

Original article

Familiarity of speech and language therapists and hearing therapists in Bosnia and Herzegovina with contemporary auditory perception treatment approaches

Tijana Simić

University of East Sarajevo,
Faculty of Medicine Foča,
Foča, Republic of Srpska,
Bosnia and Herzegovina

Primljen – Received:

25/08/2025

Prihvaćen – Accepted:

24/09/2025

Corresponding author:

Tijana Simić, Mrs

Studentska 5, 73 300 Foča

e-mail:

*logopedskikabinetglas@
gmail.com*

Copyright: ©2025 Tijana Simić.

This is an Open Access article
distributed under the terms of the
Creative Commons Attribution 4.0
International (CC BY 4.0) license.

Summary

Introduction. Modern approaches to auditory perception therapy are essential for the effective rehabilitation of individuals with hearing impairments. Speech and language therapists and hearing therapists are central to planning and delivering interventions that are grounded in current scientific knowledge and tailored to the individual needs of each client. Their familiarity with methods directly influences the quality of auditory training, speech perception development, and overall communication outcomes. This study aims to examine the extent to which speech and language therapists and hearing therapists in Bosnia and Herzegovina (BiH) are familiar with contemporary approaches to auditory perception treatment and to identify potential gaps in professional training and clinical practice.

Methods. The study included 60 speech and language therapists and hearing therapists from institutions across Bosnia and Herzegovina where auditory perception treatment was conducted. The majority of the participants were speech and language therapists (73%), while hearing therapists accounted for 15% of the sample. Participants were both males and females, aged between 25 and 44 years. A specially designed questionnaire was used for this study.

Results. The results indicated that speech and language therapists and hearing therapists in Bosnia and Herzegovina were not generally well-informed about contemporary approaches to auditory perception treatment. Many professionals reported limited opportunities to implement such treatments in their institutions.

Conclusion. The findings indicate that the availability of materials for implementing contemporary auditory perception treatment methods is limited or problematic within Bosnia and Herzegovina. This may be due to financial constraints or insufficient awareness among professionals regarding the existing possibilities. Additionally, there is a noticeable lack of organized training programs aimed at equipping professionals with the necessary skills to apply these modern methods. Improving access to materials and professional development opportunities is essential for enhancing the implementation of advanced auditory perception treatments.

Keywords: auditory perception treatment, professional awareness, speech and language therapists, modern therapeutic approaches, hearing therapists

Introduction

In today's society, voice and speech disorders in children are increasingly common, and in many cases, they are accompanied by auditory perception disorders. The most effective treatments in

such situations are provided by professionals, speech and language therapists and hearing therapists, whose roles and significance are the central focus of this master's thesis.

Auditory perception takes place simultaneously at the level of verbal and auditory activity [1]. For effective verbal communication to occur, language must be accessible to the senses, which is achieved through its activation by speech. Language is an abstract system of rules and symbols, whereas speech is its concrete realization [2]. The understanding that human speech consists of sounds, words, and sentences highlights the importance of the voice as a phonemic unit. Vowels serve as carriers of power and sonority, while consonants are essential for speech intelligibility. As a result of pathological articulation of consonants, speech intelligibility is compromised, while changes in vowels are rare and usually occur in individuals with hearing impairment. The auditory level of speech communication refers to the reception and perception of the speech signal, where the listener's attention is directed toward proper signal reception and accurate interpretation of the message [1]. Myklebust defined auditory perception disorder as the "inability to identify, discriminate, and interpret auditory sensations" [3]. Auditory perception, therefore, is not merely memorization of sensory impressions, but a process of classification, transformation, and recognition of stimuli [4]. The brain receives sound waves and processes the encoded information they carry within a short time frame. The basic units of the speech signal, representing the smallest linguistic elements exchanged, are vowels and syllables composed of vowels and consonants. Perception enables the detection of the acoustic features of the signal and their integration into a meaningful perceptual unit [5]. Speech is the acoustic signal formed by the connection of sounds based on linguistic rules, carrying specific speech information. For the speech produc-

tion process to function properly, the auditory mechanism must be intact. Dysfunction in any part of this mechanism can lead to speech perception disorders and disruptions in speech and language development. The primary task of the auditory mechanism is to receive speech in the form of the acoustic signal, then transform it into a neural signal and transmit it to the brain cortex [6]. Auditory perception develops in parallel with speech development and is a prerequisite for the development of auditory memory [7]. Auditory attention also plays a significant role. The ability to maintain alertness sustaining attention long enough to respond to a given stimulus is important [8]. The main types of articulation disorders are omission, substitution, and distortion. Vuletić describes complete omission of a sound as a silent realization of a given phoneme. Distortion refers to an incorrect articulation of a sound, which may range from barely noticeable to very pronounced [9]. Articulation disorders can be divided into functional and organic types. Functional articulation disorders (functional dyslalia) are caused by improper airflow during the articulation of the sound and undifferentiated phonemic hearing. Organic articulation disorders (organic dyslalia) are caused by injuries or diseases of the central nervous system and cranial nerves involved in articulation and are referred to as central dyslalias. Organic dyslalias can also be caused by pathological conditions of the jaw, teeth, palate, or velopharyngeal mechanism – these are known as orthodontic dyslalias [10]. According to Andrešić and colleagues (2010), the most common voice disorder in childhood is hoarseness or dysphonia. Dysphonia refers to any deviation from the normal pitch, intensity, and quality of voice. These authors differentiate between acute hoarseness, which appears suddenly and resolves with therapy, and chronic hoarseness, which lasts for weeks, months, or even years [3]. During the developmental period, chil-

dren must have intact auditory perception to ensure proper speech and language development. Well-developed auditory perception is a key prerequisite for the successful acquisition of academic skills and mastering educational content. Comprehensive diagnostics is essential for defining appropriate treatment strategies. The multidisciplinary approach refers to the teamwork of various professionals, such as an audiologist, pediatrician, neurologist, psychologist, speech and language therapists, hearing therapists, and other specialists [11].

Given the importance of auditory perception, it is necessary to intervene in cases where difficulties arise in this area, to provide appropriate support and ensure optimal development of language and communication skills, as well as the child's effective functioning in daily life.

The aim of this study was to determine the extent to which speech and language therapists and hearing therapists were familiar with modern methods of auditory perception treatment. Additionally, the research aimed to examine the degree to which these professionals in Bosnia and Herzegovina were able to apply such methods in their everyday clinical practice.

Method

Sample

The study included 60 speech and language therapists and hearing therapists from the territory of Bosnia and Herzegovina. This cross-sectional study included professionals who voluntarily agreed to participate and provided informed consent. The sample consisted of graduated speech and language therapists and hearing therapists currently working in Bosnia and Herzegovina. The

majority of participants were women (95%), and the majority had a professional title of speech therapist (73%). In addition, 63% of the respondents were located in smaller municipalities or towns. The sample size ($N = 60$), with a marked imbalance in terms of professional orientation (73% speech and language therapists, 15% hearing therapists) and an almost complete sex homogeneity (95% women), limited the power of statistical tests and the possibility of conducting multidimensional analyses. The instrument underwent basic content and internal validation (CVI and Cronbach's α), but test-retest reliability and confirmatory factor analysis were not carried out.

Instruments

For the purposes of this research, a specially designed questionnaire was used, consisting of two sections. The first section included questions aimed at collecting sociodemographic data. The second section contained statements rated on a five-point Likert-type scale: 1 (strongly disagree), 2 (partially disagree), 3 (neither agree nor disagree), 4 (partially agree), and 5 (strongly agree). Additionally, this section included three multiple-choice questions. The questions in the second section focused on modern methods of auditory perception treatment. Content validation was carried out with the assessment of five experts in the fields of speech and language therapist and hearing therapist; the Content Validity Index (CVI) was calculated. The CVI values ranged from 0.80 to 1.00, while the overall S-CVI was 0.93, indicating a high level of content validity. The internal consistency of the questionnaire was assessed using Cronbach's α coefficient. The obtained value of $\alpha = 0.87$ indicated a high reliability of the instrument.

Results

The study included a total of 60 respondents, consisting of speech and language therapists and hearing therapists working in various institutions across Bosnia and Herzegovina. Participation was voluntary, and all participants provided informed consent. The vast majority of participants were females (95%), which precluded any meaningful sex-based analysis due to the disproportionate representation (only three male participants). Although there is a lack of specific data for Bosnia and Herzegovina, global trends indicate a marked sex imbalance in the professions of speech and language therapists and hearing therapists, and it can be assumed that the local professional community also reflects the marked dominance of the females. Regarding professional background, most respondents were speech and language therapists (73%), and the majority were located in smaller towns and municipalities (63%). The mean age of the respondents was $M = 31.82$ years ($SD = 4.35$), and the mean length of professional experience was $M = 5.22$ years ($SD = 4.17$).

Respondents' views on the treatment of auditory perception

The questionnaire used in this study consisted of 18 Likert-type statements aimed at assessing participants' awareness of contemporary auditory perception treatment methods, available institutional resources, and their attitudes toward the effectiveness of these methods. Participants rated their agreement with each statement on a five-point Likert scale, ranging from "strongly disagree" to "strongly agree."

An overview of the distribution of responses provides a somewhat clearer picture of the respondents' responses to the statements in the questionnaire. In the first

part of the questionnaire, which concerns information and the method of obtaining this information, we see that the distribution is skewed towards higher values with which respondents agree with the stated statements, which could point to the conclusion that the respondents mostly use all available resources to independently obtain information about auditory perception treatments.

In the part of the questionnaire concerning available training, materials and equipment, the distribution shows an increase in the frequency of neutral central responses indicating weaker insights of the respondents into the situation, primarily at the level of BiH, while there are slightly more positive responses for the level of the home institution. As for the assessment of the usefulness of the treatments themselves, the distribution indicates extremely high frequencies of agreement with the statements in the case of various multimedia, applications and the Behringer digital set, while neutral responses are extremely frequent in the case of Neurofeedback, the interactive whiteboard and the computer programs Earobic and Phonema confirming that a large number of respondents have not had the opportunity to become familiar with the aforementioned treatments.

Regarding professional title or orientation, significant differences were found in attitudes toward the usefulness of the Behringer digital set ($U = 256$, $z = -2.30$, $p < 0.05$) and Forbrain headphones ($U = 212$, $z = -2.63$, $p < 0.01$). Based on the average rank results for the two professional groups, it can be concluded that both attitudes were significantly more strongly expressed among hearing therapists than among speech and language therapists. Since multiple comparisons were conducted without correction for multiple testing, the significance findings should be interpreted with caution.

Table 1. Descriptive indicators of the expressiveness of respondents' attitudes

Statements	N	Min	Max	Mdn	M	SD
I am sufficiently familiar with modern forms of auditory perception treatment.	60	1.00	5.00	4.00	3.77	1.00
I obtain new information in the field of auditory perception treatment via the Internet.	60	2.00	5.00	5.00	4.42	0.77
I obtain new information in the field of auditory perception treatment via seminars.	60	1.00	5.00	4.00	3.92	1.11
I obtain new information in the field of auditory perception treatment via the exchange of experiences with other colleagues.	60	2.00	5.00	4.50	4.25	0.91
The institution where I work provides the necessary materials and devices for work following modern methods of auditory perception treatment.	60	1.00	5.00	4.00	3.52	1.11
The institution where we work organizes the necessary trainings for work with materials and devices within the framework of modern methods of auditory perception treatment.	60	1.00	5.00	3.00	3.22	1.22
On the territory of BiH, there are easily accessible materials and devices for work within the framework of modern methods of auditory perception treatment.	60	1.00	5.00	3.00	3.15	0.99
Necessary trainings are organized in BiH for working with materials and devices within the framework of modern methods of auditory perception treatment.	60	1.00	5.00	3.00	3.12	0.87
I believe that in the treatment of auditory perception it is useful to apply various multimedia (pictures, videos, audio recordings,...).	59	1.00	5.00	5.00	4.58	0.81
I believe that in the treatment of auditory perception it is useful to apply various applications.	60	1.00	5.00	5.00	4.38	1.04
I believe that in the treatment of auditory perception it is useful to apply video games.	60	1.00	5.00	4.00	3.73	1.33
I believe that in the treatment of auditory perception it is useful to apply the Behringer digital speech therapy set.	60	1.00	5.00	5.00	4.65	0.80
I believe that in the treatment of auditory perception it is useful to apply Forbrain headphones.	60	3.00	5.00	5.00	4.38	0.80
I believe that in the treatment of auditory perception it is useful to apply the Tomatis device.	60	2.00	5.00	4.00	4.03	0.88
I believe that Neurofeedback is useful in the treatment of auditory perception	60	1.00	5.00	3.00	3.68	1.05
I believe that an interactive whiteboard is useful in the treatment of auditory perception.	60	2.00	5.00	3.50	3.78	0.98
I believe that the Earobic computer program is useful in the treatment of auditory perception.	60	1.00	5.00	3.00	3.30	0.94
I believe that the Phonema computer program is useful in the treatment of auditory perception.	59	1.00	5.00	3.00	3.27	0.94

N - number of participants; *Min* - minimum value; *Max* - maximum value; *Mdn* - median; *M* - arithmetic mean; *SD* - standard deviation

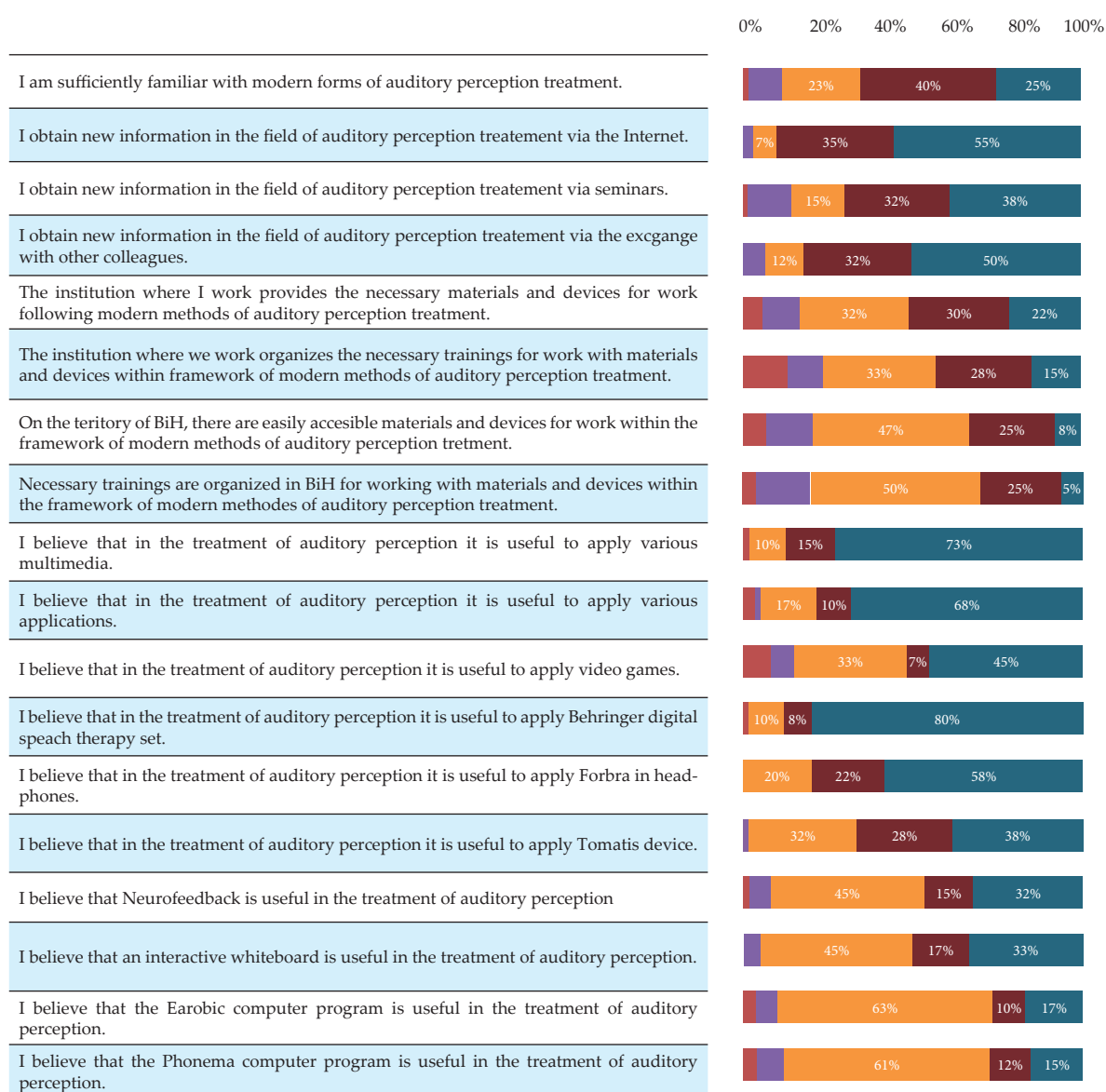


Figure 1. Distribution of responses on the respondents' attitude scale

Discussion

Analysis of the survey results showed that the sample consisted predominantly of females (95%), with only 5% of males. This finding is consistent with general trends where women are typically overrepresented in the profession. While this sex distribution likely reflects the actual structure of the workforce, it also precludes any meaningful analysis of sex-

based differences due to the statistically insignificant number of male respondents.

The sample was predominantly composed of speech and language therapists (73%), while hearing therapists comprised 15%. In addition, the majority of respondents worked in smaller cities (63%), suggesting that professionals in these settings had a greater interest in participating in research, possibly due to limited access to new

therapeutic methods and a greater need for continuing education.

Given that the statistically significant differences found in attitudes towards the Behringer digital set and Forbrain headphones were based on a comparison of groups of unequal size and without applying a correction for multiple testing, these specific findings must be interpreted solely as initial hypotheses that require mandatory confirmation in studies with a more representative and balanced professional sample of speech-language pathologists and surdoaudiologists.

The questionnaire contained 18 statements assessing participants' awareness of available auditory perception treatments and institutional support. The responses revealed significant differences in how participants perceived access to information, materials, and training regarding auditory perception therapies. Regarding sources of information, the majority of professionals reported relying on the Internet and discussions among colleagues. This is in line with global trends, where online resources are becoming the primary means of professional development due to their accessibility and rapid dissemination of information. A survey conducted in the United States, which included certified speech and language therapists, similarly showed that therapists most often consulted colleagues, participated in educational activities, and searched the open Internet [12]. These results indicate that, despite differences in health and education systems, speech and language therapists worldwide rely on a combination of formal and informal channels for acquiring knowledge, with the Internet and peer exchange playing a central role in continuous professional development.

Participants' ratings showed that the availability of materials, devices, and training was assessed as relatively low both at the institutional and national level in Bosnia and Herzegovina. The lowest scores were given to the availability of training, materials, and

equipment at the national level, which may negatively affect the quality of professional development and the application of modern therapeutic procedures in clinical practice. Similar results were reported by Grillo et al. (2017), who pointed out that clinicians often had limited access to necessary equipment and materials, while financial constraints and uneven availability of professional training further complicated the quality of therapy application [13].

The lack of materials and training in Bosnia and Herzegovina may be attributed to limited institutional budgets and insufficient awareness of available opportunities within the country. In addition, there are no sufficient organized training programs focusing on the use of modern materials in auditory perception treatment. These findings align with the results of the study *The impact of the COVID-19 pandemic on the provision of speech therapy services in Bosnia and Herzegovina*, where the authors emphasized that the pandemic further exposed the limited resources and structural shortcomings in the speech therapy system, particularly regarding unequal accessibility of services and insufficient professional support [14]. This suggests that the challenges faced by professionals are not exclusively the result of the pandemic but rather reflect broader systemic issues within which speech and hearing therapists operate.

Comparable findings have also been reported in Croatia, where 79.31% of respondents indicated that there was insufficient investment in the use of information and communication technology in speech therapy practice, and 86.21% noted a lack of access to education and knowledge in this area [15]. These results confirm the lack of support in terms of education and the availability of modern tools, similar to the situation in Bosnia and Herzegovina. Both studies highlight the need for greater investment in training and resources in order to improve professional practice and the quality of therapy.

As a cross-sectional study, this research did not allow for the establishment of causal relationships or the monitoring of changes over time. Instead, it provided a snapshot of the current level of familiarity of speech and language therapists and hearing therapists with contemporary approaches to auditory perception treatment in Bosnia and Herzegovina. It is important to emphasize this methodological limitation and to note that the cross-sectional design does not diminish the value of the obtained results, but rather highlights areas that require further investigation. The applied questionnaire underwent basic validation procedures. Content validity was confirmed using the CVI method, while internal consistency was assessed with Cronbach's α coefficient and demonstrated satisfactory reliability. Although the instrument has not yet undergone comprehensive psychometric validation (test-retest, confirmatory factor analysis), the results of this study indicate that the questionnaire is applicable for preliminary research.

Although this questionnaire has shown applicability for preliminary research, in order for it to become a standardized and objective measuring instrument for assessing experts' familiarity, future studies must primarily focus on a complete psychometric evaluation. This includes conducting test-retest reliability, as well as a Confirmatory Factor Analysis (CFA), which would confirm the stability and latent structure of the questionnaire.

This study has several important methodological limitations that should be considered when interpreting the findings. First, the sample is relatively small ($N = 60$) and unevenly structured, with a pronounced dominance of speech and language therapists (73%) and almost complete sex homogeneity (95% women), which reduces statistical power and increases the risk of Type II error. Furthermore, the data were collected via self-report, which may lead to socially desirable responding and subjective overestimation or underestimation

of actual knowledge levels. The heterogeneity of the institutions from which participants were recruited – ranging from larger urban centers to smaller towns – further limits the generalizability of the findings. Finally, the cross-sectional design of the study does not allow for causal inferences or the observation of changes over time. Future research should include larger, more representative, and longitudinally tracked samples, as well as objective measures of professional competence, to obtain more reliable and generalizable results.

In response to the limitation of collecting data via self-report methods, future research should consider applying objective measures of professional competence. This could include standardized knowledge tests on specific modern methods (such as Neurofeedback or Tomatis devices), or the collection and analysis of documentation on completed formal education and training. The use of objective measures is essential for obtaining more reliable and generalizable results.

Conclusion

Preliminary findings indicate that speech and language therapists and hearing therapists in Bosnia and Herzegovina generally have limited familiarity with, and restricted opportunities to apply, contemporary methods of auditory perception treatment.

To translate these preliminary findings into robust professional guidance, two key steps are mandatory for future research. First, studies must employ larger, more representative, and professionally balanced samples, along with the objective measurement of professional knowledge (e.g., standardized tests or analysis of formal documentation). Second, to establish a reliable tool for assessing competence in this field, the applied questionnaire requires complete psychometric validation in a subsequent study, including test-retest reliability and Confirmatory Factor Analysis (CFA).

Fulfilling these methodological requirements is essential for generating reliable and generalizable results, thereby informing effective

professional development strategies and improving the quality of auditory perception treatment across Bosnia and Herzegovina.

Funding source. The authors received no specific funding for this work.

Ethical approval. The Ethics Committee of the University of East Sarajevo, Faculty of Medicine Foča, Foča, Republic of Srpska, Bosnia and Herzegovina, approved

the study and informed consent was obtained from all individual respondents. The research was conducted according to the Declaration of Helsinki.

Conflicts of interest. The authors declare no conflict of interest.

References:

1. Furundić DV. Ocena kvaliteta artikulacije glasova srpskog jezika primenom neuronskih mreža. Doktorska disertacija. Beograd: Univerzitet u Beogradu; 2018.
2. Punišić S. Artikulatorno-akustički i auditivni aspekt odstupanja glasova u patološkom izgovoru. Doktorska disertacija. Beograd: Univerzitet u Beogradu; 2012.
3. Myklebust HR. Learning disorders: Psychoneurological disturbances in childhood. *Rehabil Lit* 1964;25:354–60.
4. Jovanović-Simić N, Slavnić S, Dobrota-Davidović N. Praktikum za razvoj vizuelne i auditivne percepcije. Beograd: Društvo defektologa Srbije; 2008.
5. Jovičić S. Govorna komunikacija. Beograd: Nauka; 1999.
6. Đoković S, Gligorović M, Ostojić-Zeljковиć S. Auditivna percepcija kod osoba s poremećajem iz spektra autizma - pregled istraživanja. *Specijalna edukacija i rehabilitacija* 2022;21(1):31–49.
7. Punišić S. Primena sistema KSAFA u procesu habilitacije dece sa patologijom govora i jezika. Interno izdanje. Beograd: IEFPG; 2008.
8. Jovanović-Simić N, Slavnić S. Atipičan jezički razvoj. Beograd: Društvo defektologa Srbije; 2009.
9. Kovačić L. Razvoj govora djeteta u predškolskoj dobi. Doktorska disertacija. Zagreb: Učiteljski fakultet; 2021.
10. Dobrota N. Artikulaciono-fonološki poremećaji. Beograd: Univerzitet u Beogradu, Fakultet za specijalnu edukaciju i rehabilitaciju; 2010.
11. Petrović-Lazić M, Kosanović R. Vokalna rehabilitacija glasa. Beograd: Univerzitet u Beogradu; 2008.
12. Nail-Chiwetalu B, Bernstein Ratner N. An assessment of the information-seeking abilities and practices of speech-language pathologists. *J Med Libr Assoc* 2007K;95(2):182–8.
13. Grillo EU. Results of a Survey Offering Clinical Insights into Speech-Language Pathology Telepractice Methods. *Int J Telerehabil* 2017;9(2):25–30.
14. Duranović M, Begić L, Gavrić BB, Lauc M. The impact of the COVID-19 pandemic on the provision of speech therapy services in Bosnia and Herzegovina. *Specijalna edukacija i rehabilitacija* 2023;22(1):31–55.
15. Joza P. Primjena informacijsko-komunikacijske tehnologije u logopedskom radu u Hrvatskoj Diplomski rad. Zagreb: Sveučilište u Zagrebu, Edukacijsko-rehabilitacijski fakultet; 2022. [pristupljeno 13.08.2025]. Dostupno na: <https://urn.nsk.hr/urn:nbn:hr:158:928360>

Upoznatost logopeda i surdoaudiologa u Bosni i Hercegovini sa savremenim pristupima tretmanu auditivne percepcije

Tijana Simić

Univerzitet u Istočnom Sarajevu, Medicinski fakultet Foča, Foča, Republika Srpska, Bosna i Hercegovina

Uvod. Savremeni pristupi terapiji auditivne percepcije ključni su za efikasnu rehabilitaciju osoba sa oštećenjem sluha. Logopedi i surdoaudiolozi imaju centralnu ulogu u planiranju i sprovođenju tretmana zasnovanih na aktuelnim naučnim saznanjima i prilagođenih individualnim potrebama svakog pojedinca. Njihova upoznatost sa metodama direktno utiče na kvalitet auditivnog treninga, razvoj percepcije govora i ukupne komunikacijske ishode. Cilj ovog istraživanja je ispitati u kojoj mjeri su logopedi i surdoaudiolozi u Bosni i Hercegovini upoznati sa savremenim pristupima tretmanu auditivne percepcije, te utvrditi eventualne nedostatke u stručnom usavršavanju i kliničkoj praksi.

Metode. U istraživanju je učestvovalo 60 logopeda i surdoaudiologa iz ustanova širom Bosne i Hercegovine u kojima se sprovodi tretman auditivne percepcije. Većinu ispitanika činili su logopedi (73%), dok su surdoaudiolozi činili 15% uzorka. Učesnici su bili oba pola, starosti od 25 do 44 godine. Za potrebe ovog istraživanja korišćen je posebno dizajniran upitnik.

Rezultati. Rezultati su pokazali da logopedi i surdoaudiolozi u Bosni i Hercegovini uglavnom nisu dovoljno informisani o savremenim pristupima tretmanu auditivne percepcije. Mnogi stručnjaci naveli su da imaju ograničene mogućnosti za primjenu takvih tretmana u ustanovama u kojima rade.

Zaključak. Rezultati ukazuju da je dostupnost materijala za primjenu savremenih metoda tretmana auditivne percepcije ograničena ili problematična u Bosni i Hercegovini. Razlozi za to mogu biti finansijska ograničenja ili nedovoljna informisanost stručnjaka o postojećim mogućnostima. Takođe, primjetan je nedostatak organizovanih programa obuka kojima bi se stručnjaci osposobili za primjenu ovih modernih metoda. Poboljšanje pristupa materijalima i mogućnostima za stručno usavršavanje ključno je za unapređenje primjene savremenih tretmana auditivne percepcije.

Ključne riječi: tretman auditivne percepcije, stručna informisanost, logopedi, savremeni terapijski pristupi, surdoaudiolozi