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## ***Polish Picture Vocabulary Test – Comprehension (OTSR)* in logopedic diagnosis of hearing-impaired children**

### SUMMARY

The article discusses the problems of the possibility of using picture word comprehension tests in logopedic diagnosis of hearing-impaired persons. The study presents the example of adjusting the procedure and interpretation of the *Polish Picture Vocabulary Test – Comprehension* [Polish: *Obrazkowy Test Słownikowy – Rozumienie (OTSR)*] to test hearing-impaired children and young people. Examples of testing persons of different age and with different characteristics of hearing deficits were presented. On the basis of these and experience of therapy work changes in the procedure for OTSR testing are proposed, which would allow the wide use of the test in surdologopedic diagnosis. The paper also discusses the consequences of introducing changes in the procedure in respect of interpretation of OTSR results and comparing them with the existing norms for typically developing monolingual Polish children.

**Key words:** hearing impairment, picture vocabulary test, OTSR, surdologopedic diagnosis

### INTRODUCTION. TESTING OF HEARING-IMPAIRED PERSONS WITH PICTURE VOCABULARY TESTS

The psychometric tools used to assess the vocabulary knowledge of children (and adults) have been prepared first of all for the population using spoken language and are generally normalized for such a population. When using tools to assess word comprehension we often deal with picture tests employing the picture selection task in response to a spoken key word. The example of one of the most popular tests of this kind employed in research and in diagnosis, used in

various countries, is the *Peabody Picture Vocabulary Test* PPVT (American version: Dunn and Dunn, 1981/1997/2007<sup>1</sup>; examples of other language versions are: the *British Picture Vocabulary Scale* BPVS, Dunn, Dunn, Whetton, Burley, 1997, Spanish – *Test de Vocabulario en Imágenes Peabody* TVIP, Dunn, Padilla, Lugo, Dunn, 1986, French – *Échelle de vocabulaire en images Peabody* EVIP, Dunn, Theriault-Whalen, Dunn, 1993). The test items in the PPVT are ordered according to the increasing difficulty level and divided into sets, owing to which the place where the test starts is determined by the child's biological age (it is assumed based on the test results that earlier items would be too simple for the child at a particular age) and the moment of finishing the test is defined by the number of incorrect answers given in a set (it is assumed that the next items would be too difficult). The test that can be regarded as a Polish equivalent of these tools is the Polish Picture Vocabulary Test – Comprehension [*Obrazkowy Test Słownikowy – Rozumienie* OTSR] (Haman and Fronczyk 2012). A significant difference between the PPVT (including its different language versions) and the OTSR is the way of selecting distractor-pictures and that it has norms exclusively for the age of 2;0-6;11 years.<sup>2</sup> The pages below discuss attempts to adjust picture tests assessing word comprehension to apply them to the hearing-impaired population.

A hearing impairment can be seen as the fundamental obstacle to using the PPVT (and its other language versions), which was pointed out by the authors of the test (e.g. Dunn et al. 1997). In literature on the subject there are, however, many examples where the PPVT (and its other language versions) is employed to assess the vocabulary of hearing-impaired children and young people. These are experimental studies with different characteristics serving to check the effect of a selected factor on the development of vocabulary. They apply largely to children whose perception abilities allow the test to be used in accordance with the defined testing procedure, consequently, they apply very often to implanted children. Measuring is performed at the same time controlling variables crucial to vocabulary development, such as the time of implanting (e.g. Fagan, Pisoni, 2011), or early therapeutic intervention (Moeler 2000). In order to estimate the extent of delays caused by a hearing defect, the vocabulary of implanted children is compared with the vocabulary of hearing-aided children and hearing children (Hayes, Geers, Treiman, Moog 2009). Apart from implanted children and children with hearing aids with better perception abilities resulting *inter alia* from early therapeutic intervention, the PPVT tests are also administered without changing the

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<sup>1</sup> The first version of the test was developed in 1959, the next in 1981 and 1997, and the latest, fourth edition in 2007. Successive changes were introduced in the consecutive editions, concerning e.g. the age bracket of the subjects or the graphic presentation of the picture material (in the latest version the black and white contour pictures were replaced with colored ones).

<sup>2</sup> The US version of PPVT has norms for the population of hearing persons at the age of from 2;6 to 90+.

procedure to children with lesser hearing losses, (e.g. Gilbertson, Kamhi 1995), because they are able to receive instructions without any hindrance by way of hearing. All scholars unanimously emphasize the need to create, while testing hearing-impaired children with the PPVT, the conditions conducive to listening and using all available hearing aids..

Stronger perception limitations will thereby largely disqualify participation in the PPVT test. There are opinions against changes in the procedure for PPVT testing, intended to adjust the test instructions to the limitations resulting from impaired hearing, and discussions on the effects of carrying them out (cf. Prezbindowski, Lederberg 2003). This does not mean, however, that some modifications in the case of more restrictive standpoints are not accepted. An unlimited number of repetitions in testing hearing-impaired children is permitted<sup>3</sup>, as is the change of the point where the testing should begin (defined in the instruction by the child's biological age), caused by delayed speech development in hearing-impaired children (cf. remarks on the use of BPVS<sup>4</sup>). Rigorous approaches to the test procedure in testing hearing-impaired children appear understandable in the situation when in a given language there are available other vocabulary assessment tests designed exclusively for hearing-impaired children, and even there are established development norms for speaking hearing-impaired children (e.g. *The Grammatical Analysis of Elicited Language-Presentence Level* GAEL-P; Moog, Kozak, Geers 1983) and those using sign language (the PPVT-based *Carolina Picture Vocabulary Test for Deaf and Hearing-Impaired Students* CPVT, Layton and Holmes 1985<sup>5</sup>; PERLESKO *Prüfverfahren zur Erfassung lexikalisch-semantischer Kompetenz*, Bizer and Karl 2002, or the *British Sign Language Vocabulary Test*<sup>6</sup>, Mann 2009; Haug and Mann 2014). In Polish surdologopedics there is a considerable shortage of diagnostic tools. The deficiency of tools makes scholars and diagnosticians employ tools designed for persons with hearing impairments, and treat the testing procedure in a less rigorous way. It should, however, be stressed that each departure from the procedure described in the manual causes the test score to differ from the scores that the subject would gain from the standard procedure (Fronczyk 2009; Hornowska 2009), consequently, it prevents comparison with the norms developed for the standard procedure. Moreover, the properties of the test defined in normalization studies for a specific population (e.g. non-hearing-impaired persons) do not apply to another population (e.g. hearing-impaired persons). To

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<sup>3</sup>There are also proposals to increase the number of acceptable erroneous answers (Forde, 1977).

<sup>4</sup> *Assessing and monitoring the progress of deaf children and young people: Communication, language and listening*: <http://www.ndcs.org.uk>.

<sup>5</sup> Presentation of test, see *inter alia* Lederberg, Spencer (2001); Prezbindowski, Lederberg (2003).

<sup>6</sup> cf. <http://www.signlang-assessment.info>.

define these properties for a new population is possible only after empirical studies have been conducted with the participation of a group of subjects belonging to this population.

In literature, apart from the foregoing slight modifications of test procedure in testing hearing-impaired persons, there are several proposals for carrying out more extensive changes, e.g. by introducing captions (Forde 1977; Bunch, Forde, 1987; Radić, Bradarić-Jončić, Farago 2008). As the writers observe, this increases the degree of difficulty of test tasks, thereby preventing reference to norms defined based on testing hearing children, to whom instructions were read out; nevertheless, it allows comparison between different groups of hearing-impaired subjects, and between clinical and control groups (cf. Radić et al 2008 ). In more recent versions the subjects are sometimes shown captions in an electronic version (Cripps, Supalla 2004). Enabling hearing-impaired persons to receive words is also carried out through the sign language (Moeller 2000), or even through simultaneous communication e.g. reading using the sign language (Cripps, Supalla 2004). However, the use of another language in the test developed for a particular language (not only the sign language), or the attempt to translate test items into a new language is impermissible if the results were to be referred to the existing norms.

A methodologically and psychometrically appropriate solution to surdopedic problems with the lack of tools to diagnose the vocabulary of hearing-impaired persons, would be to conduct empirical studies using the existing tools developed for the needs of another population (non-hearing-impaired persons). The purpose of such studies would be to verify: (1) whether changes in the procedure for testing with the existing tests (originally designed for non-hearing-impaired persons) produced significant differences in the results (in comparison with control groups), (2) whether possible changes in the scores have a similar dynamics in different age groups, (3) what are the properties of a tool (e.g. reliability, difficulty of an item, discrimination power of an item) in reference to a new population (here: hearing-impaired persons) (4) whether a tool, which originally measured vocabulary, still measures only this dimension of functioning when applied to a new population. As such studies with the participation of hearing-impaired persons learning Polish have not been conducted yet, we are presenting a Polish tool to measure vocabulary – *Obrazkowy Test Słownikowy – Rozumienie OTSR* [the Polish Picture Vocabulary Test – Comprehension OTSR], discussing its limitations and possibilities of employing it in the logopedic diagnosis of hearing-impaired persons. The case studies presented below can be treated as an introduction to the investigations that would enable wider and more reliable use of the OTSR in a group of hearing-impaired subjects.

## WHAT IS OTSR?

The Polish Picture Vocabulary Test – Comprehension (*Obrazkowy Test Słownikowy – Rozumienie*) OTSR (Haman and Fronczyk 2012) is a normalized diagnostic tool designed to assess the vocabulary of Polish-speaking children aged 2;0–6;11 years. The test assesses the level of understanding single words: nouns, verbs, and adjectives. The purpose of the test is to measure passive vocabulary, which, according to the assumptions adopted by the test authors, based on data in literature on the subject (Aitchison 2003; Clark 1995; Clark 2009), more fully reflects the child’s linguistic knowledge than active vocabulary. The measuring of active vocabulary is disturbed to a larger extent than the measuring of passive vocabulary, by such variables as: lexical access, articulation, pragmatics of child-adult interaction, and temperamental features (Haman, Fronczyk, Łuniewska 2012).

The OTSR is a test that fulfils all the criteria for a contemporary psychometric tool (Krasowicz-Kupis, Wiejak and Gruszczyńska 2014). It is a tool that has been standardized and normalized on a representative nationwide group of monolingual children (its psychometric parameters are described in detail in the manual, (cf. Haman, Fronczyk, Łuniewska 2012).

Testing with the OTSR consists in showing the child a series of four-picture charts, in which the child indicates one of the pictures whose name he hears. To each key-word tested, three distractor-words are selected. They have been selected in such a way that each of them represents one of three potential errors: phonetic, semantic, and thematic, e.g. “koń” [horse] (key word) – “dłoń” [hand palm] (phonetic distractor) – “krowa” [cow] (semantic distractor) – “siodło” [saddle] (thematic distractor). The purpose of the use of distractors and their special selection was to obtain – during testing – not only quantitative data concerning the lexicon but also to enable qualitative assessment of vocabulary<sup>7</sup>. The OTSR has two parallel versions (A and B), each of them containing 88 items organized in the order of an increasing difficulty level. Owing to this, testing starts at a specific point depending on the child’s age (the following age ranges are set, defining the beginning of administering the test: 2;0–3;11, 4;0–4;11, 5;0–5;11, and 6;0–6;11 years), and it ends when the child has committed four mistakes in a row. This quarantines the maximal shortening of the testing time.

In the normalization testing with the OTSR, children with typical development took part, that is why one of its limitations is the impossibility of referring the results obtained by children with atypical development (including deaf ones) to the norms, without interpretive reservations (Haman, Fronczyk and Łuniewska 2012). Despite these limitations, the OTSR is likely to be useful in surdologopedic

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<sup>7</sup> The described systematic selection of distractors was not used in the PPVT, consequently, qualitative error analysis is not possible in it.

practice. Because of considerable problems with the acquisition of the lexicon by hearing-impaired children (cf. *inter alia* Rakowska 1992; Cieszyńska 1993; Krakowiak 2012; Muzyka-Furtak 2013), there is a great demand for a diagnostic tool that would enable measuring vocabulary and describe its qualitative characteristics.

In the market there are also other publications containing the tools specifically designed to measure the vocabulary in children. These are: *Test Słownika Dziecka* [The Child's Vocabulary Test] (Tarkowski 2009) and *Test Słownikowy dla Dzieci* [Vocabulary Test for Children] TSD (PTP, 2013). The two tests contain a series of tasks requiring both the comprehension and active use (speaking) of words, and in addition they involve other cognitive and linguistic abilities. The OTSR has been selected for assessment on account of its usefulness in surdologopedics because of the adopted way of testing the child (measuring of word comprehension through selecting a picture), minimizing of the impact of other cognitive and linguistic variables on the test results, and the literature-based attempts to use analogous tests (i.e. PPVT) for similar purposes.

### **Research Questions about the Use of OTSR in Surdologopedics**

The issue of OTSR utilization in the logopedic diagnosis of hearing-impaired children poses the following questions already at the beginning:

1. Can the OTSR be used in the logopedic diagnosis of hearing-impaired children?
2. Which group of hearing-impaired children can be tested with the OTSR without changing the testing procedure?
3. The testing of which group of hearing-impaired children requires a change of procedure?
4. Which changes in the procedure for OTSR testing are necessary to apply the test to hearing – impaired children?
5. Which group of hearing-impaired children should not be tested with the OTSR at all?

### **OBSTACLES TO THE USE OF OTSR IN SURDOLOGOPEDICS**

An obstacle to the application of the *Picture Vocabulary Test – Comprehension* is the hearing impairment in a subject. Firstly, perception deficits make it difficult or even impossible to receive the read-out test. Secondly, the disproportion between the actual level of linguistic development and the biological age is a common phenomenon among hearing-impaired persons; consequently, the test may prove too difficult for some hearing-impaired children, particularly the youngest – on the other hand, other children, who would be able to fulfill the test tasks, are over the age of 6;11 years (for which the norms have been developed).

A special difficulty for hearing-impaired persons can be the systematic selection of distractors in the OTSR: each item contains one phonetic distractor – a picture showing the word that is phonetically close to the key word (e.g. biurko – piórko <ó sounds like u> [desk – pen/feather]). The lack of such a systematic selection of phonetic distractors in the PPVT may cause its application in a group of hearing-impaired subjects to be less problematic than in the case of OTSR.

### INTRODUCTORY THESES CONCERNING THE POSSIBLE USE OF OTSR IN SURDOLOGOPEDICS

The OTSR can be used in the logopedic diagnosis of children with different hearing impairments. Not all of them can, however, meet the requirements of the standard procedure for the OTSR testing. A certain group of hearing-impaired children can be tested with the OTSR according to the prescribed testing procedure, another group requires only a slight modification of the procedure, and finally there is a group of hearing-impaired children, in the case of whom it is necessary to change the procedure to enable testing with the OTSR and to obtain reliable results.

Apart from changes within the testing procedure, the condition that allows extending the range of OTSR application to include the area of surdologopedics is taking account of the delays in speech development of hearing-impaired children, which in practice means the possibility of testing older hearing-impaired children with the OTSR as well.

When introducing any changes in the testing procedure, it should be remembered that comparing the results with the existing norms becomes problematic or even impossible. That is why, after checking the possibility of OTSR testing in the group of hearing-impaired children and defining the necessary changes in the procedure, studies would have to be carried out to establish norms for this population and determine the actual differences in the lexical development between hearing-impaired children and those with a typical development, or to check what kinds of departures from the procedure do not cause significant changes in the results obtained by typically developed children.

### SUGGESTED CHANGES IN THE PROCEDURE FOR OTSR TESTING

The modification of the testing procedure, useful in the case of hearing-impaired children, stems from the need to overcome the perception barrier and means:



1. a change in the tester's position in relation to the subject: from the position next to the child to the position facing the subject (to ensure the possibility of recourse to visual perception);
2. a change in the way of asking questions – from reading them out from a sheet to reading out aided by the presentation of a caption (the caption appearing parallel to the read-out question or by itself without being read-out);
3. an increase in the acceptable number of repetitions of a question.

The modification, in turn, of the testing procedure resulting from the need to take account of the delays in the linguistic development of hearing-impaired children, is connected with the need to compare the obtained test results in the group of older hearing-impaired children with the norms for younger hearing children:

1. take account of the age when the child obtained a hearing prosthesis, i.e. to more closely determine the relationship between the child's biological age and the actual stage of development of his speech;
2. specify the conditions for OTSR application in hearing-impaired children aged over 6;11 years;
3. specify the possibility of changing the way of interpreting results (the objective: obtain information on *At what age does the hearing child with average vocabulary obtain the same result as the tested hearing-impaired child?*).

## RESEARCH MATERIAL

In order to verify the presented theses about the possibility of OTSR application in surdologopedic diagnosis, the results of OTSR testing conducted in three radically different cases of hearing-impaired subjects will be presented below.

**Case A.** A 23-year-old subject, female student, with a profound perilingual hearing impairment. She does not know the sign language and communicates by means of language. The OTSR testing was conducted using the A version, basically according to a standard procedure, with two exceptions: (1) after the trial items, the testing was continued from the beginning of the test (the application of the age criterion to determine the beginning of testing made no sense because of the age of the subject), (2) the testing was not interrupted in its course (i.e. after the appearance of four consecutive erroneous answers).

Results: Out of 88 items (read out in accordance with the procedure) the subject did not correctly recognize as many as 46 words. The kinds of the committed errors were as follows: 19 phonetic errors, 12 semantic errors, and 15 thematic ones. Regarding particular parts of speech the errors concerned 37.25% of nouns, 72% of verbs, and 75% of adjectives. After the first test, the second testing was carried out, using only the items to which an erroneous answer was given earlier. This time the subject, apart from the spoken question, was shown the question in the caption form. After introducing this change it turned out that the subject



did not know only one word out of the 88 words. Thus, the student obtained a very low score in the first testing (1 sten, 1 centile) as compared with the oldest available age group (6;6–6;11 years). According to the way of interpreting testing scores, described in the test instruction, it was the result approximating the level obtained by 1% of girls in this age range. The result is decidedly incompatible with the actual linguistic abilities achieved by the adult subject – a female university student. This was explicitly proved by the almost one-hundred percent correctness of answers to the questions about the knowledge of words, obtained by the same subject after captions were introduced.

Conclusion: In some cases of hearing impairments the actual assessment of vocabulary is possible only after introducing captions. The execution of the test according to the procedure may distort the result scores by significantly lowering them. The change of the procedure by introducing captions carries with it the need to check in broader empirical studies how it influences the results of hearing children and whether it changes them significantly. Moreover, comparing the result scores of subjects outside of the originally assumed age range (2;0–6;11) with the existing norms may be exclusively approximate.

**Case B.** A girl aged 3;9 years with a prelingual hearing impairment. The degree of hearing loss: 40–50dB. The child received a hearing aid at the age of 4 months. She communicates in the phonic language and stays only in the environment of hearing people. The OTSR testing was carried out using the test version A, essentially in full conformity with the testing procedure. The only exception was the necessity of repeating the test questions more frequently.

Results. Out of 88 words (read out according to the procedure) the girl did not know 21, having committed: 4 phonetic, 9 semantic, and 7 thematic errors, one answer was not given. Regarding particular parts of speech the errors concerned: nouns – 27.5%, verbs – 20% , and 16.7% of adjectives. Assessing the test results according to its instruction, the following confidence interval was determined for the general result: 63–71. As compared with the norms for the subject's age she obtained a very high score (8–10 sten). On the centile scale it corresponds to 90–100 centile, which means that it was higher than that scored by most girls her age tested in full compliance with the procedure – the test questions being read out only once. It should be observed, however, that repeating test questions may have increased the result scores.

Conclusion: Under appropriate conditions, i.e. conditions conducive to listening, some hearing-impaired children are able to precisely hear test questions and thereby to be tested without having to change the testing procedure. More frequent repetition of questions may make the obtained result impossible to compare with the norms. Consequently, on the basis of the obtained result it can be only partly concluded that the girl's vocabulary is large as compared with the reference group. Such an unreserved conclusion would be possible if it followed from the

empirical studies that the procedure modification consisting in repeating the questions more often does not cause a significant change in the results. Such studies have not yet been conducted.

**Case C.** A girl aged 8;11 years, with a profound prelingual hearing impairment. A first-grader in a public primary school. Given a hearing aid at the age of 7–8 months, implanted at the age of 5 years. The current results of free field audiometry show a hearing impairment at 40dB level. The OTSR testing was carried out using the A version, essentially in conformity with the standard procedure with one exception resulting from exceeding the age limit for which the test was designed: after trial items, the questions devised for the oldest age group began to be asked.

**Results.** Out of the words read out to the subject in compliance with the procedure, the girl did not recognize 16 words. After captions were introduced (according to the procedure described in Case A), she corrected 10 errors. In comparison with the norms for children aged 6;6–6;11 the subject scored very low – the 85% confidence interval was 34–42, which places the result at the 1–2 sten. On the centile scale it corresponds to 1–6 centile. After captions were introduced, the confidence interval was 66–74, and the scores improved, reaching the level of 3–5 sten and 9–33 centile.

In view of the test results obtained before caption introduction, the vocabulary of the almost 9-year-old girl is at the level of the average vocabulary of a child aged 3;6–3;11 years. (25–75 centile, 4–7 sten). Taking into account the higher score – obtained after introducing captions, it can be regarded as an average result obtained by girls aged 5;6–5;11. The last comparison with norms is, however, encumbered with an error associated with an essential change in the procedure (introduction of captions), whose impact on the normalized score cannot be assessed without independent studies estimating the consequences of such a change.

**Conclusion:** The OTSR testing of the hearing-impaired child aged over 7 years enables obtaining information at what age the hearing child with average vocabulary (25–75 centile, 4–7 sten) obtains the score result similar to the tested hearing-impaired child. Developmental norms appended to the OTSR allow preliminary identification of the level of lexical development in hearing-impaired children in relation to hearing children as long as the testing procedure is maintained.

## OTSR IN SURDOLOGOPEDICS

The *Polish Picture Vocabulary Test – Comprehension* can be a useful tool in surdologopedics, serving both scientific purposes and assisting individual diagnosis of hearing-impaired children at different ages. It enables precise and quick quantitative and qualitative assessment of vocabulary and makes it possible to

monitor building up of vocabulary, i.e. to observe the dynamics of language development. To determine the type of error made by the subject regarding each presented word is crucial to the assessment of lexical limitations of the hearing-impaired child, because it enables identification of his strategy for breaking the linguistic code. Combining of the quantitative and qualitative analysis of vocabulary is an important element of reliable surdologopedic diagnosis, and it can subsequently be the basis for programmed therapy (cf. Muzyka-Furtak 2013; Krakowiak, Muzyka-Furtak, Kołodziejczyk 2015).

To many hearing-impaired children the change in the OTSR testing procedure, at least in the manner of stimuli presentation (placing of the tester facing the child so that the (child) could aid himself by “reading the lips”) is a necessary condition for obtaining a reliable result. There is, however, also a group of children with limited auditory perception, who can be tested strictly in accordance with the OTSR procedure, or even more, the absolute observance of testing procedure ensures obtainment of the result that is fully comparable with norms. Perhaps, after all, the change in the procedure consisting only in a different positioning of the tester in relation to the child would not at all significantly influence the results obtained by children without hearing impairments, consequently, the tester could just as well be positioned next to the child or facing him. To verify this would, however, require separate studies.

Referring to the traditional, dichotomous division into deaf (non-hearing) and hard-of-hearing persons (cf. *inter alia* Szczepankowski 1998), it is necessary to adjust the OTSR procedure to the abilities of the non-hearing (deaf) child, which means introducing changes in the way of presenting questions, omitting the auditory channel, i.e. introduction of captions. As far as hard-of-hearing children are concerned, it may be enough to slightly modify the testing procedure: the tester will be positioned facing the subject thus enabling lip-reading, the number of acceptable repetitions will be increased, or, possibly, in case of doubt, captions will be used as an aid.

With reference, in turn, to a more recent logopedic typology of hearing impairments (Krakowiak 2012), which introduces a four-degree division into: functionally hearing, hard-of-hearing, harder-of-hearing, and functionally non-hearing (deaf) persons, it is possible to more precisely specify the conditions for adapting the testing procedure to the perception limitations of children in each group. In the case of functionally hearing children it is possible to test them with the OTSR in full compliance with the set procedure. In the case of hard-of-hearing children it is necessary to create conditions conducive to listening and using sight in the perception of instructions. With regard to harder-of-hearing and functionally non-hearing children a more radical change in the procedure is necessary. Test questions have to be shown to the child in the form of a caption because the reception of instructions by way of hearing, even aided by sight, is not possible. The group

of subjects who can be tested will naturally be narrowed down to those who can read. In the case of many hearing-impaired children, learning to read is introduced early, even at the age of two years (cf. J. Cieszyńska 2000). The OTSR testing cannot therefore be administered to profoundly hearing-impaired children who cannot read.

To further specify the foregoing conclusions, in the case of children with lesser or greater hearing deficits, but early implanted or wearing hearing aids (functionally hearing) it is possible to fully abide by the recommended OTSR testing procedure, and thereby to compare results with the developmental norms appended to the test. To obtain a reliable result from the OTSR testing with regard to hard-of-hearing children requires adjusting the testing procedure to their abilities and limitations (slight changes in the procedure). The testing of harder-of-hearing and functionally non-hearing (deaf) children conducted in compliance with the established procedure distorts the results, which are clearly lowered because of the existing perception barrier. In this case, a credible result may be obtained only after changing the procedure in order to overcome the perception barrier, which can be ensured only after introducing captions. However, this change in the procedure prevents comparison of results with norms for diagnostic purposes as long as independent empirical studies establish its impact on the results obtained.

Apart from the perception barrier, another limitation in the OTSR application in diagnosing hearing-impaired children results from setting the age range of the subjects at 2;0–6;11 years. The development norms appended to the test apply therefore only to children at that age whereas the delays in vocabulary acquisition by children with hearing deficits affect far older children. In order to obtain the information essential for the surdologist about at what level – compared with the undisturbed development – his patient is, the OTSR testing should be administered, carrying out tests designed for all age ranges and – according to the OTSR procedure – finishing the testing when four consecutive incorrect answers have appeared. Comparison with the development norms will be made in a somewhat different way from that prescribed in the instruction, because when interpreting the obtained result of the test it should not be compared with a specific age range – the one with which the testing ended, but to find in the tables of centile and sten norms the age range for which the obtained result is an average value (or 4–7 sten, 25–75 centile). In this way it is possible to get information at what age the hearing child with average vocabulary obtains the result analogous to that of the tested hearing-impaired child. Additionally, the result can be compared with the norms designed for the oldest children (6;6–6;11 years). It should be remembered, though, that such information is not equivalent to calculating a specific delay in the vocabulary development in years (e.g. by subtracting from the biological age of a child the age at which the child's results would be average), because we do not have norms for older children (aged over 6;11). The comparison of results of

older children than 6;11 years with the norms should be treated as approximate rather than diagnostic.

To sum up, the prospect of extending the application of OTSR in surdopedics is opened by the possibility of changing the positioning of the tester in relation to the subject, by introducing captions, by increasing the acceptable number of repetitions, by extending interpretations of the test results (approximate comparison of the result obtained by hearing-impaired children aged over 6;11 years with the norms designed for the oldest hearing children, or finding in tables with development norms the age range for which the result obtained by the tested hearing-impaired child can be defined as average). The conditions for adapting the OTSR to the sign language can also be considered, which would however mean the necessity of devising a new test according to the construction method defined in the OTSR manual.

It should nevertheless be stressed that the best way to adjust the OTSR to the needs of hearing-impaired persons learning Polish would be to carry out normalization studies on a representative sample of this population, taking account of necessary changes in the testing procedure and variables crucial to the population, such as the degree of hearing impairment, the age of receiving a hearing aid/implant, etc. Such studies could additionally cover a control group of hearing children, which would enable assessment of possible changes in the result, caused by changes in the testing procedure. Economic limitations (such studies are expensive) make it only possible at present to apply the OTSR to hearing-impaired persons within the area described in this article and with interpretive reservations concerning the obtained results, which have been presented here.

## ACKNOWLEDGMENTS

*The authors wish to thank Magdalena Łuniewska and Krzysztof Fronczyk for their penetrating comments on the working version of the article.*

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