



Universiteit
Leiden
The Netherlands

The processing of Dutch prosody with cochlear implants and vocoder simulations

Velde, D.J. van de

Citation

Velde, D. J. van de. (2017, July 5). *The processing of Dutch prosody with cochlear implants and vocoder simulations*. LOT dissertation series. LOT, Utrecht. Retrieved from <https://hdl.handle.net/1887/50406>

Version: Not Applicable (or Unknown)

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/50406>

Note: To cite this publication please use the final published version (if applicable).

Cover Page



Universiteit Leiden



The handle <http://hdl.handle.net/1887/50406> holds various files of this Leiden University dissertation.

Author: Velde, D.J. van de

Title: The processing of Dutch prosody with cochlear implants and vocoder simulations

Issue Date: 2017-07-05

Bibliography

- Aantal implantaties in Nederland. (2016). Retrieved from <http://www.opciweb.nl/ci-centra/aantal-implantaties-in-nederland/>
- Amir, O., & Grinfeld, D. (2011). Articulation rate in childhood and adolescence: Hebrew speakers. *Language and Speech*, 54, 225-240.
- Anderson, E. S., Oxenham, A. J., Nelson, P. B., & Nelson, D. A. (2012). Assessing the role of spectral and intensity cues in spectral ripple detection and discrimination in cochlear-implant users. *Journal of the Acoustical Society of America*, 132, 3925-3934. Doi: 10.1121/1.4763999
- Anderson, I., Weichbold, V., D'Haese, P. S. C., Szuchnik, J., Quevedo, M. S., Martin, J., . . . Phillips, L. (2004). Cochlear implantation in children under the age of two - what do the outcomes show us? *International Journal of Pediatric Otorhinolaryngology*, 68, 425-431. Doi: 10.1016/j.ijporl.2003.11.013
- American Speech-Language-Hearing Association (1993). Definitions of communication disorders and variations [Relevant Paper]. Retrieved from www.asha.org/policy
- AuBuchon, A. M., Pisoni, D. B., & Kronenberger, W. G. (2015). Verbal processing speed and executive functioning in long-term cochlear implant users. *Journal of Speech, Language, and*

- Hearing Research*, 58, 151-162. Doi: 10.1044/2014_jslhr-h-13-0259
- Baayen R.H., Milin P. 2010. Analyzing reaction times. *International Journal of Psychological Research*, 3: 12–28.
- Ball, C., & Ison, K. T. (1984). Speech production with electrocochlear stimulation. *British Journal of Audiology*, 18, 251.
- Baskent, D. (2006). Speech recognition in normal hearing and sensorineural hearing loss as a function of the number of spectral channels. *Journal of the Acoustical Society of America*, 120, 2908-2925. Doi: 10.1121/1.2354017
- Baudonck, N., D’Haeseleer, E., Dhooge, I., & van Lierde, K. (2011). Objective vocal quality in children using cochlear implants: a multiparameter approach. *Journal of voice: official journal of the Voice Foundation*, 25, 683-691.
- Baudonck, N., van Lierde, K., Dhooge, I., & Corthals, P. (2011). A comparison of vowel productions in prelingually deaf children using cochlear implants, severe hearing-impaired children using conventional hearing aids and normally-hearing children. *Folia Phoniatica Et Logopaedica*, 63, 154-160.
- Baudonck, N., van Lierde, K., D’Haeseleer, E., & Dhooge, I. (2015). Nasalance and nasality in children with cochlear implants and children with hearing aids. *International Journal of Pediatric Otorhinolaryngology*, 79, 541-545. Doi: 10.1016/j.ijporl.2015.01.025
- Baum, K. M., & Nowicki, S. (1998). Perception of emotion: Measuring decoding accuracy of adult prosodic cues varying in intensity. *Journal of Nonverbal Behavior*, 22, 89-107. Doi: 10.1023/A:1022954014365
- Beadle, E. A. R., McKinley, D. J., Nikolopoulos, T. P., Brough, J., O’Donoghue, G. M., & Archbold, S. M. (2005). Long-term functional outcomes and academic-occupational status in implanted children after 10 to 14 years of cochlear implant use. *Otology & Neurotology*, 26, 1152-1160. Doi: 10.1097/01.mao.0000180483.16619.8f

- Beers, M. (1995). *The phonology of normally developing and language-impaired children* (Doctoral dissertation). University of Amsterdam, Amsterdam.
- Bergeson, T., & Chin, S. (2008). *Prosodic utterance production*. Unpublished manuscript, Indiana University School of Medicine.
- Bilger, R. (1977). Evaluation of subjects presently fitted with implanted auditory prostheses. *Annals of Otology Rhinology and Laryngology*, 86, 1-176.
- Bingabr, M., Espinoza-Varas, B., & Loizou, P. C. (2008). Simulating the effect of spread of excitation in cochlear implants. *Hearing Research*, 241, 73-79. Doi: 10.1016/j.heares.2008.04.012
- Blamey, P., Artieres, F., Başkent, D., Bergeron, F., Beynon, A., Burke, E., . . . Gallégo, S. (2013). Factors affecting auditory performance of postlinguistically deaf adults using cochlear implants: an update with 2251 patients. *Audiology and Neurotology*, 18, 36-47.
- Blamey, P., Sarant, J. Z., Paatsch, L. E., Barry, J. G., Bow, C. P., Wales, R. J., . . . Tooher, R. (2001). Relationships among speech perception, production, language, hearing loss, and age in children with impaired hearing. *Journal of Speech, Language, and Hearing Research*, 44, 264-285.
- Blume, S. S. (1999). Histories of cochlear implantation. *Social Science and Medicine*, 49, 1257-1268. Doi: 10.1016/s0277-9536(99)00164-1
- Boersma, P., & Weenink, D. (2014). *Praat: doing phonetics by computer* [Computer program]. Retrieved from www.praat.org
- Boons, T., Brokx, J. P., Dhooge, I., Frijns, J. H., Peeraer, L., Vermeulen, A., . . . van Wieringen, A. (2012). Predictors of spoken language development following pediatric cochlear implantation. *Ear and Hearing*, 33, 617-639.
- Boons, T., De Raeve, L., Langereis, M., Peeraer, L., Wouters, J., & van Wieringen, A. (2013). Narrative spoken language skills in severely hearing impaired school-aged children with cochlear

- implants. *Research in Developmental Disabilities*, 34, 3833-3846. Doi: S0891-4222(13)00334-X
- Burkholder, R. A., & Pisoni, D. B. (2003). Speech timing and working memory in profoundly deaf children after cochlear implantation. *Journal of Experimental Child Psychology*, 85, 63-88. Doi: 10.1016/S0022-0965(03)00033-X
- Burnett, T. A., Freedland, M. B., Larson, C. R., & Hain, T. C. (1998). Voice F0 responses to manipulations in pitch feedback. *The Journal of the Acoustical Society of America*, 103, 3153-3161.
- Busby, P. A., Tong, Y. C., & Clark, G. M. (1993). The perception of temporal modulations by cochlear implant patients. *Journal of the Acoustical Society of America*, 94, 124-131. Doi: 10.1121/1.408212
- Campisi, P., Low, A., Papsin, B., Mount, R., Cohen-Kerem, R., & Harrison, R. (2005). Acoustic analysis of the voice in pediatric cochlear implant recipients: a longitudinal study. *Laryngoscope*, 115, 1046-1050. Doi: 10.1097/01.MLG.0000163343.10549.4C
- Carlyon, R. P., Deeks, J. M., & McKay, C. M. (2010). The upper limit of temporal pitch for cochlear-implant listeners: stimulus duration, conditioner pulses, and the number of electrodes stimulated. *Journal of the Acoustical Society of America*, 127, 1469-1478. Doi: 10.1121/1.3291981
- Chatterjee, M., & Peng, S. C. (2008). Processing F0 with cochlear implants: Modulation frequency discrimination and speech intonation recognition. *Hearing Research*, 235, 143-156. Doi: S0378-5955(07)00264-X
- Chen, J. K.-C., Chuang, A. Y. C., McMahon, C., Hsieh, J.-C., Tung, T.-H., & Li, L. P.-H. (2010). Music training improves pitch perception in prelingually deafened children with cochlear implants. *Pediatrics* 125, 793-800. Doi: 10.1542/peds.2008-3620
- Christiansen, J. B., & Leigh, I. W. (2004). Children with cochlear implants: Changing parent and deaf community perspectives.

- Archives of Otolaryngology–Head & Neck Surgery*, 130, 673-677.
- Coelho, A. C., Brasolotto, A. G., & Bevilacqua, M. C. (2012). Systematic analysis of the benefits of cochlear implants on voice production. *Jornal da Sociedade Brasileira de Fonoaudiologia*, 24, 395-402. Doi: S2179-64912012000400018
- Colletti, L., Mandalà, M., Zoccante, L., Shannon, R. V., & Colletti, V. (2011). Infants versus older children fitted with cochlear implants: performance over 10 years. *International Journal of Pediatric Otorhinolaryngology*, 75, 504-509.
- Connor, C. M., Craig, H. K., Raudenbush, S. W., Heavner, K., & Zwolan, T. A. (2006). The age at which young deaf children receive cochlear implants and their vocabulary and speech-production growth: Is there an added value for early implantation? *Ear and Hearing*, 27, 628-644.
- Cooper, W. B., Tobey, E., & Loizou, P. C. (2008). Music perception by cochlear implant and normal hearing listeners as measured by the Montreal Battery for Evaluation of Amusia. *Ear and Hearing*, 29, 618-626. Doi: 10.1097/Aud.0b013e318174e787
- Crew, J. D., Galvin, J. J., & Fu, Q. J. (2012). Channel interaction limits melodic pitch perception in simulated cochlear implants. *The Journal of the Acoustical Society of America*, 132, EL429-EL435. Doi: 10.1121/1.4758770
- Crosson, J., & Geers, A. (2001). Analysis of narrative ability in children with cochlear implants. *Ear and Hearing*, 22, 381-394.
- Cysneiros, H. R. S., Leal, M. d. C., Lucena, J. A., & Muniz, L. F. (2016). Relationship between auditory perception and vocal production in cochlear implantees: a systematic review. *Codas*, 28. Doi: 10.1590/2317-1782/20162015165
- de Hoog, B. E., Langereis, M. C., van Weerdenburg, M., Keuning, J., Knoors, H., & Verhoeven, L. (2016). Auditory and verbal memory predictors of spoken language skills in children with

- cochlear implants. *Research in Developmental Disabilities*, 57, 112-124. Doi: 10.1016/j.ridd.2016.06.019
- Deafness and hearing loss. (2015, March). Retrieved from <http://www.who.int/mediacentre/factsheets/fs300/en/>
- Deliyski, D. D. (1993). *Acoustic model and evaluation of pathological voice production*. Paper presented at the Eurospeech Conference.
- Dellwo, V., Fourcin, A., & Abberton, E. (2007). Rhythmical classification of languages based on voice parameters. In J. Trouvain, W. J. Barry., *Proceedings of the International Congress of Phonetic Sciences (ICPhS) XVI, August 6–10, Saarbrücken* (pp. 1129–1132).
- Djournio, A., & Eyries, C. (1957). [Auditory prosthesis by means of a distant electrical stimulation of the sensory nerve with the use of an indwelt coiling]. *Presse Medicale*, 65, 1417.
- Dorman, M. F., & Loizou, P. C. (1997). Speech intelligibility as a function of the number of channels of stimulation for normally-hearing listeners and patients with cochlear implants. *American Journal of Otology*, 18, S113-S114.
- Dorman, M. F., & Loizou, P. C. (1998). The identification of consonants and vowels by cochlear implant patients using a 6-channel continuous interleaved sampling processor and by normally-hearing subjects using simulations of processors with two to nine channels. *Ear and Hearing*, 19, 162–166.
- Dorman, M. F., Loizou, P. C., & Rainey, D. (1997). Speech intelligibility as a function of the number of channels of stimulation for signal processors using sine-wave and noise-band outputs. *Journal of the Acoustical Society of America*, 102, 2403–2411.
- Dornan, D., Hickson, L., Murdoch, B., & Houston, T. (2009). Longitudinal study of speech perception, speech, and language for children with hearing loss in an auditory-verbal therapy program. *Volta Review*, 109, 61-85.

- Drennan, W. R., Won, J. H., Nie, K., Jameyson, E., & Rubinstein, J. T. (2010). Sensitivity of psychophysical measures to signal processor modifications in cochlear implant users. *Hearing Research*, 262, 1–8.
- Driscoll, V. D., Oleson, J., Jiang, D., & Gfeller, K. (2009). Effects of training on recognition of musical instruments presented through cochlear implant simulations. *Journal of the American Academy of Audiology*, 20, 71-82.
- Edwards, L. C. (2007). Children with cochlear implants and complex needs: a review of outcome research and psychological practice. *Journal of deaf studies and deaf education*, 12, 258-268.
- Eisen, M. D. (2009). The history of cochlear implants. In J. Niparko (Ed.), *Cochlear implants: Principles & Practices*. Lippincott Williams & Wilkins.
- Evans, M. K., & Deliyski, D. D. (2007). Acoustic voice analysis of prelingually deaf adults before and after cochlear implantation. *Journal of Voice*, 21(6), 669-682. Doi: S0892-1997(06)00089-0
- Fagan, M. K., & Pisoni, D. B. (2010). Hearing experience and receptive vocabulary development in deaf children with cochlear implants. *The Journal of Deaf Studies and Deaf Education*, 15, 149-161. Doi: 10.1093/deafed/enq001
- Faulkner, A., Rosen, S., & Smith, C. (2000). Effects of the salience of pitch and periodicity information on the intelligibility of four-channel vocoded speech: implications for cochlear implants. *Journal of the Acoustical Society of America*, 108, 1877–1887.
- Fikkert, P. (1994). *On the acquisition of prosodic structure* (HIL dissertations 6). The Hague: Holland Academic Graphics.
- Finke, M., Buchner, A., Ruigendijk, E., Meyer, M., & Sandmann, P. (2016). On the relationship between auditory cognition and speech intelligibility in cochlear implant users: An ERP study. *Neuropsychologia*, 87, 169-181. Doi: 10.1016/j.neuropsychologia.2016.05.019

- Firszt, J. B., Koch, D. B., Downing, M., & Litvak, L. (2007). Current steering creates additional pitch percepts in adult cochlear implant recipients. *Otology & Neurotology*, 28, 629-636.
- Fizmaurice, G. M., Laird, N. M., & Ware, J. H. (2011). *Applied longitudinal analysis* (2nd ed.). New Jersey: John Wiley & Sons, Inc.
- Flipsen, P. (2002). Longitudinal changes in articulation rate and phonetic phrase length in children with speech delay. *Journal of Speech Language and Hearing Research*, 45, 100-110. Doi: 10.1044/1092-4388(2002/008)
- Fourcin, A., Abberton, E., Richardson, K., & Shaw, T. (2011). Aspects of voice measurement with young users of cochlear implants. *Seminars in Hearing*, 32, 42-52.
- Fox, J. (2008). *Applied regression analysis and generalized linear models*. USA: Sage Publications, Inc.
- Friesen, L. M., Shannon, R. V., Baskent, D., & Wang, X. (2001). Speech recognition in noise as a function of the number of spectral channels: comparison of acoustic hearing and cochlear implants. *Journal of the Acoustical Society of America*, 110, 1150-1163.
- Fu, Q.-J. (2013). AngelSim: Cochlear implant and hearing loss simulator [Computer program], Version 1.08.01. Retrieved from <http://www.tigerspeech.com/angelsim/>
- Fu, Q. J., Galvin, J. J., Wang, X. S., & Wu, J. L. (2015). Benefits of music training in mandarin-speaking pediatric cochlear implant users. *Journal of Speech Language and Hearing Research*, 58, 163-169. Doi: 10.1044/2014_Jslhr-H-14-0127
- Fu, Q. J., & Nogaki, G. (2005). Noise susceptibility of cochlear implant users: the role of spectral resolution and smearing. *Journal of the Association for Research in Otolaryngology*, 6, 19-27. Doi: 10.1007/s10162-004-5024-3
- Fu, Q. J., Nogaki, G., & Galvin, J. J., 3rd. (2005). Auditory training with spectrally shifted speech: implications for cochlear

- implant patient auditory rehabilitation. *Journal of the Association for Research in Otolaryngology*, 6, 180–189.
- Fu, Q. J., & Shannon, R. V. (2002). Frequency mapping in cochlear implants. *Ear and Hearing*, 23, 339-348. Doi: 10.1097/01.Aud.0000027432.18827.07
- Fuller, C. D., Galvin, J. J., 3rd, Maat, B., Free, R. H., & Baskent, D. (2014). The musician effect: does it persist under degraded pitch conditions of cochlear implant simulations? *Frontiers in Neuroscience*, 8, 179. Doi: 10.3389/fnins.2014.00179
- Galvin, J. J., Fu, Q. J., & Nogaki, G. (2007). Melodic contour identification by cochlear implant listeners. *Ear and Hearing*, 28, 302-319. Doi: 10.1097/01.aud.0000261689.35445.20
- Galvin, J. J., Fu, Q. J., & Shannon, R. V. (2009). Melodic Contour Identification and Music Perception by Cochlear Implant Users. *Annals of the New York Academy of Sciences*, 1169, 518-533. Doi: 10.1111/j.1749-6632.2009.04551.x
- Galvin, J. J., Eskridge, E., Oba, S., & Fu, Q.-J. (2012). Melodic contour identification training in cochlear implant users with and without a competing instrument. *Seminars in Hearing*, 33, 399-409.
- Geers, A. (2003). Predictors of reading skill development in children with early cochlear implantation. *Ear and Hearing*, 24, 59S-68S.
- Geers, A., Brenner, C., & Davidson, L. (2003). Factors associated with development of speech perception skills in children implanted by age five. *Ear and Hearing*, 24, 24s-35s. Doi: 10.1097/01.Aud.0000051687.99218.0f
- Geers, A., Davidson, L. S., Uchanski, R. M., & Nicholas, J.G. (2013). Interdependence of linguistic and indexical speech perception skills in school-age children with early cochlear implantation. *Ear and Hearing*, 34, 562–574. Doi:10.1097/Aud.0b013e31828d2bd6.

- Geers, A., & Moog, J. (1994). Effectiveness of cochlear implants and tactile aids for deaf-children - the sensory aids study at central institute for the deaf - foreword. *Volta Review*, 96, R5-R6.
- Geers, A., Nicholas, J. G., & Sedey, A. L. (2003). Language skills of children with early cochlear implantation. *Ear and Hearing*, 24, 46s-58s. Doi: 10.1097/01.Aud.0000051689.57380.1b
- Geers, A., Nicholas, J., Tobey, E., & Davidson, L. (2016). Persistent language delay versus late language emergence in children with early cochlear implantation. *Journal of Speech, Language, and Hearing Research*, 59, 155-170.
- Geers, A., Tobey, E., Moog, J., & Brenner, C. (2008). Long-term outcomes of cochlear implantation in the preschool years: From elementary grades to high school. *International Journal of Audiology*, 47, S21-S30. Doi: 10.1080/14992020802339167
- Gfeller, K., Turner, C., Mehr, M., Woodworth, G., Fearn, R., Knutson, J. F., . . . Stordahl, J. (2002). Recognition of familiar melodies by adult cochlear implant recipients and normally-hearing adults. *Cochlear Implants International*, 3, 29-53. Doi: 10.1002/cii.50
- Gfeller, K., Witt, S., Woodworth, G., Mehr, M. A., & Knutson, J. (2002). Effects of frequency, instrumental family, and cochlear implant type on timbre recognition and appraisal. *Annals of Otology, Rhinology and Laryngology*, 111, 349-356.
- Giezen, M. R., Escudero, P., & Baker, A. (2010). Use of acoustic cues by children with cochlear implants. *Journal of Speech Language and Hearing Research*, 53, 1440-1457. Doi: 10.1044/1092-4388(2010/09-0252)
- Gilbers, S., Fuller, C., Gilbers, D., Broersma, M., Goudbeek, M., Free, R., & Baskent, D. (2015). Normally-hearing listeners' and cochlear implant users' perception of pitch cues in emotional speech. *Iperception*, 6, 1-19. Doi: 10.1177/0301006615599139
- Glick, H., & Sharma, A. (2016). Cross-modal plasticity in developmental and age-related hearing loss: clinical

- implications. *Hearing Research*, 343, 191-201. Doi: 10.1016/j.heares.2016.08.012
- Goedemans, R., van der Hulst, H., & Visch, E. (Eds) (1996). Stress patterns of the world. Part I: Background. Leiden: Holland Institute of Generative Linguistics.
- Goffman, L., Ertmer, D. J., & Erdle, C. (2002). Changes in speech production in a child with a cochlear implant: Acoustic and kinematic evidence. *Journal of Speech Language and Hearing Research*, 45, 891-901. Doi: 10.1044/1092-4388(2002/072)
- Goldman-Eisler, F. (1968). *Psycholinguistics. Experiments in spontaneous speech*. London: Academic Press.
- Goldstein, H. (1987). *Multilevel models in educational and social research*. London: Griffen.
- Goy, H., Fernandes, D. N., Pichora-Fuller, M. K., & van Lieshout, P. (2013). Normative voice data for younger and older adults. *Journal of Voice*, 27, 545-555. Doi: 10.1016/j.jvoice.2013.03.002
- Gravel, J. S., & Tocci, L. L. (1998). Setting the stage for universal newborn hearing screening. In: L. G. Spivak (Ed.), *Universal Newborn Hearing Screening*. New York, NY, USA: Thieme Medical Publishers, Inc.
- Graven, S. N., & Browne, J. V. (2008). Auditory development in the fetus and infant. *Newborn and infant nursing reviews*, 8, 187-193.
- Green, T., Faulkner, A., & Rosen, S. (2004). Enhancing temporal cues to voice pitch in continuous interleaved sampling cochlear implants. *Journal of the Acoustical Society of America*, 116, 2298-2310.
- Guenther, F. H. (2006). Cortical interactions underlying the production of speech sounds. *Journal of Communication Disorders*, 39, 350-365. Doi: S0021-9924(06)00058-X
- Guenther, F. H., Ghosh, S. S., & Tourville, J. A. (2006). Neural modeling and imaging of the cortical interactions underlying

- syllable production. *Brain and Language*, 96, 280-301. Doi: S0093-934X(05)00115-X
- Hammer, A. (2010). *The acquisition of verbal morphology in cochlear-implanted and specific language impaired children* (Doctoral dissertation). LOT, Utrecht.
- Harrison, R. V., Gordon, K. A., & Mount, R. J. (2005). Is there a critical period for cochlear implantation in congenitally deaf children? Analyses of hearing and speech perception performance after implantation. *Developmental Psychobiology*, 46, 252-261. Doi: 10.1002/Dev.20052
- Hassan, S. M., Malki, K. H., Mesallam, T. A., Farahat, M., Bukhari, M., & Murry, T. (2011a). The effect of cochlear implantation and post-operative rehabilitation on acoustic voice analysis in post-lingual hearing impaired adults. *European Archives of Oto-Rhino-Laryngology*, 268, 1437-1442. Doi: 10.1007/s00405-011-1501-6
- Hassan, S. M., Malki, K. H., Mesallam, T. A., Farahat, M., Bukhari, M., & Murry, T. (2011b). The effect of cochlear implantation on nasalance of speech in postlingually hearing-impaired adults. *Journal of Voice*, 26, 669.e17–669.e22. Doi: S0892-1997(11)00120-2
- Hayes, H., Geers, A. E., Treiman, R., & Moog, J. S. (2009). Receptive vocabulary development in deaf children with cochlear implants: achievement in an intensive auditory-oral educational setting. *Ear and Hearing*, 30, 128-135. Doi: 10.1097/AUD.0b013e3181926524
- Henry, B. A., & Turner, C. W. (2003). The resolution of complex spectral patterns by cochlear implant and normally-hearing listeners. *Journal of the Acoustical Society of America*, 113, 2861–2873.
- Higgins, M. B., McCleary, E. A., & Schulte, L. (2001). Articulatory changes with short-term deactivation of the cochlear implants of two prelingually deafened children. *Ear and Hearing*, 22, 29-45.

- Hillenbrand, J. (1987). A methodological study of perturbation and additive noise in synthetically generated voice signals. *Journal of Speech and Hearing Research*, 30, 448-461.
- Hocevar-Boltezar, I., Radsel, Z., Vatovec, J., Geczy, B., Cernelc, S., Gros, A., . . . Zargi, M. (2006). Change of phonation control after cochlear implantation. *Otology & Neurotology*, 27, 499-503.
- Hocevar-Boltezar, I., Vatovec, J., Gros, A., & Zargi, M. (2005). The influence of cochlear implantation on some voice parameters. *International Journal of Pediatric Otorhinolaryngology*, 69, 1635-1640. Doi: 10.1016/j.ijporl.2005.03.045
- Holden, L. K., Finley, C. C., Firszt, J. B., Holden, T. A., Brenner, C., Potts, L. G., . . . Heydebrand, G. (2013). Factors affecting open-set word recognition in adults with cochlear implants. *Ear and Hearing*, 34, 342-360.
- Holler, T., Campisi, P., Allegro, J., Chadha, N. K., Harrison, R. V., Papsin, B., & Gordon, K. (2010). Abnormal voicing in children using cochlear implants. *Archives of Otolaryngology – Head and Neck Surgery*, 136, 17-21. Doi: 10.1001/archoto.2009.194
- Holt, R. F., & Svirsky, M. A. (2008). An exploratory look at pediatric cochlear implantation: Is earliest always best? *Ear and Hearing*, 29, 492-511. Doi: 10.1097/Aud.0b013e31816c409f
- Hopyan, T., Manno, 3rd, F. A., Papsin, B. C., & Gordon, K. A. (2016). Sad and happy emotion discrimination in music by children with cochlear implants. *Child Neuropsychology*, 22: 366-380, 1-15. Doi: 10.1080/09297049.2014.992400
- Horga, D., & Liker, M. (2006). Voice and pronunciation of cochlear implant speakers. *Clinical Linguistics & Phonetics*, 20, 211-217. Doi: XX61748T86823365
- Hsu, H. W., Fang, T. J., Lee, L. A., Tsou, Y. T., Chen, S. H., & Wu, C. M. (2013). Multidimensional evaluation of vocal quality in children with cochlear implants: a cross-sectional, case-

- controlled study. *Clinical Otolaryngology*, 39, 32-38. Doi: 10.1111/coa.12213
- IBM Corp, Released 2014. SPSS Statistics for Windows, Version 23.0. Armonk, NY, USA: IBM Corp.
- Johnson, C., & Goswami, U. (2010). Phonological awareness, vocabulary, and reading in deaf children with cochlear implants. *Journal of Speech, Language, and Hearing Research*, 53, 237-261.
- Johnson, E. K., & Jusczyk, P. W. (2001). Word segmentation by 8-month-olds: When speech cues count more than statistics. *Journal of Memory and Language*, 44, 548-567.
- Jongkees, L. (1978). Doven weer horen. *Nederlands Tijdschrift Voor Geneeskunde*, 122, 1621.
- Kadi-Hanifi, K., & Howell, P. (1992). Syntactic analysis of the spontaneous speech of normally fluent and stuttering children. *Journal of Fluency Disorders*, 17, 151-170. Doi: 10.1016/0094-730x(92)90008-E
- Kalathottukaren, R. T., Purdy, S. C., & Ballard, E. (2015). Prosody perception and musical pitch discrimination in adults using cochlear implants. *International Journal of Audiology*, 54, 444-452, 444-452. Doi: 10.3109/14992027.2014.997314
- Kane, M. O. L., Schopmeyer, B., Mellon, N. K., Wang, N.-Y., & Niparko, J. K. (2004). Prelinguistic communication and subsequent language acquisition in children with cochlear implants. *Archives of Otolaryngology-Head & Neck Surgery*, 130, 619-623.
- Kang, R., Nimmons, G. L., Drennan, W., Longnion, J., Ruffin, C., Nie, K. B., . . . Rubinstein, J. (2009). Development and validation of the university of washington clinical assessment of music perception test. *Ear and Hearing*, 30, 411-418.
- Kent, R. D. (1976). Anatomical and neuromuscular maturation of speech mechanism - evidence from acoustic studies. *Journal of Speech and Hearing Research*, 19, 421-447.

- Kishon-Rabin, L., Taitelbaum, R., Tobin, Y., & Hildesheimer, M. (1999). The effect of partially restored hearing on speech production of postlingually deafened adults with multichannel cochlear implants. *Journal of the Acoustical Society of America*, 106, 2843-2857.
- Knoors, H. (2008). Cochleaire implantatie bij dove kinderen: effecten op de ontwikkeling en mogelijke gevolgen voor pedagogisch beleid. In T. van der Lem & G. Spaai (Eds.), *Effecten van cochleaire implantatie bij kinderen: een breed perspectief*. Deventer: van Tricht.
- Kong, Y. Y., Cruz, R., Jones, J. A., & Zeng, F. G. (2004). Music perception with temporal cues in acoustic and electric hearing. *Ear and Hearing*, 25, 173-185. Doi: 10.1097/01.Aud.0000120365.97792.2f
- Kraayeveld, H. (1997). *Idiosyncrasy in prosody* (Doctoral dissertation). University of Nijmegen.
- Krahmer, E., & Swerts, M. (2001). On the alleged existence of contrastive accents. *Speech Communication*, 34, 391-405.
- Kuhl, P. K., & Meltzoff, A. N. (1996). Infant vocalizations in response to speech: Vocal imitation and developmental change. *The Journal of the Acoustical Society of America*, 100, 2425-2438.
- Kuhl, P. K., Stevens, E., Hayashi, A., Deguchi, T., Kiritani, S., & Iverson, P. (2006). Infants show a facilitation effect for native language phonetic perception between 6 and 12 months. *Developmental Science*, 9, F13-F21.
- Kwon, B. J., & van den Honert, C. (2006). Effect of electrode configuration on psychophysical forward masking in cochlear implant listeners. *The Journal of the Acoustical Society of America*, 119, 2994-3002.
- Ladd, B. (1996). *Intonational phonology*. Cambridge: Cambridge University Press.
- Lamoré, P. (2016). Doofheid - Algemene informatie. Retrieved from <http://www.audiologieboek.nl/htm/hfd7/7-3-1.htm#7314>

- Lane, H., Matthies, M., Perkell, J., Vick, J., & Zandipour, M. (2001). The effects of changes in hearing status in cochlear implant users on the acoustic vowel space and CV coarticulation. *Journal of Speech, Language, and Hearing Research*, 44, 552-563.
- Lane, H., Perkell, J., Wozniak, J., Manzella, J., Guidod, P., Matthies, M., . . . Vick, J. (1998). The effect of changes in hearing status on speech sound level and speech breathing: a study conducted with cochlear implant users and NF-2 patients. *Journal of the Acoustical Society of America*, 104, 3059-3069.
- Laneau, J., Moonen, M., & Wouters, J. (2006). Factors affecting the use of noise-band vocoders as acoustic models for-pitch perception in cochlear implants. *Journal of the Acoustical Society of America*, 119, 491-506.
- Laneau, J., & Wouters, J. (2004). Multichannel place pitch sensitivity in cochlear implant recipients. *Journal of the Association for Research in Otolaryngology*, 5, 285-294. Doi: 10.1007/s10162-004-4049-y
- Laneau, J., Wouters, J., & Moonen, M. (2006). Improved music perception with explicit pitch coding in cochlear implants. *Audiology and Neurotology*, 11, 38-52.
- Lang, H. G. (2002). Higher education for deaf students: Research priorities in the new millennium. *Journal of deaf studies and deaf education*, 7, 267-280.
- Lassaletta, L., Castro, A., Bastarrica, M., Pérez-Mora, R., Madero, R., De Sarriá, J., & Gavilán, J. (2007). Does music perception have an impact on quality of life following cochlear implantation? *Acta Oto-Laryngologica*, 127, 682-686.
- Lawrence, M. (1964). Direct stimulation of auditory nerve fibers. *Archives of otolaryngology*, 80, 367-368.
- Lazard, D. S., Vincent, C., Venail, F., van De Heyning, P., Truy, E., Sterkers, O., ... Blamey, P. J. (2012). Pre-, per-and postoperative factors affecting performance of postlinguistically deaf adults using cochlear implants: a new

- conceptual model over time. *PLoS ONE*, 7, e48739. Doi:10.1371/journal.pone.0048739.
- Leder, S. B., Spitzer, J. B., Kirchner, J. C., Flevaris-Phillips, C., Milner, P., & Richardson, F. (1987). Speaking rate of adventitiously deaf male cochlear implant candidates. *Journal of the Acoustical Society of America*, 82, 843-846.
- Lehiste, I. (1970). *Suprasegmentals*. Cambridge, MA: MIT Press.
- Lehiste, I. (1976). Suprasegmental features of speech. In N. Lass (Ed.), *Contemporary issues in experimental phonetics* (pp. 225-239). London: Academic Press.
- Leigh, J., Dettman, S., Dowell, R., & Briggs, R. (2013). Communication development in children who receive a cochlear implant by 12 months of age. *Otology & Neurotology*, 34, 443-450.
- Lenden, J. M., & Flipsen, P. (2007). Prosody and voice characteristics of children with cochlear implants. *Journal of Communication Disorders*, 40, 66-81. Doi: 10.1016/j.jcomdis.2006.04.004
- Lenneberg, E. (1967). *Biological foundations of language*. New York: Wiley.
- Levelt, C. (1994). *On the acquisition of place* (HIL dissertations 8). Dordrecht: ICG Printing.
- Levelt, W. (1983). Monitoring and self-repair in speech. *Cognition*, 14, 41-104.
- Levitin, D. J., Cole, K., Chiles, M., Lai, Z., Lincoln, A., & Bellugi, U. (2004). Characterizing the musical phenotype in individuals with Williams syndrome. *Child Neuropsychology*, 10, 223-247.
- Lieberman, P. (1986). The acquisition of intonation by infants: physiology and neural control. In C. H. Ltd. (Ed.), *Intonation in discourse* (pp. 239-257). London: Johns-Lewis, E. C.
- Limb, C. J., & Roy, A. T. (2014). Technological, biological, and acoustical constraints to music perception in cochlear implant users. *Hearing Research*, 308, 13-26. Doi: 10.1016/j.heares.2013.04.009

- Litvak, L. M., Spahr, A. J., Saoji, A. A., & Fridman, G. Y. (2007). Relationship between perception of spectral ripple and speech recognition in cochlear implant and vocoder listeners. *Journal of the Acoustical Society of America*, 122, 982-991. Doi: 10.1121/1.2749413
- Liu, H. M., Kuhl, P. K., & Tsao, F. M. (2003). An association between mothers' speech clarity and infants' speech discrimination skills. *Developmental Science*, 6, F1-F10.
- Loebach, J. L., Pisoni, D. B., & Svirsky, M. A. (2009). Transfer of Auditory Perceptual Learning with Spectrally Reduced Speech to Speech and Nonspeech Tasks: Implications for Cochlear Implants. *Ear and Hearing*, 30, 662-674.
- Loizou, P. C. (2006). Speech processing in vocoder-centric cochlear implants. *Advances in Oto-Rhino-Laryngology*, 64, 109-143.
- Looi, V., Gfeller, K., & Driscoll, V. (2012). Music Appreciation and Training for Cochlear Implant Recipients: A Review. *Seminars in Hearing*, 33, 307-334. Doi: 10.1055/s-0032-1329222
- Luo, X., Fu, Q. J., & Galvin, J. J., 3rd. (2007). Vocal emotion recognition by normally-hearing listeners and cochlear implant users. *Trends in amplification*, 11, 301-315. Doi: 11/4/301
- Luo, X., Fu, Q. J., Wei, C. G., & Cao, K. L. (2008). Speech recognition and temporal amplitude modulation processing by mandarin-speaking cochlear implant users. *Ear and Hearing*, 29, 957-970. Doi: 10.1097/AUD.0b013e3181888f61
- Luo, X., Masterson, M. E., & Wu, C. C. (2014). Melodic interval perception by normally-hearing listeners and cochlear implant users. *Journal of the Acoustical Society of America*, 136, 1831-1844. Doi: 10.1121/1.4894738
- Lyxell, B., Wass, M., Sahlen, B., Samuelsson, C., Asker-Arnason, L., Ibertsson, T., . . . Hallgren, M. (2009). Cognitive development, reading and prosodic skills in children with cochlear implants. *Scandinavian Journal of Psychology*, 50, 463-474. Doi: 10.1111/j.1467-9450.2009.00754.x

- Macmillan, N. A., & Creelman, C. D. (2004). *Detection theory: A user's guide*. Mahwah, New Jersey, London: Lawrence Erlbaum Associates.
- Macmillan, N. A., & Kaplan, H. L. (1985). Detection theory analysis of group data: estimating sensitivity from average hit and false-alarm rates. *Psychological Bulletin*, 98, 185-199.
- Marschark, M., Lang, H. G., & Albertini, J. A. (2002). *Educating deaf students: From research to practice*. New York, NY, USA: Oxford University Press.
- Marschark, M., Rhoten, C., & Fabich, M. (2007). Effects of cochlear implants on children's reading and academic achievement. *Journal of Deaf Studies and Deaf Education*, 12, 269-282. Doi: 10.1093/deafed/enm013
- Marx, M., James, C., Foxton, J., Capber, A., Fraysse, B., Barone, P., & Deguine, O. (2014). Speech prosody perception in cochlear implant users with and without residual hearing. *Ear and Hearing*, 36, 239-248. Doi: 10.1097/AUD.0000000000000105
- Massida, Z., Belin, P., James, C., Rouger, J., Fraysse, B., Barone, P., & Deguine, O. (2011). Voice discrimination in cochlear-implanted deaf subjects. *Hearing Research*, 275, 120-129.
- McConkey Robbins, A., Green, J. E., & Waltzman, S. B. (2004). Bilingual oral language proficiency in children with cochlear implants. *Archives of Otolaryngology -- Head and Neck Surgery*, 130, 644-647. Doi: 10.1001/archotol.130.5.644
- Mehler, J., Jusczyk, P., Lambertz, G., Halsted, N., Bertoncini, J., & Amiel-Tison, C. (1988). A precursor of language acquisition in young infants. *Cognition*, 29, 143-178.
- Meister, H. (2011). Processing prosodic cues with cochlear implants. *Sprache-Stimme-Gehör*, 35, E99-E104. Doi: 10.1055/s-0031-1284405
- Meister, H., Fursen, K., Streicher, B., Lang-Roth, R., & Walger, M. (2016). The use of voice cues for speaker gender recognition in cochlear implant recipients. *Journal of Speech, Language, and*

- Hearing Research*, 59, 546-556. Doi: 10.1044/2015_jslhr-h-15-0128
- Meister, H., Tepeli, D., Wagner, P., Hess, W., Walger, M., von Wedel, H., & Lang-Roth, R. (2007). Experimente zur Perzeption prosodischer Merkmale mit Kochleaimplantaten [Experiments on prosody perception with cochlear implants]. *HNO*, 55, 264-270. Doi: 10.1007/s00106-006-1452-1
- Ménard, L., Polak, M., Denny, M., Burton, E., Lane, H., Matthies, M. L., . . . Vick, J. (2007). Interactions of speaking condition and auditory feedback on vowel production in postlingually deaf adults with cochlear implants. *Journal of the Acoustical Society of America*, 121, 3790-3801. Doi: 10.1121/1.2710963
- Meyers, L. S., Gamst, G., & Guarino, A. J. (2006). *Applied Multivariate Research*. Thousand Oaks, CA, USA: Sage Publications.
- Mitchell, R. E., & Karchmer, M. A. (2004). Chasing the mythical ten percent: Parental hearing status of deaf and hard of hearing students in the United States. *Sign Language Studies*, 4, 138-163.
- Monini, S., Banci, G., Barbara, M., Argiro, M. T., & Filipo, R. (1997). Clarion cochlear implant: short-term effects on voice parameters. *American Journal of Otology*, 18, 719-725.
- Moon, C., Cooper, R. P., & Fifer, W. P. (1993). Two-day-olds prefer their native language. *Infant behavior and development*, 16, 495-500.
- Moon, C., Lagercrantz, H., & Kuhl, P. K. (2013). Language experienced in utero affects vowel perception after birth: a two-country study. *Acta Paediatrica*, 102, 156-160.
- Moon, I. S., Park, S., Kim, H.-N., Lee, W.-S., Kim, S. H., Kim, J.-H., & Choi, J. Y. (2014). Is there a deafness duration limit for cochlear implants in post-lingual deaf adults? *Acta Otolaryngologica*, 134, 173-180.

- Moore, B. C. (2003). Coding of sounds in the auditory system and its relevance to signal processing and coding in cochlear implants. *Otology & Neurotology*, 24, 243-254.
- Moreno, S., & Bidelman, G. M. (2014). Examining neural plasticity and cognitive benefit through the unique lens of musical training. *Hearing Research*, 308, 84-97. Doi: 10.1016/j.heares.2013.09.012
- Most, T., & Michaelis, H. (2012). Auditory, visual, and auditory-visual perceptions of emotions by young children with hearing loss versus children with normal hearing. *Journal of Speech Language and Hearing Research*, 55, 1148-1162. Doi: 10.1044/1092-4388(2011/11-0060)
- Moulines, E., & Charpentier, F. (1990). Pitch-synchronous wave-form processing techniques for text-to- speech synthesis using diphones. *Speech Communication*, 9, 453-467.
- Moulines, E., & Verhelst, W. (1995). Time-domain and frequency-domain techniques for prosodic modification of speech. In: W. B. Kleijn & K. K. Paliwal (Eds.), *Speech coding and synthesis* (pp. 519-555). New York, NY, USA; Elsevier Science Inc.
- Nakata, T., Trehub, S. E., & Kanda, Y. (2012). Effect of cochlear implants on children's perception and production of speech prosody. *Journal of the Acoustical Society of America*, 131, 1307-1314. Doi: 10.1121/1.3672697
- Netten, A. P., Dekker, F. W., Rieffe, C., Soede, W., Briare, J. J., & Frijns, J. H. (2017). Missing data in the field of otorhinolaryngology and head & neck surgery: need for improvement. *Ear and Hearing*, 38, 1-6.
- Neumeyer, V., Harrington, J., & Draxler, C. (2010). An acoustic analysis of the vowel space in young and old cochlear-implant speakers. *Clinical Linguist & Phonetics*, 24, 734-741.
- Nguyen, L. H., Allegro, J., Low, A., Papsin, B., & Campisi, P. (2008). Effect of cochlear implantation on nasality in children. *Ear, Nose, and Throat Journal*, 87, 138, 140-133.

- Nikolopoulos, T. P., Dyar, D., Archbold, S., & O'Donoghue, G. M. (2004). Development of spoken language grammar following cochlear implantation in prelingually deaf children. *Archives of Otolaryngology-Head & Neck Surgery*, 130, 629-633.
- Nilsson, M., Soli, S. D., & Sullivan, J. A. (1994). Development of the hearing in noise test for the measurement of speech reception thresholds in quiet and in noise. *Journal of the Acoustical Society of America*, 95, 1085-1099. Doi:10.1121/1.408469
- Niparko, J. K., Lingua, C., & Carpenter, R. M. (2009). Assessment of candidacy for cochlear implantation. In J. Niparko (Ed.), *Cochlear implants: Principles & Practices*. Philadelphia, PA, USA: Lippincott Williams & Wilkins.
- Niparko, J. K., Tobey, E. A., Thal, D. J., Eisenberg, L. S., Wang, N. Y., Quittner, A. L., & Fink, N. E. (2010). Spoken language development in children following cochlear implantation. *Journal of the American Medical Association*, 303, 1498-1506. Doi: 303/15/1498
- Nittrouer, S., Caldwell-Tarr, A., & Lowenstein, J. H. (2013). Working memory in children with cochlear implants: Problems are in storage, not processing. *International Journal of Pediatric Otorhinolaryngology*, 77, 1886-1898.
- O'Halpin, R. (2009). *The perception and production of stress and intonation by children with cochlear implants* (Doctoral dissertations). London: UCL. Retrieved from <http://eprints.ucl.ac.uk/20406/1/20406.pdf>
- Oller, D. K., & Eilers, R. E. (1988). The role of audition in infant babbling. *Child Development*, 59, 441-449.
- Osberger, M. J. (1994). Speech intelligibility of children with cochlear implants. *Volta Review*, 96, 169-180.
- Osberger, M. J., & McGarr, N. S. (1982). Speech production characteristics of the hearing impaired. In N. Lass (Ed.), *Speech and language: advances in basic research and practice* (pp. 227-288). New York, NY, USA: Academic Press.

- Oster, A.-M. (1987). Some effects of cochlear implantation on speech production. *Speech Transmission Laboratory – Quarterly Progress and Status Report*, 28, 81-89.
- Patel, A. D. (2014). Can nonlinguistic musical training change the way the brain processes speech? The expanded OPERA hypothesis. *Hearing Research*, 308, 98-108.
- Peng, S. C. (2005). *Perception and production of speech intonation in pediatric cochlear implant recipients and children with normal hearing* (Doctoral dissertation). Iowa City, IA, USA: University of Iowa.
- Peng, S. C., Lu, N., & Chatterjee, M. (2009). Effects of cooperating and conflicting cues on speech intonation recognition by cochlear implant users and normal hearing listeners. *Audiology and Neuro-Otology*, 14, 327–337. Doi:10.1159/000212112.
- Peng, S. C., Tomblin, J. B., Cheung, H., Lin, Y. S., & Wang, L. S. (2004). Perception and production of mandarin tones in prelingually deaf children with cochlear implants. *Ear and Hearing*, 25, 251-264. Doi: 00003446-200406000-00006
- Peng, S. C., Tomblin, J. B., & Turner, C. W. (2008). Production and perception of speech intonation in pediatric cochlear implant recipients and individuals with normal hearing. *Ear and Hearing*, 29, 336-351. Doi: 10.1097/AUD.0b013e318168d94d
- Peppé, S., & McCann, J. (2003). Assessing intonation and prosody in children with atypical language development: the PEPS-C test and the revised version. *Clinical Linguistics & Phonetics*, 17, 345-354.
- Peretz, I., Champod, A. S., & Hyde, K. (2003). Varieties of musical disorders - The Montreal battery of evaluation of amusia. *Neurosciences and Music*, 999, 58-75. Doi: 10.1196/annals.1284.006
- Perkell, J., Lane, H., Denny, M., Matthies, M. L., Tiede, M., Zandipour, M., . . . Burton, E. (2007). Time course of speech changes in response to unanticipated short-term changes in

- hearing state. *Journal of the Acoustical Society of America*, 121, 2296-2311. Doi: 10.1121/1.2642349
- Perkell, J., Lane, H., Svirsky, M., & Webster, J. (1992). Speech of cochlear implant patients: a longitudinal study of vowel production. *Journal of the Acoustical Society of America*, 91, 2961-2978.
- Perkell, J., Matthies, M., Lane, H., Guenther, F., Wilhelms-Tricarico, R., Wozniak, J., & Guid, P. (1997). Speech motor control: Acoustic goals, saturation effects, auditory feedback and internal models. *Speech Communication*, 22, 227-250.
- Perrin, E., Berger-Vachon, C., Topouzkhanian, A., Truy, E., & Morgon, A. (1999). Evaluation of cochlear implanted children's voices. *International Journal of Pediatric Otorhinolaryngology*, 47, 181-186.
- Peterson, N. R., Pisoni, D. B., & Miyamoto, R. T. (2010). Cochlear implants and spoken language processing abilities: Review and assessment of the literature. *Restorative neurology and neuroscience*, 28, 237-250.
- Pfingst, B. E., Zwolan, T. A., & Holloway, L. A. (1997). Effects of stimulus configuration on psychophysical operating levels and on speech recognition with cochlear implants. *Hearing Research*, 112, 247-260. Doi: 10.1016/S0378-5955(97)00122-6
- Pfingst, B. E., Franck, K. H., Xu, L., Bauer, E. M., & Zwolan, T. A. (2001). Effects of electrode configuration and place of stimulation on speech perception with cochlear prostheses. *Journal of the Association for Research in Otolaryngology*, 2, 87-103.
- Pisoni, D. B. (2000). Cognitive factors and cochlear implants: Some thoughts on perception, learning, and memory in speech perception. *Ear and Hearing*, 21, 70-78. Doi; 10.1097/00003446-200002000-00010
- Pisoni, D. B., Kronenberger, W. G., Roman, A. S., & Geers, A. E. (2011). Measures of digit span and verbal rehearsal speed in

- deaf children after more than 10 years of cochlear implantation. *Ear and Hearing*, 32, 60S-74S. Doi: 10.1097/AUD.0b013e3181ffd58e
- Poissant, S. F., Peters, K. A., & Robb, M. P. (2006). Acoustic and perceptual appraisal of speech production in pediatric cochlear implant users. *International Journal of Pediatric Otorhinolaryngology*, 70, 1195-1203. Doi: 10.1016/j.ijporl.2005.12.008
- Punch, R., & Hyde, M. (2011). Social participation of children and adolescents with cochlear implants: a qualitative analysis of parent, teacher, and child interviews. *Journal of Deaf Studies and Deaf Education*, 16, 474-493. Doi: 10.1093/deafed/enr001
- Purcell, D. W., & Munhall, K. G. (2006). Compensation following real-time manipulation of formants in isolated vowels. *The Journal of the Acoustical Society of America*, 119, 2288-2297.
- Qin, M. K., & Oxenham, A..J. (2005). Effects of envelope-vocoder processing on F0 discrimination and concurrent-vowel identification. *Ear and Hearing*, 26, 451-460.
- Richardson, L. M., Busby, P. A., Blamey, P. J., Dowell, R. C., & Clark, G. M. (1993). The effects of auditory feedback from the nucleus cochlear implant on the vowel formant frequencies produced by children and adults. *Ear and Hearing*, 14, 339-349.
- Rietveld, A. C. M., & van Heuven, V. J. (2016). *Algemene fonetiek* (4th ed.). Bussum: Coutinho.
- Robinson, K. (1998). Implications of developmental plasticity for the language acquisition of deaf children with cochlear implants. *International Journal of Pediatric Otorhinolaryngology*, 46, 71-80.
- Saoji, A., Litvak, L., Emadi, G., Spahr, T., & Greenslade, K. (2005). *Spectral modulation transfer functions in cochlear implant listeners*. Poster presented at the Conference on Implantable Auditory Prostheses, Pacific Grove, CA, USA.

- Scherer, K. R., Banse, R., Wallbott, H. G., & Goldbeck, T. (1991). Vocal cues in emotion encoding and decoding. *Motivation and Emotion*, 15, 123-148. Doi: 10.1007/Bf00995674
- Schorr, E. A., Roth, F. P., & Fox, N. A. (2009). Quality of life for children with cochlear implants: perceived benefits and problems and the perception of single words and emotional sounds. *Journal of Speech, Language, and Hearing Research*, 52, 141-152.
- Schweer, W. (2012). MuseScore [Computer program], Version 1.2. Retrieved from <http://musescore.org/>
- See, R. L., Driscoll, V. D., Gfeller, K., Kliethermes, S., & Oleson, J. (2013). Speech intonation and melodic contour recognition in children with cochlear implants and with normal hearing. *Otology & Neurotology*, 34, 490-498. Doi: 10.1097/MAO.0b013e318287c985
- Seifert, E., Oswald, M., Bruns, U., Vischer, M., Kompis, M., & Haeusler, R. (2002). Changes of voice and articulation in children with cochlear implants. *International Journal of Pediatric Otorhinolaryngology*, 66, 115-123.
- Shannon, R. V. (2002). The relative importance of amplitude, temporal, and spectral cues for cochlear implant processor design. *American Journal of Audiology*, 11, 124-127.
- Shannon, R. V., Fu, Q.-J., & Galvin, 3rd, J. (2004). The number of spectral channels required for speech recognition depends on the difficulty of the listening situation. *Acta Oto-Laryngologica*, 124, 50-54.
- Shannon, R. V., Zeng, F. G., Kamath, V., Wygonski, J., & Ekelid, M. (1995). Speech recognition with primarily temporal cues. *Science*, 270, 303-304.
- Shannon, R. V., Zeng, F. G., & Wygonski, J. (1998). Speech recognition with altered spectral distribution of envelope cues. *Journal of the Acoustical Society of America*, 104, 2467-2476. Doi: 10.1121/1.423774

- Sharma, A., Dorman, M. F., & Kral, A. (2005). The influence of a sensitive period on central auditory development in children with unilateral and bilateral cochlear implants. *Hearing Research*, 203, 134-143.
- Sharma, A., Tobey, E., Dorman, M., Bharadwaj, S., Martin, K., Gilley, P., & Kunkel, F. (2004). Central auditory maturation and babbling development in infants with cochlear implants. *Archives of Otolaryngology – Head and Neck Surgery*, 130, 511-516. Doi: 10.1001/archotol.130.5.511
- Shin, M. S., Song, J. J., Han, K. H., Lee, H. J., Do, R. M., Kim, B. J., & Oh, S. H. (2015). The effect of psychosocial factors on outcomes of cochlear implantation. *Acta Otolaryngologica*, 135, 572-577. Doi: 10.3109/00016489.2015.1006336
- Shirvani, S., Jafari, Z., Sheibanizadeh, A., Motasaddi Zarandy, M., & Jalaie, S. (2014). Emotional perception of music in children with unilateral cochlear implants. *Iranian Journal of Otorhinolaryngology*, 26, 225-233.
- Simmons, F. B. (1966). Electrical stimulation of the auditory nerve in man. *Archives of Otolaryngology*, 84, 2-54.
- Smith, A. B., Roberts, J., Smith, S. L., Locke, J. L., & Bennett, J. (2006). Reduced speaking rate as an early predictor of reading disability. *American Journal of Speech-Language Pathology*, 15, 289-297. Doi: 10.1044/1058-0360(2006/027)
- Smith, Z. M., Delgutte, B., & Oxenham, A. J. (2002). Chimaeric sounds reveal dichotomies in auditory perception. *Nature*, 416, 87–90.
- Snel-Bongers, J., Netten, A. P., Boermans, P. P., Briaire, J. J., & Frijns, J. H. (submitted). Evidence-based inclusion criteria for cochlear implantation in postlingual deafened patients. *Ear and Hearing*.
- Snow, D., & Ertmer, D. (2009). The development of intonation in young children with cochlear implants: A preliminary study of the influence of age at implantation and length of implant

- experience. *Clinical Linguistics & Phonetics*, 23, 665-679. Doi: 10.1080/02699200903026555
- Snow, D., & Ertmer, D. (2012). Children's development of intonation during the first year of cochlear implant experience. *Clinical Linguistics & Phonetics*, 26, 51-70. Doi: 10.3109/02699206.2011.588371
- Soderstrom, M., Seidl, A., Nelson, D. G. K., & Jusczyk, P. W. (2003). The prosodic bootstrapping of phrases: Evidence from prelinguistic infants. *Journal of Memory and Language*, 49, 249-267. Doi: 10.1016/S0749-596x(03)00024-X
- Souza, P., Arehart, K., Miller, C. W., & Muralimanohar, R. K. (2011). Effects of age on F0 discrimination and intonation perception in simulated electric and electroacoustic hearing. *Ear and Hearing*, 32, 75-83. Doi:10.1097/AUD.0b013e3181eccfe9.
- Souza, P., & Rosen, S. (2009). Effects of envelope bandwidth on the intelligibility of sine- and noise-vocoded speech. *Journal of the Acoustical Society of America*, 126, 792-805.
- Spencer, L. J., Gantz, B. J., & Knutson, J. F. (2004). Outcomes and achievement of students who grew up with access to cochlear implants. *The Laryngoscope*, 114, 1576-1581.
- Stacey, P. C., Fortnum, H. M., Barton, G. R., & Summerfield, A. Q. (2006). Hearing-impaired children in the United Kingdom, I: Auditory performance, communication skills, educational achievements, quality of life, and cochlear implantation. *Ear and Hearing*, 27, 161-186. Doi: 10.1097/01.aud.0000202353.37567.b4
- Stafford, R. C., Stafford, J. W., Wells, J. D., Loizou, P. C., & Keller, M. D. (2014). Vocoder simulations of highly focused cochlear stimulation with limited dynamic range and discriminable steps. *Ear and Hearing*, 35, 262-270.
- Stanislaw, H., & Todorov, N. (1999). Calculation of signal detection theory measures. *Behavior Research Methods, Instruments, & Computers*, 31, 137-149.

- Stephens, D., & Kerr, P. (2000). Discapacidad auditiva: Una actualización [Auditory Disablements: An Update]. *Audiology*, 39, 322-332.
- Stickney, G. S., Loizou, P. C., Mishra, L. N., Assmann, P. F., Shannon, R. V., & Opie, J. M. (2006). Effects of electrode design and configuration on channel interactions. *Hearing Research*, 211, 33-45.
- Stone, M. A., Fuellgrabe, C., & Moore, B. C. J. (2008). Benefit of high-rate envelope cues in vocoder processing: effect of number of channels and spectral region. *Journal of the Acoustical Society of America*, 124, 2272-2282.
- Strelnikov, K., Rouger, J., Lagleyre, S., Fraysse, B., Demonet, J. F., Deguine, O., & Barone, P. (2015). Increased audiovisual integration in cochlear-implanted deaf patients: independent components analysis of longitudinal positron emission tomography data. *European Journal of Neuroscience*, 41, 677-685. Doi: 10.1111/ejn.12827
- Strik, H. (1994). *Physiological control and behavior of the voice source in the production of prosody* (Doctoral dissertation). University of Nijmegen.
- Summerfield, A., & Marshall, D. (1995). *Cochlear implantation in the UK 1990-1994. Report by the mrc institute of hearing research on the evaluation of the national cochlear implant programme*. London: HMSO Books.
- Svirsky, M. A., Jones, D., Osberger, M. J., & Miyamoto, R. T. (1998). The effect of auditory feedback on the control of oral-nasal balance by pediatric cochlear implant users. *Ear and Hearing*, 19, 385-393.
- Svirsky, M. A., Lane, H., Perkell, J. S., & Wozniak, J. (1992). Effects of short-term auditory deprivation on speech production in adult cochlear implant users. *Journal of the Acoustical Society of America*, 92, 1284-1300.
- Svirsky, M. A., Stallings, L. M., Lento, C. L., Ying, E., & Leonard, L. B. (2002). Grammatical morphologic development in pediatric

- cochlear implant users may be affected by the perceptual prominence of the relevant markers. *Annals of Otology Rhinology and Laryngology*, 111, 109-112.
- Swanson, B., Dawson, P., & Mcdermott, H. (2009). Investigating cochlear implant place-pitch perception with the Modified Melodies test. *Cochlear Implants International*, 10, 100-104.
- Szyfter, W., Pruszeicz, A., Woznica, B., Swidzinski, P., Szymiec, E., & Karlik, M. (1996). The acoustic analysis of voice in patients with multi-channel cochlear implant. *Revue de Laryngologie Otologie Rhinologie*, 117, 225-227.
- Tang, Q., Benítez, R., & Zeng, F.-G. (2011). Spatial channel interactions in cochlear implants. *Journal of neural engineering*, 8, 046029.
- Tao, D., Deng, R., Jiang, Y., Galvin, J. J., 3rd, Fu, Q. J., & Chen, B. (2014). Melodic pitch perception and lexical tone perception in mandarin-speaking cochlear implant users. *Ear and Hearing*, 36, 102-110. Doi: 10.1097/AUD.0000000000000086
- 't Hart, J., Collier, R., & Cohen, A. (1990). *A perceptual study of intonation: an experimental-phonetic approach to speech melody*. Cambridge [England], New York: Cambridge University Press.
- Theunissen, S. C. P. M. (2013). *Psychopathology in hearing-impaired children* (Doctoral dissertation). Department of Otorhinolaryngology, Faculty of Medicine, Leiden University Medical Center (LUMC), Leiden University.
- Thiessen, E. D., Hill, E. A., & Saffran, J. R. (2005). Infant-directed speech facilitates word segmentation. *Infancy*, 7, 53-71.
- Thoutenhoofd, E. (2006). Cochlear implanted pupils in Scottish schools: 4-year school attainment data (2000–2004). *Journal of Deaf Studies and Deaf Education*, 11, 171-188.
- Tobey, E. A., Angelette, S., Murchison, C., Nicosia, J., Sprague, S., Staller, S. J., . . . Beiter, A. L. (1991). Speech production performance in children with multichannel cochlear implants. *American Journal of Otology*, 12, 165-173.

- Torppa, R., Faulkner, A., Huottilainen, M., Jarvikivi, J., Lipsanen, J., Laasonen, M., & Vainio, M. (2014). The perception of prosody and associated auditory cues in early-implanted children: The role of auditory working memory and musical activities. *International Journal of Audiology*, 53, 182-191. Doi: 10.3109/14992027.2013.872302
- Torppa, R., Faulkner, A., Vainio, M., & Järvikivi, J. (2010). Acquisition of focus by normal hearing and Cochlear implanted children. In: *Proceedings of the 5th international Conference on Speech Prosody*. Chicago, IL, USA.
- Tye-Murray, N., Spencer, L., Bedia, E. G., & Woodworth, G. (1996). Differences in children's sound production when speaking with a cochlear implant turned on and turned off. *Journal of Speech and Hearing Research*, 39, 604-610.
- Tye-Murray, N., Spencher, L., & Woodworth, G. G. (1995). Acquisition of speech by children who have prolonged cochlear implant experience. *Journal of Speech and Hearing Research*, 38, 327-337.
- Ubrig, M. T., Goffi-Gomez, M. V., Weber, R., Menezes, M. H., Nemr, N. K., Tsuji, D. H., & Tsuji, R. K. (2011). Voice Analysis of Postlingually Deaf Adults Pre- and Postcochlear Implantation. *Journal of Voice*, 25, 692-299. Doi: S0892-1997(10)00123-2
- Uchanski, R. M., & Geers, A. E. (2003). Acoustic characteristics of the speech of young cochlear implant users: a comparison with normally-hearing age-mates. *Ear and Hearing*, 24, 90S-105S. Doi: 10.1097/01.AUD.0000051744.24290.C1
- Vaccari, C., & Marschark, M. (1997). Communication between Parents and Deaf Children: Implications for Social-emotional Development. *Journal of Child Psychology and Psychiatry*, 38, 793-801.
- Valero Garcia, J., Rovira, J. M., & Sanvicens, L. G. (2010). The influence of the auditory prosthesis type on deaf children's voice quality. *International Journal of Pediatric*

- Otorhinolaryngology*, 74, 843-848. Doi: S0165-5876(10)00202-8
- Vandali, A., Sly, D., Cowan, R., & van Hoesel, R. (2015). Training of cochlear implant users to improve pitch perception in the presence of competing place cues. *Ear and Hearing*, 36, E1-E13.
- van de Velde, D. J., Dritsakis, G., Frijns, J. H., van Heuven, V. J., & Schiller, N. O. (2015). The effect of spectral smearing on the identification of pure F0 intonation contours in vocoder simulations of cochlear implants. *Cochlear Implants International*, 16, 77-87. Doi: 10.1179/1754762814Y.00000000086
- van Dijkhuizen, J. N., Beers, M., Boermans, P. P., Briare, J. J., & Frijns, J. H. (2011). Speech intelligibility as a predictor of cochlear implant outcome in prelingually deafened adults. *Ear and Hearing*, 32, 445-458. Doi: 10.1097/AUD.0b013e31820510b7
- van Dijkhuizen, J. N., Boermans, P.-P. B., Briare, J. J., & Frijns, J. H. (2016). Intelligibility of the patient's speech predicts the likelihood of cochlear implant success in prelingually Deaf Adults. *Ear and Hearing*, 37, e302-e310.
- van Heuven, V. J. J. P., & Sluijter, A. M. C. (1996). Notes on the phonetics of word prosody. In R. Goedemans, H. van der Hulst, & E. Visch (Eds.), *Stress patterns of the world, part 1: Background* (pp. 233-269). The Hague: Holland Academic Graphics.
- van Lierde, K. M., Vinck, B. M., Baudonck, N., De Vel, E., & Dhooge, I. (2005). Comparison of the overall intelligibility, articulation, resonance, and voice characteristics between children using cochlear implants and those using bilateral hearing aids: A pilot study. *International Journal of Audiology*, 44, 452-465. Doi: 10.1080/14992020500189146
- Velten, E. (1968). A laboratory task for induction of mood states. *Behavior Research and Therapy*, 6, 473-482.

- Vogel, I., & Raimy, E. (2002). The acquisition of compound vs. phrasal stress: the role of prosodic constituents. *Journal of Child Language*, 29, 225-250. Doi: 10.1017/S0305000902005020
- Vorperian, H. K., Kent, R. D., Lindstrom, M. J., Kalina, C. M., Gentry, L. R., & Yandell, B. S. (2005). Development of vocal tract length during early childhood: A magnetic resonance imaging study. *Journal of the Acoustical Society of America*, 117, 338-350. Doi: 10.1121/1.1835958
- Vorperian, H. K., & Kent, R. D. (2007). Vowel acoustic space development in children: A synthesis of acoustic and anatomic data. *Journal of Speech Language and Hearing Research*, 50, 1510-1545. Doi: 10.1044/1092-4388(2007/104)
- Waldstein, R. S. (1990). Effects of postlingual deafness on speech production: implications for the role of auditory feedback. *Journal of the Acoustical Society of America*, 88, 2099-2114.
- Wang, W., Zhou, N., & Xu, L. (2011). Musical pitch and lexical tone perception with cochlear implants. *International Journal of Audiology*, 50, 270-278. Doi: 10.3109/14992027.2010.542490
- Waters, T. (1986). Speech therapy with cochlear implant wearers. *British Journal of Audiology*, 20, 35-43. Doi: 10.3109/03005368609078996
- Wells, B., Peppé, S., & Goulondris, N. (2004). Intonation development from five to thirteen. *Journal of Child Language*, 31, 749-778.
- Werker, J. F., & Tees, R. C. (1984). Cross-language speech perception: Evidence for perceptual reorganization during the first year of life. *Infant behavior and development*, 7, 49-63.
- Werker, J. F., & Hensch, T. K. (2015). Critical periods in speech perception: New directions. *Psychology*, 66, 173-196.
- Whitmal, N. A., Poissant, S. F., Freyman, R. L., & Helfer, K. S. (2007). Speech intelligibility in cochlear implant simulations: effects of carrier type, interfering noise, and subject

- experience. *Journal of the Acoustical Society of America*, 122, 2376–2388. Doi:10.1121/1.2773993.
- Wiefferink, C. H., Rieffe, C., Ketelaar, L., De Raeve, L., & Frijns, J. H. M. (2013). Emotion Understanding in Deaf Children with a Cochlear Implant. *Journal of deaf studies and deaf education*, 18, 175-186. Doi: 10.1093/deafed/ens042
- Wilson, B., Finley, C. C., Lawson, D. T., Wolford, R. D., Eddington, D. K., & Rabinowitz, W. M. (1991). Better speech recognition with cochlear implants. *Nature*, 352, 236-238. Doi: 10.1038/352236a0
- Wilson, B. (2006). Speech processing strategies. In H. R. Cooper & L. C. Craddock (Eds.), *Cochlear Implants: A Practical Guide* (2nd ed., pp. 21–69). Hoboken, NJ, USA: John Wiley & Sons.
- Wilson, B. S., & Dorman, M. F. (2007). The surprising performance of present-day cochlear implants. *IEEE Transactions on Biomedical Engineering*, 54, 969-972. Doi: 10.1109/tbme.2007.893505
- Wilson, B., & Dorman, M. F. (2008). Cochlear implants: a remarkable past and a brilliant future. *Hearing Research*, 242, 3-21. Doi: S0378-5955(08)00125-1
- Wilson, B., & Dorman, M. (2009). The design of cochlear implants. In J. Niparko (Ed.), *Cochlear implants: Principles & Practices*. Philadelphia, PA, USA: Lippincott Williams & Wilkins.
- Wilson, B. (2014). Getting a decent (but sparse) signal to the brain for users of cochlear implants. *Hearing Research*, 322, 24-38. Doi: 10.1016/j.heares.2014.11.009
- Winn, M. B., Rhone, A. E., Chatterjee, M., & Idsardi, W. J. (2013). The use of auditory and visual context in speech perception by listeners with normal hearing and listeners with cochlear implants. *Frontiers in Psychology* 4, 1-13.
- Witteman, J., van IJzendoorn, M. H., van de Velde, D., van Heuven, V. J. J. P., & Schiller, N. O. (2011). The nature of hemispheric specialization for linguistic and emotional prosodic perception:

- A meta-analysis of the lesion literature. *Neuropsychologia*, 49, 3722-3738. Doi: 10.1016/j.neuropsychologia.2011.09.028
- Won, J. H., Drennan, W. R., Kang, R. S., & Rubinstein, J. T. (2010). Psychoacoustic abilities associated with music perception in cochlear implant users. *Ear and hearing*, 31, 796-805. Doi: 10.1097/Aud.0b013e3181e8b7bd
- Won, J. H., Nie, K., Drennan, W. R., & Rubinstein, J. T. (2012). Maximizing the spectral and temporal benefits of two clinically used sound processing strategies for cochlear implants. *Trends in Amplification*, 16, 201–210.
- Xin, L., & Fu, Q. J. (2004). Enhancing Chinese tone recognition by manipulating amplitude envelope: Implications for cochlear implants. *Journal of the Acoustical Society of America*, 116, 3659-3667. Doi: 10.1121/1.1783352
- Xu, L., Thompson, C. S., & Pfingst, B. E. (2005). Relative contributions of spectral and temporal cues for phoneme recognition. *Journal of the Acoustical Society of America*, 117, 3255–3267.
- Yucel, E., Sennaroglu, G., & Belgin, E. (2009). The family oriented musical training for children with cochlear implants: speech and musical perception results of two year follow-up. *International Journal of Pediatric Otorhinolaryngology*, 73, 1043-1052.
- Zeng, F. G. (2002). Temporal pitch in electric hearing. *Hearing Research*, 174, 101-106. Doi: 10.1016/S0378-5955(02)00644-5
- Zhou, N., Huang, J., Chen, X., & Xu, L. (2013). Relationship Between Tone Perception and Production in Prelingually Deafened Children With Cochlear Implants. *Otology & Neurotology* 34, 499–506.
- Zhu, M., Chen, B., Galvin, J. J., 3rd, Fu Q.-J. (2011). Influence of pitch, timbre and timing cues on melodic contour identification with a competing masker (L). *Journal of the Acoustical Society of America*, 130, 3562–3565. Doi: 10.1121/1.3658474

- Zhu, Z., Tang, Q., Zeng, F.-G., Guan, T., & Ye, D. (2012). Cochlear-implant spatial selectivity with monopolar, bipolar and tripolar stimulation. *Hearing Research*, 283, 45-58.
- Zwolan, T. A., Kileny, P. R., Ashbaugh, C., & Telian, S. A. (1996). Patient performance with the Cochlear Corporation "20+ 2" implant: bipolar versus monopolar activation. *Otology & Neurotology*, 17, 717-723.