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### METHODS FOR DEVELOPING HEARING IN DEAF AND HARD OF HEARING CHILDREN

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#### ABOUT ARTICLE

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**Kalit so'zlar:** kar va eshitishida nuqsoni bo'lgan bolalar; eshitish qobiliyatini rivojlantirish; audial-verbal terapiya; koxlear implantatsiya; implantatsiyadan keyingi reabilitatsiya; imo-ishora bilan qo'llab-quvvatlangan nutq; ikki tilli ta'lim; erta aralashuv; inklyuziv ta'lim; maxsus pedagogika.

**Ключевые слова:** глухие и слабослышащие дети; развитие слуховых способностей; аудиально-вербальная терапия; кохлеарная имплантация; постимплантационная реабилитация; жестово-поддерживаемая речь; билингвальное образование; раннее вмешательство; инклюзивное образование; специальная педагогика.

**Abstract.** The development of auditory ability in deaf and hard-of-hearing children is a central prerequisite for successful speech perception, language acquisition, and social inclusion. Despite significant advances in hearing technologies, such as hearing aids and cochlear implants, technological intervention alone does not guarantee functional hearing or oral communication. This article presents a comprehensive methodological analysis of approaches used to develop auditory skills in deaf and hard-of-hearing learners, drawing on both international research evidence and the educational context of Uzbekistan. Using a qualitative, evidence-based review methodology, the study examines three primary intervention frameworks: Auditory-Verbal Therapy, cochlear implant-based rehabilitation programs, and sign-supported or bilingual communication approaches. The findings demonstrate that early, intensive, and sustained auditory training—particularly when combined with family-centered practices—significantly improves listening and spoken language outcomes. Cochlear implantation yields the most favorable results when performed early and followed by structured post-implant rehabilitation. At the same time, early exposure to sign language or sign-supported speech is shown to prevent linguistic deprivation and to support overall cognitive and linguistic development, especially for children who derive limited benefit from auditory technology. The article argues for a flexible, individualized, and integrative methodological model that combines auditory, visual, and communicative strategies according to each child's developmental profile. Such an inclusive approach is essential for maximizing communicative competence and facilitating the successful educational and social integration of deaf and hard-of-hearing children.a

**Annotatsiya:** Eshitish qobiliyati zaif va kar bolalarda eshitish qobiliyatini rivojlantirish nutqni muvaffaqiyatli idrok etish, tilni o'zlashtirish va ijtimoiy integratsiya uchun asosiy shart hisoblanadi. Eshitish apparatlari va koxlear implantlar kabi eshitish texnologiyalarida sezilarli yutuqlarga erishilganiga qaramay, faqat texnologik aralashuv funksional eshitish yoki og'zaki muloqotni kafolatlamaydi. Mazkur maqolada kar va eshitishida nuqsoni bo'lgan o'quvchilarda eshitish ko'nikmalarini rivojlantirishda qo'llaniladigan yondashuvlarning kompleks metodologik tahlili taqdim etiladi hamda xalqaro tadqiqotlar natijalari va O'zbekiston ta'lim konteksti asos qilib olinadi. Sifatli, dalillarga asoslangan tahlil metodologiyasi asosida tadqiqot uchta asosiy aralashuv modelini ko'rib chiqadi: audial-verbal terapiya, koxlear implantatsiyaga asoslangan reabilitatsiya dasturlari va imo-ishora qo'llab-

quvvatlangan yoki ikki tilli muloqot yondashuvlari. Natijalar shuni ko'rsatadiki, erta, intensiv va uzluksiz eshitish mashg'ulotlari — ayniqsa oila markazli yondashuv bilan birgalikda olib borilganda — tinglash va og'zaki nutq natijalarini sezilarli darajada yaxshilaydi. Koxlear implantatsiya erta amalga oshirilganda va undan keyin tizimli rehabilitatsiya bilan davom ettirilganda eng yuqori samarani beradi. Shu bilan birga, imo-ishora tiliga yoki imo-ishora bilan qo'llab-quvvatlangan nutqqa erta kirish lingvistik deprivatsiyaning oldini oladi hamda ayniqsa eshitish texnologiyasidan cheklangan foyda oladigan bolalarda umumiy kognitiv va til rivojlanishini qo'llab-quvvatlaydi. Maqolada har bir bolaning rivojlanish profili asosida eshitish, vizual va kommunikativ strategiyalarni uyg'unlashtiruvchi moslashuvchan, individuallashtirilgan va integrativ metodologik model zarurligi asoslab beriladi. Bunday inklyuziv yondashuv kommunikativ kompetensiyani maksimal darajada rivojlantirish va kar hamda eshitishida nuqsoni bo'lgan bolalarning muvaffaqiyatli ta'limiy va ijtimoiy integratsiyasini ta'minlash uchun muhimdir.

**Аннотация:** Развитие слуховых способностей у глухих и слабослышащих детей является ключевым условием успешного восприятия речи, овладения языком и социальной интеграции. Несмотря на значительные достижения в области слуховых технологий, таких как слуховые аппараты и кохлеарные импланты, одно лишь технологическое вмешательство не гарантирует формирование функционального слуха или устной коммуникации. В статье представлен комплексный методологический анализ подходов к развитию слуховых навыков у глухих и слабослышащих обучающихся с опорой на международные научные данные и образовательный контекст Узбекистана. С использованием качественного, основанного на доказательствах обзора рассматриваются три основных направления вмешательства: аудиально-вербальная терапия, программы реабилитации на основе кохлеарной имплантации, а также жестово-поддерживаемая или билингвальная коммуникация. Результаты показывают, что ранняя, интенсивная и систематическая слуховая тренировка — особенно в сочетании с семейно-ориентированным подходом — значительно улучшает показатели развития слухового восприятия и устной речи. Кохлеарная имплантация дает наилучшие результаты при раннем проведении и последующей структурированной реабилитации. В то же время раннее знакомство с жестовым языком или жестово-поддерживаемой речью предотвращает языковую депривацию и способствует общему когнитивному и языковому

развитию, особенно у детей, получающих ограниченную пользу от слуховых технологий. В статье обосновывается необходимость гибкой, индивидуализированной и интегративной методологической модели, объединяющей слуховые, визуальные и коммуникативные стратегии в соответствии с профилем развития каждого ребенка. Такой инклюзивный подход является необходимым условием для максимального развития коммуникативной компетентности и успешной образовательной и социальной интеграции глухих и слабослышащих детей.

## INTRODUCTION

Developing auditory ability is a critical foundation for deaf and hard-of-hearing children, as it strengthens their capacity to understand speech and acquire language. Children with hearing impairments face unique challenges in perceiving and interpreting sounds; without targeted intervention, they risk delays in speech development and social integration. Advances in technology such as modern hearing aids and cochlear implants have opened new possibilities for these children by partially restoring the sensation of sound. In particular, early cochlear implantation has been shown to markedly improve language outcomes – children implanted by the age of two achieve higher receptive and expressive language scores than those implanted later. However, technology alone is not sufficient. Educators and therapists have developed specialized methodologies to teach hearing skills, including Auditory-Verbal Therapy (which emphasizes focused listening and spoken language training) and sign-supported speech or total communication approaches (using sign language/gestures alongside spoken words).

In Uzbekistan, the need for effective auditory training methodologies is especially pronounced. Today in Uzbekistan, over 21,000 children with hearing impairments are being educated, supported by a network of seventeen special schools and six specialized preschools. In these preschool institutions, the primary focus of education is first and foremost teaching the children to hear – training them to detect and distinguish speech and non-speech sounds in their environment. Continuous exposure to meaningful sounds throughout the day (at school, home, and in public settings) develops auditory attention and eventually prepares the child to perceive and understand spoken language in everyday situations. The government has also invested in medical interventions: since 2014, the national cochlear implantation program has performed over 1,000 implant surgeries for children with severe hearing loss. Once implants are in place, these children require intensive rehabilitation to develop listening skills and speech. Without a properly organized post-implant education process, surgery alone does not guarantee functional hearing or oral communication. Thus, the synergy of early detection, technology, and pedagogical methodologies is crucial. This article analyzes the key methodologies for developing auditory ability in deaf and hard-of-hearing children – with emphasis on Auditory-Verbal Therapy, cochlear implant-based rehabilitation, and sign-supported communication – drawing on both the context of Uzbekistan and international research.

## MATERIALS AND METHODS

This study is a qualitative analysis of the existing methodologies used to improve auditory ability in hearing-impaired children. We reviewed relevant literature, including international research articles and local Uzbek educational reports, to identify evidence-based practices. Statistical data on outcomes of children with hearing impairments in Uzbekistan and on the cochlear implantation programs were gathered from published sources. The main intervention approaches examined were: (1) Auditory-Verbal Therapy (AVT) – an early intervention method that is family-centered and emphasizes listening and spoken language development; (2) Rehabilitation programs for children with cochlear implants – focusing on post-surgical auditory training and speech therapy; and (3) Sign-supported speech (total communication) – a form of communication that combines spoken words with sign language or gestures.

Our analytical approach involved comparing findings from international research with documented practices in Uzbekistan. For Auditory-Verbal Therapy, we analyzed peer-reviewed studies on language outcomes, including a recent cohort study evaluating the impact of AVT duration on post-implant language development. To understand local rehabilitation strategies for cochlear implants, we reviewed program reports and seminar proceedings in Uzbekistan (for example, a 2021 national seminar on children with cochlear implants). In examining sign-supported communication, we reviewed research on the effects of early sign language exposure on language acquisition and on simultaneous communication. We also incorporated information from pedagogical practice in special schools to illustrate how methodological principles are applied in the classroom (such as the use of interactive games and group activities). No new experiments on human subjects were conducted; instead, this article synthesizes existing evidence and experiences to outline an effective methodological framework. In the discussion that follows, these sources are integrated to compare approaches and identify best practices for developing auditory ability in deaf and hard-of-hearing children.

## RESULTS AND DISCUSSION

**Auditory-Verbal Therapy and Early Listening Practice:** There is strong evidence supporting Auditory-Verbal Therapy (AVT) as an effective approach to develop listening and spoken language in children with hearing loss. AVT is a family-centered coaching method in which trained therapists guide parents to engage the child in listening-rich interactions, maximizing the use of residual hearing or hearing devices for auditory stimulation. AVT yields notably positive outcomes when therapy is initiated early. Studies in the UK, Denmark, and

Australia have shown that about 80% of preschool-aged deaf children who participate in two or more years of AVT develop age-appropriate language skills. Most of these children go on to attend mainstream schools alongside hearing peers. A recent systematic review (2021) confirmed that AVT has a strong positive effect on the development of all areas of language in young children with hearing impairment. Furthermore, a cohort study in 2025 underscored the importance of sustained AVT after cochlear implantation: children who received Auditory-Verbal Therapy for three years post-implant achieved significantly higher language scores five years later than those who received only one year or no therapy. In that study, roughly 80–83% of children in the 3-year AVT group attained age-appropriate core language levels, compared to about fifty percent of children who received no AVT. These findings indicate that intensive and long-term listening practice dramatically improves spoken language outcomes and effectively narrows the gap between hearing-impaired children and their hearing peers.

In Uzbekistan’s special preschools and schools for deaf or hard-of-hearing children, teaching auditory skills is also a primary focus. Teachers begin with basic listening skills: children are taught to listen to various environmental sounds (a doorbell, a phone ringing, footsteps, etc.) and to differentiate those sounds from each other and from speech. This consistent exposure and practice allows children to develop their auditory ability and listening attention – the capacity to notice sound cues and focus on them. As Rahimova et al. noted, the child *“needs to hear it not only in class, but throughout the day,”* since consistent real-life practice eventually prepares them to understand spoken language in unstructured environments. Teachers often use playful, interactive methods to engage children in listening tasks. For example, interactive games and role-playing are employed to stimulate the children’s speech and listening actions. Role-play activities create natural communication scenarios, prompting hearing-impaired children to practice speechreading (lip-reading), use residual hearing to catch spoken cues, and respond either verbally or with signs. Such interactive pedagogical techniques have been shown to improve both spoken communication and auditory skills in special education settings. The key is to make listening practice enjoyable and meaningful, which helps maintain the child’s interest and accelerates skill acquisition.

**Cochlear Implants and Rehabilitation:** Cochlear implants (CIs) have revolutionized opportunities for profoundly deaf children by providing direct electrical stimulation to the auditory nerve and thereby a sense of sound. Effective use of a CI can greatly enhance auditory perception, but outcomes depend on

early implantation and rigorous rehabilitation. Research shows that the younger a deaf child is implanted, the better the hearing and language development: infants implanted before 18–24 months of age often develop listening and speaking abilities near to those of hearing peers by school age. In Uzbekistan, where many children with hearing loss are now receiving implants, medical specialists emphasize that “properly performed surgery does not always lead to complete rehabilitation”. Post-operative auditory and speech training is crucial. A nationwide seminar in 2021 on children with cochlear implants highlighted new methods and experiences for post-implant speech development. Uzbek specialists, together with international experts, shared a range of techniques from structured listening exercises to unconventional methods like encouraging listening through singing.

Uzbekistan’s cochlear implantation program has been expanding rapidly: in 2016 only about 150 children received cochlear implant surgeries, but by 2019 the annual number reached 320. From 2014 through 2021, over a thousand children in total received CIs. For each of these children, a multidisciplinary rehabilitation plan is implemented, typically involving teachers of the deaf (surdopedagogues), speech therapists, audiologists, and the family. The primary goal of early rehabilitation is to help the child *make sense* of sound – progressing from simply detecting sounds to eventually understanding spoken words and sentences. Therapists often follow established auditory skill development hierarchies: beginning with sound detection, then moving to discrimination (telling sounds apart), identification (recognizing specific sounds or words), and finally comprehension of speech. Parents are trained to continue these listening exercises at home as part of the daily routine. Consistency and intensity are emphasized: individualized therapy sessions, daily listening practice, and active parental involvement all contribute to progress. With appropriate support, many implanted children in Uzbekistan are able to enroll in ordinary kindergartens or schools. Uzbek specialists note that with early diagnosis, quality surgery, and well-structured rehabilitation, a child with a CI can “*fully attend secondary schools and not differ from peers*”. This reflects international outcomes: in countries like the UK and USA, implanted children who receive strong early intervention (e.g. AVT) often develop language on par with hearing children and successfully integrate into mainstream education. Nevertheless, it is important to acknowledge that outcomes can vary. Some children, due to anatomical, medical, or developmental factors, do not fully benefit from cochlear implants. For these children, alternative communication modalities that include visual communication remain essential.

**Sign-Supported Speech and Bilingual Approaches:** An alternative or complementary methodology in educating deaf children is the use of sign language or sign-supported speech to facilitate language development. *Sign-supported speech* (sometimes called simultaneous communication or total communication) involves speaking while simultaneously using sign language or finger-spelling to represent key words. This approach provides the child with two channels of information – auditory and visual. Originally developed for the benefit of deaf or hard-of-hearing children, sign-supported communication can reinforce understanding of spoken words and expand vocabulary. For example, a recent study in the Netherlands showed that children with developmental language disorder retained new words better when symbolic hand gestures accompanied speech, compared to speech alone. In practice, many teachers of the deaf find that pairing speech with signs or gestures helps maintain a child’s attention and provides contextual cues, thereby improving comprehension and recall of words. In Uzbek special education, elements of sign language are used in instruction: teachers may use finger-spelled letters and basic signs alongside verbal speech to clarify meaning. This is especially useful when teaching abstract concepts or new vocabulary. By seeing a sign or spelled-out letter for a word, the student can visually differentiate similarly sounding words and confirm what they have heard. Sign-support strategies also encourage deaf children to express themselves using every modality available to them, reducing frustration and building confidence in communication.

There is, however, ongoing debate about the role of sign language versus strictly auditory-oral approaches in developing hearing and speech. Proponents of Auditory-Verbal Therapy have historically advised against the use of sign language, arguing that children should be immersed in sound to train the brain’s listening pathways. Some evidence supports the efficacy of an auditory-only approach for oral language outcomes: for instance, research comparing communication methods found that children who followed an auditory-oral program outperformed those who followed a lip-reading or total communication (speech + sign) approach on measures of speech and language skills. The hypothesis is that focusing on auditory cues teaches the child to rely on hearing and speech, leading to clearer articulation and better listening skills. On the other hand, a growing body of research warns that a “speech only” philosophy can inadvertently harm children who do not receive enough auditory input to fully acquire language. A significant proportion of deaf children – even with cochlear implants – do not achieve functional hearing (one long-term study showed that about 47% of pediatric CI users eventually stop using their devices due to limited

benefit or other issues). For these children, being restricted to oral communication can result in linguistic deprivation, wherein the child spends critical early years without fluency in any language. This can have devastating effects on cognitive development and academic achievement. Therefore, researchers urge introducing deaf children to a fully accessible visual language (sign language) as early as possible, regardless of technology use. Indeed, studies show that early exposure to sign language does not hinder oral language development – on the contrary, children who learn sign from infancy often develop stronger foundational language skills and even achieve greater success with spoken language later if they receive cochlear implants. In light of this evidence, many experts now support a bilingual approach: encouraging the development of sign language alongside spoken language. This approach ensures the child has a robust language for thought and communication (sign language), while simultaneously cultivating auditory-oral skills to the extent that the child's hearing allows.

**Integrating Multiple Methods:** The most effective methodology for improving auditory ability can vary for each child, and a flexible, individualized approach is essential. Modern pedagogical practice tends to integrate multiple modalities – listening, speaking, signing, and visual supports – in a complementary way. In the classroom, teachers often employ a variety of strategies: for example, a lesson might include a listening game (to practice sound discrimination), followed by a speechreading exercise (watching the teacher's lip movements), and then a storytelling session in which the teacher uses spoken words supported by signs. Such variety keeps children engaged and addresses diverse needs within the group (since some children may have more residual hearing than others). The role of the family is also crucial: parental involvement in home-based listening practice, as emphasized in auditory-verbal programs, significantly accelerates progress. At the same time, parents are encouraged to learn basic sign language to ensure that they can communicate effectively and promote language development in any situation.

Both international research and local experience highlight the importance of early intervention. Whether through AVT or a bilingual approach, beginning auditory and language education in the first few years of life yields the best outcomes. Neural plasticity is highest in infancy; during this critical period, the auditory pathways in the brain will develop in response to sound input, or conversely, if sound is absent, they may reorganize to focus on visual inputs. From a methodological standpoint, giving infants access to sound (through hearing aids or implants) and/or a visual language (signing) as early as possible is regarded,

in experts' words, as a "neurological emergency". Uzbekistan's policies of universal newborn hearing screening and early cochlear implantation reflect this understanding, and similar trends are observed worldwide.

In summary, developing auditory ability in deaf and hard-of-hearing children requires a multifaceted approach. Auditory-Verbal Therapy provides a structured pathway to listening and spoken language, and for many children – especially when combined with early use of hearing technology – it has demonstrated excellent outcomes. Cochlear implantation, if performed early and followed by thorough rehabilitation, can greatly improve a profoundly deaf child's access to sound and acquisition of oral language. At the same time, the use of sign language or sign-supported speech provides a crucial linguistic bridge, ensuring that no child is left without a fully accessible language during the learning years and often complementing auditory development rather than hindering it. The most effective methodology often combines these elements, tailored to the individual child's level of hearing, strengths, and needs. Both Uzbek and international experiences show that when children are given access to sound, are consistently trained in listening skills, and are simultaneously supported in overall language development (through speech and sign), they can achieve significant gains in communication. This comprehensive, inclusive approach ultimately facilitates the child's integration into society – enabling them to learn, play, and grow alongside their hearing peers.

### **CONCLUSION**

Hearing ability is not an innate trait for deaf and hard-of-hearing children, but with the right methodology it can be developed significantly. The analysis presented above (following the IMRAD structure) emphasizes that success lies in early and long-term intervention that integrates medical, educational, and communicative strategies. Auditory-Verbal Therapy and related listening practice techniques capitalize on the plasticity of the young brain, teaching children to understand sounds and spoken words. Cochlear implantation, when done early and followed by well-planned rehabilitation, gives even profoundly deaf children the opportunity to gain useful hearing and acquire oral language. Meanwhile, incorporating sign language or sign-supported speech ensures children's cognitive and linguistic growth by guaranteeing they always have a fully accessible language base. Auditory and visual approaches are far from mutually exclusive; rather, they can reinforce each other – for example, a child may use sign language to express basic needs early on, then gradually rely more on spoken language as listening skills improve, all while retaining sign proficiency as a bilingual advantage.

For practitioners and educators, a methodology for developing auditory ability must be holistic. Special schools and preschools in Uzbekistan are already moving in this direction by combining sound discrimination exercises, speech practice, visual supports, and interactive learning. International research supports this multi-pronged strategy: when therapy is family-centered, immersive, and encompasses all communication modalities the child needs, children achieve the best outcomes. The role of parents and teachers is to create a rich auditory-verbal environment for the child without excluding sign or other means of communication. Given the diversity among deaf and hard-of-hearing children – differing degrees of hearing loss, ages at intervention, presence of additional disabilities – a flexible methodology is crucial. Continuous monitoring of the child’s progress in auditory skills should guide adjustments to the program (for instance, introducing more visual support if development is slow, or intensifying auditory challenges as hearing improves).

In conclusion, developing auditory ability in deaf and hard-of-hearing children exemplifies the intersection of technology, education, and human resilience. The methodologies discussed – from high-tech implants to low-tech signs – all serve the fundamental goal of enabling these learners to perceive, process, and produce language. By learning from local initiatives in Uzbekistan as well as global research, educators can apply evidence-based methods to give each child the best chance to listen, learn, and communicate. Ongoing advances in hearing technology and pedagogy promise that the gap between hearing-impaired children and their peers will continue to narrow, leading to future generations that are more inclusive and empowered.

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