Preventing isolation of people with dementia: Effectiveness and challenges of communication robots
H. Kase (Convener)

Participants*:* R. Yamazaki-Skov (Denmark), X. Liu (China), J. Yang (Japan), R. Makino (Japan), M. Furukawa (Japan). **ISSUE** Social isolation and loneliness among older adults is a growing public health and public policy concern, made even more apparent by the COVID-19 pandemic. Social isolation and loneliness shorten older adults' lives, and damage their mental and physical health and quality of life. (WHO, 2021). A review conducted in 2015 indicated that social isolation and loneliness were associated with a 29% and 26% increased likelihood of mortality. (Holt-Lunstad et. al). Especially, people with dementia (PWD) intend to avoid talking to people around them due to their declining cognitive function. Preventing social isolation and loneliness in people with dementia can not only increase their own wellbeing but also reduce social care costs. A key concept in dementia care is to help PWD maintain communication and keep connections with their families, caregivers, and environment. However, with the increasing number of older adults living alone and the shortage of caregivers, this has become difficult. Therefore, several communication robots have been developed to deal with this problem, and recently it has been reported that they are effective by using the reminiscence methods. Reminiscence methods are known to be effective in maintaining the communication skills of people with dementia and preventing the occurrence of behavioral and phycological symptoms of dementia (BPSD), such as wandering, shouting, and problematic behavior. This symposium aims to discuss how to develop easily accessible communication robots that can prevent isolation and loneliness for people with disabilities. It is believed that the shortest way to popularize communication robots among people is to improve commercially available robots with AI models. The goal of this symposium is to clarify what problems exist and what attempts are being made to overcome them. **CONTENT** 1. Yamazaki-Skov (Denmark) will present an overview of research on intervention for elderly people with dementia using communication robots. With/without the reminiscence method, the WoZ model is the mainstream of communication robot, and AI is insufficient for conversations with elderly people with dementia. 2. Liu (Chaina)will present the effectiveness of the reminiscence method with using modified Pepper, a commercially available robot, into a WoZ model. The WoZ model showed almost the same effectiveness as the reminiscence method performed by a human coordinator.3. Yang (Japan) will report the results of an interactive experiment by implementing an AI model into RoBoHoN, a commercially available communication tool. Specifically, the changes they have made to RoBoHoN so far are as follows. ① Changed the voice recognition installed in RoBoHoN to Google STT ② Implemented GPT-4 model (AI model) in RoBoHoN ③ On top of ②, we will present about the development of an AI model using RoBoHoN, which generates repetitive utterances automatically. 4. Makino (Japan) will present a project to analyze social workers' conversational behavior with the aim of finding a distinctive conversational model that can contribute AI to maintain conversation with PWD. The findings of the interaction analysis will be useful in considering what communication role should be assigned in the robot's conversation with PWD. 5. Furukawa (Japan) will analyze a case study in which a communication robot was used by PWD who lives alone, and will report on the problems found in its use. **CONCLUSION** Researches will show that reminiscence techniques to prevent isolation and loneliness in people with dementia are effective even when using communication robots. At the same time, it will be clarified that in order to further popularize communication using robots among PWD, it is necessary to develop AI into robots that could be put into practical use. To develop an effective AI model, a multidisciplinary team approach including analysis of a chat-oriented conversational corpus and behavioral analysis will be proposed. However, whether using the WoZ model or the AI model, the issue that needs to be solved, especially for elderly people living at home, is the construction of a system that supports the use of robots.

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Phenomenological reduction with robotic media to relearn how to encounter others: Social robotics as philosophy in practice

R. Yamazaki-Skov (Yamazaki)

The difficulties of people with dementia, in terms of communication difficulties, overlap with the social isolation that has suddenly become routine for many of us with infectious diseases. Now that we are regaining our face-to-face routines, what have we learned through these experiences? Furthermore, is there any way to resolve the difficulties that keep people with dementia isolated and lonely, such as being kept away from people and not being asked for their opinions, due to misunderstandings and fears that they will not understand what people say or how to treat them anyway? **Purpose** The purpose of this presentation is to examine the significance of the use of robots as media. **Methods** Reviewing prior research, I will discuss the significance that robots have for people with dementia and the significance that robots have for those who apply or use them in general. **Results and Discussion** Previous studies have shown that the teleoperated android robot "Telenoid" at care facilities, elicited speech in older people with mild to severe dementia and elicited prosocial behaviors in people with negative and positive behavioral and psychological symptoms of dementia (BPSD), such as helping the robot and talking to people around them, which positively affected their social relationships (Yamazaki et al., 2012; Yamazaki et al., 2019). In a long-term experiment using the autonomous humanoid robot "RoBoHoN" in the homes of older people with cognitive decline who lived alone, it was shown that the older adults became strongly attached to the robot and the interactions lasted for a long period of time, suggesting that the robot had a satisfying effect that lasted even after its removal, as well as its effect of coming between family conflicts and easing them (Figueroa et al., 2023; Yamazaki et al., 2023). Although these studies represent findings that are still in the exploratory testing phase, considering these results, the following two points can be discussed regarding the significance of the use of robots as media: Robotic media can: 1) draw out the social abilities of the older adults and relieve loneliness, and 2) provide an opportunity to transcend the biases and interactional limitations that we humans have in face-to-face encounters and to relearn how to encounter others, including people with dementia. The latter point, which brackets our prejudices and biases (Nonaka, I., & Yamaguchi, I, 2022), has ethical significance, and I propose to employ the concept of "phenomenological reduction" by robots, a method in phenomenology that brings us back to the primordial experience of facing others. Further discussion will cover attachment-based guidance and "collaborative care with robots" methods to be explored, in which caregivers and family members work with robots to address various issues, such as dealing with BPSD of people with dementia and listening to their daily concerns and desires.

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Intervention experiment of reminiscence group therapy by humanoid robots for people with dementia

X. Y. Liu, R. Yamazaki, J. Yang, H. Kase

Purpose This thesis presents an reminiscence group therapy (RGT) intervention experiment for people with dementia (PWD) using humanoid robots. Attempts have been made to adapt humanoid robot intervention experiments for PWD by summarizing previous social assistant robot (SAR) evaluation frameworks. We validated the accuracy of facial recognition tools applied to PWD, applied them in several intervention experiments, and determined their applicability to mute PWD. We also attempted to establish evaluation criteria for the use of facial expression recognition tools to perform PWD during RGT. **Method** The interventional experiment conducted in an older adult facility aimed to assess the potential of humanoid robots in replacing human labor in Reminiscence Group Therapy (RGT) for dementia patients. This study built upon a scoping review of existing research on social assistant humanoid robots (SAHRs) for dementia, focusing on their effectiveness in managing Behavioral and Psychiatric Symptoms of Dementia (BPSD). Additionally, the Emo-Rec application for automatic facial emotion recognition was introduced and validated for usability and accuracy with experts in elderly care, yielding consistent results with manual evaluations. A key aspect of the study was an intervention experiment comparing face-to-face and teleoperated humanoid robot therapy. **Results and Discussion** Since we conducted a scoping review summarizing existing research on social assistant humanoid robots (SAHRs) for dementia, identifying their roles in mitigating Behavioral and Psychiatric Symptoms of Dementia (BPSD). Secondly introduced the Emo-Rec application for automatic facial emotion recognition, validated the Emo-Rec application's usability and accuracy with experts in elderly care. Afterwards, the impact of the two evaluations (from experts and application) was consistent level with a result of Intraclass Correlation Efficient (ICC) in 0.835. Particularly, we presented an intervention experiment comparing face-to-face and teleoperated humanoid robot therapy. The results indicate differences in communication dynamics, with the robot group speaking less. However, both methods show similar linguistic complexity (2-gram t=-0.622 p=0.548>0.05; 3-gram t=-1.278 p=0.230, >0.05; 4-gram t=-1.648 p=0.130, >0.05) and mood improvement(Emo-Rec application point average 10.387 to 8.531).

Overall, we believe that the potential of humanoid robots to augment dementia care and improve emotional well-being in elderly patients. The research underscores the significance of applying IT and AI technologies in healthcare, with the potential to enhance the well-being of the elderly and lay the foundation for new dementia treatments using intelligent humanoid robots.

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The effect of variation in repetitive utterances on users by a chat-oriented communication robot

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Purpose Robots with certain communication abilities through AI have been shown to improve cognitive functions in elderly individuals living alone [Tanaka et al., 2012]. However, for the effective deployment of communication robots in practical settings, it is crucial for the elderly to use them continuously. Repetitive utterances by communication robots have been suggested as a strategy to encourage users to continue engaging in the dialogue [Yang & Kikuchi, 2021]. Based on the above, this study focuses on the repetitive utterances by communication robots and examines the effect of variation in repetitive utterances on users' engagement in the dialogue. **Method** In this study, based on the analysis of chat-oriented dialogue corpus between humans, the variation of repetitive utterances was expressed by the interjections or backchannels that co-occur with the repeated words. Subsequently, based on the OpenAI GPT-4 model, we constructed a chat-oriented communication robot that automatically generates repetitive utterances. We conducted a robot dialogue experiment (Figure 1) with 41 university (graduate) students, dividing them into two groups: one with no variation in repetitive utterances (No Variation Group) and one with sufficiently high variation in repetitive utterances (Variation Group). **Results and Discussion** Without considering the characteristics of the subjects, no statistically significant difference was observed in the ratings of the 'No Variation Group' and the 'Variation Group' regarding users' engagement. However, when dividing the subjects based on their "negative attitude toward emotions in interaction with robots"(NARS-S3) [Nomura, Kanda & Suzuki, 2006], a significantly higher evaluation of dialogue continuity was observed in the 'Variation Group' among those with high NARS-S3 scores (n = 21, p = 0.044, r = 0.440). In the future, we plan to verify the effectiveness of repetitive utterances by communication robots targeting elderly people with dementia.

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Figure1: Scenery of the experiment

How can interaction analysis research contribute to the development of a conversation system between a robot and an older person with dementia?

R. Makino, A. Yamamoto, K. Uchida, K. Kadota

Purpose Various troubles can arise when older individuals with dementia interact with robots. These troubles can reduce their motivation to converse with a robot, thereby diminishing its value as a conversation partner. To resolve this, it is crucial to understand the structure of troubles that occur in the conversations between robots and older patients with dementia. Interaction analysis is a highly effective approach to address this issue. It views communication as a phenomenon in which participants execute their actions in a sequential and interconnected way. By adopting this perspective, it is possible to understand how communication problems are structured and how they can be resolved through the organization of actions, presenting this as a concrete process (e.g. Streeck et.al, 2011). This presentation provides an overview of interaction analysis with a focus on the structure of problems that arise in conversations between robots and humans, highlighting prior studies (Komuro, 2018; Komuro & Funakoshi, 2020). Additionally, it demonstrates how interaction analysis can be used to describe the procedures by which experts resolve issues that occur in conversations with older patients with dementia (Kadota et.al, in prees). **Methods** The interaction scenarios featured conversations between dementia-afflicted older adults and social workers, specifically simulated interviews between social workers with over 20 years of experience and older individuals with dementia. Prior to the recording, social workers were instructed to conduct a needs assessment to understand the living environment and needs of the older adults. The Mini-Mental State Examination score (Folstein et al., 1983) of a woman with dementia in her 80s was 12. The presentation included a recorded simulated interview lasting approximately 30 minutes, during which interaction analysis was applied to one of the areas of conflict believed to be caused by the symptoms of dementia. **Results and Discussion** In the case study, the analysis focused on the issues faced by the older person in responding to questions from the social worker. Older adults do not address the difficulties and respond; rather, the social worker changes the format of the questions and adjusts them to one that older adults can respond to. This type of question format change in response difficulties has also been observed in general adult conversations. The unique aspect about the case study is that when we specifically observe the way in which the social worker makes the change, it was revealed that they follow procedures that do not attribute the cause of the problems encountered to the older person's dementia. In other words, it can be said that the social worker performs their professional practice based on the principle of personalization (Biestek, 1957), that is, they do not regard the illness and treat the older person as an individual rather than as a "person with dementia." As described above, when conversing with an older person with dementia, it is necessary to respond appropriately to problems based on the type of activity to which the conversation belongs and the role of the conversation partner. The findings of the interaction analysis, which specifically clarify the structure of conversations with older people with dementia, will be useful in considering what role should be assigned to which activity within that activity, depending on the robot's communication ability.

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Challenges in family support systems for older adult individuals living alone using communication robots

M. Furukawa

Purpose The objective of this study was to identify the issues and concerns faced by families in relation to the use of communication robots. One potential solution to alleviating social isolation and loneliness among older people is the use of communication robots in the home. Families with older adult living alone have expressed interest in using these communication robots to alleviate the loneliness experienced by older adult. However, some older adults have difficulty using communication robots due to technical unfamiliarity or physical limitations. Previous research has demonstrated the efficacy of a user-centered design approach in addressing these challenges. Specific strategies to address these issues include improving access to technology, designing user-centered interfaces, and establishing psychological and emotional support systems to reduce anxiety among older adults. Support for communication robots is primarily provided by manufacturers through telephone and online channels. However, for some older adult it is challenging to contact the manufacturer's support center independently, necessitating the involvement of family members. The provision of individual support to an elderly person living alone by family members may increase the financial, physical, and psychological burden on the elderly person. It is therefore of great importance, especially for remote family members supporting elderly relatives who use communication robots, to ensure that the burden on the family is not increased. **Method** In this study, semi-structured online interviews of approximately 60 minutes per one-to-one session were conducted with family members of an elderly person living alone who had introduced a communication robot. The objective of the interviews was to elucidate the relationship between the older person and the family, the duration of use of the robot and the reasons and motivations for using the robot. In addition, participants were asked to discuss freely the challenges faced by the older person themselves when using the communication robot, as well as their own experiences of supporting the communication robot. The interviews were recorded, transcribed in full and analyzed qualitatively and inductively using MAXQDA analysis software. **Results and Discussion** The results of the study indicated that the older participants exhibited more positive attitudes towards the communication robot and engaged in more conversations. Loneliness was reduced, and family members experienced relief. However, attachment to the robot led to a refusal to evacuate in the event of a disaster or other emergency, causing significant anxiety for the family. Technical problems, such as internet connectivity issues, meant that distant family members had to visit the elderly person's home frequently. It is of the utmost importance to provide emergency response and technical support to reduce the burden on families.

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