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## **The Effectiveness of Vocal-Rhythmic Stimulation Methodology in the Development of Phonemic Awareness in Children Aged 5-6 years**

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### **Abstract**

The study presents the results of research aimed at verifying the effectiveness of an original method of vocal-rhythmic stimulation designed to develop phonemic awareness in children at the end of preschool education. Using a quantitative research design without a control group, the results of 22 children in a pre-test and post-test were analyzed using subtests from the D.B. El'konin test. The results showed improvement in most of the phonemic abilities assessed, especially in syllable analysis, sound isolation, synthesis, and rhyming. Only two children showed a slight decline in performance. The average results showed slightly better scores for girls, but without statistically significant differences between the sexes, confirming the universality of the methodology. Although the level of children's participation in activities did not show a direct correlation with performance, a positive effect of regular and playful stimulation was demonstrated. The research identified several limitations, including the small sample size, the absence of a control group, and organizational influences that may affect the validity of the results. Nevertheless, the research supports the use of the vocal-rhythmic methodology as an effective tool for developing pre-reading literacy and recommends its verification in a larger, longitudinal study focusing on the long-term impact on children's reading success.

**Keywords:** phonemic awareness, teaching methodology, pre-primary education, stimulation.

### **1. Introduction**

Phonemic awareness is one of the basic components of phonological processing of speech. It is a key indicator of successful reading and writing acquisition (Kapalková et al., 2005). Preschool age is characterized by intensive language development, when children learn many skills, including the use of phonemes (the smallest units of sound in a language). The development of the ability to distinguish sounds, form rhymes, and divide words into syllables and sounds should be

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an integral part of the development of reading literacy (Lipnická, 2013). Sedlák and Váňová (2013) and Tichá (2014) agree that phonemic awareness should be developed through targeted pedagogical interventions with an emphasis on play, word manipulation, auditory differentiation and rhyming. Effective approaches to developing phonemic awareness also include rhythmic, musical, and movement activities (Shapiro, 2011; Kmentová, 2019), which stimulate perceptual and metalinguistic processes in a natural context.

As stated by Šedinová and Seidlová Málková (2021), the development of phonemic awareness and letter knowledge can be significantly supported by stimulating activities. Early intervention to support the development of phonological and other pre-reading skills in preschool children is an important topic in teacher professional development (Markussen-Brown et al., 2017). Caravolas et al. (2019) found that the development of early reading and writing in preschool and early school-age children is mainly influenced by three areas of ability: phonemic awareness, knowledge of letters of the alphabet, and rapid automated naming.

With this in mind, one of the authors of the study is conducting two ongoing scientific projects. One is called Children's Ideas about Reading Literacy (VEGA 1/0505/24) and the other is Games with Letters in Preschool Education. Creation of methodological material integrating educational areas (KEGA 001UMB-4/2025). This study complements the scientific findings of these projects with the issue of the development of phonemic awareness in children at the end of preschool education.

### **Research in this area**

Phonemic awareness is part of a broader framework of pre-reading literacy, and its development in preschool age is considered one of the key prerequisites for a child's success in school. Research by Kantor (1969) and later by Lysáková, Kopinová and Podhorná (1989) pointed to the importance of sensory experience, rhythm, and everyday language situations as means of developing phonological perception. Kodejška and Váňová (1989) emphasized planned pedagogical intervention in the area of linguistic thinking, as spontaneous verbal communication may not be sufficient for the development of phonological sensitivity. Deficits in this area may signal a risk of learning disorders, including dyslexia (Liberman, Shankweiler, 1985; Hulme, Snowling, 2013). From an international perspective, research by Lundberg, Frost, and Petersen (1988) confirmed the effectiveness of a hierarchical model of phonemic awareness development, which progresses from rhythm to rhyme to syllables and phonemes. Adams et al. (1998) showed that fun language activities (e.g., substituting sounds in songs) significantly contribute to metalinguistic abilities. Gillon (2000) and Eissa (2014) demonstrated that even short-term, targeted intervention programs can improve the phonological abilities of children with speech disorders.

Sedlák and Váňová (2013) analyzed phonemic awareness as a basic component of pre-reading skills. Their research confirmed that the ability to distinguish and use phonemes has a direct impact on successful reading. Therefore, they proposed forms of pedagogical work that integrate phonemic tasks into regular educational activities in kindergarten. In this process, they emphasized the importance of pedagogical diagnostics. Tichá (2014) also supported an inclusive approach to the development of phonemic abilities. She emphasized the importance of a differentiated approach to children with different needs and abilities. She proposed the creation of a language-stimulating environment so that each child could develop phonemic awareness at their own pace through interactive and playful activities. Research has also shown that phonemic awareness does not develop spontaneously in all children equally, but is influenced by biological, cognitive, and social factors (Kapalková, Palugyayová, 2016). The home environment, pedagogical intervention, and cooperation between professionals play an important role (Kutálková, 1996; Klenková, 2006). Eccles et al. (2020) also emphasized that active participation of children and an environment that supports autonomy have a fundamental impact on language and cognitive development.

Music and musical activities are an effective tool for developing phonemic awareness, as confirmed by several studies. According to Patel (2006), music and language share common neural and cognitive processes, particularly in the areas of rhythm, melody, and sound patterns. Bergeson and Trehub (2002) emphasized that children from an early age spontaneously respond to rhythm and melody, thereby creating conditions for the development of language skills. Kaplan and Berman (2010) and Tafuri (2008) found that musical activities – especially singing, rhythmic and musical movement games – increase children's phonological sensitivity and support their ability to work with phonemes. The significant influence of music education on phonemic

awareness is also confirmed by Anvari et al. (2002), Douglas and Willats (1994) and Moyeda, Gómez and Flores (2006), who point to a correlation between musical abilities and language skills. Research by Tierney and Kraus (2013), Moreno et al. (2009) and McPherson and Hallam (2012) shows that regular participation in musical activities improves speech processing, auditory perception and phonological processing, which are essential prerequisites for learning to read and write. Pramling and Wallerstedt (2009) found that integrating musical activities into the regular educational process contributes not only to children's emotional and social development, but also to the development of metalinguistic awareness. Feierabend (2001) showed in his programs First Steps in Music and Conversational Solfege that rhythmic singing and repetition of musical phrases significantly support the differentiation of sound units. Harms, Hyson, and Tomlinson (2014) add that systematic work with music improves attention, auditory perception, and memory, thereby creating a solid foundation for the development of reading skills.

These research findings suggest that phonemic awareness should be developed systematically, purposefully, and interactively, with musical activities providing an effective and natural way to stimulate it. This interdisciplinary perspective, combining language, cognitive, and musical domains, offers a solid framework for the development of stimulating methodologies in preschool education. Targeted and structured training in phonemic awareness significantly supports children's reading skills and their readiness for school (Torgesen et al., 1994; Share, 1995). The creation and verification of the effectiveness of programs and methodologies therefore has a firm place in pedagogical research. Our evaluation research is based on these findings.

The aim of the research was to develop a methodology for vocal-rhythmic stimulation and to evaluate its effectiveness in developing phonemic awareness in children at the end of preschool education. The study provides answers to selected research questions:

*Does the vocal-rhythmic stimulation methodology increase children's phonemic awareness to a higher level? Are there differences between girls and boys in phonemic awareness?*

### **Research methodology**

The authors of the study conducted an evaluation study to assess the strengths and weaknesses of the vocal-rhythmic stimulation methodology. This study presents an evaluation of the effectiveness of the methodology using a quantitative strategy. The data were collected using D.B. El'konin's phonemic awareness test (Mikulajová, Dujčíková, 2001). The data provided feedback to the authors of the methodology. Based on this, they formulated recommendations for its modification and application in pedagogical practice.

The research was conducted in three phases: pre-test, application of the vocal-rhythmic stimulation methodology, and post-test in a single-phase design comparing individual and group outputs and results (Žižlavský et al., 2014). The outputs are activities in educational activities that make up the methodology. The results are the effects of the methodology on the development of phonemic awareness in children in the research sample.

The research design was chosen for the following reasons. The methodology intensively stimulated the development of skills in a relatively short period of time. Children would not have learned these skills in free play. Learning was conducted in prepared conditions to minimize variables from the external environment. The aim was to verify and demonstrate how the stimulating effect on children in preschool education can be monitored and evaluated.

### **Method of collecting research data**

A phonemic awareness test was used before applying the vocal-rhythmic stimulation method (pre-test) and after its application (post-test). The test was developed by Russian psychologist Professor Daniil Borisovich El'konin. It was published in Slovak translation by Mikulajová and Dujčíková (2001). The test consists of eleven subtests, each containing five items (a total of 55 items and points): first subtest: rhyming awareness; second subtest: rhyming production; third subtest: syllable analysis; fourth subtest: syllable synthesis into words; fifth subtest: isolation of the first syllable of a word; sixth subtest: omission of a syllable in a word; seventh subtest: isolation of the first sound in a word; eighth subtest: synthesis of sounds into words; ninth subtest: analysis of words into sounds; tenth subtest: omission of a sound in a word; eleventh subtest: substitution of sounds in words.

The testing took place in a separate room with each child individually. It was conducted by a researcher, one of the authors of this study. At the beginning of each subtest, the child was given

clear instructions. For the subtests rhyming words, isolating the first syllable, and analyzing words into syllables, the child also heard an example to better understand the task. She recorded the child's results in the subtests on a sheet taken from the standardized test. She circled the results achieved by the child. The testing was not limited by time. The average length of testing for one child was 12 minutes. The child could score a maximum of 55 points in the test.

### Research data processing methods

The standardized test has a set evaluation of the child's performance. The scores of each child from the pre-test and post-test were transferred from the sheets to Excel, which enabled statistical description of the data for each child and for groups of children (girls, boys). Mean values (median, average, mode) were also used. The data were presented in tables and graphs.

### Characteristics of the research sample

The research sample consisted of 22 children (N) – 8 girls and 14 boys aged 5-6 years. This was an accessible sample based on informed consent from the kindergarten director, two classroom teachers, and parents. Presissová Krejčí (2022) looked at the size of the research sample and found that in research where findings aren't generalized to the whole population, even a small sample of participants is enough. This was also true in our research.

### Research organization

The research was conducted from January to March 2024 in a kindergarten in Zvolen. A preliminary test was conducted in the second week of January. From the third week of January to the second week of March, educational activities based on the vocal-rhythmic stimulation methodology were conducted with the children. A follow-up test was conducted in the third week of March. The data obtained were processed in April and May 2024.

The vocal-rhythmic stimulation methodology was implemented intensively, every working day from 8:00 to 9:00 a.m. From 7:00 a.m. to 8:00 a.m., the environment and aids for the implementation of specific educational activities were prepared. The presence of children at the beginning of each educational activity was recorded in an attendance sheet. The educational activity then took place. Short breaks were scheduled for personal hygiene and relaxation.

The educational activities were led by a researcher with a background in music. The class teacher also participated in each educational activity to make the children feel safe. The course of each educational activity was recorded on the researcher's mobile phone. Audio recordings were used for qualitative analysis of the children's statements, activities, and behavior during the educational activities. Due to the amount of data, we do not present them in this study.

### Description of the vocal-rhythmic stimulation methodology

It is based on phonemic awareness training according to D.B. El'konin (Mikulajová, Dujčíková, 2001). It consists of introductory texts and plans for educational activities. The methodology has been assigned an ISBN and will be published in 2025 by Vydavateľstvo Písmenkové školičky pre malé detičky (Publishing House for Little Children). The introduction includes recommendations for using the methodology, explanations of musical symbols and terms, and an alphabetical list of words and names suitable for working with preschool children. There are also examples of auditory word discrimination after substitution of sounds and syllables in different positions in words, examples of work with the synthesis of syllables and sounds into words, as well as analysis of words into syllables and sounds. The second part of the methodology consists of 29 educational activities. They have themes whose initial letter (sound) guides the content of the children's learning. Each educational activity includes the musical notation of a children's song whose content supports learning in its theme.

**Table 1.** Themes of educational activities in the vocal-rhythmic stimulation methodology

|          |                   |           |                     |          |                       |
|----------|-------------------|-----------|---------------------|----------|-----------------------|
| <b>A</b> | Auto (Car)        | <b>T</b>  | Trúbka (Trumpet)    | <b>Č</b> | Čmeliak (Bumblebee)   |
| <b>E</b> | Električka (Tram) | <b>D</b>  | Dúha (Rainbow)      | <b>Š</b> | Škôlka (Kindergarten) |
| <b>O</b> | Otecko (Daddy)    | <b>J</b>  | Ježko (Hedgehog)    | <b>Ž</b> | Žaba (Frog)           |
| <b>U</b> | Užovka (Snake)    | <b>K</b>  | Kukučka (Cuckoo)    | <b>L</b> | Lastovička (Swallow)  |
| <b>M</b> | Mamička (Mommy)   | <b>G</b>  | Gaštany (Chestnuts) | <b>R</b> | Rodina (Family)       |
| <b>P</b> | Pavúk (Spider)    | <b>Ch</b> | Chrobáky (Beetles)  | <b>Ň</b> | Nezábudka (Forget-me- |

|          |                          |          |                          |          |                     |
|----------|--------------------------|----------|--------------------------|----------|---------------------|
|          |                          |          |                          |          | not)                |
| <b>B</b> | Bocian (Stork)           | <b>H</b> | Hudobníci<br>(Musicians) | <b>Ť</b> | Ťava (Camel)        |
| <b>F</b> | Fialka (Violet)          | <b>C</b> | Cesta (Journey)          | <b>Ď</b> | Ďateľ (Woodpecker)  |
| <b>V</b> | Vlak (Train)             | <b>S</b> | Slimák (Snail)           | <b>Ľ</b> | Lietadlo (Aircraft) |
| <b>N</b> | Nosorožec<br>(Rhinceros) | <b>Z</b> | Zebra (Zebra)            |          |                     |

The educational activities were designed to comprehensively develop phonemic awareness of each phoneme. Each educational activity has the following structure:

1. *Storytelling* begins with a riddle and continues with a discussion about the appearance, function, or occurrence of a particular phenomenon, as well as experiences and impressions of it.
2. *Breathing* takes the form of breathing exercises and games so that children become aware of and try out different ways of breathing with appropriate motivation or aids.
3. *Articulation* means playful preparation for the correct pronunciation of a particular Slovak sound by imitating the movements of the articulatory organs and the sounds using that sound.
4. *Rhythmization* is based on reciting short rhymes and expressing their content through movement (*awareness of rhymes – subtest no. 1*). It can be identical to the lyrics of a song in the activity. Children learn to analyze words into syllables (*subtest no. 3*), distinguish the first syllables in words (*subtest no. 5*), and form words from syllables (*subtest no. 6*).
5. *Discrimination* in children develops the ability to analyze and synthesize words from simple to more complex in terms of phonemes and syllables, up to the creation of rhymes (*subtests 4, 5, 6, 7, 8, 9, 10, 11*).
6. *Clarification* leads children to individually explain the meanings of abstract and foreign words used in songs and to discuss different concepts of meaning.
7. *Singing* takes place in the process of learning children's songs accompanied by a musical instrument and rhythm. The songs have a range of tones appropriate for the age of the children.
8. *Movement* is linked to the rhythm and content of the song, based on examples given by the teacher or the children themselves. Children can also improvise dance moves freely.
9. *Evaluation* means looking for answers to simple evaluation questions: *What did we do together? What did we learn? What did you like best? What else would you like to do?*

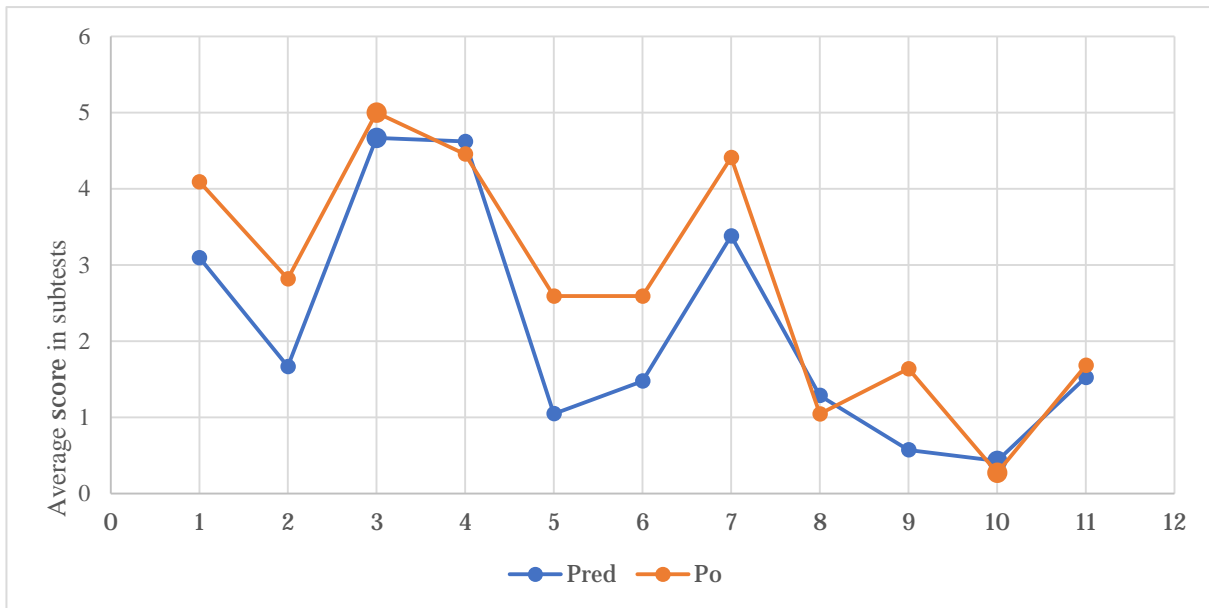
### Research ethics

Work ethics and GDPR protection through informed consent were priorities in our research. We also worked ethically with children during the testing and implementation of educational activities. We respected not only standardized testing procedures, but also the rights and needs of children. We communicated empathetically and behaved according to the rules applicable in schools and kindergartens. We made sure that the children were not under time pressure during the testing and that they felt safe. The presence of the class teacher also contributed to the positive emotional atmosphere. Audio recordings of the testing, implementation, and reflection on the educational activities were made using a mobile phone. The device was quick to operate and worked quietly. The children were not informed that they were being recorded, nor could they see the recording device. Parents did not give their consent to the making of video recordings and photographs, but these were not necessary. The data were processed and presented using coded names for the children (boy 1 – boy 14, girl 1 – girl 8).

## 2. Results

### Effectiveness of the vocal-rhythmic stimulation methodology

The effectiveness of the methodology was evaluated by comparing the results of children from the research sample in the pre-test and post-test in individual subtests. The data in [Figure 1](#) and [Table 1](#) answer the first research question: *Does the vocal-rhythmic stimulation methodology improve children's phonemic awareness skills?*



**Fig. 1.** Average point score (minimum 0 and maximum 5 points) in 11 subtests (pre-test and post-test) in the research sample

**Table 2.** Success rate of children from the research sample in 11 subtests (pre-test and post-test) from the highest to the lowest average result (minimum 0 and maximum 5 points in one subtest)

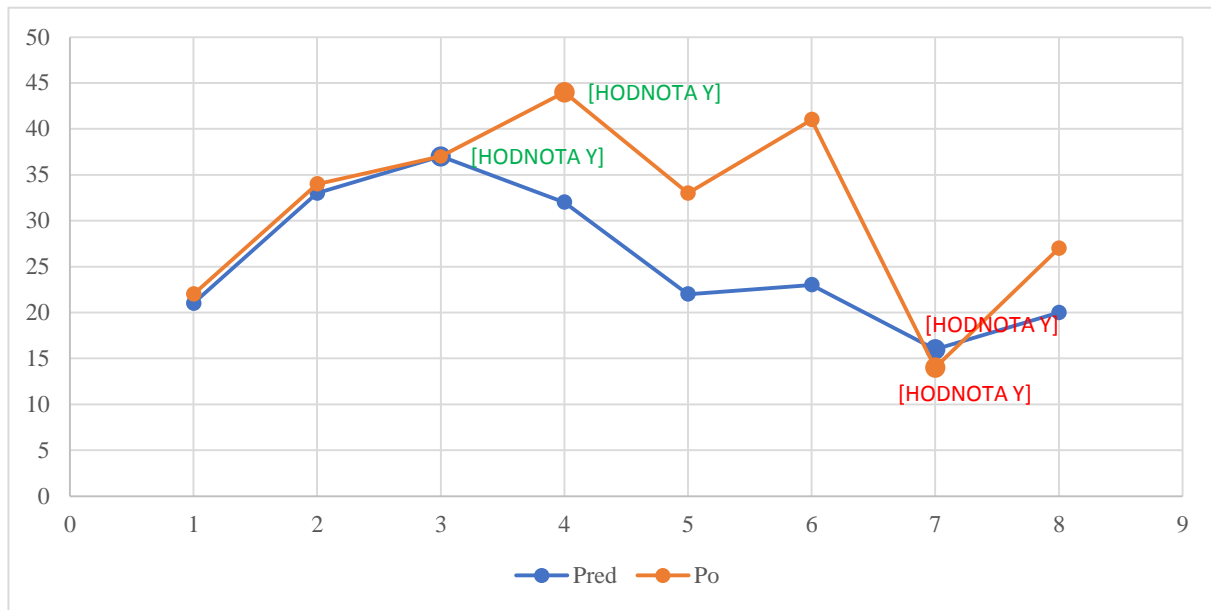
| Subtest number  | Points in the pre-test | Ranking | Points in the post-test | Ranking |
|---|------------------------|---------|-------------------------|---------|
| 1st subtest: <i>Awareness of rhymes</i>                       | 3,09                   | 4.      | 4,09                    | 4.      |
| Second subtest: <i>Rhyme production</i>                       | 1,66                   | 5.      | 2,82                    | 5.      |
| 3rd subtest: <i>Analysis of words into syllables</i>          | 4,66                   | 1.      | 5                       | 1.      |
| 4th subtest: <i>Synthesis of syllables into words</i>         | 4,61                   | 2.      | 4,45                    | 2.      |
| 5th subtest: <i>Isolation of the first syllable of a word</i> | 1,05                   | 9.      | 2,59                    | 6.      |
| 6th subtest: <i>Omitting syllables in words</i>               | 1,47                   | 6.      | 2,59                    | 6.      |
| 7th subtest: <i>Isolation of the first sound in a word</i>    | 3,38                   | 3.      | 4,41                    | 3.      |
| 8th subtest: <i>Synthesis of sounds into words</i>            | 1,28                   | 8.      | 1,04                    | 9.      |
| 9th subtest: <i>Analysis of words into sounds</i>             | 0,57                   | 10.     | 1,64                    | 8.      |
| 10th subtest: <i>Omitting sounds in words</i>                 | 0,43                   | 11.     | 0,27                    | 10.     |
| 11th subtest: <i>Substitution of sounds in words</i>          | 1,52                   | 7.      | 1,68                    | 7.      |

A comparison of the results of children from the research sample in the pre-test and post-test showed that children achieved higher levels in almost all phonemic awareness skills. The exceptions were subtest 8, where they scored 0.24 points lower in the post-test, and subtest 10, where they scored 0.16 points lower in the post-test. In subtests 5 and 9, there was a change in the order of success. The results also showed which phonemic skills the children had most and least developed.

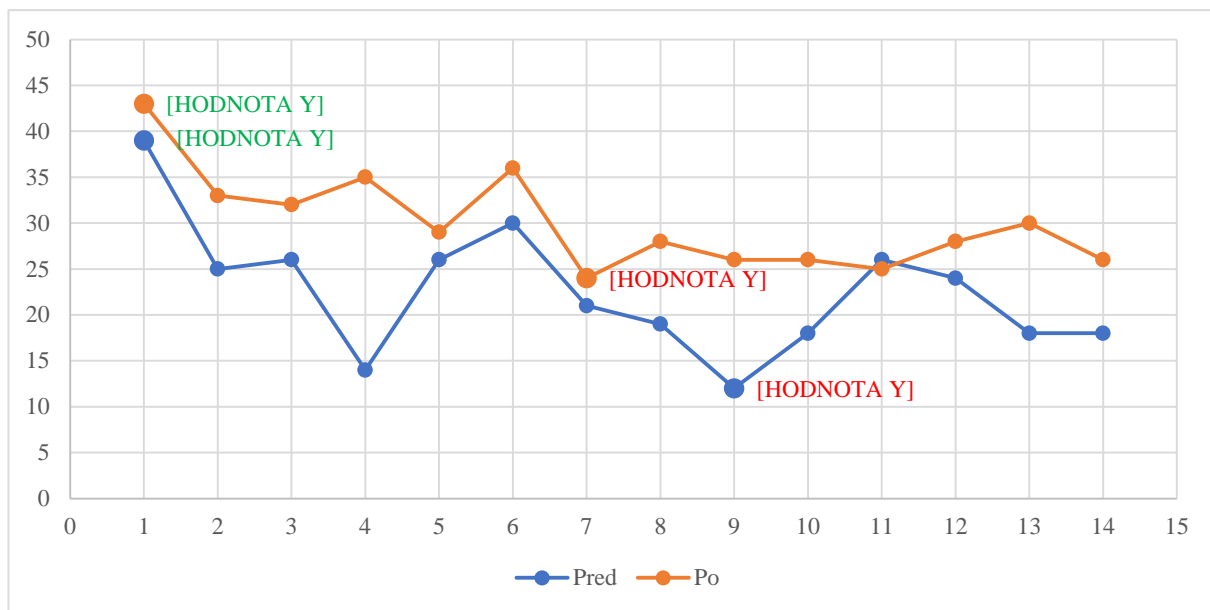
#### Comparison of test results for girls and boys

We also focused on comparing the results of girls and boys from the research sample in pre-test and post-test individual subtests in order to evaluate the effectiveness of the methodology.

The aim was to answer the second research question: Are there differences between girls and boys in phonemic awareness abilities? First, we compared the individual results of the children to determine the overall results.



**Fig. 2.** Number of points scored by 8 girls from the research sample in the pre-test and post-test in a total of 11 subtests (minimum 0 and maximum 55 points)



**Fig. 3.** Number of points scored by 14 boys from the research sample in the pre-test and post-test in a total of 11 subtests (minimum 0 and maximum 55 points)

**Table 3.** Success rate of girls and boys from the research sample in 11 subtests of the pretest and posttest (minimum 0 and maximum 55 points)

| Girls | Points in the pre-test | Points in the post-test | Improvements in points | Boys | Points in the pre-test | Points in the post-test | Improvements in points |
|-------|------------------------|-------------------------|------------------------|------|------------------------|-------------------------|------------------------|
| 1     | 21                     | 22                      | 1                      | 1    | 39                     | 43                      | 4                      |
| 2     | 33                     | 34                      | 1                      | 2    | 25                     | 33                      | 8                      |

| Girls   | Points in the pre-test | Points in the post-test | Improvements in points | Boys    | Points in the pre-test | Points in the post-test | Improvements in points |
|---------|------------------------|-------------------------|------------------------|---------|------------------------|-------------------------|------------------------|
| 3       | 37                     | 37                      | 0                      | 3       | 26                     | 32                      | 6                      |
| 4       | 32                     | 44                      | 12                     | 4       | 14                     | 35                      | 21                     |
| 5       | 22                     | 33                      | 11                     | 5       | 26                     | 29                      | 3                      |
| 6       | 23                     | 41                      | 18                     | 6       | 30                     | 36                      | 6                      |
| 7       | 16                     | 14                      | -2                     | 7       | 21                     | 24                      | 3                      |
| 8       | 20                     | 27                      | 7                      | 8       | 19                     | 28                      | 9                      |
| Median  | 22,5                   | 33,5                    |                        | 9       | 12                     | 26                      | 14                     |
| Average | 25,5                   | 31,5                    |                        | 10      | 18                     | 26                      | 8                      |
| Modus   | --                     | --                      |                        | 11      | 26                     | 25                      | -1                     |
|         |                        |                         |                        | 12      | 24                     | 28                      | 4                      |
|         |                        |                         |                        | 13      | 18                     | 30                      | 12                     |
|         |                        |                         |                        | 14      | 18                     | 26                      | 8                      |
|         |                        |                         |                        | Median  | 22,5                   | 28,5                    |                        |
|         |                        |                         |                        | Average | 22,5                   | 30                      |                        |
|         |                        |                         |                        | Modus   | 26                     | 26                      |                        |

**Table 4.** Improvement of girls and boys from the research sample in 11 subtests according to a comparison of pre-test and post-test results and depending on participation in educational activities from the methodology

| Girls | Participation | Improvements in points | Boys | Participation | Improvements in points |
|-------|---------------|------------------------|------|---------------|------------------------|
| 1     | 79,91 %       | 1                      | 1    | 58,62 %       | 4                      |
| 2     | 55,17 %       | 1                      | 2    | 55,17 %       | 8                      |
| 3     | 44,83 %       | 0                      | 3    | 48,27 %       | 6                      |
| 4     | 96,55 %       | 12                     | 4    | 72,41 %       | 21                     |
| 5     | 48,27 %       | 11                     | 5    | 41,38 %       | 3                      |
| 6     | 75,86 %       | 18                     | 6    | 68,97 %       | 6                      |
| 7     | 62,07 %       | -2                     | 7    | 75,86 %       | 3                      |
| 8     | 58,62 %       | 7                      | 8    | 41,38 %       | 9                      |
|       |               |                        | 9    | 86,21 %       | 14                     |
|       |               |                        | 10   | 55,17 %       | 8                      |
|       |               |                        | 11   | 68,97 %       | -1                     |
|       |               |                        | 12   | 65,52 %       | 4                      |
|       |               |                        | 13   | 79,91 %       | 12                     |
|       |               |                        | 14   | 72,41 %       | 8                      |

Based on the results of testing girls and boys from the research sample, we can conclude that both groups showed improvement in phonemic awareness skills, with the exception of two children (girl 7 and boy 11). According to the median and average, girls achieved slightly better results.

Based on these data, we can conclude that the vocal-rhythmic stimulation methodology had positive effects on the development of phonemic awareness skills in children from the research sample. However, it needs to be verified on a larger sample of children from several kindergartens in different regions of Slovakia. This also applies to further verification of the assumption that the development of a child's phonemic awareness skills depends on the extent of their participation in educational activities from the methodology.

### 3. Discussion

The aim of the evaluation research was to create a vocal-rhythmic stimulation methodology and evaluate its effectiveness in developing phonemic awareness in children at the end of pre-primary education. In this study, we supported its achievement with a quantitative strategy. We compared the results of children from the research sample in the pre-test and post-test, also according to gender. A qualitative strategy was not presented here. It contains extensive data processed by methods of thematic analysis of children's statements and pedagogical reflection on their behavior and actions during the implementation of individual educational activities. This research study answered two questions selected from the research.

Does the vocal-rhythmic stimulation methodology advance children's phonemic awareness to a higher level? The results of the children in the pre-test and post-test showed that it has developmental effects. Most children in the research sample showed improvement in almost all phonemic awareness skills. Only two children out of a total of 22 showed a slight deterioration in their post-test scores. This may be related to their emotional insecurity in situations of controlled mental work. Similar phenomena have been reported in the literature by Share (1995) and Brady (1997). They pointed to the variability in the development of children's phonological abilities and the dependence of their manifestation on environmental conditions and current mental state. These and many other determinants of performance in preschool children are common (Horáková, 2009; Smolík, Seidlová Málková, 2015).

The children studied performed best at syllable analysis of words and isolation of the first sound in words. They were less able to identify sounds at the end of words and had problems identifying sounds within short words. Most of them are unable to analyze words into individual sounds. Phonemic analysis is one of the more difficult metalinguistic operations and is usually consolidated at the beginning of school attendance (Ehri, 2005; Seidlová Málková, 2016). These findings correspond to the recommendations of Gillon (2000), Adams et al. (1998) and Zavrazhina and Terentyevy (2021) on stimulating these abilities. Eccles et al. (2020) empirically confirmed the positive influence of musical-rhythmic activities on the development of phonological sensitivity in preschool children.

Lundberg, Frost and Petersen (1988) found that children who completed a phonological program focused on rhythm, rhyming, and word manipulation scored higher on reading skills later in school. Torgesen et al. (1994) pointed out that phonological intervention has the greatest effect when it is implemented regularly, purposefully, and playfully. We have fulfilled this condition through intensive daily implementation. Equally important is the transfer effect of musical and rhythmic elements on language skills, as demonstrated by research by authors such as Pramling and Wallerstedt (2009) and Tafuri (2008).

Our research has confirmed this. The tested vocal-rhythmic stimulation methodology is original and, in addition to phonemic awareness, it integrates the development of language, musical, cognitive, and motor skills. It respects the development of phonemic awareness in preschool children, from the perception of sound units (syllables, rhythm) to the differentiation of phonological elements of words (Gillon, 2004; Hulme, Snowling, 2013; Kapalková et al., 2005). Research data have confirmed that it is suitable for preschool children.

#### *Are there differences between girls and boys in phonemic awareness abilities?*

No significant differences between boys and girls were found in the sample studied, which indicates the universality of the methodology in these groups. Despite the positive findings, it is important to mention the children who did not score higher in the post-test than in the pre-test (girl 3) and those who showed a slight deterioration in their post-test results (girl 7, boy 11). Girl 3 already achieved a relatively high score (37 points) in the pre-test, which indicates a possible ceiling effect, where the child had already reached an advanced level of phonemic awareness before the start of the research. In the case of girl 7 and boy 11, this may be a fluctuating performance, influenced by something or someone.

The research also showed that there is no direct correlation between the increase in phonemic ability and the child's level of participation in activities. Therefore, it is not true that the higher the participation, the better the results (e.g., girl 5 with 48 % participation improved by 11 points, versus girl 1 with 80 % participation improved by only 1 point). According to Allen (2011), it is not usually true that the more intensive the intervention, the more effective it is. There are reasons for this phenomenon, which we have not investigated. They will be the subject of

further research when verifying the effectiveness of the methodology on a broader research sample. This may be related to the quality of engagement, individual developmental level, and the ability to learn new things outside of stimulating activities (Gan, Chong, 2006; Eccles et al., 2020). The affective tone of the activities also appears to be an important factor, i.e., whether the child found the activities fun, meaningful, and personally significant, which influences their motivation and level of engagement (Stanovich, 1986; Winsler et al., 2011).

When comparing the results for the groups by gender, boys improved by an average of 7.5 points and girls by 6 points. However, girls had higher average scores than boys in both the pre-test and post-test. Therefore, it can be said that girls were slightly more successful in developing phonemic awareness skills, by an average of only 1.5 points (Table 3).

### **Limitations of the research**

A serious limitation is the evaluative research focused on verifying the effectiveness of the methodology without a control group of children. This design made it possible to capture authentic expressions of children in a real educational context, but at the same time limited the possibility of formulating clear causal conclusions about the impact of the methodology on the observed abilities. Another limitation was the size and structure of the research sample. The small number of children and uneven gender representation make it impossible to generalize the results to a wider population or to make reliable comparisons between subgroups. The short-term nature of the intervention limited the possibility of verifying the sustainability of the changes achieved over time.

The data collection process was also affected by organizational and operational circumstances specific to the pre-primary education environment. During some activities, there were interruptions due to children arriving late, staff arrivals, or parallel activities, which could have disrupted the continuity and quality of the activities carried out. Variable attendance of children, mainly due to illness, was another disruptive factor.

Some children did not participate in all educational activities, which may have affected their post-test results. The epidemic situation in the kindergarten, the researcher's illness during February and March (a total of 2 days), and the flu holidays (1 week in February) led to repeated interruptions in the research process. For these reasons, the retesting of almost half of the sample was carried out three weeks after the end of the intervention, which may have affected the validity of the post-test data.

Another limitation was the fact that the person implementing the stimulation methodology was not a regular member of the class team. In the initial stages, this aspect manifested itself in increased shyness or, conversely, excessive activity on the part of some children, which may have temporarily distorted their authentic participation. The initial adaptation contact with the class, carried out a week before data collection, served to familiarize the children with the research aim and eliminate unfamiliar stimuli, but it was not possible to guarantee that the initial uncertainty would be completely overcome.

Taking these limitations into account is crucial for drawing conclusions from this study. At the same time, it provides a valuable starting point for optimizing the methodological framework in future research projects.

### **4. Conclusion**

The results of the research confirmed the effectiveness of the vocal-rhythmic stimulation methodology in the development of phonemic awareness in children at the end of pre-primary education. A comparison of children's performance in the pre-test and post-test showed a clear improvement in several phonemic awareness skills. The most significant progress was observed in skills such as sound isolation, synthesis and analysis of words into sounds and syllables, as well as in rhyming. These findings are consistent with previous research confirming the importance of targeted intervention in pre-reading skills already in preschool age (Markussen-Brown et al., 2017; Caravolas et al., 2019; Šedinová, Seidlová Málková, 2021).

An important contribution of the research is the creation and verification of a methodology that combines musical and linguistic elements in a systematic approach with an emphasis on rhythm, articulation, breathing exercises, and analytical-synthetic language activities. This comprehensive support was positively reflected in the children's performance in the individual subtests of the D.B. El'konin test. In addition, the methodology respected the developmental needs of children, supported their natural interest, and enabled learning through play, music, and movement.

In terms of gender, no significant differences between boys and girls were found in the sample, which points to the universality of the methodology within diverse groups of children. Although the research sample was small and does not allow for generalisation of the results to the entire population, the data obtained through quantitative analysis provide valuable insights for further research and pedagogical practice. Given the positive results of the research, further application and development of the vocal-rhythmic stimulation methodology in kindergartens can be recommended, especially when working with children with risk factors in the area of literacy. At the same time, there is a need for further longitudinal studies to monitor the durability of the methodology's effects at a later age and its impact on children's school performance in reading and writing.

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