A Study on Factors that Improve Web Information Access Literacy by Speech Input among Blind People Living in Suburban Areas

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Abstract: Purpose: To determine the percentage of blind people living in suburban areas in Japan who can be operated by voice input. Besides, to clarify the influence of teachers on the spread of literacy in voice input operation. Subjects and Methods: The people in a community of blind people living in suburban areas. The method was to conduct telephone interviews. Web access became available and the time of contact with the key person, and likelihood-based chi-square tests of the degree to which the presence or absence of a teacher was associated with Web access by voice input. Results: In 120 visually impaired people, the study participants included 8 blind and 1 low vision person. Dictation was used by 3 of the 9 participants. All of them used Siri. The longest period of use was 63 to 20 months. The association between the presence or absence of a teacher and web access by voice input was significant (p=0.03). For Siri users, one prior user was the teacher for the remaining two users.

Keywords: Web Information Access Literacy, Speech Input, Blind People, Suburban Areas

1. Introduction

Most blind people in Japan have used radio, television audio and Braille publications as a means of obtaining health-related information, when accessibility to the Web was inadequate before 2000. However, radio and television health information are only providing information for the masses. In contrast to this average information, methods for obtaining information that meets the individual needs of each situation have been stored on the Web and are available for use. Sighted people and users of the Internet can now easily obtain highly effective information. In contrast, it is unclear whether the blind population in our cohort study has the same accessibility to the Web as the sighted population, and if the blind population will be 45 years old or older by 2020, it will be increasingly difficult to access health information if they have difficulty operating information devices themselves. Information accessibility support based on the actual situation of web information access literacy among the blind should be considered. In this study, we investigated the actual situation of the blind population in a suburban area of Japan, which has a community of visually impaired people, and tried to clarify the actual situation of Web information access literacy and to find out what factors improve the literacy. In this study, we report on the analysis of the results of the survey conducted in a situation where people were exposed to COVIT-19 infections after March 2020.

In this study, information accessibility (Accessibility) is defined as "ease of use of information," and is the elimination of inconveniences that can be achieved by designing products and services that are easy to use, taking into account the needs of people with visual, auditory, tactile, and manual handicaps, in order to enable all users, including the elderly and people with disabilities, to use information resources such as computers and web pages without any inconvenience. The definition was added to the related JIS standard on June 20, 2004, as "the elimination of inconvenience realized by designing products and services that are easy to use, taking into account the needs of people with visual, auditory, tactile, and manual disabilities. Among them, the ability to utilize a smartphone using voice input was defined as Web information accessibility as one of the information accessibilities that includes access to the Internet and operation of smartphone applications2.

There are few concrete reports on the use of smartphones operated by voice input among blind people living in suburban areas in Japan, especially for obtaining health-related news and living information. In addition, it is unclear how literacy in these operations improves. By clarifying these issues, we hope to obtain hints for developing a program to improve literacy in information access.

2. Purpose

To determine the percentage of middle-aged and older blind people living in suburban communities in Japan who use smartphones that can be controlled by voice input. In addition, to clarify the structure of factors that influence the spread of voice input literacy, such as those who play a leading role in app usage and information environment factors.

Hypothesis

It is assumed that at least 50% of people under the age of 75 are using voice input. We also assume that a structure exists in which

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a non-blind supporter of speech input operation exists prior to its widespread use, and through training, its widespread use is limited to that person's social circle.

3. Subjects and Methods

The target population was a group of visually impaired people, including 20 members of a community of blind people living in the town of A, Gunma Prefecture, Japan, who continued to participate in the health survey. The method was a telephone interview to explain the purpose of the study and to obtain responses to semi-structured questions and a survey paper from those who accepted to cooperate in the study. The study design was a cross-sectional survey. The survey included the following items in the outcomes: total scores on the e-health literacy questionnaire (Table 1)3,,4,5 total scores on questions related to web information accessibility (Table 2), and their sub-attribute items

(Do you use a PC or smartphone to obtain news and information on the web alone? What devices do you use? What application do you use for voice input? How long have you been using it? When did you learn to use it? Who taught you how to use it? What are the inconveniences? Are you satisfied with it? (Are you satisfied?) were set. In addition, personal attributes (age, gender) were added to the interview and questions were asked as factors for analysis

I know what health information sites are available on the Internet.
I know where to find useful health information sites on the Internet.
I know how to find useful health information sites on the Internet.
I know how to use the Internet to solve questions about my own health condition.
I know how to use the health information I find on the Internet.
I have the skills to be able to evaluate health information sites found on the Internet.
I can distinguish high quality health information sites from low quality health information sites on the Internet.
I am confident that I can use information from the Internet to make decisions about my health.

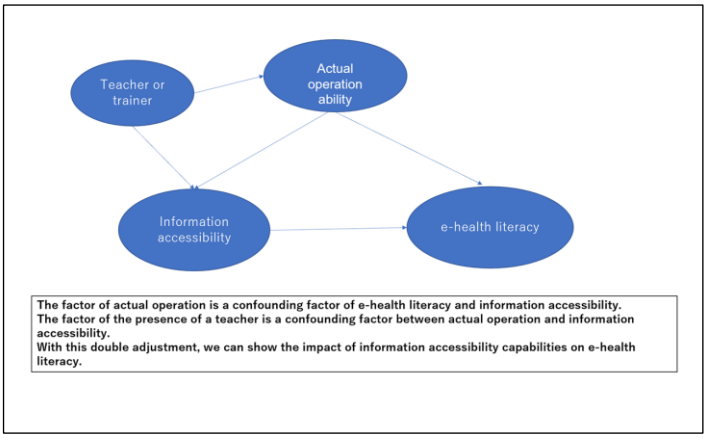
Table 1 e-Health literacy questions: 5 points on a Likert scale, 1 for not at all true and 5 for quite true (expressed on a scale of 8 to 40)

I know who can help me from the beginning to use the Internet.
I know who will help me from the beginning to use the Internet.
I know who will make it easy for me to use the Internet.
I have someone who can help me to use the Internet in a user-friendly way.
I am interested in using the Internet.
I know that I can use only my voice to use the Internet.
I have been informed that I have the opportunity to be taught from somewhere to use the Internet.
I have been informed that there is an opportunity to get assistance with the cost of using the Internet from somewhere.

Table 2 Total score for Web information accessibility-related questions, 1 for not at all true and 5 for quite true (expressed on a scale of 8 to 40)

As a causal graph analysis, a graph was drawn assuming the following three points, and the strength of the influence of each factor on the dependent variable of "e-health literacy" was calculated and evaluated as a partial correlation coefficient by multiple regression analysis. The "actual operation" factor is a confounding factor between "e-health literacy" and "information accessibility. The factor of teacher presence is a confounding factor between "actual operation" and "information accessibility. With this double adjustment, we can show the impact of "information accessibility" on "e-health literacy" (Figure 1).

Fig. 1 Hypothetical causal graph of the relationship of each factor on the dependent variable of e-health literacy



Descriptive statistics of personal attributes and outcomes were used as dependent variables, and causal graphs were drawn using Web access-related factors as explanatory variables and causal factors, and Bayesian regression using quantified interview response scores was used to evaluate the impact. In addition, a log-rank test was attempted for the time required to start operating the application by voice input with and without a person in an instructional role on how to use the application using the Kaplan-Meier method.

4. Results

The total population of the target area was 6255, and there were about 120 visually impaired people. The study participants included 8 blind and 1 low vision person. The duration of residence ranged from 20 to 60 years. The main results are shown in Table 2. Voice input was used by 3 of the 9 participants.

Age

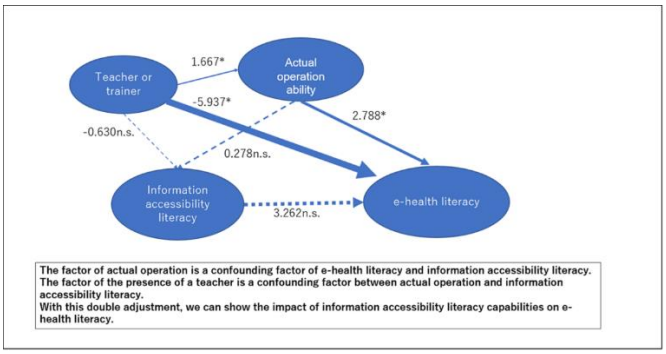
	Frequency	Percent	Valid Percent	Cumulative Percent
48	1	11.1	11.1	11.1
62	1	11.1	11.1	22.2
70	1	11.1	11.1	33.3
72	2	22.2	22.2	55.6
74	1	11.1	11.1	66.7
80	1	11.1	11.1	77.8
82	1	11.1	11.1	88.9
84	1	11.1	11.1	100.0
Total	9	100.0	100.0	

Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
Women	3	33.3	33.3	33.3
Men	6	66.7	66.7	100.0
Total	9	100.0	100.0	

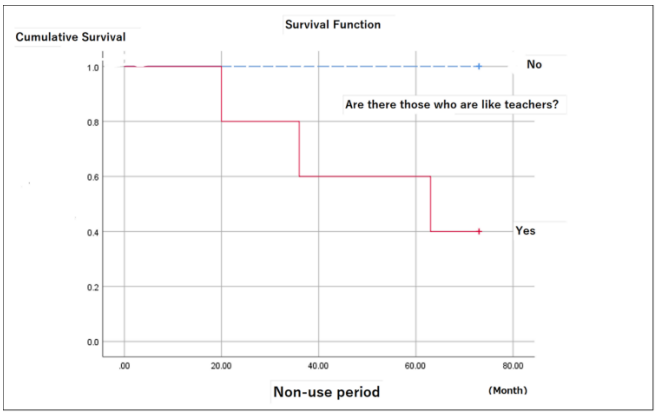
Table 3 Age and gender of participants

A causal graph was drawn with e-Health literacy ability as the dependent variable and "actual operation ability," "information accessibility ability," and "existence of someone who can teach" as the explanatory variables, and the partial regression coefficients obtained by multiple regression analysis as the influence values in this model were 2.788. The partial regression coefficients obtained by multiple regression analysis were 2.788 (0.304to5.272), 3.262 (-11.396to-0.478), and -5.937 (-0.113to6.638), respectively.



All users of voice input applications used iOS and Siri. The longest period of use was 63 months and the shortest period of use was 20 months. The results of the Kaplan-Meier curve are shown in Figure 3. In the case of Siri users, one prior user served as a teacher for the remaining two users. The key person as this teacher was a low-vision person; I taught myself about Siri.

Fig. 3 Duration of using voice input application (Effect of teacher presence on suburban deaf-blind people's acquisition of web information access literacy by voice input)



Survival Rate Chart

Are there those who are like teachers?		Time	State	Cumulative survival rate: Estimated value	Cumulative survival rate: Standard error	Accumulation of final events	Number of remaining cases
No	1	73.000	0			0	3
	2	73.000	0			0	2
	3	73.000	0			0	1
Yes	1	20.000	1	0.800	0.179	1	4
	2	36.000	1	0.600	0.219	2	3
	3	63.000	1	0.400	0.219	3	2
	4	73.000	0			3	1
	5	73.000	0			3	0

5. Discussion

In the blind population, 3 out of 9 people used smartphones that can be operated by voice input, especially to obtain health-related news and lifestyle information. This usage rate seems to be a good trend in this population, where the percentage of people over 65 years old exceeds 80% in terms of age structure. Even among the blind, the younger the age, the greater the ability to use information devices, so this figure may be a reasonable indication of performance.

The presence of a teacher was effective in improving operational literacy. This history contains an important finding. The smartphones used by the students were iPhone without exception. This is probably due to the fact that the teacher-like person recommended Siri. Siri has become the dominant voice input application. Those in this teacher role also used Android. However, the overall ease of use of the iPhone, with its physical home button, is superior to that of smartphones running the Android operating system, which may have influenced the choice of model. Accessibility of the Internet web has been studied4)5)6). However, there are few PC applications in the literature that are specifically designed to allow blind people to use voice input from the start to the end of the application and to save data7)8). This may be the reason why smartphone applications have a high affinity for substituting visual functions for blind people.

Thus, all users of voice input applications used iOS and Siri, with the longest period of use being 63 months and the shortest period of use being 20 months. According to the curve drawn by Kaplan-Meier method, the cumulative time with and without a teacher on how to use the app at the time of the survey was clearly different. Although statistics could not be calculated because all

cases had been surveyed, the association between the presence or absence of a teacherly presence and web access by voice input was significant at p=0.03 in a likelihood-based chi-square test. among Siri users, one prior user was the teacher of the remaining two users. This ordering on the time axis was confirmed. The delay in information transmission during this period took 40 months. We named this the time lag phenomenon of information propagation.

The time lag in information propagation is caused by the state of readiness on the part of the non-information holder, even if the information transmitter passes the appropriate information to the information holder. In this case, one of the reasons was the lack of budget for not only the purchase of a smart phone but also for the cost of packets in their lives. The state of readiness reflects the psychological and economic state of the people involved. Although this study did not address their disposable income, the expenses they avoid for information devices in their lives are less than those of the sighted in terms of absolute income. This is also one of the important issues to be addressed when aiming to improve information accessibility. We should consider how to deliver smartphones and application services as inexpensive or specially designed welfare devices to people in this situation. We should also consider how to create a system that will enable stress-free access to information by understanding this situation. Raising the issue with the local government and related organizations would be an important action to take9)10).

This shows that the presence of a key person who plays an educational role is essential for middle-aged and older blind people living in such suburbs to access the Web from scratch and utilize health information. For those who can easily go to workshops for the blind in urban areas, there are opportunities to improve accessibility literacy even without such a key person, but for the blind in the suburbs who do not have such opportunities, this may be one of the issues that need to be addressed.

Although the scope of this study can only be extrapolated from a limited sample population, we must intervene in this suburban blind community and create a situation where all people can easily access Web information on the Internet while constantly monitoring the condition of those who are considered informationally vulnerable. We will have to intervene in suburban communities of the blind to create a situation where all people can easily access Web information on the Internet, while constantly monitoring the condition of those who are said to be informationally impaired.

6. Conclusion

We found that 33% of blind people living in suburban areas in Japan use smartphones that can be operated by voice input. The results also suggest that the role of teachers in the spread of voice input literacy is related to the access to information by voice input. In an increasingly information-oriented society, it may be necessary to establish a system of public services in which key persons in the community of blind people living in the suburbs can easily provide guidance in the operation of information devices.

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