Introducing Echolocation into O&M University Courses for Professionals

Inger C. Berndtsson and Leif Sunneson

It is well known that echolocation makes it possible for a person who is blind to get to know their surroundings and that it strengthens an individual's ability to move independently. In order to learn echolocation skills as a newly blind or vision impaired individual, the orientation and mobility (O&M) specialist needs to become well acquainted with these techniques. However, based on the authors' own experiences as professionals and researcher in the field of vision rehabilitation it is anticipated that very few O&M professionals are familiar with, and practice echolocation. If people who are blind are to have the possibility of learning advanced echolocation skills, then there must be trained O&M specialists to teach echolocation. This report describes the way echolocation skills were taught at a Master's level course in Sweden during 2011–2012.

In Sweden echolocation has not traditionally been included within university programs, despite being mentioned. However, at some of the rehabilitation centres because of the interest and knowledge of O&M specialists, echolocation has been practiced. Echolocation has currently started to be focused upon within learning institutions. As an example, two echolocation workshops were arranged by the ForumVision organisation. The first workshop attended by O&M and low vision professionals was held in Gothenburg 2008 where Bo Schenkman and Mats Nilsson introduced their laboratory studies of echolocation (Schenkman & Nilsson, 2010). Leif Sunesson, a skilled user of echolocation who is blind, demonstrated echolocation and recorded echolocation sounds on a CD. Participants also had the opportunity to learn some echolocation skills. The second workshop in 2010 addressed O&M professionals. In this workshop, participants were introduced the topic by Sunesson who described how he as a young child discovered the phenomenon of echolocation and also gave practical examples of the way it works in a variety of situations. The participants during the workshop used echolocation and developed exercises to use when introducing skills of echolocation to people who are blind or vision impaired. These exercises are available on the World Wide Web but have not, as yet, been systematically evaluated (Sveriges Syncentraler i samverkan, 2013). These exercises are comparable to the echolocation training package presented by Holmes (2011).

Attention has been paid to echolocation throughout the Nordic countries. During the

summer of 2010 a seminar was organised by Magnus Wahlberg University of Southern Denmark and Fjord&Bælt, Kerteminde, Denmark that focused on echolocation used by animals and human beings. Resulting from this seminar was the creation of the Nordic Network Nord Ekko. Both authors are active in this network. Nord Ekko is currently planning a Nordic conference in Denmark in June 2013.

Historically there have been many explanations about the phenomenon of echolocation. An early understanding was "facial vision" and "the sixth sense" (Lawson & Wiener, 2010, p. 128-129). Nowadays it is explained that echolocation is the possibility of hearing sounds reflected from objects in the surroundings towards a person, either self- produced sounds or sounds from other sources (Schenkman & Nilsson, 2010, 2011), which can be perceived in many ways, for instance towards different parts of the body. However, this can be difficult for non-skilled persons to perceive. Traditionally, research has been conducted more on animals than human beings, and consequently we know more about the way bats (Moss & Surlykke, 2010), whales, and porpoises (Linnenschmidt, Beedholm,Wahlberg, et.al., 2012) use echolocation (or biosonar).

It is important for O&M professionals to understand the way people who are blind echolocate. Children who are congenitally blind appear to spontaneously develop and use echolocation skills (Lawson & Wiener, 2010). Also Brazier (2008) found that clients had naturally acquired the skill of echolocation. Even spontaneously produced echolocation sounds are used even though individuals might not be aware they are using echolocation.

People who have become blind as adults do not often have the capability to use echolocation compared to those who are born blind (Lawson & Wiener, 2010; Schenkman & Nilssons, 2010; Voss, Collignon, Lassonde, et.al., 2010). Accordingly, O&M professionals need to teach people echolocation skills so they will get to "see with their ears" and enhance their O&M skills. It is, therefore, important that echolocation skills be integrated into O&M training for professionals.

In the course *Orientation and Mobility in Vision Rehabilitation*, 15 European Credit Transfer and Accumulation System (ECTS) credits advanced level at the Department of Special Education, Stockholm University, echolocation skills are taught to students. The aim of the course is to try various methods and strategies to teach students echolocation and evaluate the practical methods used. The purpose of this report is to describe the content of the echolocation package and consider the methods used.

Design of the course

The echolocation package was one part of the course and comprised four lectures including theory and practice. The echolocation package was executed over two days. In order to learn about echolocation, the theory was combined with practical echolocation exercises (Lawson & Wiener, 2010). There were 13 of 15 students participating in the echolocation training.

Lectures

Associate professor Bo Schenkman gave two technical lectures during the course. One lecture included hearing and perception and the other about his five year

experience in researching echolocation. In the echolocation research lecture, Schenkman gave an historical overview and explanation about the phenomenon of echolocation. Furthermore, he explained his way of conducting laboratory experiments concerning reflecting objects, loudness, and pitch.

Sunesson, the skilled echolocator, also described and demonstrated echolocation.

Sunesson's two lectures about hearing and echolocation were experience-based. He started with an overview of how as a young child he discovered and deliberately learned to use echolocation, and the way he orientated himself using environmental sounds. As Sunesson explained, important factors when learning echolocation as a child is the understanding of the self-to-object spatial relationship (Guth, Rieser, & Ashmead, 2010), self-efficacy, confidence, curiosity, self-reflection, and the importance of responses from next of kin accepting the child's expressions about sensations that are hard to describe. It is important for children and adults to develop symbols, images, and concepts in relation to their echolocation sensations.

These four lectures gave a theoretical basis and insights for the practical sessions about hearing and strategies for learning echolocation.

Echolocation practice

After the lectures students participated in echolocation exercises. The students did not use a cane, though wore a blindfold. The exercises were guided by the skilled echolocator. Echolocation was used in a university corridor containing walls, doorways, openings, a fence, a ceiling, and a staircase. The students were guided one by one through the passage by the echolocator who encouraged them to make sounds by clapping, clicking, smacking, foot stomping, hissing, and tapping the body. The echolocator closely followed each student encouraging them to listen, create concepts, put words to what they heard, for example, the pressure on the face when close to the wall, create images, and symbols. The students observed each other during the trials.

Evaluation of the echolocation practical exercises

After echolocation practice the students received an evaluation form enquiring about their experiences during the exercises. All 13 students responded, of which only four were earlier acquainted with echolocation. The nine students who had not developed echolocation skills earlier had learned to identify walls, distances to walls, beginnings and endings of walls, openings, variations in ceiling heights, stairs, and create their own mental images of the rooms. Only one student did not learn to echolocate. One of the earlier skilled students did learn to identify a fence and a stair by auditorily discriminating between the echo sounds emanating from the each object.

The students reported some important strategies used when learning to echolocate and included, first, not being afraid of making their own sounds and using various sound sources such as feet stamping, tongue clicking, and finger snapping. Second, several students also found it useful not being able to see because of the blindfold, and being guided through the practice by a skilled teacher. Third, recurrent training was

useful as well as the ability to concentrate and listen to the sound-type of the echo and the direction from which it travelled. Finally, to learn echolocation skills time is required and a calm approach, as well as repetition of each exercise to reinforce learning.

Training material on CD

One month later the students received a 12 track CD of material. Tracks 1 – 7 were recorded with a Tascam Hd-P2 and a stereo microphone Soundman okm marc 2, and a stereo-head worn on the head by the recording person. Tracks 8-12 were recorded with an interview recorder Olympic DM550 with an inbuilt stereo microphone. The aim of the CD was to examine if it was possible for the students to recognise the echolocation shadows from a variety of objects at various distances. Specifically, the CD included the following: (i) Track 1: echo shadows in a home environment where benches, corners, walls, closed doors, and a bush was evident (ii) Track 2: Kitchen recording of echo's reflected off a wall, cupboard, and corners (iii) Track 3: A man moves and turns around in a kitchen. The listener needed to identify the man's positions and movements according to the echo shadows (iv) Track 4: Echo shadows in a bedroom that contained a bed, many books, and a closed window (v) Track 5: A vocalised 'S' was given at the same time the person was ascending and descending. The students were required to identify the various changes in height according to the change of position. (vi) Track 6: Three different positions were recorded while a person talked, standing, knelt, and lay. Positions were to be detected by matching the echo shadows with the position (vii) Track 7: Footpath walking was recorded. The sounds of birds, the wind, an airplane, a moped, a traffic light, and a tunnel were also heard (viii) Track 8: The university corridor echo shadows were described by the recorder (ix) Track 9: The same recordings as in Track 8 but without the explanation about the echo shadows (x) Track 10: Echo shadows from a fence were made by foot stamping, hissing, smacking, and clicking (xi) Track 11: The skilled echolocator vocalises letter 'S' which makes it possible for skilled echolocators to hear a half of a centimetre edge of a flat, plain wall (xii) Track 12: Daniel Kish (2003), an expert in echolocation, demonstrates a variety of ways to make clicks useful for echolocating.

The students received a questionnaire that asked about echolocation shadows on each track on the CD in an attempt to identify what the students perceived and understood of the training material. Only six of 15 students answered the questionnaire. The reasons for the small response might be that the CD exercise was complicated and/or the questionnaire was voluntary.

The six students reported to hear echo shadows off the walls, ceilings, and corners. When comments were made on a track, echo shadows became much easier to detect. However, students experienced some difficulties concentrating and differentiating between the various sounds. For example, students reported not hearing sounds from objects close to the ground like benches, as well as distant sounds.

Interestingly, the student's echolocation experiences in practice were similar when listening to the CD. Further, echolocation from objects in the corridor familiar to the students were no longer heard when the echolocator talked on the CD.

Evaluation of the CD

The six students reported that the echo shadows from objects recorded on the CD were difficult to consistently identify. The easiest echolocation track to identify was track seven characterised by an outdoor promenade without talk but with a lot of clues although few echolocation possibilities. Though the students had listened to the tracks many times they still had challenges identifying the echolocation tasks. Most students preferred the outdoor recordings where it was easier to identify echo shadows from objects.

All students thought it should be worthwhile to have recorded material when learning echolocation. However, the recording needs to be more structured with a pedagogically developed strategy.

Conclusion

It appears possible for unskilled echolocators to learn basic echolocation skills. The students and teachers had positive experiences integrating echolocation skills into the O&M course. Students' seemed to have developed their echolocation skills enormously within a short period of time. Students also integrated echolocation in their case studies, which was one of the examinations at the course. The author's believe that after the course students' were capable of teaching echolocation skills to people who are blind or vision impaired.

Important prerequisites for the students learning echolocation skills were the practical exercises. Also the skilled echolocator was useful as a guide and teacher when learning echolocation skills.

The CD was useful but too complicated and unstructured. This learning tool needs a great deal of refinement. There is also a need for more sophisticated recording equipment to record echolocation tasks. A video/DVD might also help introducing the skills of echolocation.

When teaching echolocation skills to people who are blind or vision impaired there needs to be discussion and reflection on the concepts and processes of echolocation. Hence, there seems to be a need within the O&M profession to develop a comprehensible language for describing echolocation phenomena. By applying "dialogical pedagogy" where the concepts are discussed between the O&M professional and client, new ideas and applications of echolocation for the client will emerge.

The authors recommend that echolocation theory and practice be integrated in O&M courses for professionals internationally.

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Inger C. Berndtsson, PhD, *Assistant Professor, Department of Education and Special Education, University of Gothenburg, Box 300 SE 405 30 Göteborg, Sweden; e-mail: <Inger.Berndtsson@ped.gu.se>.* ***Leif Sunesson, B.A.,*** *Braille Teacher, Dahlströmsgatan 24, SE 414 65 Göteborg, Sweden; e-mail: <leif.sunesson@bredband.net>.*