# Do they know why there are acoustic signs?

# Nonusers' recognition ratio of acoustic support systems for visually impared people.

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## ABSTRACT

The usage of acoustic signs for visually impaired people is insufficiently recognized by nonusers excluding experts engaging in supporting them. However, if the nonusers correctly recognize the roles of these signs, it is anticipated that positive changes can be occurred in their impressions to these sounds. In this paper, we investigated the recognition rates of acoustic signs in nonusers of the signs for acquiring basic data to demonstrate dissemination effects of the signs. The results suggested that tactile ground surface indicators and white canes were known by most of the participants while auditory guide signals were not. Then, after informing the correct usage of the signs to the participants who gave incorrect answers, we asked them to send e-mail about the reflection to the signs in public space when they see and hear them. As a result, 34% of them replied positive answers. This result implies that disseminating the usage and significance of acoustic signs can elicit the positive changes of consciousness to them in nonusers.

## INTRODUCTION

In order to facilitate the movement of visually impaired people, there developed acoustic support systems for presenting surrounding information in public environments and mobile assistive devices for single users (Ueda et al. 2010; Ifukube 1997). These support systems sometimes cause the unpleasantness on sighted people who do not know and use these systems and the information provided by them (Policy Bureau, Ministry of Land, Infrastructure, Transport and Tourism (MLIT) 2002, Ueda 2009). We reported in the previous study (Ueda et al. 2013) that if the product that can reduce the environmental noise level for helping people with visual impairments (Ueda et al. 2010) causes radiating harsh sound for nonusers, their evaluation scores were improved after the nonusers knew an explicit value of the product. Moreover, this understanding of the nonusers reduced their own discomfort to the products (Ueda et al. 2013). These results imply that after realizing the identity and the value of the acoustic assistive products for people with disabilities, even nonusers of these products can rather have tolerant attitudes of the sounding systems.

The role of acoustic signs for the visually impaired in public environment were understood by most of the nonusers who are families of and experts of special support for the visually impaired. However, the Japanese education program hardly teaches the functions of acoustic signs, including audible pedestrian traffic signals and auditory guide signals (Mamada 2012). As a consequence, the usage and the

role of these acoustic signs are merely understood, sometimes misunderstood, by sighted people who have very little relation to visual impaired people or the support acoustic signs, even if other people teach the role of the signs. In order to promote the non-users' value of the acoustic signs for supporting the visually impaired, the activities for spreading and educating the signs will be one of the significant issues to consolidate a barrier-free public environment.

In this paper, the objective is to evaluate the recognition situation of the mobility support systems for visually impaired people in the nonusers. Specifically, we conducted a questionnaire survey about the acoustic signs in university students.

## QUESTIONNAIRE SURVEY

### Participants

Sixty-seven university students comprised of thirty-nine males and twenty-eight females participated in this investigation. All of the participants have normal hearing and vision, and usually use the public transportation including stations. The mean age of the participants was 21.0 years old.

### Method

The questionnaire survey aimed to investigate the recognition rates of the support systems including an audible pedestrian traffic signal and an acoustic guide sign in the participants. As control support objects, a white cane and tactile ground surface indicators were employed as investigation objects. The questionnaire items were composed of the following 5 items: i) Recognition rates: Whether the participants know the support systems, ii) use of the systems, iii) installation purpose in a public environment, iv) name or alias, and v) the reason the participants know. Only the participants who gave a correct answer were asked to respond successively to the other questions.

In this survey, the appearance figures of audible pedestrian traffic signal, an acoustic guide sign, a white cane and tactile ground surface indicators, were presented to the participants as references. When these pictures were shown to the participants, the sounds of the audible pedestrian traffic signal and the acoustic guide sign were also presented. At the same time, we employed dry sources such as peep-peep and cuckoo birdsong-like sounds emitted by the audible pedestrian traffic signal, and the general ding-done sound synthesized by successive ding and dong sounds whose fundamental frequency were 640 Hz and 770 Hz, respectively. The participants listened to these sources with the sound intensity ranged 65 to 70 dB ($L_{Aeq}$, 5 sec). The photographs of a white cane and tactile indicators are illustrated in Figure 1.

The survey was conducted in the shield room or the soundproof chamber located at Tsukuba Central 6, National Institute of Advanced Industrial Science and Technology, in May 2011 to September 2012. This survey was carried out concurrently with the other psychoacoustic experiment and the brain functional measurement during auditory stimuli. Completing this questionnaire survey, the experimenter gave the correct answers of the support systems that the participants had not understood.

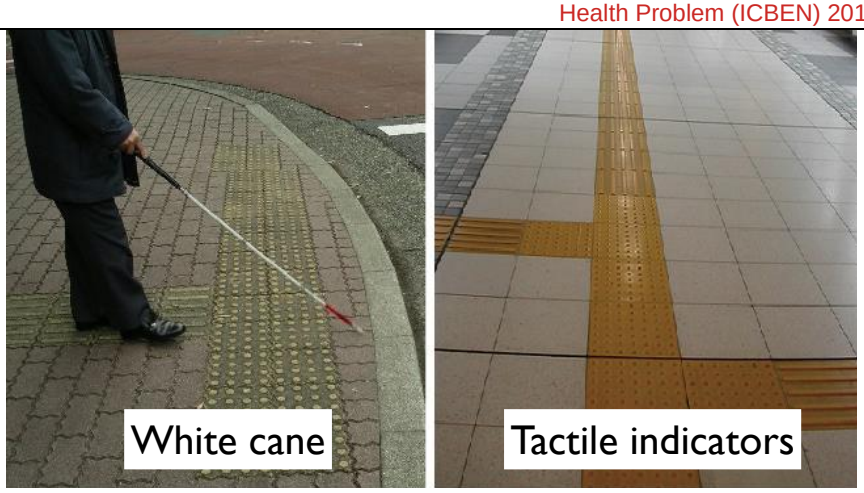


**Figure 1:** Schematic figures of a white cane (left) and tactile surface ground indicators (right). The experimenter showed the participants these figures and then asked them questions.

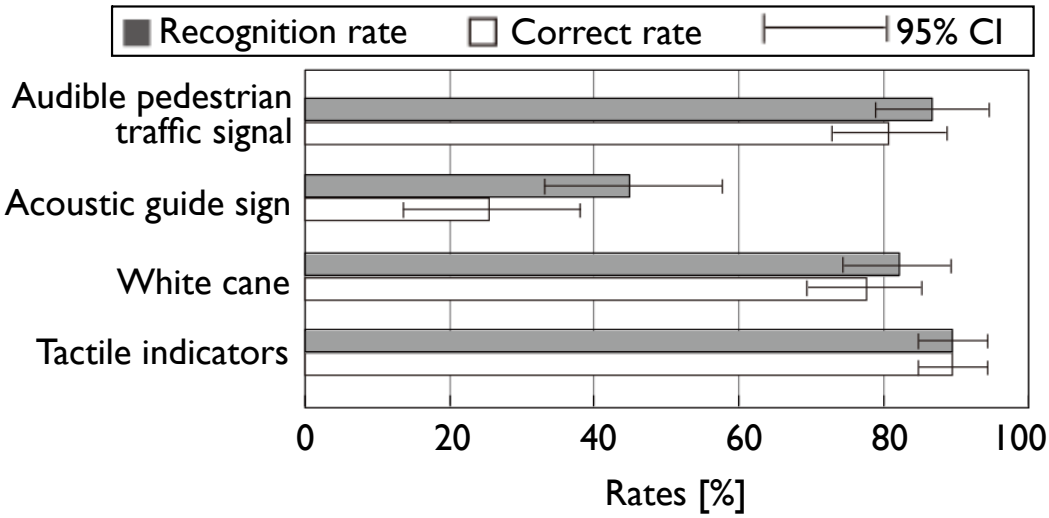


**Figure 2:** Recognition and correct rates of mobility support systems in the participants

## Results

Figure 2 shows the recognition and correct rates on each support system. The recognition rate and correct rate are defined as the rates of the participants who responded "I know" on questionnaire item i), and the participants who gave correct answers on questionnaire items ii)-iv), respectively. The error bars in this figure represent 95% confidence interval. The recognition and correct rates on tactile surface ground indicators were 89% and 89%, respectively, and the highest among all the support systems. These rates on the other items were as follows: audible traffic signal (Recognition: 86%, correct: 80%), white cane (Recognition: 82%, correct: 77%), and acoustic guide sign (Recognition: 44%, correct: 25%). This result indicated that the sighted nonusers least recognized the acoustic guide sign.

There were some incorrect answers that the participants identified the support system, but misunderstood the different usage. Four of the participants regarded the sound of the audible pedestrian traffic signal as a train starting bell that can be heard on the station platform. Three of them considered a white cane as the support aid for seniors or people with physical disabilities. The correct rates of the acoustic guide

sign were least and fifteen of thirty participants who responded they know misunderstood the purpose and the usage of the sign. Eleven out of the fifteen thought the sign as emergency bells, or disaster prevention bells and broadcastings, and the other four identified as time signals or guide information.

The reasons the participants know the tactile indicators as well as the white cane mainly include commercial messages by broadcasting, traffic safety classrooms in their elementary school, and the talk of their parents. According to the participants' comments, they were most affected by the commercial messages broadcasted a few years ago. Eleven of them also told that the notice that reads "traffic signals for visually impaired people" had informed them of its use while the other four responded that they somehow have known the signal. The reasons some of the participants knew the acoustic guide signs include the talk of their family and "somehow." Most of the comments on the free description describe the specific responding that they were careful not to park their bicycles on tactile surface ground indicators after watching movies and TV commercials whose contents illustrated the visually impaired people crushed to objects on the indicators and then fell.

### Consciousness changes of the participants after signified the correct usages

After the survey, fifty-two of the participants who gave their ignorance and incorrect answers were asked to voluntarily send an e-mail within a week about the situation of their consciousness changes on the support systems after knowing the intended use of the systems. They were likewise asked to give us the reflection after finding and hearing two of the acoustic support systems as directly as possible. The collection rate of the e-mail was 34% (n=19).

As a result, one of the participants reported that s/he became more careful to notice the person who has a white cane. Three of them mailed us about reaffirming the sound of the audible pedestrian traffic signals like "They actually had known the sound and the location that they can hear." Regarding the acoustic guide sign, eleven of them reported that they felt good after understanding what kind of sound the sign is though they misunderstood it as bells for emergency or disaster prevention. Four of them also described that they regard the noisiness of the sign as more acceptable than what they were before the survey. Other comments included that some stations installed noisy signs, that they became more conscious of visually impaired people, that their family had not known the signs, and that they did not feel their change.

## DISCUSSION AND CONCLUSION

A questionnaire survey was conducted, in sighted people, to clarify their recognition situation of the support systems installed in public environment including acoustical systems for visually impaired people. The result indicated that the sighted participants highly recognized tactile surface ground indicators, a white cane, and an audible pedestrian traffic signal because of TV commercials, educations by schools and families, and explicit notices written to the support systems. On the other hand, the recognition and correct rates of an acoustic guide sign were less than half those of the others. The role and purpose of these acoustic signs are merely understood, sometimes misunderstood, by the participants, even if they encountered an opportunity to know their intended use. After the notification of the role of auditory

guide signs, the participants reported the positive changes of their awareness. Most of them send feedbacks that it was beneficial to know the role of the acoustic guide sign. According to their other comments about the sign, some consider the sign as more acceptable sound, some became more careful, and others did not have any changes in their consciousness.

Given the number and the characteristics of the participants, the result of this study was not completely statistically significant. However, this result can be sufficiently effective as basic data for suggesting the necessity of education and outreach of the acoustic support systems to sighted nonusers. Moreover, though this study did not conduct to verify the potency of the notification about the systems, the result also suggested that even nonusers, excluding visually impaired people and their related people, became more positive to the sound that emits by the acoustic guide sign after informing them of its identity and its value.

Future studies should quantify the efficacy to enlighten non-users of the support systems about the intended use of an acoustic guide sign for helping visually impaired people to travel. The other questions worthy of the future research include establishing and evaluating a methodology about effectively disseminating specific reason and intended use of the sign.

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