

Draft Recommendations on the Incorporation of Echolocation into Standard Orientation and Mobility Training Programmes for Visually Impaired Persons in Denmark, Poland and Lithuania

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Partner organizations participating in the project:

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PART I

1. The historical background for the development of using active echolocation in O&M training for visually impaired persons in Denmark, Poland and Lithuania

The main aim of this part of the *Recommendations* is to show individual national ways of the development of the active echolocation approach in orientation and mobility for VIPs in partner countries. Consequently, we can see a big difference in knowledge, experience and skills of using the active echolocation approach of orientation and mobility instructors for the visually impaired in the partner countries.

1.1 Brief description of the evolution of the active echolocation approach in O&M training for visually impaired persons in Denmark

In 2007 in Copenhagen, Daniel Kish gave a lecture on human echolocation and his own experiences in using the method at the annual O&M Associations Meeting that inspired IBOS to try to organise a conference in cooperation with researchers in marine mammal echolocation from the Nordic research and experience centre, Fjord & Belt. Unfortunately, this conference did not take place, but the cooperation between the involved partners was fruitful and became a stepping stone for some Danish O&M instructors to learn more about human echolocation as a tool in the O&M training programmes.

At the IMC 14 – International Mobility Conference in New Zealand 2012 – the Royal Dutch Visio presented their work on active echolocation, also inspired by Daniel Kish. Afterwards Visio was invited to give a course on active echolocation for O&M specialists at IBOS and generously shared their exercises. This resulted in the development of a Danish first version compendium incorporated as a two-hour introductory course into the Pedagogic Diploma education and training of Danish O&M professionals at IBOS since 2015. The development of follow up courses for further education in echolocation is recommended.

1.2. Historical development of the active echolocation approach in orientation and mobility programmes for VIP in Poland

The first information about echolocation in Poland could be found in the 1930s. Scientists made attempts to explain the phenomenon of localisation of various obstacles in the environment by blind people by using terms like: 'face vision', 'the sixth sense', 'the sense of obstacles'. Such phrases can be found in publications of Maria Grzegorzewska (Grzegorzewska, 1929). However, the first Polish researcher who provided a complex analysis of this phenomenon was Włodzimierz Dolański. In 1930 he ran experiments in which he examined the detection of a board by blind people who wore earmuffs, masks and cotton in their ears. The finding was that the basis of localising obstacles was the hearing and not the touch generated by the air pressure, as it was thought before (Dolański, 1954). Another reports on the importance of echolocation in the orientation and mobility of blind persons appeared in the 1980s. Czesław Puzyna found that to detect an object the hearing must be used (it is enough to use one healthy ear only). On the basis of the reflection of acoustic waves form given objects, blind persons can draw conclusions on the size of a space and what objects there are around. When there are no sounds or noises, a blind person can produce them by mouth clicks and tapping his or her leg or cane against the floor. This is so-called Flash Sonar (Puzyna, 1993). Despite various interesting research, the topic of echolocation was not of interest to scientists in Poland for many years.

Currently, for some years now a team of scientists form The Lodz University of Technology has been conducting research into human echolocation. The researchers compare echolocation skills (detecting obstacles from various distances) in the natural environment of blind children, blind adults as well as sighted adults. They also examine the precision of recognising the same scenes using recordings and a mobile application (comparative studies). As a practical outcome of the research, a mobile application supporting echolocation skills development is to be designed. Under this project several applications are planned, each covering a different area. The first one is to serve as a teaching tool for sound recognition at the basic level. The second one will be used to learn passive and active echolocation at different levels of advancement by persons with visual impairment as well as a support tool for orientation and mobility instructors. The third application is to be an audio game using the echolocation phenomenon (Bujacz, 2018).

1.3. Using active echolocation in perceiving and understanding the surroundings for visually impaired persons in Lithuania

In 1991 Prof. J. and J. Kwapiszowie (Poland) trained the first orientation and mobility instructors in Lithuania. The O&M Instructors who worked with people with visual impairment noticed that some of them use active echolocation. When visually impaired persons oriented in the environment, they scanned echoes from short whistling, finger flickering and a sliding cane.

Before the EchoProVIP project started, there had been a huge lack of information on human echolocation in the Lithuanian language. Only few articles on active human echolocation could be found on the Internet:

- 01.05.2010 – It is claimed that people with visual impairments can navigate the environment using echolocation
- 04.10.2012 – *How blind people imagine reality* <https://www.lrt.lt/naujienos/mokslas-ir-it/11/5698/kaip-aklieji-isivaizduoja-tikrove>
- 12.01.2017 – *Echolocation Primary for Blind and Visually Impaired. How to Learn to See with Your Ears?* <http://tiflotyra.labiblioteka.lt/2017/01/echolokacijos-pradziamokslis-akliesiems.html>

The first speeches and presentations on the use of active echolocation in orientation and mobility of visually impaired people were presented by the EchoProVip project researchers at several rehabilitation courses and conferences:

- 20.03.2018 – Practical republican conference on: “Inclusive education for the Blind and Visually Impaired – today and perspectives” Presentation on “Echolocation for visually impaired people: Support for orientation and movement in space” Vision education centre, Klaipeda.
- 14.10.2019 – Event dedicated to the White Cane Day “Let's build bridges to the world” in the Seimas of the Lithuanian Republic. Presentation: “Echolocation as an opportunity to develop the orientation and mobility of the blind”.

PART II

2. Recommendations for inclusion of the curriculum of instructors' training in echolocation into the education system of professionals

Taking into account the peculiarities of each partner country's individual historical, political, social and cultural development, there are noticeable significant differences in the national education systems for teachers for the visually impaired people.

Therefore, the recommendations on the incorporation of echolocation in standard orientation and mobility training curricula for visually impaired people at the national level will be based on basic general rules, but highly individual for each partner country.

2.1. General description of the national education systems for teachers for blind and visually impaired people in the partner countries

In Denmark, the educational background for O&M students are a Bachelor's degree, typically as an occupational therapist, pedagogue or teacher. A few opticians and physiotherapists have taken the module as well. The 5-module Pedagogical Diploma Education for professionals in sight rehabilitation, developed by South Denmark University College and IBOS, recommends two basic modules about eye diseases, optical aids, learning approach, etc., before attending the O&M module.

In Poland, special pedagogues, to gain their qualifications, are obliged to complete special education studies. Under the offered curricula, special pedagogues obtain both practical and theoretical knowledge to work with different groups of visually impaired persons. From 1981 special education courses were offered within 5-year studies at the Master's level, but in 1999 the Bologna system was implemented, under which there are two levels of studies: the Bachelor's and Master's levels. From Oct 1st 2007 to 2019 special pedagogy was offered within 3-year Bachelor's studies and 2-year Master's studies, but currently special pedagogy is offered only within unified 5-year Master's studies, in line with the standards of educating pedagogues.

In the Polish education system a person wishing to work with the visually disabled needs to study special pedagogy and major in typhlopedagogy. A few universities and academies offer this kind of studies in Poland: the Maria Grzegorzewska Academy of Special

Education in Warsaw (typhlopedagogy with early school education), The Maria Curie-Skłodowska University in Lublin (typhlopedagogy and oligophrenopedagogy), Cardinal Stefan Wyszyński University in Warsaw (typhlopedagogy and oligophrenopedagogy).

In Lithuania typhlopedagogue is a special pedagogue who provides special pedagogical assistance to blind and visually impaired persons of all ages. The educational background for the position of a typhlopedagogue can be:

- a higher education degree and qualifications of a typhlopedagogue,
- a special pedagogical qualification degree, or
- a pedagogical qualification with the completed typhlopedagogical study module at a higher education institution.

Special pedagogues study general education subjects, like general and special pedagogy and special education, (professional) subjects depending on the chosen specialisation: speech therapist (logopedy), surdopedagogy, typhlopedagogy, etc.

2.2. Detailed information on the training curriculum for O&M instructors in Denmark, including echolocation training

The O&M module is a 122-hour course (10 ECTS), combining theory and practice with an emphasis on practice. Learning goals are:

- to be able to council and guide visually impaired people and their environment, including topics such as accessibility and design
- to assess, analyse and evaluate the possibilities of traveling for individual people with visual impairment
- theory and special pedagogic methods, techniques, strategies and compensating assistive tools
- perception and the influence of the senses on the ability to travel for people that are visually impaired
- to handle and analyse complex issues, including psychological, social and attitudinal factors
- to evaluate, reflect upon and argue for methods and didactics in the (sight adapted) special pedagogic teaching of Orientation & Mobility.

2.3. Information on the training model for O&M instructors in Poland and recommendations for inclusion of the echolocation curriculum at the national level

In Poland there is no unified education system of Orientation and Mobility teachers/instructors. Those interested in pursuing such a career can gain the required qualifications studying typhlopedagogy at the Maria Grzegorzewska Academy of Special Education in Warsaw or participating in special courses run by the Polish Association of the Blind

The Maria Grzegorzewska Academy of Special Education in Warsaw is the only Polish university which has been educating typhlopedagogues continuously since 1983, equipping them with necessary competences to teach orientation and independent mobility. Typhlopedagogy studies are offered in the daily studies system and each year there are 10–12 graduates. Practical and theoretical subjects cover 200 hours of workshops over three consecutive years and they include the following: Basic mobility techniques of persons with visual impairment (15h), Methodology of teaching mobility to partially sighted persons (30h), Methodology of teaching mobility to blind persons (60h), Methodology of teaching mobility to small children with visual impairment (30h). The subjects are ordered according to their advancement and base on gaining subsequent competences. Students work in pairs using blinds/goggles imitating the state of vision loss or using visual impairment simulators. Groups of up to 12 students are managed by three teachers, while those above 12 students – by three teachers (the number of teachers depends on the need to guarantee safety of students imitating the loss of vision). Over the whole course students are required to complete 60h of individual assistance-pedagogy internships.

The Polish Association of the Blind is one of the oldest institutions offering support for persons with visual impairment. For many years, its Kujawsko-Pomorski Regional Office offered courses in O&M instruction, lasting from 2 weeks to 1 month. Additionally, in 2007 and 2014 the Polish Association of the Blind ran two rounds of such courses in Warsaw as well, completed by ca. 30 participants. Currently, there are about 250-300 O&M teachers/instructors in Poland.

Under the current system of educating O&M instructors/teachers, no syllabi have included teaching echolocation so far. On the basis of the gained experience under the programme entitled *Echolocation for persons with Visual Impairment* (2017-1-pl01-ka204-038557) as well as the analysis of implementation possibilities, it is recommended to include

echolocation training to the curricula of educating O&M teachers/instructors in Poland within minimum 15h of instruction (15 classes of 45 minutes). The echolocation syllabus should include two basic blocs: the basic knowledge of echolocation (terminology, echolocation research review, examples of everyday use, etc.) and the methodology of teaching echolocation (rules, teaching stages, teaching methods, echolocation teaching tools) as well as practical exercises. Classes should be offered to small groups of no more than 10 participants. Echolocation should be taught both within longer university courses as well as shorter training courses or workshops.

2.4. Information on the training model for O&M instructors in Lithuania and recommendations for inclusion of the echolocation curriculum at the national level

The typhlopedagogical study programme was run two years ago at one of the universities in Lithuania. It consisted of 90 credits (ECTS). The duration of the studies was 1.5 years.

The main study areas were: orientation and mobility of the blind (16 credits), special psychology and pedagogy (3 credits), Braille printing (5 credits), technical devices (2 credits), anatomy, physiology, pathology of visual organs (3 credits), etc.

Currently, in Lithuania there is implemented the Typhlopedagogical Qualification Improvement Programme for teachers who have begun to educate students with significant visual impairment (accredited until the end of 2020). The duration of the Programme is 40 academic hours (22 hours for the theory, 13 hours for practical work and 5 hours of self-study). A two-hour introductory course into the active echolocation compendium is recommended.

PART III

3. Recommendations for the incorporation of active echolocation training into regular O&M training programmes for visually impaired persons in the partner countries

Echolocation training during regular O&M training for visually impaired adults

Echolocation training during regular O&M training for visually impaired children of the school age

Active echolocation training facilities for small children with visual impairment

One of the main goals of the ECHOproVIP project is to create recommendations how to include the active echolocation competence training into national regular O&M training programmes for visually impaired people, regardless of whether they were born blind, were early blinded or lost their sight later as a consequence of an accident, eye disease or ageing. To achieve this objective, there will be presented specific tips on how to incorporate new curricula content into existing O&M training programmes for visually impaired persons in each partner country.

Denmark

We recommend that echolocation should become a natural part of visually impaired people's O&M training. O&M specialists should be able to present an opportunity to learn active echolocation as part of the general O&M training. For that to happen we would recommend the development of two-day follow up courses to the current introductory course, which should be offered at the national scale to all O&M professionals.

With the knowledge provided from the EchoProVip curriculum and compendium, O&M instructors should be able to offer and plan an individual course based on a given visually impaired person's individual needs, abilities and requests.

Poland

In Poland the echolocation training of adults with visual impairment should be organised according to their possibilities and needs. Therefore, the first step ought to be conducting a functional diagnosis and needs analysis, which should cover an in-depth interview as well as an assessment of a given person's skills as for using the white cane and localising and interpreting surrounding sounds. In the echolocation teaching methodology it is advised to teach echolocation to a blind person only when she/he can use the white cane correctly. This guideline is justified by the fact that there is a need for maximum concentration on sound stimuli while moving. Thus, if a blind person cannot move using the white cane, it will be hard for him/her to concentrate on additional acoustic stimuli and interpret them

correctly. Certainly there are exceptions to this rule and these are highly motivated persons with visual impairment who can develop both skills at the same time.

The echolocation training for children should begin when a child reacts to sound stimuli (after its infancy). Parents should be the first instructors of echolocation – their role is to develop sound concentration in their child, both in spontaneous situations (while playing, talking, singing, etc.) as well as during specially designed exercises (playing with different objects, in different rooms). After the phase of developing sound sensitivity in children, what is important is to give them an opportunity to experience and experiment with sounds independently. Parents should give their children plenty of opportunities to move, encourage them to clap their hands, look for their shoes with their feet, moth click to know their acoustic surroundings better.

Older children should practise their echolocation skills with their O&M teacher, according to the accepted teaching methodology in this respect (starting with exercises indoors, e.g. in the class, school, at home, to outdoor exercises, e.g. at stations, parking lots, etc.; starting from exercises with big objects, ending with exercises with small objects).

Active echolocation training facilities for small children with visual impairment:

- parents' voices, surrounding sounds
- singing, talking, quiet and louder whispering
- everyday objects (bowls, sieves, trays, boards, boxes, lids, etc.)
- playing with different panels and boxes
- playing with the sound memo

Lithuania

In Lithuania complex social rehabilitation services are provided to adults with visual impairment according to the description of service provision approved by the Minister of Social Security and Labour. These complex services are provided according to the individual needs of a blind person.

Complex services are provided for 30 calendar days: development of orientation and mobility skills – up to 90 hours, development of daily living skills – up to 60 hours, development of communication skills – up to 60 hours, the help of a medical psychologist – up to 24 hours, vocational guidance and counseling – up to 4 hours.

The individual plan and the number of hours are chosen according to the needs and capabilities of an individual. The orientation and mobility skills programme consists of 3 parts:

- training of orientation and mobility skills without using the white cane,
- walking with the help of the white cane,
- development of orientation and mobility skills and mastering the routes to the most needed objects.

Recommended exercises for training of orientation and mobility skills without using the white cane are basic indoor exercises of active echolocation, e.g., determination of useful active echolocation signals, demonstration of the echo with a panel, demonstration of the echo at varying distances, standing still and observing a wall with the 'ssh' sound, observing a wall with the 'ssh' sound while walking, determining the kind of echo in various rooms, identifying rooms including staircases, etc.

Recommended exercises for walking with the help of the white cane are all active echolocation exercises outdoors, e.g. approaching a wall, perceiving inner angles (corners), observing objects, the size of a van/car (not lower than the head level), etc.

Recommended exercises for the development of orientation and mobility skills and mastering the routes to the most needed objects are: complex exercises in active echolocation outdoors, e.g. observing large objects up to the eye level (cars, vans, containers), perceiving narrow objects at the head level (e.g. street lights or tree trunks), perceiving an open space (clearing), perceiving bushes, following a natural guideline in the form of trees, bushes, hedges, etc.

The distribution of hours is discussed individually with a blind person and depends on his or her needs and capabilities. They are given up to 90 hours for spatial orientation and independent movement (mobility) education, recommended no more than 30 percent for exercises of echolocation. A recently blinded person has more hours for simpler exercises, while a skilled white cane user has more time for more difficult exercises.

The content of education and provision of special pedagogical assistance in general education schools in Lithuania is regulated annually by the primary, basic and secondary education plan approved by the Lithuanian Minister of Education, Science and Sports. This plan defines the forms and hours of special lessons and training.

For example, for a visually impaired basic school pupil who is at risk of blindness, at least 37 lessons per year shall be provided in individual Braille lessons, spaced at intervals that allow the pupil to learn Braille as soon as possible. Blind (visual acuity from light to 0.04)

and low vision (visual acuity – 0.05-0.1) pupils receive 37 and more lessons per year for low vision training. A blind pupil shall be given at least 37 lessons per year (1 hour per week) for individual orientation and mobility training. These lessons can also be used to develop everyday life and communication skills.

The General Orientation and Mobility Curriculum is created for blind children and young people who are visually impaired from birth or with sight loss in childhood. The programme was approved in 2000 by the Lithuanian Ministry of Education and Science. It consists of 36 topics divided into 4 sections (levels) and includes 250 hours of individual work with a visually impaired student, of which: 80 hours at the elementary school level, 100 hours in basic school (5–10 grades) and 70 hours at the higher school level.

The O&M curriculum topics are only general, whereby an orientation and mobility teacher develops an individual education plan for each student. How to integrate active echolocation skills training is selected by the teacher, based on the child's age, the degree of the visual impairment, his/her abilities and desires. It could be started from the preliminary exercises inside: demonstration of the echo with a panel, demonstration of the echo at varying distances, finding a panel above, etc. For the orientation and mobility curriculum inside the school building and at home all active echolocation indoor exercises can be used. At the higher school level students could start to create their own routes using active echolocation landmarks with the help of Google maps.

The process itself and the development of active echolocation skills are important when working with students using various active echolocation exercises during each orientation and mobility training session. The training for students should be fun, purposeful and playful. A child, a young man or girl needs to develop self-confidence, the courage to use active echo-sounds in school and different social spaces and to develop resistance to the attention of those around him or her.

Preschoolers: active echolocation exercises should be part of general sensomotoric training. The exercises must be engaging and playful. Listening skills of a child are developing and the source of sound is perceived as playing and making sounds such as palming, singing, trembling.

Parents should be made aware of the possibilities of using active echolocation while they understand the cause of their child's making specific sounds, rather than prohibit them.

4. Conclusion

Generalisation of the Project's outcomes at the national level. Important findings and perspectives for each partner country of the Project.

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