks. The CRDL was moved to get it within reach or spun around its axis, something mostly initiated by a caregiver or activity supervisor (n=53).
Half of the **open category** responses (n=61) consisted of a caregiver or activity supervisor *controlling the settings of the CRDL* (n=30). They wanted to increase or decrease the volume or select another soundscape. Furthermore, there were residents *looking at (their hand) on the CRDL* with focus while they interacted (n=22). Small numbers of residents *closed their eyes* a few times (n=5) or were *startled* by a sudden sound pro(n=4).

3.2.2. Verbal responses (n=27)

There were very few verbal responses in the human-artwork category (n=29). Most of them were in the subcategory ***describe what is seen/heard*** (n=25). Mainly residents (n=17) *recognized, named or remembered a sound* and made that remark out loud. The remaining four responses were instances where a resident verbally expressed their joy while interacting with CRDL.

3 Discussion

In nursing homes, touch is mainly used in a therapeutic and functional way by staff. An increase in expressive touches and the conscious use of them could be beneficial for residents. However, touching each other outside of the strictly functional and necessary is uncommon, especially in a hierarchical relationship such as a caregiver or activity supervisor and a nursing home resident. Therefore, it **was the aim of this study to describe how groups of nursing home residents respond to the CRDL.**

The results show that use of the CRDL in a group setting creates opportunities for expressive and therapeutic touch. It generates an atmosphere of curiosity, a playful context and is an intermediary between people. This lowers the threshold to touch, provides an incentive to touch and encourages experimentation with different types of touches on the arms and hands because the produced sound changes accordingly. Additionally, the sounds the CRDL produces sometimes trigger memories and provide themes to start and support conversation. The large amount of discussion about the controls, functioning and purpose of the CRDL can be attributed to the novelty of the CRDL and will probably diminish over time.

However, to involve a large group is challenging. Caregivers and activity supervisors had a hard time making multiple residents close a circle of hands and make them understand the outer edges should touch the CRDL pads. All caregivers and activity supervisors eventually switched to several small groups (three people) or individual interactions with the residents (two people) while the other participants watched.

3.1 Future development of the CRDL

All caregivers, activity supervisors and residents agreed the CRDL looked well designed, rich textured and luxurious. The material used to cover the device was soft and smooth to the touch. However, the CRDL could benefit from a design iteration, as residents did not initially understand that the CRDL was designed to be touched. Additionally, the contrast between the touch pads and the wooden body of the CRDL was low; thus, it is unclear where a participant or user needed needed to place their hand. Because residents have to undertake two actions at once (place a hand on the felt pad and simultaneously use the other to touch someone else), they often forget that their hand needs to be on the felt pad. As a result of the rounded design of the CRDL, their hand slid off and the interaction was interrupted. The felt pad could be redesigned in such a way that a a grip or hole is added so the hand is less likely to slide off when not actively kept in place.

The differences in interests, visual and auditory functioning and mental capabilities between individuals who live in a closed nursing home ward are large. A uniform volume, for instance, does not cater to the whole group; while some did not even register the sounds when at full volume, others became annoyed because of the loud ‘noise’. Additionally, the interface to adjust volume and select another soundscape is too hard to reach for the caregivers and activity supervisors. The buttons also seem to be too deep to reach comfortably.

In order to make it easier for people who live with severe cognitive limitations to engage with the CRDL and for people who need a more complex challenge to remain engaged for a longer period, the design should incorporate opportunities for differentiation to address different needs and capabilities. The current soundscapes could be expanded with additional sounds and pieces of recognisable music to cater to different individual preferences (tailored content) and cognitive functioning. More research and development are required.

3.2 Study limitations

The current study was explorative; it investigated how groups of nursing home residents respond to the CRDL. Effects on the emotional state and/or wellbeing of the residents during and after the sessions were not studied and no differentiation in cognitive functioning has been made when selecting the participants. Since participants had to signal the caregiver or activity supervisor, it might have been harder for people with no speech to exit study during the session.

If a resident carried out two or more types of response at the same time, these were coded in all corresponding categories. This has influenced the total number of responses, possibly overstating some responses.

Moreover, the duration of interactions was not measured, which might have distorted some results. For example, when CRDL was touched, this was recorded only once. Because the duration is not taken into account, it has the same value as a quick glance or a touch that occurred while CRDL was continuously touched.

3.3 Implications for research

The results of this study illustrate the potential of interactive devices such as the CRDL in nursing home environments. In order to more fully understand the potential of the CRDL, it's use should be studied in different group and individual sessions and the effects of tailored content, adjusted to individual preferences and/or stages of cognition should be explored. Finally, the effects of using the CRDL on the general wellbeing of nursing home residents should be studied.

3.4 Implications for practice

the CRDL has the potential to evoke interactions in the form of touches between residents and caregivers that otherwise would not occur as often or consciously. Furthermore, it is suited to start and support conversations in a group.

When the CRDL is used in a group setting during routine care, the session should be guided by an experienced caregiver, preferably an activity supervisor or music therapist. Some familiarisation and practice with the CRDL, such as knowing about and using the different settings and getting used to its possibilities to activate and engage residents, are advised. To make a group session work, a quiet environment with little sensory stimulation is advised.

4 Conclusion

The results of this study show that the CRDL can help caregivers and activity supervisors to use touch as an alternative way to make contact with groups of their residents. The potential for use of the CRDL in private sessions (two people) and as a tool to (re)establish contact with friends and family could also be further studied. The use of the CRDL requires some practice on the part of the therapist or staff member. Design improvements and differentiation of sounds and soundscapes may improve overall experience and better meet individual needs or preferences.

Literature

CAI, F.-F. & ZHANG, H. 2015. Effect of therapeutic touch on agitated behavior in elderly patients with dementia: A review. *Int J Nurs Sci,* 2**,** 324-328.

FIELD, T. 2014. *Touch, 2nd ed,* Cambridge, MA, US, MIT Press.

GALLACE, A. & SPENCE, C. 2010. The science of interpersonal touch: an overview. *Neuroscience & Biobehavioral Reviews,* 34**,** 246-259.

HANSEN, N. V., JORGENSEN, T. & ORTENBLAD, L. 2006. Massage and touch for dementia. *Cochrane Database Syst Rev,* 4.

HERTENSTEIN, M. J., KELTNER, D., APP, B., BULLEIT, B. A. & JASKOLKA, A. R. 2006. Touch communicates distinct emotions. *Emotion,* 6**,** 528.

KRIEGER, D. 1979. *The therapeutic touch: How to use your hands to help or to heal*, Prentice-Hall Englewood Cliffs, NJ.

LINDGREN, L., WESTLING, G., BRULIN, C., LEHTIPALO, S., ANDERSSON, M. & NYBERG, L. 2012. Pleasant human touch is represented in pregenual anterior cingulate cortex. *Neuroimage,* 59**,** 3427-3432.

LIVINGSTON, G., KELLY, L., LEWIS-HOLMES, E., BAIO, G., MORRIS, S., PATEL, N., OMAR, R. Z., KATONA, C. & COOPER, C. 2014. Non-pharmacological interventions for agitation in dementia: systematic review of randomised controlled trials. *The British Journal of Psychiatry,* 205**,** 436-442.

LUYTEN, T., BRAUN, S., HOOREN, S. V. & WITTE, L. D. 2017. Participant responses to physical, open-ended interactive digital artworks: a systematic review. *International Journal of Arts and Technology,* 10**,** 94-134.

LUYTEN, T., BRAUN, S., JAMIN, G., VAN HOOREN, S. & DE WITTE, L. 2018. How nursing home residents with dementia respond to the interactive art installation 'VENSTER': a pilot study. *Disability and Rehabilitation: Assistive Technology,* 13**,** 87-94.

MCFEETERS, S., PRONT, L., CUTHBERTSON, L. & KING, L. 2016. Massage, a complementary therapy effectively promoting the health and well-being of older people in residential care settings: a review of the literature. *International journal of older people nursing,* 11**,** 266-283.

MINDJET 2018. MindManager.

SUVILEHTO, J. T., GLEREAN, E., DUNBAR, R. I., HARI, R. & NUMMENMAA, L. 2015. Topography of social touching depends on emotional bonds between humans. *Proceedings of the National Academy of Sciences,* 112**,** 13811-13816.

WATSON, W. H. 1975. The meanings of touch: Geriatric nursing. *Journal of Communication,* 25**,** 104-112.

WU, J., WANG, Y. & WANG, Z. 2017. The effectiveness of massage and touch on behavioural and psychological symptoms of dementia: A quantitative systematic review and meta-analysis. *Journal of advanced nursing,* 73**,** 2283-2295.