MANUAL FOR USING ICT AND TEACHING ITS EFFECTIVE USE

Volume 3 Persons with higher brain dysfunctions and related disorders

Editor EIICHI ONO



NATIONAL REHABILITATION CENTER FOR PERSONS WITH DISABILITIES JAPAN

(WHO COLLABORATING CENTRE)

March,2023

Note : This rehabilitation manual is published by the National Rehabilitation Center for Persons with Disabilities, which is a WHO Collaborating Centre for Disability Prevention and Rehabilitation, and not a publication of WHO. The publisher is responsible for the views expressed in this manual, and it does not necessarily represent the decisions or policies of the World Health Organization.

Rehabilitation Manual 37 Manual for Using ICT and Teaching its Effective Use Vol.3 Persons with higher brain dysfunctions and related disorders March 30, 2023

Editor: Eiichi Ono

©National Rehabilitation Center for Persons with Disabilities Koichi Mori, M.D., Ph.D., President 4-1 Namiki, Tokorozawa, Saitama Prefecture 359-8555, Japan Tel. +81-4-2995-3100 Fax. +81-4-2995-3102 E-mail whoclbc@mhlw.go.jp

PREFACE

ICT stands for Information and Communication Technology. Although the progress of ICT has induced the issue of the digital divide, ICT can be extremely useful for life and independence support for persons with disabilities.

This manual is in four volumes. It summarizes elements of the knowledge on teaching and using ICT, which staff members of the National Rehabilitation Center for Persons with Disabilities have cultivated in training, research, and clinical practice for persons with disabilities.

Volume 3 draws from researcher at the Research Institutes working on assistive products and technology for persons with higher brain dysfunctions and related disorders to help such persons and their supporters. It introduces support via ICT and how to use such devices for various cases of higher brain dysfunctions, such as memory impairment, attention disorder, and executive dysfunction.

The URLs in this manual are current as of March 2021.

Currently, Japan is entering the world of 5G mobile communication systems, and ICT is expected to keep evolving. Hopefully, the teaching strategies in this manual should serve as a reference for the development and use of ICT.

E.ONO

EDITOR

Eiichi ONO

National Rehabilitation Center for Persons with Disabilities

AUTHOR

Tsuyoshi NAKAYAMA

National Rehabilitation Center for Persons with Disabilities

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Chapter 1. Definition and Epidemiology

In the field of welfare administration in Japan, impairment of cognitive function, especially higher brain dysfunctions^{*}, refers to disabilities that impede the ability of a person to adapt to daily and social life. These include memory problems, attention problems/memory impairment, executive dysfunction, and social behavior disorder, stemming from sequelae of brain injury, cerebrovascular disease, encephalitis, hypoxic encephalopathy, and brain tumor.¹⁾ Regarding welfare administration, higher brain dysfunctions is classified as a mental disorder.

However, higher brain dysfunctions in an academic and general sense refers to general cognitive impairment caused by brain damage. These include focal symptoms such as aphasia, apraxia, agnosia, memory problems, attention problems, executive dysfunction, and social behavior disorders. Currently, there is no medical consensus on the definition of higher brain dysfunctions. Furthermore, aphasia, generally considered one of the typical symptoms of persons with higher brain dysfunctions, is classified as "Impairment of voice, speech, and mastication function" among physical disabilities in the definition of welfare administration.

Approximately 270,000 people have higher brain dysfunctions in Japan according to the definition of welfare administration.¹⁾ In Tokyo alone, it is approximately 49,000 people, as per a broad academic definition; nationwide, it is approximately 500,000 people.²⁾ The website of Information and Support Center for Persons with Higher brain dysfunctions of National Rehabilitation Center for Persons with Disabilities explains the main symptoms and diagnostic criteria for higher brain dysfunctions.³⁾ Beyond the definition of higher brain dysfunctions by the welfare administration and the broad academic definition, there is also a system for recognizing higher brain dysfunctions in compulsory automobile liability insurance, which must be considered.⁴⁾

^{*} Neurocognitive Disorders due to vascular disease, traumatic brain injury, and other organic brain disease.

Chapter 2. Subjects

This volume is a manual on teaching and using ICT for higher brain dysfunctions as defined by welfare administration and includes aphasia and related disorders. The manual is divided into the following: "persons with memory problems/memory impairment," "persons with attention problems/attention impairment," "persons with executive dysfunction," "persons with a social behavior disorder," "persons with aphasia," "persons with unilateral spatial neglect," "topographical disorientation," and "persons with other higher brain dysfunctions and related disorders." However, there are many cases where people have several of these higher brain dysfunctions. Further, given that there are stark individual differences even for the same symptoms, some methods of teaching and using ICT introduced in this article may not be necessarily effective. In other words, it is not that methods of teaching and using ICT for persons with higher brain dysfunctions and related disorders have already been established and sufficient to simply introduce such methods; it is necessary to find the suitable method by evaluating the challenge and ability of each case. This volume provides information about assistive devices that are often useful. Moreover, ICT and applications have been developed for training or testing and evaluating cognitive functions for persons with higher brain dysfunctions and related disorders. Nonetheless, this volume focuses on the use of ICT by persons with disabilities, their families, and supporters.

Chapter 3 Persons with Memory Problems/Memory Impairment

Symptoms include forgetting where things were placed, being unable to remember new events, and repeatedly asking the same questions.³⁾ The main symptoms are as follows:

Anterograde amnesia: Inability to remember new information or episodes after the onset of an injury or causative disorder.

Retrograde amnesia: Loss of memory before injury or onset; in particular, memory related to episodes and experiences is severely impaired³).

The target of support by ICT is mainly anterograde amnesia.

For some persons with higher brain dysfunctions who often forget where they placed things, it is effective to search for the things they lost or prevent losing things. Further, smartphones and mobile phones—typical examples of ICT—have functions and applications for such situations, in addition to telephone company services.⁵In addition to it, some telephone companies provide useful services in such situations.

Among the ways to address cases where people "forget where they placed things" is to use ICT that can find lost items (e.g., locators and key finders) or ICT with an alarm function to prevent misplacement. They include devices with Global Positioning System (GPS) functions that can search for lost items, devices linked to smartphones, and devices that can search for a smartphone from a locator. Moreover, they are readily available on the market. Figures 1–3 show examples of commercially available locators and anti-lost alarm sensors.



Figure 1. Example of a locator (manufactured by Loc8tor Ltd. (UK), Loc8tor)⁶⁾

It is a high-frequency radio (RF)-based locator that can search for the position of a tag from the main unit (range: 120m). Depending on the distance and direction of the tag from the main unit, the approximate distance and direction can be determined from the sound and light on the main

unit. A tag is attached to an often-misplaced item, such as a wallet or key, which would allow the person to search for it when they misplace the item.



Figure 2. Example of a locator (manufactured by Denso Corporation, key finder)⁷⁾



Figure 3. Example of anti-lost alarm sensor (manufactured by AirJ Co., Ltd., anti-lost alarm sensor)⁸⁾

Among the ways to address cases of "being unable to remember new events" and "repeatedly asking the same question," which are symptoms of memory problems/memory impairment, is using ICT that can record and devices that assist memory, such as voice recorders, cameras, video cameras, and mobile phones.⁹⁻¹²⁾ Elements such as images, videos, and sounds are often useful for evoking or assisting memory. ICT make searching for keywords easy. If a person repeatedly asks questions, a Frequently Asked Questions (FAQ) list can be created in the ICT device to allow for searching and getting answers to typical questions. For those who have difficulty remembering people's names and faces, apps that associate names with photos and apps that manage business cards can also be put to practical use. From the perspective of using ICT to assist memory, many models such as mobile phones, smartphones, and tablets are equipped with applications and functions like voice recorders, cameras, and videos, which can be effectively used to address

the noted issues. A diary application can be used to record daily events, which has yielded positive results in some reports.¹³⁾ Of course, paper-based diaries are effective in many cases, but diary applications can easily import photos, sounds, and videos. They are easy to use as memory aids, and if cloud management is used, information can be shared with smartphones, tablets, and personal computers. Another advantage is that information can be shared with the person concerned and family members. Various social networking services (SNS), which are closely tied to ICT, provide diary applications or services that share information with family members. Further, like ICT equipment, the keyword search is another advantage of the diary application. Applications that supplement the daily tasks of persons with higher brain dysfunctions and dementia are already on the market, and some have a diary function.

Although closely related to "persons with executive dysfunction," later discussed in this volume, for some time, there have been case reports of the use of generic clocks, calendars, and alarms as memory aids or reminders for persons with higher brain dysfunctions.^{14,15} Specialized devices have also been developed for persons with higher brain dysfunctions and related disorders. For example, pager-based services, such as NeuroPage (The Oliver Zangwill Centre), assistive devices based on a personal digital assistant (PDA), such as Planning and Executive Assistant and Trainer (PEAT) Attention Control Systems, Inc., and some applications and services have been put into practical use.^{16,17)} In Japan, specialized devices are being developed for persons with higher brain dysfunctions. For example, Yasuda et al. developed a memory aid called Voice Output Memory Aids (VOMA).¹⁸⁾

Chapter 4. Persons with Attention Problems/Attention Impairment

Symptoms include being absent-minded and prone to making many mistakes, getting confused when doing two things simultaneously, and being unable to continue working for long periods. The main symptoms are as follows:

Generalized attention problem:

- ①Concentration difficulty/distraction: The person has difficulty maintaining focus on a certain stimulus and easily loses attention to other stimuli.
- ⁽²⁾Difficulty sustaining/maintaining attention: Difficulty sustaining attention for a long time, unable to concentrate for 15 minutes.³⁾

Further, to address "absent-mindedness leading to many mistakes" and "confusion when doing two things simultaneously," space, time, and work can be structured to consider persons with higher brain dysfunctions and related disabilities such that they can understand their environment visually. This workaround is often used for persons with attention problems/attention impairment and the "persons with executive dysfunction" described later.

The support application (Memory Assist Light), researched and developed mainly by Research Institute of National Rehabilitation Center for Persons with Disabilities, has procedure support, schedule, and alarm functions to support persons with higher brain dysfunctions who have memory problems/memory impairment, attention problems/attention impairment, and executive dysfunction.¹⁹⁻²²⁾ As the biggest feature of this app, the procedure support function supports work execution by presenting the procedure sequentially. The procedure can be presented in characters, notes, pictures, voice, or videos for easy comprehension. Although closely related to the "persons with executive dysfunction," it is an example of work structuring. Moreover, to make the operation as simple as possible, the support app allows users to simply press the OK button (the button in the middle of the four-way controller) when using a mobile phone or touch the screen when using a smartphone to proceed to the next step in the procedure. Furthermore, as per user needs, the user, caregiver, or hospital medical staff can freely edit and create using a smartphone with the application installed, and it can be synchronized with schedules and alarms. Figure 4 shows an example of the smartphone screen when using the procedure support function.



① Procedure support ② Return

Figure 4. Example of the smartphone screen when using the procedure support function of the Memory Assist Light (procedure for making hot milk in the microwave)

Some apps are designed to reduce mistakes by providing checklists and checkboxes at the end of each work procedure to check them individually.²³⁾ Figure 5 shows examples of checklists and checkboxes. Regarding the latter, this application is not specifically meant for persons with higher brain dysfunctions and related disease. Rather, it was developed for those who want guidance when going out (especially when using public transportation).

Furthermore, there are generic devices and applications that structure and present procedures for persons with higher brain dysfunctions and related disorders. For example, in some cooking apps, the user selects a recipe that presents the steps in order. When the user touches the screen, the next step will be presented. Some users can finish cooking a dish merely by repeating this operation. Cooking is a task often used in training for persons with higher brain dysfunctions. In fact, there are cases where cooking apps are used during training, and persons with higher brain dysfunctions use cooking apps at home.



⁽⁵⁾ Having trouble?

(Note) Research Institute of National Rehabilitation Center for Persons with Disabilities conducted research on a PDA application to support persons with higher brain dysfunctions in collaboration with the Japan Organization for Employment of the Elderly, Persons with Disabilities—National Vocational Rehabilitation Center (currently the Japan Organization for Employment of the Elderly, Persons with Disabilities and Job Seekers), and Meiden Software Co., Ltd. (Meiden System Solutions Co., Ltd.).^{19,20)} Part of the research results was commercialized by Meiden Software Co., Ltd. in 2004 as "Software for supporting rehabilitation, living, and work for persons with higher brain dysfunctions: Memory Assist," contributing to the independence of persons with higher brain dysfunctions.²¹⁾ Subsequently, a mobile phone and smartphone application (Memory Assist Light) was developed, bearing the same functions as Memory Assist. Currently, a website has been set up where the app can be downloaded for free.²²⁾

Figure 5. Example of a check box for "Communication Support Board Digital Personal Edition - My Board"²³⁾ After completing a certain procedure, touch 🖌 to move to the next procedure.

Chapter 5. Persons with Executive Dysfunction

This dysfunction may present symptoms such as "inability to make and conduct plans," "inability to do anything without someone's instructions," and "inability to be punctual." The main symptoms are as follows.

Impairment of purposeful planning of action: This impairment results in haphazard or impulsive behavior, given automatic sustained responses to stimuli and acting before planning. The inability to set clear goals makes it difficult to initiate planned action, which can lead to a lack of motivation and reduced initiative. Given their ability to perform, they can continue activities when directed sequentially.

Impaired execution of purposeful behavior: It includes impairment in monitoring and controlling one's behavior and impairment in the process of creating basic policies for managing activities, sustaining attention, and objectively viewing oneself and one's environment. Moreover, one acts immediately without analyzing options, often making similar choices even after failure. Impaired ability to restrain inappropriate behavior leads to socially inappropriate behavior.³⁾

Support applications, checklists, and checkboxes introduced in "persons with attention problems/attention impairment" can be used as one way to address the "inability to make and conduct plans" and "inability to do anything without someone's instructions." For the "inability to make and conduct plans," it is effective to present the task to make it easier to see the task (Figure 6). Furthermore, there are cases where users could make and conduct plans by themselves by attaching sounds, images, videos, or memos to the actual task. The same applies to time and duration, and there are cases where the method of structuring time and schedule is effective. In some cases, it is effective to display the schedule such that it is easy to predict the schedule (Figure 7).

Furthermore, the Memory Assist Light ¹⁹⁻²²⁾ and commercially available support applications for persons with higher brain dysfunctions and dementia are expected to encourage action by linking with alarms and schedules and teaching persons with higher brain dysfunctions what to do next. In fact, the probability of executing an action by a person with higher brain dysfunctions increased when the voices of the person's family members were uploaded into the ICT device and used as reminders (in place of alarms) to take action at specific periods (or several minutes before).



Figure 6. Example of the smartphone screen when using the procedure support function of the Memory Assist Light

Structuring and visualizing time and schedule and linking notes, audio, images, and task procedures¹⁹⁻²¹⁾

Structuring and visualization make the procedure easy to understand. Memos and voice can also be used together, making it easier to understand. The user can also use the schedule function to set up the procedure automatically at the time specified in the schedule.

1) 2021年1月18日 (月)	▲▲ ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ●
Lunch time	
Self-study(medical consultation, if necessary)	Self-study(medical consultation, if necessary)
	⑥ メモ
<mark>13:00 - 13:45</mark> 2 あと9分です	medical consultation

Figure 7 Example of the smartphone screen when using the schedule function of

⑦ Close

(5) Return

6 Memo

Figure 7. Example of the smartphone screen when using the schedule function of Memory Assist Light It allows for the structuring and visualization of time and schedule and linking with memos, sounds, images, and work procedures.

There are cases where schedule management and alarm functions, reminders, can effectively address the "inability to be punctual." Many applications and ICT devices, such as mobile phones, PDAs, smartphones, tablets, and personal computers, already have alarm and schedule functions. There have been case reports of training and support for persons with higher brain dysfunctions (including some with dementia) using timers with alarms, pagers, voice recorders, mobile phones, and online scheduler services.^{9-12, 24, 25)} As mentioned in the introduction of the diary application, the advantage of using cloud services for schedules is that information can be shared through smartphones, tablets, and personal computers with the person concerned and family members. Similarly, various SNS provide services that have the function of sharing schedule information with family members.

Chapter 6. Persons with Social Behavior Disorder

This disorder presents symptoms such as "excitement and violence," "screaming when things do not go as expected," and "self-centeredness." The main symptoms are as follows.³)

Decreased willingness/spontaneity: Lack of voluntary activity, leading an idle life such as staying in bed all day long even if the person does not have a motor impairment.

Impaired emotional control: Irritable moods that gradually escalate into excessive emotional reactions and aggressive behavior that are challenging to control once in motion. Those with such a condition refuse to acknowledge their disability and refuse training. Anti-social behaviors such as sudden agitation and screaming, violence, and sexual advances toward nurses are often observed.

Interpersonal disorders: These may include diminished social skills, sudden change of subjects, overly intimate and uninhibited speech, approach behavior, repeating what the other person said, thinking literally, difficulty recognizing sarcasm, satire, and abstract references, and difficulty in generating various topics.³⁾

In a case report, the problematic behavior of persons with dementia was reduced by using voice guidance via electronic devices²⁶. Moreover, the notification and call-to-action function introduced in the "Chapter5. Persons with Executive Dysfunction" may be effective in cases of "decreased motivation/drive." However, in general, only a handful of cases have tried to use ICT to help persons with social behavior disorders.

One method utilizes robots for therapeutic effects ("Robot Therapy/Robot Assisted Therapy"). For example, the seal-type robot "PARO," which aims to cheer up and calm people's minds, looks like a baby harp seal (Figure 8).²⁷⁾ It responds to human voice through numerous sensors and artificial intelligence. Hugging this robot may provide happiness and soothe the user because of its animal-like behavior. Although reports mainly target persons with dementia, a case has been reported where the same robot reduced the aggression of a female resident in a nursing home.²⁸⁾ From large-scale clinical trials in the United States and Australia, "reduction of anxiety," "improvement of depression," "reduction of pain," "reduction of stress," and "reduction of antipsychotic dosage for anxiety" were statistically significant.^{29,30)} In the United States, since 2018, patients with dementia, Parkinson's disease, PTSD, cancer, and brain injury have been diagnosed with depression, anxiety, and pain and have been prescribed biofeedback therapy using PARO for their treatment. In such cases, public health insurance-Medicare-covered the medical expenses for the treatment. Further, BFT-PARO for physical or cognitive rehabilitation after cerebral infarction is now covered by insurance.³¹⁾ As noted, it can be said that Robot Therapy/ Robot Assisted Therapy may be effective for persons with higher brain dysfunctions accompanied by social behavior disorder and related disorders.



Figure 8. Example of a robot for mental therapy $(Paro)^{27)}$

Chapter 7. Persons with Aphasia

Aphasia is a condition that makes it challenging to understand other people's thoughts or express one's thoughts because of brain injury.³²⁾ In other words, language functions such as listening, reading, speaking, and writing do not work. The person cannot understand instructions, comprehend what people are saying, or answer questions correctly. Moreover, they think they are speaking fluently, but people around them cannot understand what they are saying, and they cannot read a book and write a letter.³²⁾

From the perspective of utilizing ICT, augmentative and alternative communication (AAC) can be used to address aphasia. Speech recognition technology may be useful for people who can read letters and sentences but cannot understand what other people are saying. Similarly, voice recognition technology can also be useful for people who cannot write. In recent years, the continuous speech recognition rate has improved considerably. Thus, it has become a pre-installed feature in smartphones and tablets, with numerous compatible apps.

Although there is a common group between the "inability to understand what other people are saying," "inability to find words," and "inability to speak coherently," there are cases where communication using pictograms, photographs, or the Japanese syllabary is effective. Support devices and apps for that purpose have also been developed. Some can read out written sentences (e.g., Voice Output Communication Aids [VOCA]). Figure 9 shows an example of a commercially available product.

The commercial product in Figure 9 is mainly intended for users with aphasia. However, ICT that use pictograms, photographs, or the Japanese syllabary can help people beyond those with aphasia. Many ICT and applications targeting persons with other disabilities (e.g., autism and other speech disorders) have also been put to practical use. In some cases, ICT and applications for persons with other disabilities are also useful for persons with higher brain dysfunctions and related disorders.

For instance, DAISY can be a good solution for people who are "unable to read."

DAISY is an abbreviation for Digital Accessible Information System. As an international standard for accessible e-books for the visually impaired and those who have difficulty reading ordinary print, DAISY was developed and maintained by the Japan DAISY Consortium (Switzerland), which comprises member organizations from more than 50 countries.³⁴⁾





- (1) Daily Conversation Assistance & Language Training
- ② Settings
- ③ Japanese syllabary conversation assistance
- ④ Language training
- (5) Songs/Calculation
- 6 Point at pictures/letters

- ⑦ (Auditory comprehension)
- (8) Conversation list: Touch to read the sentence
- (9) I will be at the hospital tomorrow.
- 10 Create
- (1) It is time for medicine
- 12 speech
- (13) Return to the conversation list
- Figure 9. Example of conversation assistance and language trainer (conversation assistance function screen)^{_{33)}}

Chapter 8. Persons with Unilateral Spatial Neglect

Unilateral spatial neglect includes missing stimuli in the space opposite to the brain injury. Right hemisphere injury (especially parietal lobe injury) often causes spatial neglect of the left side, accompanied by the following symptoms.³⁾

Mild: No constant spatial neglect upon examination, although there is the neglect of daily-life activities or short exposures. When bilateral simultaneous stimulation is performed, those with the condition miss the stimuli from the side opposite to the injury, which is also called extinction.

Moderate: Neglect occurs constantly, but those with the condition can see the affected side when their attention is drawn.

Severe: The body turns to the side of the injury, and those with the condition cannot see the affected side even if their attention is drawn.

For people who can "see the affected side when their attention is drawn," ICT can be used to draw their attention. For instance, a smartphone placed on the affected side can call the attention of the user by vibrating or making a sound. Persons with unilateral spatial neglect have a high risk of falling or colliding with other people or objects when walking. Although it depends on the case, it may be effective to use an object like a cane to supplement the information of the space on the neglected side to reduce risk. Although there is room for debate as to whether such items fall under the category of ICT, electronic devices that use ultrasound and other technologies to help the visually impaired walk have been developed and are commercially available.^{35,36} These electronic devices may also help persons with unilateral spatial neglect when walking. Further, although it belongs to the disorder of spatial cognition, there are cases where a person has difficulty judging the distance between oneself and an object.³⁷ Even in such cases, devices using techniques such as ultrasound may serve as tools to compensate for this impairment.



Figure 10. Example of ultrasonic walking aid for the visually impaired³⁵⁾

Chapter 9. Persons with Topographical Disorientation

Apart from topographical disorientation, difficulty going out or using public transportation is also often caused by higher brain dysfunctions and related disorders (including aphasia).³⁹⁾ Only 37.1% of persons with higher brain dysfunctions can use public transportation independently, and 49% of persons with aphasia have difficulty going out alone using public transportation.^{40,41}

Topographical disorientation is also called topographical disorder, topographical impairment, or topographical agnosia. Its symptoms include getting lost in familiar places and being unable to memorize new directions, draw rough sketches of familiar places, and recognize landscapes and buildings that should be familiar. There are several methods of classifying topographical disorientation, but one method divides them into two: landmark agnosia/scene agnosia and defective route finding.³⁸⁾ Street agnosia is a disorder that makes it challenging to identify streetscapes, such as landscapes and buildings. It can be considered a type of visual agnosia where a person finds it challenging to recognize objects despite sufficient vision and visual acuity. It is also called topographic or environmental agnosia. Defective route finding is a disorder that makes it challenging to locate a route, given the inability to recognize invisible spaces. It can be considered a type of visuospatial agnosia where a person has spatial neglect and faces difficulty in locating objects in space.³⁸⁾

Written notes or photographic maps as compensatory measures are highly effective for persons with defective route findings.^{42,43} In some cases, people take pictures of the scenery with their smartphone cameras and record them for reference when they go out. In some cases, directions were treated as a kind of procedure, and the procedure support function of Memory Assist Lite was used as a compensatory measure.

From the perspective of utilizing ICT, GPS and map data can be used to address the disorder. Most smartphones and mobile phone models have GPS functions and various GPS-based services. Moreover, various map data can be used in most models of smartphones and mobile phones. One application that utilizes GPS and map data is the GPS navigation system; it searches for the best route and means of transportation when a destination is entered. Indeed, it can be a reassuring tool for persons with higher brain dysfunctions and related disorders accompanied by topographical disabilities. However, in many cases, persons with higher brain dysfunctions find it challenging to master navigation systems. Many who have topographical disorders and memory problems/ memory impairment, attention problems/attention impairment, and executive dysfunctions find it challenging to enter a destination when using the GPS navigation system on a smartphone.

Moreover, services and applications that use the GPS function of smartphones and other devices are widely used to measure the user's current location regularly and provide appropriate information and services to the user based on the location information.⁴⁴ Furthermore, an

application that gives off an alarm when entering a set area or when leaving a set area based on GPS location information has also been put into practical use. For example, these applications can be set to prevent people from missing trains or buses; in some cases, it is a useful tool for persons with higher brain dysfunctions.⁴⁵

Many services and applications provide current location information from the GPS function of smartphones; however, this is provided not to the user but to supporters.^{46,47} Figure 11 shows an example of an in-app screen. Accordingly, position information can be shared with the users and other people; in some cases, the trajectory (log) of the user's movement can be recorded.



Figure 11. Example of an application that provides location information using GPS (check the location of others)⁴⁷⁾

These services and apps are safe and secure for users (persons with higher brain dysfunctions and related disorders) and supporters (e.g., families) to share location information. In some cases, they can be essential.

Some services and apps share your location with others in other ways than through GPS. For example, some railway companies have put into practical use a service that delivers passage information by e-mail to a specific e-mail address when passing through a ticket gate at a station using a transportation electronic card or mobile phone.^{48,49} Many of the current services are mainly aimed at minors. However, in some cases, such services can be useful for persons with higher brain dysfunctions and related disorders and their families for safety and security.

As noted, many persons with higher brain dysfunctions and related disorders (including those with aphasia) have difficulty using public transportation. Although not necessarily aimed at persons with higher brain dysfunctions, attempts from the barrier-free transportation perspective can be useful.

Given barrier-free software, since 2007, the Foundation for Promoting Personal Mobility and Ecological Transportation has distributed around 17,000 copies of the "Communication Support Board Paper Version" as a support tool to facilitate communication in various situations for transportation users with intellectual, developmental, and hearing disabilities, older adults, and foreigners who do not understand Japanese (Figure 12).^{23,50} Subsequently, it was released as a "Communication Support Board digital version," focusing on guidance (Figure 13)⁵¹. Furthermore, in FY 2016, persons with higher brain dysfunctions, their families, and supporters





Figure 12. Foundation for Promoting Personal Mobility and Ecological Transportation, Communication Support Board

Example page of the paper version⁵⁰⁾

were interviewed, and the "Communication Support Board Digital Individual Version—My Board," which focuses on those who wish to be guided, was released.²³⁾ It was also introduced as an example of the checkbox mentioned under "persons with attention problems/impairment" (Figure 5). However, it can also be used for task management and communication support. It is equipped with functions like conveying the problem of the person concerned in a few steps, confirming what the person should do now, and allowing the supporter to quickly grasp the task of the person concerned (Figure 14)²³.







Please don't worry, I am a station attendant.
Are your father and mother with you?
Let's go to the office.
Are you going with someone?
I'm calling the police.
Yes
No
I don't know.

Figure 13. Foundation for Promoting Personal Mobility and Ecological Transportation, Communication Support Board Example screen of digital version⁵³⁾

2 NRRH	TOP 4	7	8 TOP 00にいく 9 他タスク
1		- (10 · 家を出る AM10:37
1 コミューリーション支援ホート デジタル個人版 ーマイボードー	5 進捗確認	•	11)・かぎをしめる AM10:37
		(12・ゴミを出す AM10:37
\bigcirc	6 927J2F	•	13 ORE行く
		(14 電車にのる
	7 困ったとき	•	15 ∞Rrc#96
		(16 oddizeta
3 新規作成+	下の「シェアボタン」を クリックして、ホーム両面に 金録してください。		177 / Marie 52
	7 困ったとき		7 困ったとき
	8 電車がおくれて、こまっています。	0 2	3 現在やること 第5世ズ
	9 バスがとまって困っています。	0 2	メモルシ 4 困っていること
ć	20 まいごになりました。	0	電車がおくれて、こまっています。 わたしは障害があります。○○まで行きたいので すが、こまっています。行き方を教えてくださ
(•	21 きみがわるいです		No.
	く 222 タスクに戻る		< 25 一覧に戻る
(1) Communication support	(1) Lock the door		21) I don't feel well
board digital individual	12 Throw the trash		22 Return to task
version - my board -	(13) Go to $\circ\circ$ station		3 Current task: Go out of
2 Terms of service	(14) Ride a train		the house
③ Create new	$\textcircled{5}$ Get off at $\circ\circ$ station		24 Having trouble? I'm in
④ Help	(16) Change trains		trouble because the train
⁽⁵⁾ Check your progress	17 Previous log		is late. I have a disability.
6 Task list	18 I'm in trouble because	the	I want to go to $\circ\circ$, but I'm
7 Having trouble?	train is late		having trouble. Could you
(8) Go to $\circ\circ$	19 I'm in trouble because	the	please give me directions?
(9) Other tasks	bus stopped		25 Back to list
10 Go out of the house	20 I'm lost		

Figure 14. Foundation for Promoting Personal Mobility and Ecological Transportation, Communication Support Board Example screen of digital individual version - My Board -²³⁾

Chapter 10. Persons with Higher brain dysfunctions and Related Disorders

In many cases, persons with higher brain dysfunctions and related disorders find it challenging to operate ICT like mobile phones and smartphones³⁹⁾. In some cases, the challenge regards performing operations like tapping, flicking, and swiping screens and icons. In other cases, persons with higher brain dysfunctions and related disorders fail to remember operations themselves. There are also cases where too many icons on the screen induce the challenge of which one to choose and cases of accidentally setting the operation to airplane mode. Thus, persons with higher brain dysfunctions and related disorders encounter numerous challenges when operating mobile phones and smartphones, warranting simpler and easier-to-understand operations.

Generally, people limit the number of apps on their smartphones to only those that are necessary or remove irrelevant icons from the home screen. It may be effective to make the settings as easy to operate as possible for persons with higher brain dysfunctions and related disorders. Moreover, functions and applications that make the home screen of smartphones simple and intuitive have been put into practical use,⁵²⁾ and mobile phones and smartphone models designed for easy operation are being sold by various companies.⁵³⁾ For example, in cases where the person has difficulty responding to incoming calls, there are phone models and apps on the market that automatically accepts incoming calls or allows the user to accept a call by simply holding the smartphone to their ear.⁵⁴⁾ However, in cases where making a call is challenging, some phone and app features allow the user to call a specific phone number with one click or tap or make a call by simply shaking the smartphone and holding it to the ear.⁵⁴⁾ Additionally, smartphone services developed mainly for persons with intellectual disabilities and those with higher brain dysfunctions have been put to practical use.⁵⁵⁾ Although this service is only compatible with specific smartphone models, it can assist in daily-life activities like "contacting, reporting, and confirming, "commuting to work/school," and "troubleshooting."

In some cases, higher brain dysfunctions may also make calculations challenging. A calculator may compensate for this challenge, and many mobile phones, smartphones, and tablets have calculator functions and applications pre-installed. Despite not being developed for persons with higher brain dysfunctions and related disorders, ICT device functions, applications, or services developed for regular use for persons with disability or older adults may be useful.⁵⁶

Among persons with higher brain dysfunctions and related disorders, some have difficulty operating e-mails on regular mobile phones and smartphones. However, an "e-mail application that supports dot patterns" has been developed to support operations like creating and sending e-mails, mainly for persons with intellectual disabilities.⁵⁶⁾ This application allows users to create, send, and make phone calls by touching pictures and icons drawn on invisible barcodes with a special scanner (Figure 15). By touching the GPS mark icon with this dedicated scanner, the app

also has a function to send GPS location information to a pre-registered e-mail address and a function to read out icons and text. In some cases, it was an extremely useful function for persons with higher brain dysfunctions.



Figure 15. Dedicated scanner and scanner-compatible booklet for the "e-mail application that supports dot patterns" and operations such as creating and sending e-mails on mobile phones

Furthermore, applications that promote communication mainly for persons with disabilities living alone and the elderly have been developed, which can benefit persons with higher brain dysfunctions.^{57,58} Such apps were developed with the desire to realize a society where anyone can easily send messages in response to cases of people who cannot easily use e-mail. By simply selecting eight buttons, you can easily create and send a total of 80 types of messages. (Figure 16)^{57,58}



Figure 16. Communication support app for older adults living alone and persons with disabilities^{57,58)}

As noted, for persons with higher brain dysfunctions and related disorders, ICT can be an extremely useful compensatory means if they can be used well. However, higher brain dysfunctions has various symptoms, and various ICT and applications have been researched, developed, and put into practical use. Unfortunately, how to teach and use ICT for persons with higher brain dysfunctions and related disorders have not been established, as this publication can only provide current information. Moreover, when using ICT equipment, information literacy is required to avoid being victims of phishing scams. For safety, it is also important to remember to follow proper etiquette, such as not using smartphones while walking.

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