MANUAL FOR USING ICT
AND
TEACHING ITS EFFECTIVE USE

Volume 1 Persons with visual disabilities

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FOR PERSONS WITH DISABILITIES
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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 1 draws from instructors of the Rehabilitation Services Bureau who teach the visually impaired persons how to use computers. It introduces the subject of how to operate devices mainly for persons with visual disabilities, including computers and iPhones.

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.

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Preface

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Chapter 1.
Types and Degrees of Visual Disability Covered by this Manual

Visual disability is broadly classified into total blindness (inability to see objects or sense light) and low vision (amblyopia).

There is a difference depends on the individual, persons with low vision not only suffer from reduced visual acuity, but also have narrower visual field, night blindness that makes it difficult to see in glare or dark places, people and objectives are blur, and there are central vision defect and/or difficulties of color distinguishment.

Thus, after confirming a vision impairment, creative solutions, such as text enlargement and monochrome inversion, verbal communication, and touching objects, are necessary.

This volume introduces methods of instruction for using ICT like personal computers for persons with visual disabilities, considering "blindness" and "low vision."

Chapter 2.
Instructions for the Use of ICT

1) Start with a brief explanation of the overall size and shape of the device being used and move on to specific explanations of each component.
2) Know the current position on the screen or the "starting point."
   *Starting point: The screen or place used as a reference when starting (resuming) work.
It is also a place to return to when you lose track of where you are.
3) Create "clues" using various senses.

Chapter 3.
Personal Computer

Persons with visual disabilities find it challenging to grasp the overall picture of an environment (e.g., size, shape, and positional relationships of objects). Next, give a detailed explanation of the devices to be used (e.g., personal computer, display, keyboard) and start the instruction after the positional relationship and environment of each device are arranged.

Application software includes screen reader for persons with visual disabilities. It is challenging for a person with a visual disability to operate a mouse while looking at the screen, especially when operating in a window. However, the screen reader enables even persons with visual disabilities to use office work application software (e.g., Microsoft Word and Excel). Furthermore, the screen reader can be used with voice commands to alleviate the burden experienced by persons with low vision when using a device.

1) Environmental arrangement

The instructor prepares all devices to be used such that the user can concentrate on training without distraction. If necessary, ask the user to prepare a laptop computer or a flash drive.
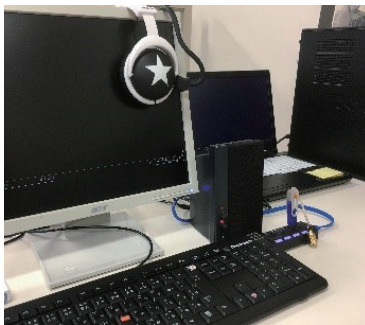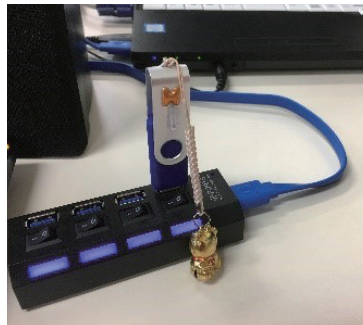

| Figure 1-1. | Figure 1-2. | Figure 1-3. |

Figure 1-1. Always put the same things in the same places
        (e.g., speakers and earphones used when the sound of the computer is unclear)
Figure 1-2. Using a USB hub to insert and remove a flash drive at hand
Figure 1-3. Operating the power supply at hand using an extension cord

(1) An overall image of the training room, a seat that makes it easy to grasp one's position and that of the device, creating an environment that reduces stress and allows for concentrating on the original purpose

① Concrete Example 1

If the PCs in the training room are arranged in five rows and three columns, assign names to the seats (e.g., 1-1), especially for beginners such that they can train in the same seat near the entrance as much as possible.

② Concrete Example 2 (Figure 1-1)

As with the training room, it is necessary to consider the layout of desks following certain rules. For example, from the user's perspective, the keyboard is in front, the monitor is behind the keyboard, the earphones are at the upper right of the monitor, and the speaker is at the right side of the monitor. Whenever possible, consideration should be given to training in the same environment at all seats.

③　Concrete example 3 (Figures 1-2, 1-3)

Prepare extension cords and USB extension cables for elements with potential plug-in challenges, such as AC adapters and flash drives, to allow for easy insertion, reducing unnecessary stress and allowing for concentrating on the original purpose.

2) Preparation of devices and application software
(1) Devices
①　Laptop (desktop computer)
②　Keyboard
③　Monitor
④　Speaker or earphone
⑤　Extension cord
⑥　USB extension cable
⑦　Magnifiable reading devices
⑧　Braille display
⑨　DAISY recording and playback device, etc.

*DAISY (Digital Accessible Information System): International standard for digital audiobooks

(2) Application software
①　Screen readers (e.g., NonVisual Desktop Access [NVDA], Job Access With Speech [JAWS])
②　Note-taking app (e.g., Notepad)
③　File management (e.g., Explorer)
④　E-mail app (mailer) (e.g., Outlook)
⑤　Internet browser (e.g., FireFox)
⑥　Application software necessary for work (e.g., Word, Excel, and PowerPoint)

3) Formulating a training plan
(1)Evaluation
①　Listen to the person's goals and interests in training
②　Check the status of IT device operation

a.　Typing

b.　Experience with text-to-speech application software

c.　Basic operations (e.g., file management and saving)

d.　E-mail, Internet

e.　Application software for work

f.　Application software

g.　Knowledge of IT, networks, and business rules

(2) Assuming the number of training hours according to the goal

　① Case 1 (teenage male with total blindness)

　　・Wants to pursue a career after training: Transfer to a massage, acupuncture, and moxibustion training facility

　　・Experience operating a computer: none

　　・Training goal: Acquisition of skills for use as a learning tool

　　・PC training time: 140 hours (192 hours including self-study time)

　② Case 2 (woman in her 30s, low vision)

　　・Wants to pursue a career after training: Transfer to a vocational training facility

　　・Experience operating a computer: basic operations only (no voice operation experience)

　　・Training objective: Acquisition of skills necessary for creating business documents

　　・PC training time: 64 hours (124 hours including self-study time)

4) Initial settings depending on the vision

(1) In case of total blindness

　① Adjust settings such that the text-to-speech application automatically starts when the computer boots up.

　② Change the settings to the sound quality, pitch, and speed that are easy for the person to hear.

　③ Use launcher software (e.g., to make settings to list frequently used application software).

(2) In case of low vision

　① Change to a color scheme that is easy for the person to see (e.g., high contrast).

　② Change the screen display to a magnification that is easy for the person to see.

　③ If the magnifier is effective, set the magnifier to start automatically when the computer starts.

5) Basic operation

When using a personal computer, the first preferable action is to turn on the power, and it is necessary to know the location of the power button. It is a good idea to mark it such that the person can tell it is the power button by touching it.

(1) Make the power supply easy to grasp

It is effective to put a thick sticker on the power button for easy identification (Figure 2).
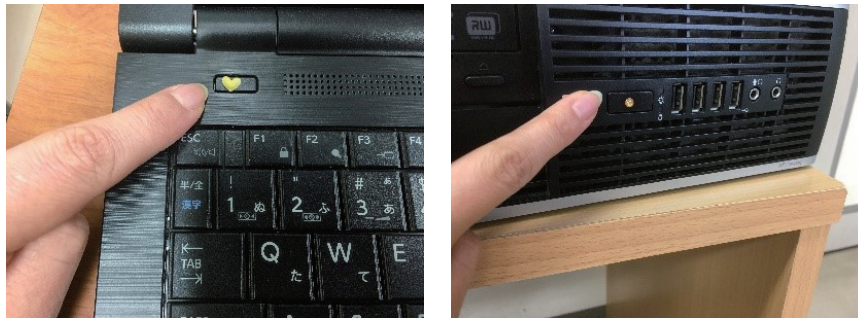

Figure 2. Putting a thick sticker on the power button and creating a clue

(2) Basic keyboard practice

① Repeated practice such that the person can press the left CTRL and SHIFT keys with their left hand and the right CTRL and SHIFT keys with their right hand

② Repeated practice such that the person can press the function keys (F1 to F12) with their index, middle, ring, and little fingers

③ Repeated practice such that the person can press the up and down keys with their middle finger, the left key with their index finger, and the right key with their ring finger

Figure 3. Keyboard with thick stickers affixed to fit the individual

*It is also effective to put a thick sticker on keys that the person is having difficulties with to give a "clue" (Figure 3).

(3) Review of basic typing practice

① When the person losses track of their location, always return to the starting point. The basic starting point is the home position (left hand FDSA, right hand JKL)

② The two typing methods can effectively serve as starting points for the upper-level keys (number keys) and lower-level keys, which are considered to be challenging.

・Compass typing method: The starting point is the index finger or pinky finger, and the wrist is rotated while the fingers are fixed (Figure 4).

・Parallel typing method: The right and left hands move in parallel, and the starting point is the entire home position (Figure 5).
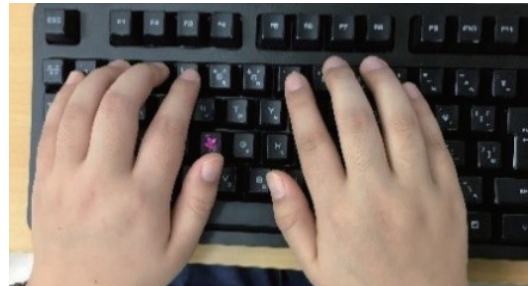

Figure 4. Compass typing method   Figure 5. Parallel typing method

(4) Character input/editing

If the person loses track of the input or makes a mistake, they can return to the starting point (before input) at any time. When inputting characters, press the ESC key and say the word "clear" to delete all characters and return to the "starting point."

(5) Screen-reading application software (screen reader)

(e.g., NVDA and JAWS)

Frequently used shortcuts

(e.g., read the full text, check the current location, read one line, check the active window, and check the number of running application software)

http://tfusvsun.tfu.ac.jp/mko/

(6) Folder management

Application software to manage files and folders

(7) Introduction of various application software that can be used by persons with visual disabilities

① Application software for work
   ・Word (creating business documents)
   ・Excel (spreadsheet/database)
   ・PowerPoint (presentation)
② Applications software for enjoying life
   a. E-mail
      ・Outlook
   b. Internet
      Introduce application software that read out text information on the Internet and are compatible with screen-reading application software.

c. Audiobooks and e-books

Introduce application software that allow you to download and play digitized books with a simple operation.

d. Check the contents of the printed material

Introduce application software that read aloud the content of the printed material set in the scanner.

6) Examples of instructions

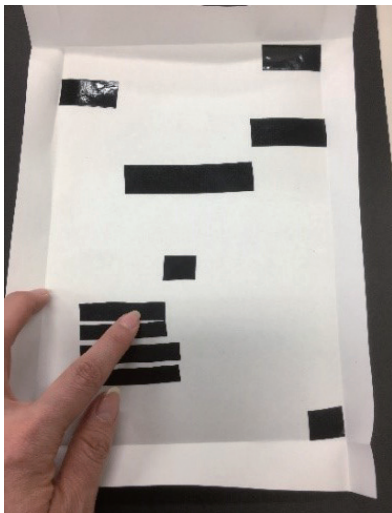### (1) Use of tactile teaching materials

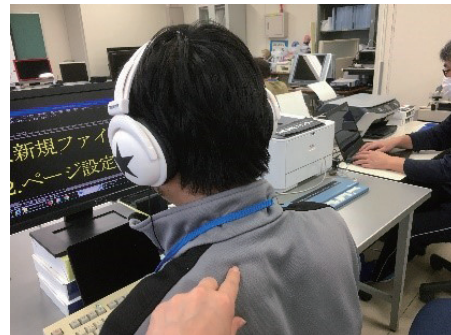Figure 6. Example of tactile teaching materials

Figure 7. Conveying the location of the cursor on the person's back

For example, for persons with congenital visual impairment, tactile teaching materials were created by sticking vinyl tape to the positions of the sentences such that they could understand the layout of business documents by touching them, helping them grasp the overall picture. Folding the edges of the paper also communicates the presence of white space (Figure 6).

For persons with acquired visual disabilities, it is also effective to convey screen information and movement on their backs or palms if it is challenging for them to understand verbal explanations (Figure 7).

(2) Setting an effective theme

Setting the training according to the interests of the trainees will motivate them for the training. Moreover, training will also be implemented to help familiarize the operation of personal computers.

① Acquiring qualifications

If the person is interested in acquiring qualifications, check the qualification they want

to obtain and introduce measures for persons with visual disabilities.

② Experiencing convenience

Introduce and provide experience on certain conveniences, such as checking the contents of printed materials by oneself. Examples include a "print reading system" comprising a computer, scanner, optical character recognition software, and "digitization of printed documents (a series of operations in which the back cover of a book is cut by a cutting machine and separated into individual pages, which are read by a scanner and converted into text)."

③ Linking owned devices

If the person has a device that can be connected to a computer (e.g., smartphone, tablet device, DAISY recording-playback device, and Braille display), introduce how to share data after connecting and how to use it as an output device. Provide information on how to use various online services, such as other externally connected devices (e.g., keyboards, printers, and earphones) and online storage. If the person is interested in disseminating information, introduce how to create a website and how to use various social networking services.

(3) Examples (practical support according to goals)

If their career path is concrete, provide practical support according to the situation assumed in their career path.

① Advancing to higher education

a. Create an environment that simulates that of a university entrance exam (e.g., selection of devices and application software to use and desk placement)

b. Repeated practice of expected exam questions (samples)

② Vocational training (examination measures simulating entrance exams for each vocational training facility)

a. Repeated practice of expected exam questions (samples)

b. Essay writing

c. Input while listening

Figure 8. Creating a "simulated workplace" environment for returning to work

③　Return to work: Write down the following in detail.

    a. Create a "simulated workplace" environment that assumes a place of employment (e.g., selection of devices and applications used and placement) (Figure 8)

       A work environment that simulates the workplace environment is constructed in the training room, and training is conducted using applications and forms used in business.

    b. Repeated practice with specific data (samples) per the work content

       Practical training is provided using the format used in business.

    c. Practice (e.g., practice PowerPoint presentation)

       Provide opportunities for training and simulated presentations on the creation of presentation materials in preparation for company presentation opportunities.

④　Returning home

    Further, to enrich one's leisure time in family life, introduce applications and explain the screen composition following the purpose of creating postal items, such as New Year's cards, creative activities, creating posts, and messages using the Internet.

Chapter 4.
iPhone ∕ iPad

1) Recommended initial settings

(1) General / accessibility settings and introduction

①　Shortcuts

    Introduce the functions and set shortcuts for the functions that the person often uses.

②　Zoom function

    Introduce full-screen zoom. Note the change in gesture operation, given the addition of a three-finger double-tap.

③　Bigger letters

    This setting may destroy the layout of the document.

④　Speech/Voice

    Set to a voice that is easy for the person to hear.

⑤　VoiceOver

    a. Setting the reading speed

    b. Rotor

       Unnecessary items are removed from the list to prevent erroneous operations.

    c. Input mode (standard input mode)

       Touch input is not compatible with VoiceOver.

d. Double-tap time out

　　　　　Set for those who are not good at double tapping.

　　⑥　3D touch

　　　　As a delicate operation is required, turn off this function if it is not necessary.

(2) Touch ID (Face ID) and passcode

　　①　Turn off the function "Require Attention for Face ID".

　　②　Passcode request settings

　　　　If unlocking the phone becomes bothersome, extend the time until the phone automatically locks or turn off this function but sufficiently explain how such actions will weaken the phone's security.

(3) Sound

　　Prevent VoiceOver volume reduction by disabling the change function on the ringtone and notification buttons.

(4) Apple ID name/iCloud/Shared application software

　　Check what the person wants to back up to the cloud

　　→The person can return to an environment that is easy to use by themselves after the training is over.

2) Basic operation

(1) Practicing basic gestures

　　①　Settings/General/Accessibility/VoiceOver/VoiceOver operation practice

　　②　Utilization of VoiceOver help

　　③　Gestures that the person wants to prioritize

　　　　・Frequently used items: left/right/up/down flick, double-tap, split tap

　　　　・Frequently malfunctioning… Read aloud ON/OFF, screen curtain

(2) Restart, unlock the lock screen

　　If VoiceOver fails, try restarting the device.

(3) Calculator

　　Perfect for practicing left/right flicks, double taps, and split taps.

(4) Character input training

　　①　Utilization of message application software and the App Store "Notepad" application software

② Senior application software

App Store. Application software for seniors.

③ Voice input... text field/launch with two-finger double-tap

・Introduce a three-finger single tap to know the current location (cursor position)

・The goal is to input efficiently by using voice and manual inputs.

(5) Other gestures

① Other gestures with two, three, and four fingers and cancel by shaking

② Notification area, control panel

③ Move app icon (high difficulty; Consider requesting assistance)

(6) Rotor

① Reading speed

② Headline (Practice searching for any contact using the Contacts app)

③ Edit (copy and paste)

For copying, practice starting with the method of tapping three fingers four times and teaching the method of rotor "text selection" in the application software.

④ Deletion and insertion in sentences

⑤ Other rotor items, items added by setting

"Text fields" and "buttons" make online browsing with Safari convenient. If it is challenging to use the iPad keyboard, Google keyboard can be installed to enter characters like you would on an iPhone.

3) Setting an effective theme

(1) Receiving and making calls

Call by voice, two-finger double-tap operation.

(2) Introduction of voice operation

① Starting the application

② Creating a simple e-mail

③ Managing schedule

④ Creating and confirming a simple memo

⑤ Weather

⑥ Store search

⑦ Searching for a Twitter post (i.e., a Tweet)

⑧ Others

(3) Password management
  ①   Use a user dictionary
  ②   In the App Store "Notepad" application software, rotor/"line"/selected copy

(4) Social networking services (e.g., e-mail, LINE, and short message)
The more trainees practice gesture operations, the more efficient their training will be.

(5) Introduction of various applications
By introducing application software that address trainees' problems and interests, trainees can experience convenience and operability, such as shopping, transferring information, and map navigation.

4) Examples of instructions software

(1) If it is challenging to read sentences despite seeing the screen, use VoiceOver only when reading long sentences or use voice input when typing long sentences.

(2) Introduce zooming and color inversion functions if they can be used for screen enlargement or monochrome inversion (images taken with the camera are not inverted through Smart inversion).

(3) If the trainee is not good at gestures, change the double-tap time out and introduce AssistiveTouch. Moreover, when typing, use an external Bluetooth keyboard.

(4) Utilization of familiar goods
  ①   Using a smartphone and a transparent stand purchased at a dollar store to read a thick book (Figure 9)
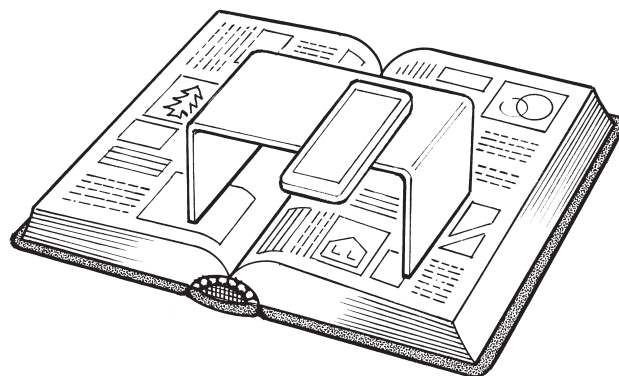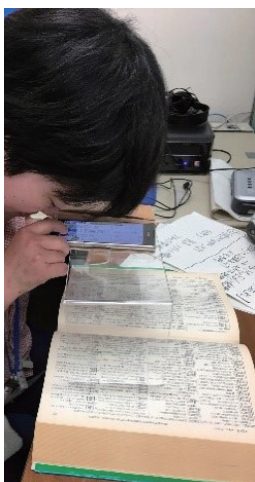

Figure 9. Transparent stand for low vision

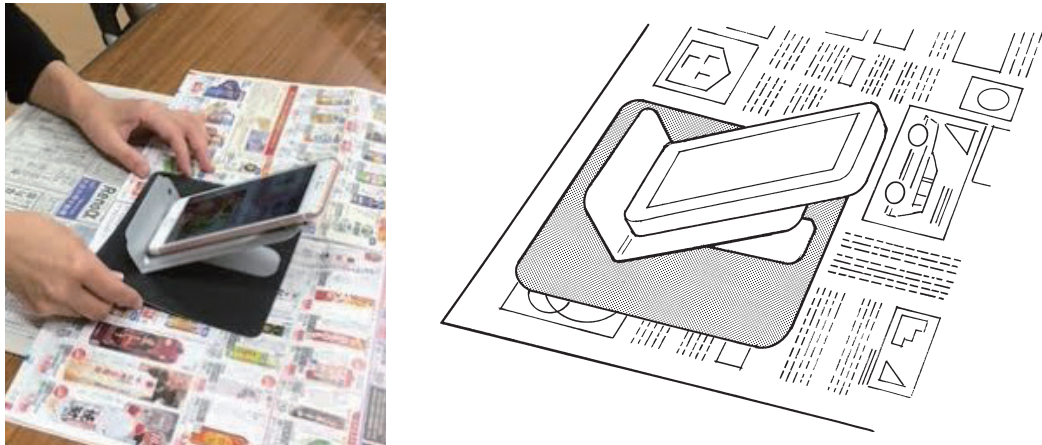② Using a smartphone and a bookend purchased at a dollar store, check the supermarket flyer (Figure 10)

Figure 10. Bookends for low vision (a device to stick a mouse pad on the bottom to make it slippery)

③ Import printed data with a smartphone and laptop (Figure 11)

Figure 11. Proper shooting distance when leaning against an A4 laptop

5) Android device

(1) Features of TalkBack

① Similar to the iPhone, it is possible to perform character input operations with only voice information.

Touching the keyboard and releasing the finger at the key that was read aloud will confirm the character; thus, a full-width alphabetic key input can be entered.

Take advantage of external keyboards and voice input.

② Flick operation can be changed in the settings

The "select and read" function is convenient.

If the person has low vision and can input characters, the Talk Back function can be

turned off and used only when they want to read long sentences, which will improve the efficiency of smartphone operation.

(2) Application software

Many of the useful application software introduced on the iPhone are also available on Android.

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