Role of rescreening in special education intervention

(overview essay)

Jana Zvědělíková, Adéla Hanáková

Abstract: *According to the statistics of the World Health Organization in March 2015, 328 million adults and 32 million children have hearing impairment. Early diagnosis and early special education intervention affect the quality of life of the child and their family. A big part of hearing defects can be detected a few days after birth by new-born hearing screening, which is done through examination of otoacoustic emissions. This examination should ideally establish hearing rescreening. Our study confirmed that in some individual cases, test results using BERA or SSEP indicate a significant difference between the measured values and actual hearing status. According to the results of check-up (rescreening), after a certain time no pathology of hearing or hearing impairment of milder degree in maturing central nervous system may be reported. From the qualitative data, we obtained results of 10 respondents, while in 3 of them a milder degree of hearing impairment was measured.*

Keywords: *hearing impairment, hearing rescreening, childhood, diagnostics*

1 Introduction

Sensory development is complex, with both morphologic and neural components. Development of the senses begins in early fetal life, initially with structures and then in utero stimulation initiates perception. Sound transmission from the mother's speech, heartbeat, and external noise stimulates fetal hearing development prior to birth. After birth, environmental stimulants accelerate each sensory organ to nearly complete maturity several months after birth (Clark-Gambelunghe & Clark, 2015).

In persons with hearing impairment speech perception is disrupted (hence stimulus deprivation) a disruption of auditory orientation in their environment occurs.

There can appear difficulties in social communication and the consequent lack of social experience can arise.

As reported by Hanakova and Stejskalova (2015), although symptomatic speech disorder is not the dominant issue in terms of primary disability, it can significantly affect the quality of life of individuals, especially its psychosocial dimension. "Communication, cognition, language, and speech are interrelated and develop together. It should come as no surprise to us that the key to intervention with deaf children is to establish, as early as possible, a functional communication system for the child and the parents. Early intervention programs need to be multidisciplinary, technologically sound and most important; it should take cognizance of the specific context (community, country) in which the child and family function" (Daneshmandan et al., 2009, p. 363).

In the context of increasing demands on professionals who provide intervention, Hanakova and Stejskalova (2015) focused on the currently relatively marginalized issue – symptomatic speech disorders in people with sensory impairment. Their main goal was the exploration of current needs of special education practice. The intention of their research was to explore the current state from the perspective of speech therapists and identify specific and potentially problematic aspects. Their data showed that the majority of respondents (speech therapists) had already had some experience with clients with sensory disabilities. Many of them, however, admitted that they felt not competent enough for working with these people, and therefore turned to other professionals. In this context, the therapists also admitted that they lacked sources of scientific information. However, the possibility of cooperating with other experts looks promising. The majority of respondents know where to turn to for help and actively cooperate with other professionals. But only in a few cases can we describe this cooperation as interdisciplinary.

2 Research Focus

Lejska and Havlik (2008) state that currently, abroad (mainly in the USA), combined standard hearing tests using otoacoustic emissions and ABR (Auditory Brainstem Response) are used. ABR reveals defects in hearing that after examination of otoacoustic emissions come out false positives. Using only one method may produce a distorted diagnosis.

Examination of otoacoustic emissions, among the objective tests of hearing, the diagnosis belongs exclusively to doctors, the medical staff. As part of special educational practice, use of subjective tests of hearing, depending on the child's age, cooperation and intellect, is increasingly common. Medical staff use subjective tests of hearing (mostly tone audiometry) to preschool / school-age children. In establishments providing special educational intervention, training takes place in response

to a sound stimulus, called Hearing Education. For this reason, subjective hearing test can be done at an early age. Horakova (2012) states that it is important to keep in mind that you cannot rely solely on objective methods for demonstrating how a child hears a sound, but it is necessary to take into account the results obtained from behavioural methods, i.e., whether the child responds to some sounds at home, identifies sounds and how the child normally reacts to them. In this case, it is necessary to cooperate with the child's parents, ENT doctors and special education teachers.

In healthy term neonates, newborn hearing screening is performed at neonatal departments, usually on day 2 to 4 postpartum, or on day 2 to 4 of corrected age in preterm neonates so that the auditory tract becomes more mature. Investigations have either a positive result, i.e. physiological or negative, i.e. abnormal (it is uncertain whether the child has hearing loss greater than 40 dB). If the result is negative, the attending physician will examine the ear canals and this examination should be repeated at least after 24 hours as the first rescreening of the newborn's hearing to avoid measurement errors. Children, in whom the negative result of newborn hearing screening is confirmed during the first rescreening, should be referred to the local ENT/phoniatric clinic within 1 month for second rescreening. If the result is confirmed, the patient's hearing should be tested and further procedure planned at this clinic. Any correction of hearing disorders by using conventional hearing aids should be made within 6 months of age, respectively 6 months of corrected age in preterm infants with attending ENT doctor. Children with very severe hearing loss are sent to a specialized department of ENT to determine the suitability of cochlear implantation and to provide a method of rehabilitation. (Ministry of Health, 2012)

3 Material and method

In a qualitative design, we used the method of observation. It was a short, direct observation to monitor sensate phenomena. Sensate effects were caused by the intervention of the observer – specifically inducing sound initiative audiometer PA5 and children were monitored in response to the tone of a certain frequency and intensity.

The sample of observation were 10 children aged 2 (1y. 7m.) to 7 years of age diagnosed with hearing impairments of varying degrees. Indicative hearing tests using child audiometer PA5 was conducted on November 5, 2014 in the department of special education centre. Investigations took place in a room designed and furnished for sitting with the children's parents. The clients were in a familiar environment, familiar room, so they did not hesitate. At each examination the child's teacher and possibly one parent were also present.

Figure 1: *Participants*

	Age	Hearing loss	Presence of associated disability	Note
Child 1	3y. 7m.	Profound	No	–
Child 2	6y. 2m.	Profound	No	–
Child 3	6y.	Profound	No	–
Child 4	7y.	Profound	No	–
Child 5	1y. 7m.	Profound	No	Despite the low age, the child actively cooperated, there was no need for help from the teacher, the child had a very good vocabulary in the sign language, it was easy to motivate, and the examination was an obvious joy.
Child 6	5y. 8m.	Mild	No	–
Child 7	6y. 1m.	Severe	Yes (autistic spectrum disorder)	The examination was actively attended by a kindergarten teacher, who motivated the child to work. The child did not respond to the researcher at all, only perceiving his presence. Every time she was supposed to „listen to the ball," she checked the presence of the researcher in the mirror and then looked at the head of the special education center. The child responded to the sound stimulus without visual support. Based on the measured values, we repeated the exam to be valid. Therefore, this examination lasted for a long time and without the participation of the kindergarten teacher it would hardly be done.
Child 8	4y. 3m.	Profound	No	–
Child 9	2y.	Profound	No	The child was accompanied by the mother from the session at a special pedagogical center. The child was tired and kept their attention only for the right ear. We started at 500 Hz and at 80 dB. From 80 dB we got up to 20dB, at 1000Hz the situation was repeated. The examination was verified because the mother of the child claimed she did not hear the right ear. The child ceased to have fun and could not cope with further cooperation. With the Special Education Teacher, we agreed that the reactions were valid. I offered the parents the option of rescreening. The mother was not interested.
Child 10	5y. 5m.	Severe	No	The own-initiative examination was actively attended by a kindergarten teacher who motivated the child to work.

With the child audiometer, PA5 hearing checked tone audiometry in the range of 20 to 80 dB and 500 to 4000 Hz. Specifically, we measured the ear at frequencies of

500, 1000, 2000, 3000 and 4000 Hz. The results were entered in an audiogram manually. The distance between the speaker and the ear of the child shall be 50 cm. Fair distances ranged from 40 to 60 cm. The measurement we used was an intermittent tone, and the intensity at a particular frequency is always verified.

After the arrival of the child, all compensatory aids were removed and the child was seated at a children's table. The examination was carried out as a game to be more attractive for the child. The tests employed tools: balls, drum, and audiometer PA5 and carpet pipe. First, the child was explained what was going to happen. To understand the activity, we used the first reaction to the drum sound perception, in which in addition to a strong acoustic initiative and feeling of the vibrations. The baby grasps the ball to the opposite ear than was investigated and, if heard, or if the eardrum felt sensory perception, dropped the ball into the carpet pipe. For children who have not responded to PA5, first rehearsal took place through the eardrum, examinations' highest intensity at all frequencies using PA5 and subsequently re-used drum.

4 Results

Figure 2 shows the current classification of hearing impairment according to the World Health Organization. Figure 3 shows the measurement results.

Figure 2: *Classification of hearing loss (WHO)*

Classification of hearing loss (WHO)	
Verbal description	PTA (0,5–4 kHz)
Normal	≤ 25 dB HL
Mild	26–40 dB HL
Moderate	41–60 dB HL
Severe	61–80 dB HL
Profound	≥ 81 dB HL

Figure 3: *Measurement results*

	Hearing loss (medical report ENT doctor)	**PA5**	**Result – rescreening**	**Note**
Child 1	Profound	without response	Respond	
Child 2	Profound (71–90 dB)	measured at 80dB at 2000 Hz right ear, others without response	Respond	
Child 3	Profound (70–90 dB)	without response	Respond	

Child 4	Profound (80–100 dB)	on the right ear – 80 dB at 3000 and 4000 Hz, on the left ear – 80 dB at 2000, 3000 and 4000 Hz	Respond	
Child 5	Profound	without response	Respond	
Child 6	Mild (total loss of 23 %)	bilateral loss of 40–50 dB was measured	**Severe degree of hearing loss**	
Child 7	Severe (50–60 dB)	bilateral loss of 20–30 dB was measured	**Milder degree of hearing loss**	Child with autistic spectrum disorder
Child 8	Profound (100–110 dB)	without response	Respond	
Child 9	Profound (left hearing is diagnosed with severe hearing impairment – loss of 70–80 dB, full deafness detected on the right ear)	On the right ear at 500 and 1000 Hz–20 dB	**Milder degree of hearing loss**	
Child 10	Severe (bilateral 60 dB)	bilateral loss of 20–40 dB was measured	**Milder degree of hearing loss**	

Discussion

For the six children, we measured hearing rescreening with the same degree of hearing impairment, as stated in the medical report ENT doctor. In one case, we measured a severe degree of hearing loss and in 3 cases a milder degree of hearing loss. Nine children cooperated without difficulty. Only one of the children did not respond to the investigators, therefore, to actively involve the examination kindergarten teacher. It was a child diagnosed with Autism Spectrum Disorder and moderate hearing impairment, which was subsequently measured milder degree of hearing loss (for the validity of the result we repeated a full screening for this child). Another child, in whom we measured milder degree of hearing loss, was the child was the "Child 9". This two years old child came with mother after sitting in a special education centre. The child was obviously tired, but thanks to the motivation willing to cooperate. In all children, we first investigated the highest intensity and lowest frequency. We gradually decreased intensity. With "Child 9" we got up to 20 dB at frequencies 500 and 1000 Hz right ear. Given that a child has been diagnosed loss in his left ear 70–80 dB and the right profound hearing loss, we needed to check the results several times, which has led to fatigue and eventually the child refused to cooperate. We offered her mother rescreening, but she refused.

The results of measurements conducted show that rescreening hearing in children with hearing impairment is justified and therefore cannot rely solely on objective

tests of hearing. From the experience of workers for early care we know that they would like to use subjective tests for rescreening of hearing children. Great predictive value has made the results rescreening hearing in 10 children with hearing impairment. 3 of the 10 children were measured milder degree of hearing impairment. We believe that in some individual cases, the test results using BERA or SSEP indicate a significant difference between the measured values and actual status hearing. Cause can be abnormal electrical activity in the brain – e.g. in children born prematurely may be through objective tests of hearing diagnosed with severe hearing impairment. According to the results of the check-up, but after some time, no pathology of hearing may be exhibited or hearing impairment is much milder grades because maturing central nervous system.

There is no doubt that the implementation of rescreening hearing is important for both quality and compensation for hearing defects and subsequent rehabilitation. In this case, transdisciplinary collaboration is necessary, where individual experts consult each intervention for that client.

4 Conclusion

We believe that it is advisable to equip the clinic paediatricians with audiometers. Acquisition of child audiometer is not so expensive; prices of audiometers are around 50 000 CZK. Paediatricians are required (since 2012) to monitor child development and focus inter alia on the detection of hearing defects. If the clinic paediatricians were equipped by audiometers, not only could lead to early detection of hearing loss, but also for rescreening hearing impaired children. Some of today's audiometers are equipped with a touch screen display, so that the children could operate by themselves. Children usually do not have difficulties with technology; today's generation of children is technically proficient. Komínek (2012) reported that in a small percentage hearing impairment may occur at a later age, and therefore it is important to monitor children who have already passed the hearing screening. With the inclusion of preschool facility and a group of peers with more frequent illness of a child, so we can at this time meet with obtaining hearing impairment, e.g. because of recurring inflammation of the middle ear. Timeliness detection of hearing impairment affects the possibility of compensation for hearing defects, initiate intervention and hence improve the quality of life of individuals.

Acknowledgements

This paper was supported by grant IGA_PdF_2017_021

References

[1] Clark-Gambelunghe, M. B., & Clark, D. A. (2015). Sensory Development. *The Pediatric Clinics Of North America*, *62*(The Healthy and Sick Newborn), 367–384. doi:10.1016/j.pcl.2014.11.003.

[2] Daneshmandan, N., Borghei, P., Yazdany, N., Soleimani, F., & Vameghi, R. (2009). Oral Communication Development in Severe to Profound Hearing Impaired Children After Receiving Aural Habilitation. *Acta Medica Iranica*, *47*(5), 363–367.

[3] Ministry of health (Czech Republic). (2012). Bulletin no. 7/2012 – Guidelines for the implementation of new-born hearing screening in new-borns. [online]. 31.8.2012 [cit. 2016-03-12]. Dostupné z:*http://www.mzcr.cz/Legislativa/dokumenty/vestnik-c7/2012_6706_11.html.*

[4] Hanáková, A., Stejskalová, K. (2015) Symptomatic Speech Disorders – Theoretical Basis and Practical Applications. In *Society, Integration, Education. Proceedings of the International Scientific Conference*. Rezekne : Rezeknes Augstskola, s. 97–105. ISSN 2256-0629.DOI 10.17770/sie2015vol3.388.

[5] Hanáková, A. Stejskalová, K. (2015) Fenomén symptomatických poruch řeči u osob se senzorickým postižením z pohledu logopedů. (The phenomenon of symptomatic speech disorders in people with sensory disabilities from the perspective of the speech therapists). *Lifelong Learning – celoživotní vzdělávání*, roč. 5, č. 2, s. 79–97. ISSN 1804-526X.DOI: http://dx.doi.org/10.11118/lifele2015050279.

[6] Horáková, R. (2012) *Sluchové postižení. Úvod do surdopedie. (Hearing impairment. Introduction to hearing impairment).* Praha: Portál.

[7] Hrubý, J. (1999) *Velký ilustrovaný průvodce neslyšících a nedoslýchavých po jejich vlastním osudu. 1. díl.* Praha: FRPSP.

[8] Komínek, P. et al. (2012) Screening sluchu u novorozenců – jaká je role dětských lékařů? (Hearing Screening in Newborns – what is the role of paediatricians?) *Pediatrie pro praxi* [online]. Přístup dne 30. 10. 2015, z http://www.pediatriepropraxi.cz/pdfs/ped/2012/05/09.pdf

[9] Lejska, M. Havlík, R. (2008) *Auditory Neuropathy.* proLékaře.cz [online]. Přístup dne 17. 8. 2014, z http://www.prolekare.cz/otorinolaryngologie-foniatrie-clanek/auditory-neuropathy-2140?confirm_rules=1.

[10] Rai, N., & Thakur, N. (2013). Universal screening of newborns to detect hearing impairment—Is it necessary?. *International Journal Of Pediatric Otorhinolaryngology*, *77*1036-1041. doi:10.1016/j.ijporl.2013.04.006.

(reviewed twice)

Mgr. Jana Zvědělíková, Mgr. Adéla Hanáková, Ph.D.
Institute of Special Education Studies, Faculty of Education
Zizkovo nam. 5,
77140, Olomouc
Czech Republic
zvedelikova.j@centrum.cz, adela.hanakova@upol.cz