Assistive Technologies for People with Dementia: Personal Review

Kiyoshi Yasuda, Speech & Language therapist   Aug. 6. 2020

Osaka Institute of Technology / Kyoto Prefectural University of Medicine / Saiga Clinic

Chapter 8 Therapy for Communication and ICT

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8.1 Dementia and Communication

The traditional term ''communication'' is used for exchange of information between people and exchange of information between a user and a system (Borg, Lantz, & Gulliksen, 2004). Conversation is a very high-level cognitive activity and involves large brain areas, language understanding, language production, and so on. It is believed that keeping engaging in conversation can activate brain activities. (Huang, Matsushita, & Yasuda, 2014).

The first symptoms of dementia are typically word-finding problems, comprehension deficits for abstract and complex conversation, and short-term memory problems that often interfere with conversational interactions (Bourgeois et al., 2010). As the disease progresses, these memory deficits intensify and create related problems such as repetitive questions and limited verbal output, characterized as "empty speech." Over time spoken output is further eroded to echolalic, perseverative, and paraphasic speech, then to incoherent vocalizations, and finally to mutism. Areas of preserved ability-such as reading, writing, and pragmatic skills that remain functional until the later stages of the disease (Bourgeois et al., 2010).

A clinician assesses the communication environment and identifies barriers and facilitators that interact with a client's communication needs and abilities (Beukelman &Mirenda, 2005). Instead of expecting the client to recall personal information when presented with minimal verbal cues, the clinician might expect the client to read aloud personal information and point to the correct photograph when presented with a memory book with sentence-length captions (Bourgeois et al., 2010).

Communication, especially verbal conversation, is an easy, common, and enjoyable activity for most of us. Dementia sufferers, however, tend to be alone and poorly informed, with few chances to converse. A simple interface would thus enable individuals with dementia to talk with various partners on the video phone whenever they want (Yasuda, Kuwahara, Kuwabara et al., 2013).

Aphasia is a cognitive disorder, usually acquired as a result of damage to the language centers of the brain due to a stroke, or other brain disease such as dementia. The symptoms generally include disturbances in naming, reading out load and/or comprehension of speech. There are different multidimensional classifications schemes fall into the categories of fluent, non fluent and other aphasias. (Aye, Ito, Hattori et al., 2008).

Applying Technology for people with cognitive Disabilities: For people with aphasia, language deficits can create a

significant barrier to technology use. Difficulty understanding spoken and written language would impede an individual's ability to understand and apply spoken and written instructions (Brandenburg, Worrall, Rodriguez et al., 2013). The review of Borg. Lantz, & Gulliksen (2004) was to identify and synthesize measures for accessibility to electronic communication for people with cognitive disabilities.

People with cognitive disabilities may experience difficulties in electronic communication due to reduced capacity in mental functions, such as orientation, attention, memory, abstraction, organization and planning, experience and management of time, problem solving, language, and calculation. Medium, ATM, cash machine, communication system, cellphone, cloud, computer, digital, electronic communication, electronic device, ICT, information system, information tech, information and communication tech, interface, internet, iPad, iPod, laptop, mediated com, messaging, mobile phone, on-line, pad, palmtop, PC, phone, player, portable, reader, smart card, smartcard, smartphone, SNS, social media, social medium, surf pad, tele-communication, telephone, TV, terminal, text message, texting, ticket machine, ticket purchasing point, vending machine, video, web (Borg. Lantz, & Gulliksen, 2004).

Nevertheless, a small number of high-tech devices have been developed specifically for people with more severe forms of aphasia. The *Talksbac* system, developed with input from people with aphasia and their carers, generated some useful information on features that may maximize usability, which included less information on the screen, removal of prediction algorithms etc. Simple design, a static interface and use of different modes such as symbols/pictures may be important when designing technology for people with aphasia.

PhotoTalk is a mobile app for small mobile computers to assist people with aphasia to independently organize their photographs with the aim of supporting conversation. Participants were able to use the app independently and were using it most days of the month-long study (Brandenburg, Worrall, Rodriguez et al., 2013).

There are also apps which utilize video stimuli, which uses real-life video stimuli. Video stimulus may also be useful as stimulus for verbs, adjectives, sentences and longer stories. A particular advantage of using mobile technology is that there is an opportunity for people with aphasia to use the camera to take their own pictures and videos to create personally relevant and contextualized therapy materials. Behavior tracking **Trackers** are apps used by the client or carer in everyday life to track behaviors. Use of handheld computers for tracking behavior has the advantage of mobility and easy accessibility (Brandenburg, Worrall, Rodriguez et al., 2013).

8.2 Vocabulary Data File (Yasuda, Nemoto, Takenaka et al., 2007)

Regular conversations may significantly reduce the frequency of the behavioral and psychological symptoms of dementia and enhance psychological stability, and this would in turn reduce the burden borne by caregivers (Yasuda, 2007).

Proper names are of practical importance for verbal communication. For instance, they are indispensable for transmission of autobiographical information concerning a person. Proper names are neuro-psychologically and anatomically processed in a manner which differs from the processing of common nouns. Peoples' names in proper names were sufficiently comprehended by globally aphasic patients. Curiously enough, they are the most difficult words even for non-brain damaged people to retrieve. This is because proper names are associated with one person arbitrarily. (Yasuda, Nakamura, & Beckman, 2000).

In order to assist people with aphasia, Yasuda et al. (2007) developed a vocabulary data file *Rakuraku Jiyu Kaiwa* (Easy, Natural Conversation). The patients would like to make daily conversation with their family members, relatives or friends beyond their basic needs and wants. Enjoying conversation itself would be a basic requirements or necessary condition of anyone's happiness to maintain their QOL. In this system, called "Rakuraku Jiyu Kaiwa", the topic list taken from the vocabulary file is shown on a PC monitor. By pointing at the word on a PC monitor, aphasic patients enjoy daily communication with their partners.

Vocabulary data file, named Rakuraku Jiyu Kaiwa contains approximately 50,000 words, of which 70% are proper names. These words have been collected from catalogues, magazines, newspapers, etc., and can function as keywords in conversations. Most words are written in kanji letters. Words are displayed using a 20-point font to make them more easily readable to older people

without glasses.

A typical scenario of the system goes like this: A person with aphasia and his or her communication partner sit in front of a PC. First, they decide on a topic of a conversation, for example, "Sports". The partner clicks the category "Sports" on the first level page, and then a list of keywords of various sport names appear on the screen such as "Baseball", "Soccer", "Tennis" and "Judo". If the person points the word "Baseball" that he/she likes, the partner clicks on this word to make the names of baseball team appear. If the person points at the "Boston Red Sox" from the third level page, the partner opens that page to display the names of players of this team. The partner asks the aphasic's favorite or most interesting player's name. If the person points to "Daisuke Matsuzaka", the partner might complete the conversation by saying "he is a famous baseball player in Japan". In this way, a conversation continues until it reaches the lowest level of category (Aye, Ito, Hattori, Kuwabara, & Yasuda, 2008).

More words have been continually added to the vocabulary books (Yasuda & Nakamura, 1998) since the first edition. To simplify the process, the books were converted into HTML files and published on the Internet in 2003 as a vocabulary data file. In order to collaboratively use, the vocabulary data file, the encyclopedia, and the homepages are includedas a conversation-support system.

In this study Yasuda et al tried to establish which, if any, resource is most effective in eliciting information within a reasonably limited timeframe. The results demonstrated that only the data file succeeded in eliciting more information from participants, as indicated by the increase in the number of points with convinced marks in the use condition when compared with the non-use condition. The increased points were gained mostly by participants pointing to proper names. This increase was not observed in the other two resources.

By incorporating proper names into the data file, the range of conversational topics has been widely extended. For example, the names of favorite musicians, painters, movies, cars, towns, or restaurants can be conveyed to partners. These kinds of topics have not been considered conversation themes in traditional AAC systems. Hence, it was difficult to talk about these kinds of themes in using the traditional AAC systems. To our knowledge, our vocabulary data file is the first AAC system in which proper names are exploited to such an extent for communication with moderate-to-severe aphasia people.

However, the encyclopedias and homepages have their own specific merits. The range of their topics is very wide. Moreover, the quantity of information is enormous and continually expanding. They are often useful for talking about specific or professional topics. Furthermore, the encyclopedia and homepages have enormous archives of auditory and visual images. These images may facilitate conversation with people with profound aphasia (Elman, 2001), who are unable to comprehend even words or proper names

Progress of Vocabulary Data File: Aye, Ito, Hattori et al., (2008) have extended the concept of vocabulary data file Rakuraku Jiyu Kaiwa to facilitate remote conversation over the network. They presented the overall framework of remote conversation support for people with aphasia along with preliminary experimental results. In this system, they created a topic list based on the categories that would be included in conversation. The same topic list is displayed on both PC monitors. The word/icon that is currently being talked about is highlighted on the list of both displays.

To solve the problem of insufficient topic words in the Rakuraku Jiyu Kaiwa, Yamane, Ishida, Hattori et al., (2010) used the Japanese version of Wikipedia. The freshness of its information is another merit, because they are constantly edited and updated. Articles can be retrieved not only by keyword search but also by navigating categories. Each category has a number of subcategories and links to articles that belong in that category.

Using *WikIE*, the Wikipedia data analyzing tool, all category names and the titles of all articles are extracted as topic word candidates. Parent and child relationships between category names and between category names and article titles are also extracted. For each category, its subcategories are listed on the left and article titles that belong to the category are listed on the right. About 1,030,000 words were extracted. The proposed method not only resolved the problem of insufficient topic words but also the rigid structure of Raku-raku Jiyu Kaiwa's topic lists. Experimental results show that with the proposed tools, people with language

disorders can enjoy conversations. Moreover, the proposed methods eliminated the requirement to make and maintain topic lists by volunteers.

Kuwabara, Hayashi, Uesato et al., (2009) have constructed an initial prototype using Skype for video chat and the RemoteX plug-in for screen sharing over a network. Homan, Morita, Yamaguchi et al., (2012) described the construction of a topic database for conversation support for people with cognitive handicaps. Kuwabara (2012) proposed an agent-based approach to customizing a remote conversation support system for cognitively handicapped people. The system of Morita, Kuwabara (2014) is built from 'gadgets', each of which implements a particular conversation support function. Since the need for conversation support varies from person to person, such a system needs to be customized to suit the requirements of multiple users who conduct the conversation. The proposed approach introduces a user agent that corresponds to a human user.

8.3 Conversation Advantage of Videophone

Boman, Lundberg, Starkhammar et al., (2014) argued that being able to use the telephone can be very important for many purposes such as maintaining social networks, getting stimulation, and for reaching help when needed. Persons with dementia might not only have difficulty handling an ordinary telephone; they might also have difficulty visualising the person they wish to talk to when she or he is not present as well as to hear, interpret, and understand what is said in the conversation. Moreover, talking on the telephone might be experienced as an abstract action that makes it difficult to relate to the person spoken to. Therefore, a videophone might be an appropriate communication tool for persons with dementia to help them demonstrate their ideas and to understand what is said in a conversation with gestures, signs and body language, and to feel safe and secure while they interpret the other person's message.

Videophone is considered as one of the best assistive communication tool for these people since video communication is not only a tool to break an isolation caused by the disease, but also a powerful way to help people demonstrate their ideas and understand what is said in a conversation with pictures, signs and body language (Wan, 2010).

One of the most important interventions in the networked interaction therapy is to provide them with talking partners on the Internet, such as friends, partners, and family members living in remote locations. A simple interface would thus enable individuals with dementia to talk with partners on the video phone whenever they want. However, there were no studies on how long and how eagerly individuals with dementia could talk with a partner on the video phone, in comparison with the face to face settings. Yasuda et al. (2006) have conducted an experiment in which nine individuals with dementia talked with a partner on a video phone and in a face-to-face session. The results revealed that there was no difference in the total response time and in the eagerness observed between the two sessions. This suggested that the video phone talking could potentially have the same effects as face-to-face talking (Yasuda et al., 2006).

One caregiver-patient dyad received the educational material face-to-face, the other received it via videophone. Both were equally satisfied. Curiously, the investigators noticed an increase in the number of verbal interactions between hospice staff and caregivers in the dyad when a videophone was used. In another study, how useful videophones were compared in delivering psychoeducational material with face-to-face sessions. No differences were found between face-to-face and videophone results when 24 geriatric patients were evaluated using the Geriatric Depression Scale and Hamilton Depression Rating Scale. Videophones have also been used successfully to provide access and "virtual visits" to nursing home residents from distant family members in an effort to prevent isolation and depression. This visual access provided enough "social presence" to allow family members to "visit" with a nursing home resident and alleviate some of the isolation these residents often experience (Nieves, Briscoe, Edwards et al., 2015).

Applying Videophone for Generic Use: Nakamura, Takano et al., (1999) installed Integrated Services Digital Network (ISDN) in individual homes of clients and service providers. An intervention group of home healthcare cases were provided with

videophones, and it was compared to a control group of regular healthcare cases. The effectiveness of the videophones in home healthcare service was found to be significant. This evidence supports the use of videophones in home healthcare to improve the quality of service.

Problem-solving therapy (PST) has been found effective when delivered to informal caregivers of patients with various conditions. The purpose of Demiris, Oliver, Wittenberg-Lyles et al., (2012) was to compare the effectiveness of a PST intervention delivered face-to-face with one delivered via videophone to hospice primary caregivers. PST delivered via video was not inferior to face-to-face delivery. Caregiver quality of life improved and state anxiety decreased under both conditions. The delivery of PST via videophone was not inferior to face-to-face. Audio-visual feedback captured by technology may be sufficient, providing a solution to the geographic barriers that often inhibit the delivery of these types of interventions to older adults in hospice.

The innovation project was conducted in two new apartment buildings for older persons (Goumans, Bussmann, Hupkens et al., 2012). In all apartments the videophone is standard equipment. The independently living older persons did not accept the videophone. The older persons, who were mostly active, did express that at this moment in their life they did not see the value of an extra opportunity for communication to relatives or a care giver. The research will come up with concrete recommendations for improvements in the implementation and valuing process of ICT in home settings.

The delivery of mental health care via electronic devices-also called telemental health has gradually become an established alternative to improve access to mental health services. Telemental health services routinely include psychotherapy, psychological testing, medication management, and evaluations. Videophones could serve as an adjunctive means to mental health services for special populations, such as the severely mentally ill or those living in rural areas. In another study, dignity psychotherapy was delivered via videophone to terminally ill patients in an effort to prevent depression (Nieves, Briscoe, Edwards et al., 2015).

Videophones are an ideal telehealth alternative for delivering patient-center care. They are affordable, portable, and durable and can be used to provide an array of adjunct care services to patients with barriers to treatment-whether geographical, functional, or otherwise. Video conferencing equipment, on the other hand, is more expensive, requires dedicated space, and is not mobile; also, it requires technical support and incurs infrastructure expenses (Nieves, Briscoe, Edwards et al., 2015).

Users found it helped them deal with feelings of isolation, family members were able to assess their well-being using visual clues as well as spoken words and carers felt the system aided them in their daily role and reduced their stress levels. Despite the fact that the project has now ended, some users continue to use the system and it is interesting to note that video telephony appears to continue to be considered a key element of AT/ tele health (Bonner & Idris, 2012).

Videophone Conversation for people with Dementia: *Televisits* contact between elderly people living in a nursing home and their family via a videophone was demonstrated to promote social contact. In a similar study, Sävenstedt et al. (2003) showed that a videophone as a means of communication between patient and family reduced feelings of guilt in family members, allowed more frequent visits than was possible with face-to-face visits and let family members see the physical and emotional state of the patient on a daily basis. In some cases, the conversations were more focused and of better quality than during face-to-face visits.

In most cases, however, more emphasis was placed on the family member to direct and lead the conversations which was seen by many as demanding. The relationship between staff and family members improved as a side effect of staff helping the patient use the videophone. Two studies showed that by using videophone technology, the quantity and quality of conversations between the person with dementia and others would be enhanced (Lauriks et al., 2010).

Newcastle Social Services Video conferencing was a core driver for another innovative initiative implemented, known as *Connect for Care*. Essentially, they harnessed the power of video telephony to help those with dementia of age 75 upwards to connect with relatives, carers and friends. The basic hardware was a touch-screen PC with a simplified software menu to explain the technology and to encourage use (Bonner & Idris, 2012).

A broader use of videophone for people with dementia, their family and professional carers is reported in an earlier study (Lee et al., 2000). They utilized the video phone for assessment, diagnosis, counselling and staff education etc. The education provided

through the videophone was over traditional face-to-face education and the interactions between clinicians and patients were well accepted by their patients. The results of assessment of their severity of dementia obtained via the videophone link and from resident specialist were identical. A neuropsychological tests via video phone technology and traditional face-to-face methods was also administered and highly similar test scores were obtained for persons with MCI and mild- moderate Alzheimer's disease (Cullum, Weiner, Gehrmann et al., 2006).

Wan （2010）designed a graphical user interface (GUI) for an easy-to-use videophone for people with mild dementia. The videophone should be introduced in an early stage of the disease, and should be introduced as a product which is a pleasure to use (Boman, Nygård, & Rosenberg, 2013).

As for the daily assistance by the video phone, Smith, Lunde, Hathaway et al., (2007), and Wade, Izzo, & Hamlyn (2008) assessed the delivering daily medication management by videophone for elderly clients with dementia and other clients. The medication management was delivered safely, and the service was time and cost-efficient compared to a home visit by a field nurse (Wade, Izzo, & Hamlyn, 2008).

A total 12 cognitive intervention sessions such as attention, memory, calculation and language were conducted over six weeks via either videophone or face-to-face (Poon, et al., 2005). Both groups improved significantly in most of areas. Most of the videophone group members were satisfied with the system. Elderly adults including three patients with dementia increased the number of words by videophone conversation (Mochizuki-Kawai, Tanaka, Suzukji et al., 2008). The effect of videophone communication between patients with dementia, their cares, and nurses were clarified (Hori, Kubota, Kinoshita, 2008; Hori, Kubota, Ando et al., 2009). For a period of several weeks, a patient-caregiver pair communicated with a nurse via computer for 30 minutes once a week. The result showed a significant improvement in hours of sleeping, signs of improvement on an neuropsychological test (Kubota, Ando, Kihara et al., 2009; Hori, Furuya, Kubota et al.,2011. Demiris, Oliver, Wittenberg-Lyles et al., (2012) compared the effectiveness of a problem-solving therapy intervention delivered face-to-face with one delivered via videophone to hospice primary caregivers. These literatures suggest that videophone conversation is a feasible and acceptable means of providing cognitive support to older people with dementia.

The purpose of Wade, Izzo, & Hamlyn (2008) was to assess the practicality, suitability, safety and cost-effectiveness of delivering daily medication management by videophone. Over a period of 6 months, 9 clients had broadband and IP Videophones installed in their homes. Clients with mild to moderate cognitive impairment, multiple medical problems and who lived alone were able to use the service. The clients and Call Centre staff viewed the videophone service positively, medication management was delivered safely, and the service was time and cost-efficient compared to a home visit by a field nurse.

Videoconferencing (VC) based diagnostic interviewing has shown good agreement with conventional face-to-face diagnosis of dementia in several investigations, but extension of this technology to neurocognitive assessment has received little attention. To this end, Cullum, Weiner, Gehrmann et al., (2006) administered a brief battery of common neuropsychological tests via VC technology and traditional face-to-face methods to 14 older persons with mild cognitive impairment (MCI) and 19 persons with mild to moderate Alzheimer's disease (AD). Highly similar test scores were obtained when participants were tested in-person or via VC. Telecognitive assessment appears to be a valid means to conduct neuropsychological evaluation of older adults with cognitive impairment.

One article reports that users with mild-to-moderate Alzheimer's disease were able to follow instructions and respond to Yes/No questions by an avatar on a TV. The avatar had a realistic voice and its lip movements were synchronized with its speech (Borg, Lantz, & Gulliksen, 2004).

Remote Reminiscence Conversation Experiment 1 (Kuwahara, Yasuda, Abe eta al., 2006): In this study, they intended to evaluate the effectiveness of a networked reminiscence session. The senior care-home company provided two of its care facilities for this experiment and recruited dementia sufferers living in each facility as subjects. The severity of subjects' dementia ranged from mild to severe. Seven subjects (all female) and six talking volunteers (two male and four female) took part in this experiment.

During the first few weeks, volunteers conducted face-to-face reminiscence sessions and selected photos to be used in networked reminiscence sessions. Selected photos were stored in the Community Platform and were used to produce reminiscence videos that were also used in this experiment. The results indicate that even for the subject with very severe dementia, the networked reminiscence session served in a way comparable to the face-to-face reminiscence session. "Field Trial of Networked Reminiscence Therapy," networked reminiscence therapy seems to work well even for people with very severe dementia.

Remote Reminiscence Conversation Experiment 2 (Kuwahara, Yasuda, Tetsutani et al., 2010). Kuwahara et al. (2004) focused on the effect of reminiscence therapy to provide such communicative intervention as talking on video phones, offering private reminiscence contents, and managing daily schedules by TV monitors. Based on this concept, they developed reminiscence systems that consist of reminiscence video and remote reminiscence conversation systems to calm individuals with dementia and to relieve the burden of family caregivers.

The researches discussed so far suggest that a combination of video phone and reminiscence interventions would be effective for psychological stability. Kuwahara et al. (2007) created a system to incorporate video phone and reminiscence photo sharing and conducted an experiment of this system's effectiveness in an institution for senior citizens.

There have been no reports about using video phones to assist individuals with dementia living at home. They conducted experiments to evaluate the above remote reminiscence conversation and schedule prompter systems. Compared to our previous experiments in care homes, this field experiment's technical and social aspects were much more challenging. Finding family caregivers to participate in our field experiment was especially difficult. Few such families used PCs with broadband connections; they also hesitated to buy PCs and subscribe to the Internet. Therefore, during the experiment we rented PCs or Internet connections for family caregivers who didn't have them so they could participate in the field experiment.

Remote reminiscence conversation system: Remote reminiscence conversation was effective for Subjects 2 and 4 in terms of psychological stability. Since Subject 4 sometime became anxious in the evening, remote conversation in the evening stabilized her and provided a break for her caregiver. Our system might prevent such syndromes as wandering in the evening, agitation, etc. Furthermore, Subject 4 was even stable three hours after the conversation. This may be the most valuable finding of this experiment and for future research. Since Subject 4's family caregiver had its own PC and Internet connection, she wanted to continue the remote reminiscence talk after the field experiment. It has continued for more than a year, and the above effectiveness is still being achieved. For Subject 1, there was no difference in psychological stability between watching TV and remote conversation. Her dementia was mild, so she could still enjoy ordinary TV programs. This might explain why there was no difference in the psychological stability. According to Subject 3's daughter, her skeptical attitude continued. She wondered why a "stranger" was asking personal questions.

Remote Reminiscence Conversation Experiment 3 (Yasuda, Kuwahara, Kuwabara et al., 2013): A remote reminiscence conversation system was created that incorporates a video phone with reminiscence photo sharing. This system was activated remotely by a conversation partner and in terms of psychological stability, it was effective for individuals living at home. Interestingly, one patient remained stable for more than 3 h after the conversation session ended. This sustained psychological effect of conversation had not been reported previously. If this effect is confirmed in other patients, remote conversation in advance may prevent behavioral disturbances from arising.

The results of this experiment revealed that remote conversation was effective in one out of four subjects. The mean psychological stability of subject 3, as evaluated using the GBS scale, was more explicit while conversing remotely than while watching TV programs. According to the caregiver, she had difficulty in watching TV programs and often exhibited restless behavior in the evening. However, she seemed to enjoy the remote conversation with the partner, leading to dramatic increases in psychological stability. Furthermore, the increased stability of subject 3 was statistically significant in the delayed evaluation, which was performed 3 h after the remote conversation ended.

Sustained psychological effects of music and video biographies in individuals with dementia have been reported.

Communicating with a partner may have reduced the stress of subject 3, and this stress-reduced state may have persisted for 3 h. This result agrees with the hypotheses that behavioral disturbances arise from a lack of social contact[3] and that reminiscence interventions decrease these disturbances.

Although subject 3 was the second case to exhibit this phenomenon, it is suggested that the conversation itself has the potential to prevent individuals with dementia from showing anticipated behavioral disturbances such as "evening syndrome." However, it is very difficult for individuals with dementia to engage in frequent and regular face-to-face conversations. In contrast, remote conversation with volunteers via video phone may be easier. This stability may ease the burden of the caregiver.

The caregivers of subjects 1 and 2 observed that they enjoyed talking with the partner. They also enjoyed watching TV programs, which explains why remote conversation had no significant effect on their psychological stability. Regarding the effectiveness of this system, further studies should focus on subjects who exhibit restless behaviors but are able to enjoy the conversation.

Remote Reminiscence Conversation Experiment 4 (Yasuda, Kuwahara, Kuwabara et al., 2019): A remote reminiscence conversation system was created to provide opportunities for individuals with dementia (Kuwahara et al., 2010, Yasuda et al., 2013). This system incorporates a videophone with reminiscence photo sharing enabling individuals with dementia to remain stable during and after conversing with talking partners. Furthermore, it was very interesting to note that some individuals were even stable for more than 3 h after the conversation session ended. This sustained psychological effect of conversation has not been reported. As the third experiment, they investigated whether psychological stability was again observed in other individuals while conversing with talking partners on the videophone than while watching TV programs. In this experiment, the remote photo sharing on the screen was not performed in order to understand the single effect of conversation.

Methods: Six outpatients with dementia participated in this experiment. Their mean age was 75.8. Their mean MMSE score was 22.1. Furthermore, three males and three females of the same ages participated as talking partners. ABAB design was applied to investigate the effects of the conversation. In session A, the talking partner remotely booted Skype[TM] on the individual's computer (videophone) and asked the individual to have a 30–40 min conversation. In session B, the individuals were requested to watch their favourite TV programs. The total period of sessions A and B lasted for two or three weeks. The talking partner for each individual was same in this period.

The 'different symptoms common in dementia' section of the Gottfries-Brane-Steen (GBS) scale was used to evaluate psychological stability while they were talking with the partner or while they were watching TV programs (concomitant evaluation). The caregiver graded the psychological stability on the GBS scale of 0–6 every day in sessions A and B. The overall psychological stability was also evaluated 3 h after each session (delayed evaluation). These scales were converted to the corresponding scores.

Results: The average A score (conversing on the videophone) of the GBS scale was 0.6 in the concomitant evaluation and 0.42 in the delayed evaluation. The average B score (watching TV) was 0.93 and 0.86, respectively. In this scale, lower scores denote more psychological stability.

Discussion: In both evaluations, individuals with dementia demonstrated more psychological stability while they were conversing on the video phone than while watching the TV programs. The stability was more apparent 3 h after the conversation ended, supporting our previous two experiments. Sufficient conversations in advance may prevent behavioural disturbances, such as evening syndromes. Remote conversation is a promising intervention for assisting individuals with dementia and for reducing caregivers' burden in their daily lives.

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