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# Auditory-Verbal Therapy: A systematic Review for the Effectiveness of Intervention to Children with Hearing Loss

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## Abstract

*This systematic review was designed to investigate the effectiveness of auditory-verbal therapy (AVT) based on recent research findings of the literature. AVT is seen today as the primary treatment approach for developing spoken language in children with cochlear implants despite the debate about educational options for these children. The AVT effectiveness should be examined by systematic reviews. The present review was conducted following PRISMA guidelines (preferred reporting items for systematic reviews). Search terms were chosen based on the research question and used in a search in PubMed/Medline. Last decade's published peer-reviewed papers meeting inclusion criteria were reviewed. The reviewed articles measured many levels of language development and parent's use of alternative communication models. The result of this review reveals AVT as an important clinical approach that improves young cochlear implant (CI) children to outperform peers in bilingual-bicultural programs in receptive vocabulary and speech perception or at the least be at a similar level on speech, language and self-esteem. Other aspects related with voice seemed also benefited, placing young CIs in the normal range for receptive vocabulary development. Less improvement noted in the area of reading. AVT approach can positively assist infants develop spoken language and support full integration into mainstream society despite the limited evidences presented. This position is supported by research findings of young CIs comparable to their hearing peers. Overall studies suggest AVT as a positive clinical approach for spoken language of young CIs and provide evidences that there is no advantage for the use of other alternative communication models before or after CI.*

**Keywords:** *Cochlear implant, AVT, Language development, rehabilitation approach, review*

## 1. Introduction

Parents of infants who receive cochlear implants (CIs) have already chosen as their primary concern how their child will develop spoken language. Infants will develop spoken language comparable to their hearing peers, only if they receive the best primary treatment approaches there are today which are evidence informed (EIP). The early identification alone will not lead to better developmental outcomes but the quality of the intervention services which follow affect the communication outcomes [1]. Auditory-Verbal Therapy (AVT) is a Listening and Spoken Language (LSL) approach which has been practiced since the 1930s in the USA. The AG Bell Academy for Listening and Spoken Language is the only academy responsible for the certification of professionals [2]. Hearing deprivation affects mainly the development of speech and communication and many of these children struggle to develop communication skills comparable with their typically developing peers [3,4]. Early intervention for infants and toddlers focuses on the development of the language skills based on the context of their families [5].

AVT is an approach targeting ~~to~~ the development of spoken communication regardless of the level of hearing impairment enabling full integration into mainstream society. This approach is provided by trained and certified speech and language therapists, audiologists or teachers of the deaf. The aim of this (re)habilitative method is children with hearing impairment to reach the expressive and receptive level of their hearing peers following a set of ten principles of practice. These specific techniques and strategies aim to develop the child's auditory cortex while at the same time support parents to promote their child's listening and expressive language skills [6]. Nowadays, children with hearing impairment are diagnosed at a very primary stage (few days after their birth) and therefore they have access to sound and hearing input at a very early stage. As such, audition is not a link between things they already know. The following research question was investigated:

-What is the effectiveness of AVT approach in speech and language skills of early fitted babies and infants with cochlear implants?

## 2. Objective

To assess the effectiveness of auditory-verbal therapy (AVT) in communication skills in children who are hearing impaired.

## 3. Method

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines formed the basis of this systematic review [7,8]. PRISMA guidelines provide an evidence-based guide for reporting in systematic reviews. The present systematic search was based on the database of PubMed with Full Text and conducted in December 2019 (Fig.1).

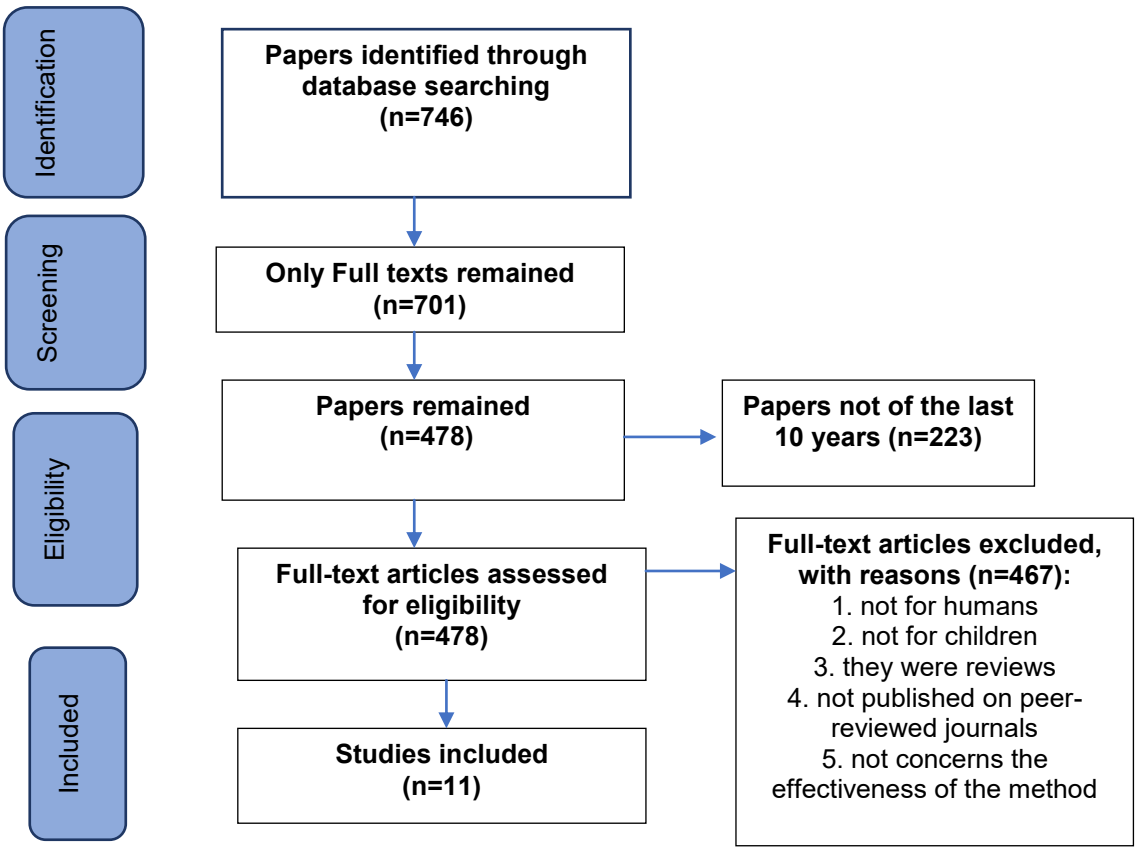
### 3.1 Inclusion Criteria

The search strategy comprised the following term of "Auditory-verbal therapy" or "auditory-verbal therapy AND cochlear implants". Studies were considered eligible if they were research reports of the last decade, if they were published in English and concerned only babies, infants and children. The search included also all journal articles, classical articles, clinical studies and trials, comparative studies and only if the database involved them as full texts. The search concerned only published papers from 01/01/2009 onwards. Older studies provide valuable findings but current SLP and pediatric clinical practice and hearing technology no longer represent their participants who fitted with implants over 10 years ago.

### 3.2 Exclusion Criteria

After removal of papers concerning adult population, more exclusion criteria were implemented. The search excluded also papers of non-humans, any published reviews and if they were not published on peer-reviewed journals. Other papers were also excluded due to their aim which was different than studying the effectiveness of the AVT method to communication levels of participants.

Figure 1. Flow chart of the search



## 4. Results

Table 1. Details of studies investigating effects of AVT on speech and language outcomes in children with hearing impairment

| Study | Number of participants/age range |
|---|---|
| Sharma et al (2017) [9] | 180 children/below 4 years |
| Monshizadeh et al (2018) [10] | 30 CI children/mean age 7.96±0.91y |
| Dettman et al (2013) [11] | 39 children (only 8 received AVT, PTA>80 dB HL)/ mean chronological age 1.7y & mean device experience: 3.7y |
| Yanbay et al (2014) [12] | 42 prelingual children with HL (implanted 3;6y) |
| Percy-Smith et al (2018a) [13] | 130 children (34 received AV)/Mean CA 48m, Mean Post-Implant Age 24m). Participants received 3y AVT |
| Percy-Smith et al (2018b) [14] | 36 CI children with bilateral hearing impairment, 19 children with Hearing Aid-Bahs vs NHs/median age of diagnosis 6m, median age at intervention 12-13m |
| Necula et al (2013) [15] | 84 CIs (G1 received CI<5y, G2 subgroup received CI>5y) vs 50 HA children (<18m years old)/CI group aged between 19-219m while age at implantation ranged from 12-191m, PIA ranged from 6-92m) |
| Sahli (2019) [16] | 169 CI children with bilateral S/N HL/mean CA 26.4m with unilateral CI |
| Jackson & Schatschneider (2014) [17] | 24 children with HL received AVT. Eleven of them were CIs/Mean CA 3m-6;6y old |
| Yoshinaga-Itano et al (2010) [18] | 87 children with bilateral childhood hearing impairment (49 with CI)/CA 48-87m of age. Mean CI activation 30.5m |
| Fulcher et al (2012) [19] | 45 CIs (≤12m) vs 49 CIs (>12m to <5y) |
| | **What was studied** |
| Sharma et al (2017) [9] | 1 y AVT as factor that influence hearing perception and speech intelligibility |
| Monshizadeh et al (2018) [10] | Effectiveness of AVT in social interaction |
| Dettman et al (2013) [11] | Comparison effectiveness of AVT, AV & BB (bilingual-bicultural) |
| Yanbay et al (2014) [12] | Comparison between sign-spoken vs AO vs AV in receptive vocabulary, auditory comprehension, expressive language and SES |
| Percy-Smith et al (2018a) [13] | Effectiveness of AVT |
| Percy-Smith et al (2018b) [14] | Effectiveness of AVT in early vocabulary development of CIs vs HAs with 3y habilitation |
| Necula et al (2013) [15] | Assess the CI benefits not only on auditory-verbal performances but in terms of health-related quality of life |
| Sahli (2019) [16] | The performance of CIs with AVT evaluated on personal-social skills, language, fine and gross motor field capabilities |
| Jackson & Schatschneider (2014) [17] | Evaluate responsiveness to AVT |
| Yoshinaga-Itano et al (2010) [18] | Describe language growth of HI children who received AVT |
| Fulcher et al (2012) [19] | Assess if early CIs achieve and maintain age-appropriate speech/language outcomes by 3,4,5y of age. All participants received AVT |

| | Post-AVT outcomes |
|---|---|
| Sharma et al (2017) [9] | Improvements in audioty perception and speech perception. More AVT (re)habilitation greater speech emphasis |
| Monshizadeh et al (2018) [10] | Final comparable abilities of CIs to NH children in social interaction abilities |
| Dettman et al (2013) [11] | AVTs achieved optimum spoken communication outcomes better than other methods |
| Yanbay et al (2014) [12] | No significant differences in language outcomes across the 3 groups but participants who fell more than 1 SD below the normative mean was AO>AVT>BB. Also, for PLS-4 the results were AO>AVT>BB (1 SD below the normative mean) |
| Percy-Smith et al (2018a) [13] | AVTs had better results from the Standard Habilitation (Speech Therapy) in all 3 subjects which were investigated |
| Percy-Smith et al (2018b) [14] | Hearing Impairment group had lower vocabulary development than NH peers after 3y AVT |
| Necula et al (2013)[15] | For younger CIs (<5y) the difference was in favor of AVTs in sound perception, production, self-esteem, activity and socialization |
| Sahli (2019) [16] | When AVT started <6m of age the results gave normal fine and gross motor capabilities, 95.2% normal personal-social outcomes and 90.5% normal language development |
| Jackson & Schatschneider (2014) [17] | Degree of severity of HL and duration of AVT contribute to differences in AVT outcomes. CIs did not significantly outperform HA children in language growth |
| Yoshinaga-Itano et al (2010) [18] | HAs deviated more than CIs to the age equivalent trajectory. The combination of oral-aural and sign language gives approapriate language levels in expressive vocabulary and receptive syntax (for 4-7 y old participants) |
| Fulcher et al (2012) [19] | Early CIs significantly outperformed the late ones in speech, understanding vocabulary and receptive/expressive language |

## 5. Discussion

To our knowledge, this is the first study to evaluate the effects of AVT based on papers of the last decade on various areas of speech and language development. Many advances in hearing amplification technology and diagnosis of hearing loss have been accomplished and AVT seems to play a crucial role as the main communication model after surgery, especially in young infants with CI. Nevertheless, there are results that suggest that more research should be made involving larger samples, longer application of AVT and controlled prospective studies.

## References

[1] Yoshinaga-Itano C., “Levels of evidence: universal newborn hearing screening (UNHS) and early hearing detection and intervention systems (EHDI)”, Journal of Communication Disorders, 2004, 37: 451–465.

[2] Estabrooks, W. et al. “Auditory Verbal Therapy, for young children with hearing loss and their families, and the practioneers who guide them”, Plural Publishing, San Diego, 2016.

[3] Davis, A. “Epidemiology of permanent childhood hearing impairment. In: Newton VE editor(s). Pediatric Audiological Medicine. 2nd Edition. Chichester, UK: John Wiley & Sons, 2009, 1-26.

[4] Niparko, J. K., Tobey, E. A., Thal, D. J., Eisenberg, L. S., Wang, N. Y., & Quittner, A. L., . . . The CDaCI Investigative Team, “Spoken language development in children following cochlear implantation”, Journal of the American Medical Association, 2010, 303, 1498-1506, doi:10.1001/jama.2010.451.

[5] Centers for Disease Control and Prevention, “Treatment and intervention services”, 2015.

[6] AG Bell Academy, “AG Bell Academy for Listening and Spoken Language”, www.listeningandspokenlanguage.org/AGBellAcademy/ (accessed 27 December 2019).

[7] Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G., “Preferred reporting items for systematic reviews and meta- analyses: The PRISMA statement”, Annals of Internal Medicine, 2009, 151, 264–269.

[8] Moher, D., Liberati, A., Tetzlaff, J., & Alman, D. G., “Preferred reporting items for systematic reviews and meta- analyses: The PRISMA statement”, International Journal of Surgery, 2010, 8, 336–341.

[9] Sharma S, Bhatia K, Singh S, Lahiri AK, Aggarwal A., "Impact of socioeconomic factors on pediatric cochlear implant outcomes", Int J Pediatr Otorhinolaryngol. 2017, Nov;102:90-97. doi: 10.1016/j.ijporl.2017.09.010.
[10] Monshizadeh L, Vameghi R, Sajedi F, Yadegari F, Hashemi SB, Kirchem P, Kasbi F., "Comparison of Social Interaction between Cochlear-Implanted Children with Normal Intelligence Undergoing Auditory Verbal Therapy and Normal-Hearing Children: A Pilot Study", J Int Adv Otol. 2018, 14(1):34-38. doi: 10.5152/iao.2018.3663.
[11] Dettman S, Wall E, Constantinescu G, Dowell R., "Communication outcomes for groups of children using cochlear implants enrolled in auditory-verbal, aural-oral, and bilingual-bicultural early intervention programs", Otol Neurotol, 2013, 34(3):451-9. doi: 10.1097/MAO.0b013e3182839650.
[12] Yanbay E, Hickson L, Scarinci N, Constantinescu G, Dettman SJ., "Language outcomes for children with cochlear implants enrolled in different communication programs", Cochlear Implants Int, 2014, 15(3):121-35. doi: 10.1179/1754762813Y.0000000062.
[13] Percy-Smith L, Tønning TL, Josvassen JL, Mikkelsen JH, Nissen L, Dieleman E, Hallstrøm M, Cayé-Thomasen P., "Auditory verbal habilitation is associated with improved outcome for children with cochlear implant", Cochlear Implants Int, 2018, 19(1):38-45. doi: 10.1080/14670100.2017.1389020.
[14] Percy-Smith L, Hallstrøm M, Josvassen JL, Mikkelsen JH, Nissen L, Dieleman E, Cayé-Thomasen P., "Differences and similarities in early vocabulary development between children with hearing aids and children with cochlear implant enrolled in 3-year auditory verbal intervention", Int J Pediatr Otorhinolaryngol, 2018, 108:67-72. doi: 10.1016/j.ijporl.2018.02.030.
[15] Necula V, Cosgarea M, Necula SE., "Health-related quality of life in cochlear implanted patients in Romania", Int J Pediatr Otorhinolaryngol, 2013, 77(2):216-22. doi: 10.1016/j.ijporl.2012.10.026.
[16] Sahli, AS., "Developments of children with hearing loss according to the age of diagnosis, amplification, and training in the early childhood period", Eur Arch Otorhinolaryngol, 2019, 276(9):2457-2463. doi: 10.1007/s00405-019-05501-w.
[17] Jackson CW, Schatschneider C., "Rate of language growth in children with hearing loss in an auditory-verbal early intervention program", Am Ann Deaf, 2014, 158(5):539-54.
[18] Yoshinaga-Itano C, Baca RL, Sedey AL., "Describing the trajectory of language development in the presence of severe-to-profound hearing loss: a closer look at children with cochlear implants versus hearing aids", Otol Neurotol, 2010, 31(8):1268-74. doi: 10.1097/MAO.0b013e3181f1ce07.
[19] Fulcher A, Purcell AA, Baker E, Munro N., "Listen up: children with early identified hearing loss achieve age-appropriate speech/language outcomes by 3 years-of-age", Int J Pediatr Otorhinolaryngol, 2012, 76(12):1785-94. doi: 10.1016/j.ijporl.2012.09.001. Epub 2012 Oct 17.