



## BÖLÜM 17

# İŞİTME HABİLİTASYONU/ REHABİLİTASYONU VE İMLANTE EDİLEBİLİR İŞİTME CİHAZLARI

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### GİRİŞ

İşitme kaybı 1000 canlı doğumun 1-3'ünde görülür (1). 1,5 milyar işitme kaybının çoğu (1,16 milyar) hafif işitme kaybına sahiptir (2,3). Orta veya ileri işitme kaybının küresel prevalansı yaşla birlikte artar ve 60 yaşında %12,7'den 90 yaşında %58'in üzerine çıkar (4-6).

İşitme kaybı yaşamın çeşitli yönlerini: işitsel (işitme, dinleme, iletişim, konuşma), sosyal (ilişkiler, izolasyon, depresyon, sosyal yaşam, mesleki) ve benlik (çaba ve yorgunluk, duygular, kimlik) etkiler (7-10). Çocuklarda işitme kaybının en belirgin etkisi dil gelişimi üzerinedir (11-14). İşitme kaybında beyinde yapısal değişikliklerin de geliştiği görülmüştür. Yapılan bir çalışmada konjenital işitme kaybında gri maddenin en çok frontal lobda, kazanılmış işitme kaybında ise en fazla insulada (aynı zamanda frontal lobda da) azalduğu görülmüştür (15,16). Zayıf işitme, yetişkinlerde sosyal izolasyon, 60 yaşından büyükler için artan bunama, düşme ve diğer zararlı sağlık koşulları riski ile ilişkilendirilmiş ve demans gelişimi için en güçlü risk faktörü olduğu belirtilmiştir (17-19). İşitsel yoksunluk merkezi sinir sisteminde işitme ile ilgili sahalarда atrofiye, bu

da ilgili tüm temporal fonksiyonlarda zayıflamaya, konuşmayı algılayamama ve ayırt edememe sorunlarına neden olur (20,21).

### HABİLİTASYON/ REHABİLİTASYON

Rehabilitasyon bir hastalık veya yaralanmadan sonra becerilerin iyileştirilmesi veya geri kazandırılması,abilitasyon ise olmayan veya henüz gelişmemiş bir yeteneğin öğretilmesidir (22,23).

İşitsel rehabilitasyonda yapılması gerekenler sırasıyla işitme kaybının tanımlanması, uygun dinleme cihazları, yardımcı dinleme cihazları, işitsel algı eğitimi, iletişim strateji eğitimi, aile rehberliği, psiko-sosyal danışmanlık, bilişsel/lisan gelişimi, konuşma-dil terapisi ve hizmet içi eğitimden oluşmaktadır (22,24).

### İŞİTME CİHAZLARI

#### İşitme Cihazının Bölümleri

1. Mikrofon: Akustik enerji şeklinde gelen sesi elektrik enerjisine dönüştürür.
2. Amplifikatör: Mikrofonda elektrik enerji-

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## KAYNAKLAR

1. Yücel E., Özkan, H. B. İşitsel rehabilitasyon. 2020. Turkish Journal of Audiology and Hearing Research, 19(3); 310-317. DOI :10.34034/TJAHR.23209
2. World report on hearing. Geneva: World Health Organization; 2021. Licence: CC BY-NC-SA 3.0 IGO. 14/12/2021 tarihinde <https://www.who.int/publications/item/world-report-on-hearing> adresinden ulaşılmıştır.
3. World Health Organization. Deafness and hearing loss. Updated March 1, 2020. Accessed July 23, 2020. 14/12/2021 tarihinde <https://www.who.int/news-room/fact-sheets/detail/deafness-and-hearing-loss> adresinden ulaşılmıştır.
4. Danielle S. Powell, Esther S. Oh, Frank R. LiN. Hearing Impairment and Cognition in an Aging World. JARO (2021) DOI: 10.1007/s10162-021-00799-y
5. Anna M. H. Korver, Richard J. H. Smith, Guy Van Camp, et al. Congenital hearing loss. Nature Reviews Disease Primers volume 3, Article number: 16094 (2017). doi: 10.1038/nrdp.2016.94
6. Gant S., Francois D., Fred K. Kozak, et al. Cost-effectiveness of Universal and Targeted Newborn Screening for Congenital Cytomegalovirus Infection. JAMA Pediatr. doi: 10.1001/jamapediatrics.2016.
7. Shukla A, Harper M, Pedersen E, et al. Hearing loss, loneliness, and social isolation: a systematic review. Otolaryngol Head Neck Surg. 2020;162(5):622–633. DOI: 10.1177/0194599820910377
8. Venessa Vas, Michael A. Akeroyd and Deborah A. Hall. A Data-Driven Synthesis of Research Evidence for Domains of Hearing Loss, as Reported by Adults With Hearing Loss and Their Communication Partners. Trends in Hearing 2017 Jan-Dec.
9. Idstad M, Engdahl B. Childhood sensorineural hearing loss and educational attainment in adulthood: results from the HUNT study. Ear Hear. 2019;40(6):1359–67.
10. Wilson BS, Tucci DL, Merson MH, et al. Global hearing health care: new findings and perspectives. Lancet. 2017;390(10111):2503–15
11. Fulcher AN, Purcell A, Baker E, et al. Factors influencing speech and language outcomes of children with early identified severe/profound hearing loss: Clinician identified facilitators and barriers. International Journal of Speech-Language Pathology. 2015; 17(3): 325-333
12. Whicker JJ, Muñoz K, Nelson LH. Parent challenges, perspectives and experiences caring for children who are deaf or hard-of-hearing with other disabilities: a comprehensive review. Int J Audiol. 2019;58(1):5–11.
13. Zaidman-Zait A, Most T, Tarrasch R, et al. The impact of childhood hearing loss on the family: mothers' and fathers' stress and coping resources. J Deaf Stud Deaf Educ. 2016 Jan;21(1):23–33.
14. Mohr PE, Feldman JJ, Dunbar JL. The societal costs of severe to profound hearing loss in the United States. Policy Anal Brief H Ser. 2000; 2(1): 1-4.
15. David McDaid, A-La Parka and Shelly Chaddha. Estimating the global costs of hearing loss. INTERNATIONAL JOURNAL OF AUDIOLOGY 2021, VOL. 60, NO. 3, 162–170.
16. Francis A.M. Manno, Raul Rodríguez-Cruces Rachit Kumar et al. Hearing loss impacts gray and white matter across the lifespan: Systematic review, meta-analysis and meta-regression. NeuroImage February 2021 231(46):117826.
17. Yong M, Panth N, McMahon C, et al. How the world's children hear: a narrative review of school hearing screening programs globally. OTO Open. 2020;4(2).
18. Livingston G, Sommerlad A, Orgeta V, et al. Dementia prevention, intervention, and care. Lancet 2017; 390: 2673–734.
19. Craig A. Buchman, Jacques A. Herzog, Jonathan L. McJunkin, et al. Assessment of Speech Understanding After Cochlear Implantation in Adult Hearing Aid Users. JAMA Otolaryngology–Head & Neck Surgery 2020;146(10):916-924.
20. Hannah Anneli Glick and Anu Sharma. Cortical Neuroplasticity and Cognitive Function in Early-Stage, Mild-Moderate Hearing Loss: Evidence of Neurocognitive Benefit From Hearing Aid Use. Frontiers in Neuroscience. February 2020 Volume 14. Article 93.
21. Jonas T. Johnson, Clark A. Rosen. Bailey's Head and Neck Surgery Otolaryngology. Volume two. Fifth edition. Lippincott Williams and Wilkins. Philadelphia, United States. 01 Aug 2013.
22. Gündüz M. Odyolojide Temel Kavramlar ve Yaklaşımalar. Nobel Tip Kitapevleri. Ekim 2015 İstanbul.
23. Ferguson M, Maidment D, Henshaw H et al. Evidence-based interventions for adult aural rehabilitation: that was then, this is now. Seminars in hearing; 2019: Thieme Medical Publishers. DOI: 10.1055/s-0038-1676784
24. Holzinger D, Fellinger J, Beitel C. Early onset of family centred intervention predicts language outcomes in children with hearing loss. International Journal of Pediatric Otorhinolaryngology. 2011; 75(2): 256-260.
25. Maidment DW, Barker AB, Xia J et al. A sys-

- tematic review and meta-analysis assessing the effectiveness of alternative listening devices to conventional hearing aids in adults with hearing loss. *Int J Audiol.* 2018;57(10):721-9. DOI: 10.1080/14992027.2018.1493546
26. Tran NR, Manchaiah V. Outcomes of direct-to-consumer hearing devices for people with hearing loss: a review. *J Audiol Otol.* 2018;22(4):178-88.
  27. Matthew L. Carlson, Kathryn M. Van Abel, David J. Archibald et al. *Otolaryngology Head and Neck Surgery. Rapid Clinical and Board Review. Otology, Neurotology, and Lateral Skull Base Surgery* (page 221) Thieme Medical Publishers, Inc. 333 Seventh Ave. New York. NY 10001.
  28. Yitao Mao Jing Yang Emily Hahn, et al. Auditory perceptual efficacy of nonlinear frequency compression used inhearing aids: A review. *Journal of Otology* 12 (2017) 97-111. doi: 10.1016/j.joto.2017.06.003.
  29. Yvonne Chan, John Goddard. KJ Lee's Essential Otolaryngology. 12th edition McGraw-Hill Education. OH, United States. 18 Aug 2019.
  30. Claire McSweeney, Sharon L. Cushing, Jennifer L. Campos et al. Functional Consequences of Poor Binaural Hearing in Development: Evidence From Children With Unilateral Hearing Loss and Children Receiving Bilateral Cochlear Implants. *Trends in Hearing.* Jan-Dec 2021;25. doi: 10.1177/23312165211051215.
  31. Patricia L. Purcell, Rose Jones-Goodrhc, Meghan Wisneski, et al. Hearing devices for children with unilateral hearing loss: Patient-and parent-reported perspectives. *Int J Pediatr Otorhinolaryngol.* 2016 Nov;90:43-48.
  32. Cranford JL. *Basics of Audiology: Vibrations to Sounds*, 1 th ed. Oxfordshire, Plural Publishing, 2007: 81-210.
  33. Sataloff RT. *Sataloff's Comprehensive Textbook of Otolaryngology: Head & Neck Surgery: Pediatric Otolaryngology*, 1 th ed. London, JP Medical Ltd, 2015: 28-9.
  34. Doshi J, McDermott AL. Bone anchored hearing aids in children. *Expert Rev Med Devices.* 2015;12:73-82.
  35. Qong Luo, Ying Shen, Ting Chen et al. Effects of SoundBite Bone Conduction Hearing Aids on Speech Recognition and Quality of Life in Patients with Single-Sided Deafness. *Neural Plast.* 2020 Sep 8;2020:4106949. doi: 10.1155/2020/4106949.
  36. Chisolm TH, Noe CM, McArdle R, et al. Evidence for the use of hearing assistive technology by adults: the role of the FM system. *Trends Amplif.* 2007;11(2):73-89. doi: 10.1177/1084713807300879.
  37. Kim JS, Kim CH. A review of assistive listening device and digital wireless technology for hearing instruments. *Korean J Audiol.* 2014;18(3):105. doi: 10.7874/kja.2014.18.3.105.
  38. Alfakir R, Holmes AE, Kricos PB, et al. Evaluation of speech perception via the use of hearing loops and telecoils. *Gerontol and Geriatr Med.* 2015;1:2333721415591935. doi: 10.1177/2333721415591935
  39. Harkins J, Tucker PE, Williams N, et al. Vibration signaling in mobile devices for emergency alerting: a study with deaf evaluators. *J Deaf Stud Deaf Educ.* 2010;15(4):438-45. doi: 10.1093/deafed/enq018.
  40. What is Captioning? National Association of the Deaf. 2020 Captioning Activism and Community. CCAC Survey – Captioning users describe experience and value of captioning inclusion. 2016. November 2020.14/12/2021 tarihinde <https://www.nad.org/resources/technology/captioning-for-access/what-is-captioning/> adresinden ulaşılmıştır.
  41. Xinmiao Fan, Yibei Wang, Pu Wang, et al. Aesthetic and hearing rehabilitation in patients with bilateral microtia-atresia. *International Journal of Pediatric Otorhinolaryngology.* Volume 101, October 2017, Pages 150-157.
  42. Katarzyna Beata Cywka, Bartłomej Król, and Potr Henryk Skarżyński. Effectiveness of Bone Conducton Hearing Aids in Young Children with Congenital Aural Atresia and Microtia. *Med Sci Monit.* 2021 Sep 25;27:e933915. doi: 10.12659/MSM.933915.
  43. Ontario Health (Quality) Implantable Devices for Single-Sided Deafness and Conductive or Mixed Hearing Loss: A Health Technology Assessment. *Ont Health Technol Assess Ser.* 2020 Mar 6;20(1):1-165.
  44. Önerci M. (Ed.), Nörootoloji cilt 2. Kulak Burun Boğaz Baş Boyun Cerrahisi. Ankara: Matsa Basimevi 2016.
  45. Granström G. Osseointegrated implants in children. *Acta Oto-Laryngologica* 2000, 120: 118-21.
  46. Wardenga N, Snk A F.M., Kludt E., et al. Hearing Aid Treatment for Patients with Mixed Hearing Loss. Part II: Speech Recognition in Comparison to Direct Acoustic Cochlear Stimulation. *Audiol Neurotol.* 2020;25(3):133-142.
  47. Kuhn JJ, Perez AJ. Implantable Hearing Devices. In: Pensak ML, Choo DI, eds. *Clinical Otology*. 4th Ed. New York: Thieme Medical Publishers; 2015. P. 401-2020.
  48. Linder T, Schlegel C, DeMin N, et al. Active middle ear implants in patients undergo-

- ing subtotal petrosectomy: a new application for the Vibrant Soundbridge device and its implication for lateral cranium base surgery. *Otol Neurotol* 2009;30(1):41-7.
49. Wagner F, Todt I, Wagner J, et al. Indications and candidacy for active middle ear implants. *Adv Otorhinolaryngol*. 2010;69:20-26. DOI: 10.1159/000318518
50. Maurer J, Savvas E. The esteem system: a totally implantable hearing device. *Adv Otorhinolaryngol*. 2010;69:59- 71. DOI: 10.1159/000318523
51. Frenzel H, Sprinzl G, Widmann G, et al. Grading system for the selection of patients with congenital aural atresia for active middle ear implants. *Neuroradiology*. 2013 Jul;55(7):895-911.
52. Chang CYJ, Spearman M, Spearman B, et al. Comparison of an Electromagnetic Middle Ear Implant and Hearing Aid Word Recognition Performance to Word Recognition Performance Obtained Under Earphones. *Otol Neurotol* 2017 Oct;38(9):1308-1314. doi: 10.1097/MAO.0000000000001554.
53. Olgun L. Orta kulağa implantle edilebilir işitme cihazları (Aktif orta kulak implantları). *Türkiye Klinikleri J E.N.T.- Special Topics* 2015;8(2):67-74.
54. Uğur, M.B. Orta kulağa implantle edilebilir işitme cihazları (orta kulak implantları). *Türkiye Klinikleri J E.N.T.- Special Topics* 2013;6(3):47-53.
55. Tobias Balkenhol, Elisabeth Wallhäusser-Franke, Nicole Rotter, et al. Cochlear Implant and Hearing Aid: Objective Measures of Binaural Benefit. *Front Neurosci*. 2020;14: 586119.
56. Asuman Alnıaçık Erdoğan. Hearing Loss and Approaches to Hearing Loss in Elderly. *TJFM&PC*, 2016;10(1):25-33.
57. Holder J. T., Reynolds S. M., Sunderhaus, et al. Current profile of adults presenting for preoperative cochlear implant evaluation. *Trends Hear*. 2018 22 1-16. 10.1177/2331216518755288.
58. Sarah Nyirjesy, Cole Rodman, Terrin N Tamati, et al. Are There Real-world Benefits to Bimodal Listening? *Otol Neurotol*. 2020 Oct; 41(9): e1111-e1117. doi: 10.1097/MAO.0000000000002767.
59. Emily Buss, Margaret T. Dillon, Meredith A Rooth, et al. Effects of Cochlear Implantation on Binaural Hearing in Adults With Unilateral Hearing Loss. *Trends Hear*. Jan-Dec 2018;22:2331216518771173.
60. Anandhan Dhanasingh, Ingeborg Hochmair. ABI-auditory brainstem implant. *Acta Otolaryngol*. 2021 Mar;141(suppl):63-81.
61. Tadashi Nishimura, Hiroshi Hosoi, Ryota Shimokura, et al. Cartilage Conduction Hearing and Its Clinical Application. *Audiol. Res*. 2021, 11, 254–262. doi: 10.3390/audiolres11020023
62. Paula Folkeard, Maake Van Eeckhoutte, Suzanne Levy, et al. Detection, Speech Recognition, Loudness, and Preference Outcomes With a Direct Drive Hearing Aid: Effects of Bandwidth. *Trends Hear*. Jan-Dec.2021;25:2331216521999139. doi: 10.1177/2331216521999139

