



Eating Behavior and Environments of Severe Alzheimer's Disease Patients With Loss of Language Skills

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Abstract

Background: As Alzheimer's disease (AD) progresses, AD patients become more and more dependent on the environment. To prevent the patients from being distracted from eating, it is necessary to pay attention to the environment. **Purpose:** Five severe AD patients with loss of language skills were observed closely to identify the environments that interfered with their eating behaviors and environments that encouraged them to eat. **Methods:** The author, a certified care worker, recorded the behaviors of five severe AD patients while providing care for the overall aspects of their daily lives. From these records, the author extracted the situations in which the subjects exhibited self-eating behavior and situations in which they were distracted from eating, and organized the meanings of these environments for the subjects. **Results:** Eating behavior was interrupted: (1) when staff members started conversations nearby a subject, or when a caregiver attempted to stop a subject's behavior in order to get her to eat; (2) by physical environmental changes, such as phone ringing and reflection of artificial light on their table. **Conclusion:** By organizing the meanings of the environments surrounding each individual, we can identify the environments that encourage a patient to start eating and environments that interfere with a patient's eating behavior.

Keywords

Alzheimer's disease, environment, eating, language, caregivers

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Introduction

As Alzheimer's disease (AD) progresses, eating behavior disorders begin to appear, such as difficulty in starting to eat, becoming distracted while eating, inability to use chopsticks and spoons properly, eating with the hands, grabbing other people's food, and taking too long to eat (Ahmed et al., 2014; Ikeda et al., 2002; Shinagawa et al., 2009). For such patients, assistance with eating is necessary. Eda-hiro et al. (2012) has noted that this loss of independence in eating results in decreased food intake, potentially leading to complications such as malnutrition, dehydration, decreased immune functions, aspiration pneumonia, and increased mortality (Easterling & Robbins, 2008). They conducted logistic regression analyses to identify factors related to the loss of independence in eating in 150 AD patients, which identified difficulty in starting to eat (OR=14.498), signs of dysphagia (OR=5.214), and severity of dementia (OR=4.538) as factors that were significantly related to the loss of independence in eating (Eda-hiro et al., 2012). Based on these findings, Eda-hiro et al. (2012) emphasized

the need for eliminating environmental factors that interfere with starting of a meal and for providing assistance to encourage the patients to start a meal in order to promote independence of eating in AD patients.

Individuals with AD lose their sense of self, which is the subject of consciousness and actions. As a result, they become more susceptible to extraneous influences, that is, become more dependent on environmental cues. Therefore, to promote independence of eating in AD patients, it is necessary to focus on the environment surrounding AD patients, as proposed by Eda-hiro et al. (2012).

Environmental interventional studies have been conducted, aimed at improving the food and fluid intake behaviors of AD patients with disorders of eating behavior (Charras & Frémontier, 2010; Dunne et al., 2004;

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McDaniel et al., 2001). Based on a search of previous literature to the best of our ability, we could identify no studies that were focused on identifying the environments that interfered with the start of eating behavior or environments that encouraged self-eating behavior in AD subjects, for the purpose of maintaining independence in the eating behaviors of these subjects.

The ecological psychologist Gibson (2015) who studied behaviors from the interactions between the human beings and the environment, coined the term, "affordance," on the basis of the verb "afford," which means to provide, in order to describe what the environment prepares for and provides to human beings, whether it is good or bad. According to Gibson (2015), the environment includes, among its contents, things that human beings can do. Unlike other animals, humans are biological, psychological, and social beings. For humans, eating is an individual behavior. Therefore, to identify the types of environments that prepare a human to exhibit eating behavior, it is necessary to observe the eating situations of individuals.

The objective of this study was to organize the meanings of the environments that influenced the eating behaviors of five participants with severe AD and identify the environments that interfered with/encouraged the eating behaviors. Toward this objective, from the records of observation of the eating situations of the participants, the author extracted the situations in which the participants exhibited self-eating behavior and situations in which they were distracted from eating. The findings are expected to help in identifying what considerations need to be given to individual patients by their caregivers to elicit appropriate eating behaviors and maintain independence in eating behaviors in participants with severe AD.

Participants

The study participants were five patients with severe AD with loss of language skills who were living in the same nursing facility. The sense of self is a linguistic product (Maruyama, 1984). Therefore, patients who have lost their language skills also lose their sense of self, which is the subject of consciousness and actions. As a result, they become more susceptible to extraneous influences, that is, become more dependent on environmental cues. To clearly show the meaning of the environment, which is the objective of this study, we selected patients with severe AD with loss of language skills as the study participants. The participants were regularly examined by physicians, and did not have consciousness disorders associated with delirium, infectious diseases, electrolyte abnormalities, etc.

Methods

To find something special in routine things of everyday lives of study participants, participant observation, with the researcher going into the field of study in order to organize events in the field from both internal and external perspectives, is said to be effective (Flick, 2018). Aiming to find the meanings that have hitherto remained

unnoticed in the daily living environment of severe AD patients, the study representative, a certified care worker, was involved in the care of AD patients twice weekly from 9 am to 7 pm for 5 months as a participant-observer, and assisted them with the overall aspects of their daily lives, such as eating, dressing, bed bathing, toileting, and bathing. During the first 2 months, no records were kept, so as to allow a rapport to be established with the subjects and staff members. From the third month, the author started to keep various records covering the daily lives of the five subjects in field notes.

The cognitive function was assessed using the Clinical Dementia Rating (CDR) scale (Morris, 1993), and the ability to perform ADL was assessed using the Barthel Index (BI; Mahoney & Barthel, 1965). The CDR and BI were assessed by the person responsible for the care of the five participants in the third month from the start of the behavior recording by the study representative. Their daily living conditions and language skills were assessed based on the observation records made by the study representative.

Table 1 shows the demographic characteristic, dementia severity, daily living conditions, abilities for ADL, and language skills of the five participants. Not only their eating situations, from which the results were to be obtained, but also the daily living conditions and language skills of the participants are described, focusing on concrete events and situations extracted from records of the overall aspects of the daily lives of the participants, so that persons who were not there, that is, the readers, can also understand the conditions of the participants.

Analytical Methods

From the situations in which the participants exhibited self-eating behavior and situations in which they were distracted from eating, which were extracted from the records of the eating situations of the participants, the author organized the meanings of these environments.

Ethical Approval

The study plan was explained orally and in writing to the family of each participant and the facility director, and their written consent was obtained. This study was conducted with the approval of the Research Ethics Committee of University of Kochi and also by the Social Welfare Research Ethics Committee of University of Kochi (Approval number: 19-50).

Results

Ms. A's Eating Situations

On one occasion, when the caregiver got the participant to hold a spoon with the right hand and a bowl of rice porridge with some side dishes placed on top of it in her left hand, she started eating with a spoon. She was eating at a table near the nurse station. When a staff member at the nurse station picked up her ringing phone and started talking, she

Table 1. Daily Living Conditions, Ability for ADLs, and Language Skills of the five Participants.

<p>Ms. A female in her early 90's</p> <p>Severity of dementia: Clinical dementia rating 3 (severe)</p> <p>Daily living conditions and ADLs: She usually spends most of the day time sitting on a chair in the dining room. Sometimes, she gets up and starts walking, but her caregiver stops her from walking because of the risk of falling. She walks to the toilet with assistance. The BI is 0, and she is completely dependent on assistance for her ADL.</p> <p>Language skills: To the greeting "Good morning," she replies "Yes, I'm okay (followed by laughter)." To the greeting in Chinese "Good morning (zao shang hao)," she replies with something that does not make sense, such as "(with laughter) Yes, thank you, go over there."</p> <p>Ms. B female in her early 90's</p> <p>Severity of dementia: Clinical dementia rating 3 (severe)</p> <p>Daily living conditions and ADLs: She lies in bed throughout the morning. After eating lunch in the dining room, she spends the rest of the day sitting on a chair in the dining room. While sitting on the chair, she often holds on to a large cushion that supports her trunk to prevent her from losing balance, and hits the table with both hands while shouting "Oh! Oh!" When staff members and other residents pass in front of her, she swings her arm while shouting "Oh! Oh!" She moves on a wheelchair. Her BI is 0, and she is completely dependent on assistance for her ADL.</p> <p>Language skills: She shouts "Oh! Oh!" when she hits the table and when staff members and other residents pass in front of her. However, in other situations, she does not speak at all.</p> <p>Ms. C female in her late 80's</p> <p>Severity of dementia: Clinical dementia rating 3 (severe)</p> <p>Daily living conditions and ADLs: She usually lies in bed throughout the morning and thereafter spends the rest of the day sitting on a chair with her face down and falling asleep in the corner of the dining room. She moves on a wheelchair. The BI was 0, and she was completely dependent on assistance for her ADL.</p> <p>Language skills: When the caregiver says "Good morning," she turns her face toward the caregiver, without saying anything or exhibiting any form of interactions. She calls out "Ah!" in a loud voice when she is moved into her wheelchair.</p> <p>Ms. D female in her late 80's</p> <p>Severity of dementia: Clinical dementia rating 3 (severe)</p> <p>Daily living conditions and ADLs: She usually spends most of the day sitting on a chair in the dining room. Sometimes, she takes off her jacket and shoes and places them on the table in the dining room. When the caregiver sprays sanitizer on to her hands, she lightly taps her face with her fingers, as if applying a face lotion. She walks to the toilet with assistance. The BI was 0, and she was completely dependent on assistance for her ADL.</p> <p>Language skills: She rarely speaks spontaneously. However, when the caregiver says "Good morning," "Good night," etc., she just repeats the words of the caregiver, saying "Good morning," or "Good night." She never acts in response to what the caregiver asks her to do, such as "Please take off your clothes."</p> <p>Ms. E female in her late 80's</p> <p>Severity of dementia: Clinical dementia rating 3 (severe)</p> <p>Daily living conditions and ADLs: She sometimes wanders, apparently aimlessly. While wandering, she touches other residents' heads, enters other residents' rooms, and pulls out bed sheets. When sitting on a chair in the dining room, she repeatedly tries to pick up the image of light reflected on the table with her right hand and to transfer it to the palm of her left hand, and also tries to scoop a scratch on the wood grain at the edge of the table with a spoon and putting it in a bowl. The BI was 15; she was independent in respect of mobility skills, but was completely dependent on assistance for her other ADL.</p> <p>Language skills: She does not turn her head when her name is called. She never acts in response to what the caregiver asks her to do, such as "Please brush your teeth."</p>
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Note. BI = Barthel Index.

also started speaking, saying “Yes, Yes, I see. . .,” and stopped eating. When the staff member finished the phone conversation, the caregiver again had her hold the spoon with her right hand and the bowl in her left hand. However, this time, she was not willing to eat, and was mixing the rice porridge in the bowl with the spoon. At this moment, two staff members near her started talking to each other. Then, she put the spoon in the bowl, placed the bowl on the table, and sat facing the two staff members. She spoke slightly *rhythmically*, saying “Oh, I see. Then, the person. . .,” while clapping her hands. Then, the caregiver tried to get her to hold the spoon and bowl with her hands, but she refused to hold them. On another occasion, when the caregiver tried to feed her, she was about to touch the tip of the spoon. Therefore, the caregiver stopped her from doing that in order to get her to eat her meal. When the caregiver held her hand so as to get her to hold the spoon, she angrily retorted in a sneering voice, “Oh, you should take it,” and shook off the hand of the caregiver.

Ms. B’s Eating Situations

On one occasion, when the caregiver got the participant to hold a spoon with her right hand and plate in her left hand, she started eating the food on the plate with a spoon. She was eating at the same table near the nurse station where Ms. A was sitting. When two staff members standing in the nurse station started talking, she started to clap her hands while still holding the spoon in her right hand, and thereafter she switched, unnoticed, the spoon to her left hand. Although the conversation between the two staff members standing nearby ended in a few minutes, she kept holding the spoon in her left hand, and would not resume eating. After a while, the caregiver got her to hold the spoon with her right hand and plate in her left hand, and she started eating again. Then, Ms. A, who was sitting in front of her, pulled her apron. As a result, she stopped eating again and pulled off her apron toward herself. With the apron, she began to wrap the plate and spoon that she was holding in her hands.

Ms. C’s Eating Situations

On one occasion, the caregiver put a spoon in a cup containing jelly and placed the cup in front of her. The spoon was on the left side of the cup for her. She reached out to the spoon with her left hand, grasped it, tried to scoop the jelly without success, and brought the empty spoon into her mouth several times. Then, she put the spoon back into the cup, grasped the handle of the cup with her left hand and tried to drink. At that moment, the spoon fell onto the apron. Then, as she began to touch the apron with her right hand, the spoon fell to the floor. She did not try to pick up the spoon, but kept touching the apron. Even during this time, her left hand kept holding the cup. On another occasion, when the caregiver got her to hold a spoon in her right hand and to grasp the handle of the cup with her left hand, she began to eat the jelly by scooping it out with the spoon.

Ms. D’s Eating Situations

On an occasion, she stood up and started wiping the image of light reflected on the table with both her hands. When the caregiver brought her a meal on a tray, she pushed the tray away and continued to wipe the table. Nearby, two residents were having a conversation about having to go home while walking, and the caregiver was in a hurry to guide these two residents to the dining room. At this time, another caregiver came to her and got her to hold her chopsticks; she ate two or three bites of the food, and then she began to exchange the plates with the side dishes. Then, she took a wet hand towel lying in front of her and wrapped the pasta served as dinner with the towel. After a while, another caregiver wiped her hands and got her to hold her chopsticks in her right hand and bowl in her left. Then, she began to eat slowly.

Ms. E’s Eating Situations

On one occasion, she was trying to pick the image of light reflected on the table with her right hand and transfer it to the palm of her left hand. When the caregiver placed her meal on a tray in front of her, she tried to grab the food by hand. The caregiver moved the tray out of her reach, hung an apron around her neck and pulled the apron under the tray, in order to make her ready to eat. She stopped picking up the image of the light reflection with her hand, but then started touching her apron continuously. Although the caregiver tried to feed her, she would not open her mouth. After a while, another caregiver came to her and pulled the apron from underneath the tray and let it hang over her lap. Then, the caregiver got her to hold her chopsticks with her right hand and bowl in her left hand, and she started eating herself. On another occasion, she grasped the body (not the handle) of the cup containing tea with her left hand, covered the top of the cup using the entire palm of her right hand, and started to turn the palm as if she were opening a screw-top lid of a bottle. Some of the tea spilled. At that moment, the caregiver came and got her to grasp the handle of the cup with her left hand. Then, she put her mouth close to the cup and drank the tea.

Eating Situations That Were Favorable and Unfavorable for Self-Eating Behavior of Individual Participants, and the Meaning of the Environment for Each Participant

Based on the eating situations described above, for the situations in which the participants exhibited self-eating behavior and situations in which they were distracted from eating, the author organized the environments in which each participant exhibited a particular eating behavior, as well as the meanings of these environments (table 2).

Table 2. Eating Situations that were Favorable and Unfavorable for Self-Eating Behavior of Individual Participants, and the Meaning of the Environment for each Participant.

Ms. A.

Eating situations that were favorable and unfavorable for self-eating behavior of individual participants	Meaning of the environment for each participant
Holding a spoon with her right hand and a bowl in her left hand	Prepared the action of self-eating by scooping the food with the spoon.
Phone ringing and conversation on the phone	Prepared disruptive speech, discontinued eating, and the disruptive action of mixing the rice porridge and soup in the bowl.
Conversations of others nearby	Prepared discontinuation of eating and disruptive speech with hand clapping.
Getting her to eat by stopping her behavior	Prepared the feeling of anger and the action of shaking off the hand of the caregiver.

Ms. B.

Eating situations that were favorable and unfavorable for self-eating behavior of individual participants	Meaning of the environment for each participant
Holding a spoon with her right hand and a bowl in her left hand	Prepared the action of self-eating by scooping the food with the spoon.
Nearby conversation of others	Prepared discontinuation of eating, avoided resumption of eating, and the disruptive action of hand clapping.
Her action of taking off the apron which was pulled by another person	Prepared the disruptive action of wrapping the plate and spoon with the apron.

Ms. C.

Eating situations that were favorable and unfavorable for self-eating behavior of individual participants	Meaning of the environment for each participant
Spoon placed on the left side in the cup	Prepared the action of reaching the spoon with her left hand, grasping it, trying to scoop the food from the cup without success, but brought the tip of the spoon into her mouth.
The handle of the cup in front of her	Prepared the action of drinking the food item in the cup by grasping the handle of the cup
Apron which was hung from her neck and fell within her visual field	Prepared the action of continuously touching the apron.
Holding the spoon with her right hand and grasping the handle of the cup in her left hand	Prepared the action of eating the food in the cup by herself.

Ms. D.

Eating situations that were favorable and unfavorable for self-eating behavior of individual participants	Meaning of the environment for each participant
Image of light reflection on the table	Prepared the action of wiping the image of the light reflection on the table with her hands.
Busy surroundings and multiple plates	Prepared the disruptive action of exchanging the plates with the side dishes.
Busy surroundings and a wet hand towel	Prepared the disruptive action of wrapping the food with the hand towel.
Holding chopsticks with her right hand and a bowl in her left hand	Prepared the action of self-eating by using chopsticks.

Ms. E.

Eating situations that were favorable and unfavorable for self-eating behavior of individual participants	Meaning of the environment for each participant
Image of light reflection on the table	Prepared the action of picking up the image of the light reflection on the table with her fingers.
Food in front of her	Prepared the action of picking up the food with her hands.
Apron which was hung from her neck and fell within her visual field	Prepared the action of continuously touching the apron.
Holding chopsticks with her right hand and a bowl in her left hand	Prepared the action of self-eating by using chopsticks.
The body of the cup	Prepared the action of covering the cup with the palm of the hand and turning the palm as if she were opening a screw-top lid of a bottle.
Grasping the handle of the cup with her left hand	Prepared the action of drinking the liquid from the cup.

Discussion

In this study, to identify the environments that interfered with/encouraged the eating behaviors in five patients with severe AD with loss of language skills, the author extracted the situations in which the participants exhibited self-eating behavior and situations in which they were distracted from eating, from the records of observations of the eating situations of individuals, and organized the meanings of the environments.

In all the five participants of this study, holding a spoon or chopsticks in the right hand and a bowl, plate, or cup in the left hand prepared them for showing self-eating behavior. In Ms. C, the handling of the cup in front of her prepared her for the action of drinking the food item in the cup by grasping the handle of the cup. In Ms. E, grasping the handle of the cup with her left hand prepared her for the action of drinking the liquid in the cup. In other words, these environments were conducive to the participants exhibiting eating behavior.

On the other hand, in Ms. A, the phone ringing and conversations on the phone prepared her for disruptive speech, discontinuation of eating, and the disruptive action of mixing the rice porridge and soup in the bowl, the conversations of others nearby prepared her for discontinuation of eating behavior and disruptive speech with hand clapping, and getting her to eat by stopping her behavior prepared her for the feeling of anger and refusal of nursing care. In Ms. B, the conversations of others nearby prepared her for discontinuation of eating behavior, avoidance of resumption of eating behavior and the disruptive action of hand clapping, and her action of taking off the apron when it was pulled by another person prepared her for the disruptive action of wrapping the plate and spoon with the apron. In Ms. C, the spoon placed on the left side in the cup prepared her for the action of scooping the food in the cup without success but bringing the empty spoon into her mouth, and the apron hung from her neck falling within her visual field prepared her for the action of continuously touching the apron. In Ms. D, the image of the light reflection on the table prepared her for the action of wiping the reflection image with hands, the busy surroundings and multiple plates prepared her for the disruptive action of exchanging the plates of the side dishes, and the busy surroundings and the wet hand towel prepared her for the disruptive action of wrapping the food with the hand towel. In Ms. E, the image of the light reflection on the table prepared her for the action of picking up the reflection with her fingers, the food placed in front of her prepared her for the action of picking up the food with the hand, the apron hung from her neck falling within her visual field prepared her for the action of continuously touching the apron, and viewing of the body (other than the handle) of the cup prepared her for the action of covering the cup with the palm of the hand and turning the palm as if she were opening a screw-top lid of a bottle. In other

words, these environments interfered with the eating behavior of the participants.

Motivation is a concept used to explain the situation in which a certain action, including eating behavior, takes place and continues, as well as the direction of the action (Akai & Ando, 2013). The behaviorism psychologist, Hull (1952) who constructed a motivation model from precise experimental data showed that the reaction potential is the product of drive, habit, and incentive ($\text{reaction potential} = \text{drive} \times \text{habit} \times \text{incentive}$), and that drive is undirected energy, incentive is external stimuli, and habit strength is correlated with the frequency of past behavior. In other words, if any of drive, habit, and incentive is 0, no action will occur. Since human beings are not machines, while actions resulting from $\text{drive} \times \text{habit} \times \text{incentive}$ are likely, they may not necessarily occur. In our study, incentive corresponded to the environment in which the behavior of the participant in an eating situation was prepared. It is said that Hull's motivation model does not fit neatly for intellectual curiosity, that is, intrinsic motivation induced by cognitive function, but fits neatly for the behavior related to regular maintenance functions of the body, such as eating, drinking, and sleeping (Akai & Ando, 2013). If the behavior is the product of drive, habit, and incentive, the behavior orients in some direction in the presence of an incentive as long as the drive is not 0. Also, the behavior exhibited after a subject becomes distracted from eating is modified by the participant's habitual behavior. The environment that interfered with eating behavior led Ms. A to make a disruptive speech with hand clapping, Ms. B to start wrapping the plate and spoon with the apron, Ms. C to continually touch her apron, Ms. D to start wrapping the food with the hand towel, and Ms. E to try and pick the reflection of the light on the table with her hand and transfer it somewhere else.

Stating that the environment contains what animals can do, either for good or bad, Gibson (2015) explains what the environment prepares (affordance) as follows. A surface knee-high above the ground affords an individual to sit on it. A long and narrow object of an adequate size and weight affords an individual to swing it around. A hard object of adequate size and weight that can be grasped affords an individual to throw it. In other words, a surface at a level as high as the chest would not afford an individual to sit on it. A spherical object would not afford an individual to swing it around, even if it is of adequate size and weight. A large object that cannot be grasped would not afford an individual to throw it, even if it is of adequate weight and hardness. To sum up, we cannot perform actions that the environment does not prepare us for. The start and interruption of the eating behavior of the study subjects, and the actions that led them in a different direction, away from exhibiting eating behavior, were actually behaviors the environment prepared them for.

The study subjects were severe AD patients with loss of language skills. People who have lost their language

skills cannot use conceptual representations. In other words, both the behavior of starting self-eating by holding a spoon or chopsticks in the right hand and a bowl, cup, or plate in the left hand and the behavior of becoming distracted from eating by wrapping the plate and spoon with the apron took place in the absence of representation of the concepts of the right hand, spoon, chopsticks, left hand, bowl, plate, cup, eating, apron, wrapping, etc. This implies that the behavior of the participants used procedural memory, which is non-declarative memory and does not use conceptual representation. Procedural memory can be retrieved by actions, without words (Squire, 1987). All the five participants started self-eating behavior, when they were made to hold a spoon or chopsticks in the right hand and a bowl, plate, or cup in the left hand. Since procedural memory is the memory of actions stored in chronological order (Cohen & Squire, 1980), the subjects were able to start self-eating behavior by being prepared for starting self-eating behavior. In AD, episodic memory, which is retrieved in consciousness, mediated by words, is impaired from the early stage, but procedural memory, which does not use conceptual representation, is spared, even in severe AD patients who have lost their language skills, as shown by the present results. Recent systematic reviews and meta-analyses have suggested that procedural memory, which is the memory of perceptual-motor skills that can be evaluated based on rotary pursuit tasks and other methods, can be acquired even in patients with Alzheimer's disease (De Wit et al., 2021).

Procedural memory is associated with habitual actions. In other words, if we focus on habitual actions, it is possible that even patients with severe AD with no concept representation skills, can start self-eating behavior, as long as the drive, that is, the energy for taking actions is maintained. Hull (1952) reported that habit strength was correlated with the frequency of past behaviors. For example, assuming that an AD patient aged 85 years old showed the eating behavior of using chopsticks or a spoon for three meals a day (bringing chopsticks or a spoon to the mouth 100 times per meal) for 365 days for 80 years, starting from 2 years of age until 82 years, the patient would have used chopsticks or a spoon properly about $3 \times 100 \times 365 \times 80 = 8,760,000$ times. In other words, the patient ate rice and side dishes with chopsticks and a spoon about 9 million times. This frequency of past behavior reflects the strong memory that the eating behavior of using chopsticks or a spoon has created.

Conclusion

The eating behavior is habitual, and is based on strong procedural memory, which can be retrieved even in severe AD patients. In order to retrieve this memory, it is necessary to organize the meanings of the environment, including the relationship between the patient and the caregiver. This approach would inevitably lead us to identify what

considerations would need to be given to individual patients by their caregivers to elicit self-eating behavior.

Application of This Study

In order to find meanings in the daily living environment that have hitherto remained unnoticed, it is absolutely necessary to have both internal and external perspectives. If a caregiver routinely involved in the care of dementia people organizes the meanings of the environments that prepare the behaviors of the users of the facility from the external perspectives, it will be possible to identify conducive/non-conducive environments that have hitherto remained unnoticed, that is, environments that interfere with or encourage actions for even other ADLs than eating, such as the sit-to-stand movement, transfer, dressing, grooming, toileting, and bathing. The behavioral patterns of individuals with severe AD who have become more dependent on the environment are limited. Therefore, it is not difficult to organize the meanings of the environments that prepare the behaviors of the participants in performing their ADLs.

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Ethical Approval

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References

- Ahmed, R. M., Irish, M., Kam, J., van Keizerswaard, J., Bartley, L., Samaras, K., Hodges, J. R., & Piguet, O. (2014). Quantifying the eating abnormalities in frontotemporal dementia. *JAMA Neurology*, *71*(12), 1540–1546. <https://doi.org/10.1001/jamaneurol.2014.1931>
- Akai, S., & Ando, A. (2013). Motivation. In N. Uchida, K. Shigemasa, & K. Sugiyama (Eds.), *The latest psychological dictionary* (pp. 548–551). Heibonsha (in Japanese).

- Charras, K., & Frémontier, M. (2010). Sharing meals with institutionalized people with dementia: A natural experiment. *Journal of Gerontological Social Work, 53*(5), 436–448. <https://doi.org/10.1080/01634372.2010.489936>
- Cohen, N. J., & Squire, L. R. (1980). Preserved learning and retention of pattern-analyzing skill in amnesia: Dissociation of knowing how and knowing that. *Science, 210*(4466), 207–210. <https://doi.org/10.1126/science.7414331>
- De Wit, L., Marsiske, M., O’Shea, D., C. Kessels, R. P., Kurasz, A. M., DeFeis, B., Schaefer, N., & Smith, G. E. (2021). Procedural learning in individuals with amnesic mild cognitive impairment and Alzheimer’s dementia: A systematic review and meta-analysis. *Neuropsychology Review, 31*(1), 103–114. <https://doi.org/10.1007/s11065-020-09449-1>
- Dunne, T. E., Nearingard, S. A., Cipolloni, P. B., & Cronin-Golomb, A. (2004). Visual contrast enhances food and liquid intake in advanced Alzheimer’s disease. *Clinical Nutrition, 23*(4), 533–538. <https://doi.org/10.1016/j.clnu.2003.09.015>
- Easterling, C. S., & Robbins, E. (2008). Dementia and dysphagia. *Geriatric Nursing, 29*(4), 275–285. <https://doi.org/10.1016/j.gerinurse.2007.10.015>
- Edahiro, A., Hirano, H., Yamada, R., Chiba, Y., Watanabe, Y., Tonogi, M., & Yamane, G. (2012). Factors affecting independence in eating among elderly with Alzheimer’s disease. *Geriatrics & Gerontology International, 12*(3), 481–490. <https://doi.org/10.1111/j.1447-0594.2011.00799.x>
- Flick, U. (2018). *An introduction to qualitative research* (6th ed.). SAGE.
- Gibson, J. J. (2015). *The ecological approach to visual perception*. Psychology Press.
- Hull, C. L. (1952). *A behavior system*. Yale University Press.
- Ikeda, M., Brown, J., Holland, A. J., Fukuhara, R., & Hodges, J. R. (2002). Changes in appetite, food preference, and eating habits in frontotemporal dementia and Alzheimer’s disease. *Journal of Neurology, Neurosurgery, and Psychiatry, 73*(4), 371–376. <https://doi.org/10.1136/jnnp.73.4.371>
- McDaniel, J. H., Hunt, A., Hackes, B., & Pope, J. F. (2001). Impact of dining room environment on nutritional intake of Alzheimer’s residents: A case study. *American Journal of Alzheimer’s Disease and Other Dementias, 16*(5), 297–302. <https://doi.org/10.1177/153331750101600508>
- Mahoney, F. I., & Barthel, D. W. (1965). Functional evaluation: The barthel index. *Mayland State Medical Journal, 14*, 61–65.
- Maruyama, K. (1984). *Feticism of culture*. Keiso Shobo (in Japanese).
- Morris, J. C. (1993). The Clinical Dementia Rating (CDR): Current version and scoring rules. *Neurology, 43*(11), 2412–2414. <https://doi.org/10.1212/wnl.43.11.2412-a>
- Shinagawa, S., Adachi, H., Toyota, Y., Mori, T., Matsumoto, I., Fukuhara, R., & Ikeda, M. (2009). Characteristics of eating and swallowing problems in patients who have dementia with lewy bodies. *International Psychogeriatrics, 21*(3), 520–525. <https://doi.org/10.1017/S1041610209008631>
- Squire, L. R. (1987). *Memory and brain*. Oxford University Press.