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Untwisting amusia

What behavior, brain waves and genetic underpinnings reveal about perception in congenital amusia

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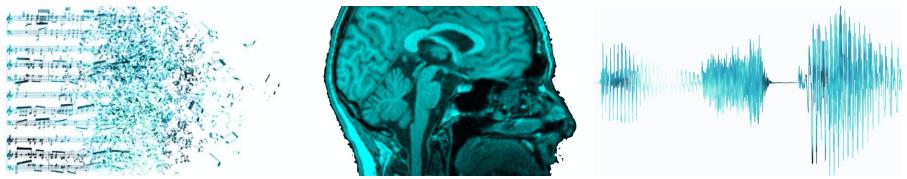
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7. References

References

- Alain, C., Woods, D. L., & Knight, R. T. (1998). A distributed cortical network for auditory sensory memory in humans. *Brain Research*, 812(1), 23–37.
- Albouy, P., Cousineau, M., Caclin, A., Tillmann, B., & Peretz, I. (2016). Impaired encoding of rapid pitch information underlies perception memory deficits in congenital amusia. *Scientific Reports*, 6, 18861.
- Albouy, P., Mattout, J., Bouet, R., Maby, E., Sanchez, G., Aguera, P.-E., Daligault, S., Delpuech, C., Bertrand, O., Caclin, A., & Tillmann, B. (2013). Impaired pitch perception and memory in congenital amusia: the deficit starts in the auditory cortex. *Brain*, 136(5), 1639–1661.
- Albouy, P., Schulze, K., Caclin, A., & Tillmann, B. (2013). Does tonality boost short-term memory in congenital amusia? *Brain Research*, 1537, 224–232.
- Anderson, S., Himonides, E., Wise, K., Welch, G., & Stewart, L. (2012). Is there potential for learning in amusia? A study of the effect of singing intervention in congenital amusia. *Annals of the New York Academy of Sciences*, 1252, 345–353.
- Asendorpf, J. (2009). *Persönlichkeitspsychologie* (4th ed.). Heidelberg: Springer.
- Auditory (2007). *Online listening tests and psychoacoustic experiments with large N*. Discussion on Auditory mailing list, see www.auditory.org/mhonarc/2007/threads.html#00531.
- Ayotte, J., Peretz, I., & Hyde, K. (2002). Congenital amusia - A group study of adults afflicted with a music-specific disorder. *Brain*, 125, 238–251.
- Baayen, R. H., Davidson, D. J., & Bates, D. M. (2008). Mixed-effects modeling with crossed random effects for subjects and items. *Journal of Memory and Language*, 59, 390–412.
- Baayen, R. H., Piepenbrock, R., & Gulikers, L. (1995) *The CELEX Lexical Database* (CD-ROM). Philadelphia: Linguistic Data Consortium, University of Pennsylvania.
- Bagiella, E., Sloan, R. P., & Heitjan, D. F. (2000). Mixed-effects models in psychophysiology. *Psychophysiology*, 37(1), 13–20.
- Bates, D., Maechler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, 67(1), 1–48.
- Birnbaum, M. H. (2004). Human research and data collection via the internet. *Annual Review of Psychology*, 55, 803–832.
- Boersma, P., & Weenink, D. (2011). Praat: doing phonetics by computer (Version 5.2.25). Retrieved from www.praat.org/
- Boersma, P., & Weenink, D. (2016). Praat: doing phonetics by computer (Version 6.0.15). Retrieved from www.praat.org/

- Bones, O., & Wong, P. C. M. (2017). Congenital amusics use a secondary pitch mechanism to identify lexical tones. *Neuropsychologia*, 104, 48–53.
- Braun, A., McArdle, J., Jones, J. L., Nechaev, V., Zalewski, C., Brewer, C., & Drayna, D. (2008). Tune deafness: Processing melodic errors outside of conscious awareness as reflected by components of the auditory ERP. *PLoS ONE*, 3(6), 1–6.
- Chen, J., Kumar, S., Williamson, V., Scholz, J., Griffiths, T., & Stewart, L. (2014). Detection of the arcuate fasciculus in congenital amusia is dependent on tractography algorithm. *Proceedings of the 20th Annual Meeting of the Organization for Human Brain Mapping*, 6, 1–11.
- Chen, J., & Yuan, J. (2016). The neural causes of congenital amusia. *The Journal of Neuroscience*, 36(30), 7803–7804.
- Chládková, K., Escudero, P., & Lipski, S. C. (2013). Pre-attentive sensitivity to vowel duration reveals native phonology and predicts learning of second-language sounds. *Brain and Language*, 126(3), 243–252.
- Cohen, C. A., & Hegarty, M. (2012). Inferring cross sections of 3D objects: A new spatial thinking test. *Learning and Individual Differences*, 22(6), 868–874.
- Corrow, S. L., Stubbs, J. L., Schlaug, G., Buss, S., Paquette, S., Duchaine, B., & Barton, J. J. S. (2019). Perception of musical pitch in developmental prosopagnosia. *Neuropsychologia*, 124, 87–97.
- Cousineau, M., Mcdermott, J. H., & Peretz, I. (2012). The basis of musical consonance as revealed by congenital amusia. *Proceedings of the National Academy of Sciences*, 109, 19858–19863.
- Cousineau, M., Oxenham, A. J., & Peretz, I. (2015). Congenital amusia: A cognitive disorder limited to resolved harmonics and with no peripheral basis. *Neuropsychologia*, 66, 293–301.
- Cowan, G. M. (1948). Mazateco whistle speech. *Language*, 24, 280–286.
- Cox, J. (1948). Tone deafness. *Music Educator's Journal*, 34(4), 62–63.
- Cuddy, L. L., Balkwill, L.-L., Peretz, I., & Holden, R. R. (2005). Musical difficulties are rare - A study of “Tone Deafness” among university students. *Annals of the New York Academy of Sciences*, 1060, 311–324.
- Cutini, S., Szűcs, D., Mead, N., Huss, M., & Goswami, U., (2016). Atypical right hemisphere response to slow temporal modulations in children with developmental dyslexia, *NeuroImage*, 143, 40–49.
- Cutler, A. (1986). *Forbear* is a homophone: Lexical prosody does not constrain lexical access. *Language and Speech*, 29(3), 201–220.
- Dalla Bella, S., Berkowska, M., & Sowiński, J., (2011). Disorders of pitch production in tone deafness. *Frontiers in Psychology*, 2(164).

References

- Dandurand, F., Shultz, T., & Onishi, K. (2008). Comparing online and lab methods in a problem-solving experiment. *Behavior Research Methods*, 40, 428–434.
- De Bree, E., Wijnen, F., & Zonneveld, W. (2006). Word stress production in three-year-old children at risk of dyslexia. *Journal of Research in Reading*, 29, 304–317.
- de Jonge, M. J. I., & Boersma, P., (2015). French high-mid vowels are underspecified for height. *Proceedings of the 18th International Congress of Phonetic Sciences*, Paper 948.
- Della Sala, S., Gray, C., Baddeley, A., & Wilson, L. (1997). *The Visual Patterns Test: A new test of short-term visual recall*. Suffolk, England: Thames Valley Test Company.
- Dogil, G. (1995). The phonetic manifestation of stress. *Arbeitspapiere des Instituts für Maschinelle Sprachverarbeitung (Universität Stuttgart)*, 2, 3–51.
- Douglas, K. M., & Bilkey, D. K. (2007). Amusia is associated with deficits in spatial processing. *Nature Neuroscience*, 10, 915–921.
- Drayna, D., Manichaikul, A., de Lange, M., Snieder, H., & Spector, T. (2001). Genetic correlates of musical pitch recognition in humans. *Science*, 291, 1969–1971.
- Dupoux, E., Pallier, C., Sebastian, N., & Mehler, J. (1997). A destressing “deafness” in French? *Journal of Memory and Language*, 36(3), 406–421.
- Dupoux, E., Sebastián-Gallés, N., Navarrete, E., & Peperkamp, S. (2008). Persistent stress ‘deafness’: The case of French learners of Spanish. *Cognition*, 106(2), 682–706.
- Eggeling, J. (1882). *The Satapatha-Brahmana* (J. Eggeling, Trans.). Oxford: Clarendon Press.
- Escudero, P., & Boersma, P. (2004). Bridging the gap between L2 speech perception research and phonological theory. *Studies in Second Language Acquisition*, 26(4), 551–585.
- Fiedler, D., & Müllensiefen, D. (2015). Validation of the Gold-MSI questionnaire to measure musical sophistication of German students at secondary education schools. *Proceedings of Ninth Triennial Conference of the European Society for the Cognitive Sciences of Music*.
- Fikkert P., & Penner Z. (1998). Stagnation in prosodic development of language-disordered children. *Proceedings of the Boston University Conference on Language Acquisition*, 201–212.
- Foxton, J. M., Dean, J. L., Gee, R., Peretz, I., & Griffiths, T., D. (2004). Characterization of deficits in pitch perception underlying “tone deafness”. *Brain*, 127, 801–810.

- Foxton, J. M., Nandy, R. K., & Griffiths, T. D. (2006). Rhythm deficits in ‘tone deafness’. *Brain and Cognition*, 62(1), 24–29.
- Frömer, R., Maier, M., & Abdel Rahman, R. (2018). Group-level EEG-processing pipeline for flexible single trial-based analyses including Linear Mixed Models. *Frontiers in Neuroscience*, 12(48).
- Frost, R. (1969). *The Poetry of Robert Frost: The Collected Poems, Complete and Unabridged*. New York: Henry Holt.
- Gallón, N., Harris, J., & Van der Lely, H. (2007). Non-word repetition: An investigation of phonological complexity in children with grammatical SLI. *Clinical Linguistics & Phonetics*, 21, 435–455.
- Geschwind, N. (1984). The brain of a learning-disabled individual. *Annals of Dyslexia*, 34, 319–327.
- Giegerich, H. (1985). *Metrical Phonology and Phonological Structure: German and English*. Cambridge: Cambridge University Press.
- Gingras, B., Honing, H., Peretz, I., Trainor, L. J., & Fisher, S. E. (2015). Defining the biological bases of individual differences in musicality. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 370(1664).
- Gordon, E. E. (1965). *Muscial Aptitude Profile*. Boston: Houghton Mifflin.
- Gosselin, N., Jolicœur, P., & Peretz, I. (2009). Impaired memory for pitch in congenital amusia. *Annals of the New York Academy of Sciences*, 1169(1), 270–272.
- Goswami, U., Mead, N., Fosker, T., Huss, M., Barnes, L., & Leong V. (2013). Impaired perception of syllable stress in children with dyslexia: A longitudinal study. *Journal of Memory and Language*, 69, 1–17.
- Grant, A. (1878). Note-deafness. *Mind*, 10, 157–167.
- Green, D. M., & Swets, J. A. (1966). *Signal Detection Theory and Psychophysics*. New York: Wiley.
- Haake, C., Kob, M., Willmes, K. & Domahs, F. (2013). Word stress processing in specific language impairment: Auditory or representational deficits? *Clinical Linguistics & Phonetics*, 27(8), 594–615.
- Hamann, S., Exter, M., Pfeifer, J., & Krause-Burmester, M. (2012). Perceiving differences in linguistic and non-linguistic pitch: A pilot study with German congenital amusics. *Proceedings of the 12th International Conference on Music Perception and Cognition (ICMPC) and 8th Triennial Conference of the European Society for the Cognitive Sciences of Music (ESCOM)*, eds. Cambouropoulos, E., Tsougras, C., Mavromatis P., & Pastiadis, K., 398–405.
- Harmon, R. (2003). From themistocles to philomathes: Amousos and amousia in antiquity and the early modern period. *International Journal of the Classical Tradition*, 9(3), 351–390.

References

- Hay, R. A., Roach, B. J., Srihari, V. H., Woods, S. W., Ford, J. M., & Mathalon, D.H. (2015). Equivalent mismatch negativity deficits across deviant types in early illness schizophrenia-spectrum patients. *Biological psychology*, 105, 130–137.
- Hayward, K. (2000). *Experimental Phonetics*. Harlow: Pearson Education Limited.
- Hegarty, M., & Waller, D. (2004). A dissociation between mental rotation and perspective-taking spatial abilities. *Intelligence*, 32(2), 175–191.
- Henry, M. J., & McAuley, J. D. (2010). On the prevalence of congenital amusia. *Music Perception: An Interdisciplinary Journal*, 27, 413–418.
- Henry, M. J., & McAuley, J. D. (2013). Failure to apply Signal Detection Theory to the Montreal Battery of Evaluation of Amusia may misdiagnose amusia. *Music Perception: An Interdisciplinary Journal*, 30(5), 480–496.
- Honing, H., & Ladinig, O. (2008). The potential of the internet for music perception research: A comment on lab-based versus web-based studies. *Empirical Musicology Review*, 3, 4–7.
- Huang, W. T., Liu, C., Dong, Q., & Nan, Y., (2015). Categorical perception of lexical tones in Mandarin-speaking congenital amusics. *Frontiers in Psychology*, 6(829).
- Huang, X, Zhang, C., Shi, F., Yan, N., & Wang, L. (2016) Impaired vowel discrimination in Mandarin-speaking congenital amusics. *Proceedings of the 5th International Symposium on Tonal Aspects of Language*.
- Hutchins, S., Gosselin, N., & Peretz, I. (2010a). Identification of changes along a continuum of speech intonation is impaired in congenital amusia. *Frontiers in Psychology*, 1, 1–8.
- Hutchins, S., & Peretz, I. (2013). Vocal pitch shift in congenital amusia (pitch deafness). *Brain and Language*, 125, 106–117.
- Hutchins, S., Zarate, J., Zatorre, R., & Peretz, I. (2010b). An acoustical study of vocal pitch matching in congenital amusia. *Journal of the Acoustical Society of America*, 127, 504–512.
- Hyde, K., Lerch, J. P., Zatorre, R., Griffiths, T., D., & Evans, A. (2007). Cortical thickness in congenital amusia: When less is better than more. *The Journal of Neuroscience*, 47, 13028–13032.
- Hyde, K., & Peretz, I. (2003). “Out-of-Pitch” but still “In-Time”. *Annals of the New York Academy of Sciences*, 999, 173–176.
- Hyde, K., & Peretz, I. (2004). Brains that are out of tune but in time. *Psychological Science*, 15(5), 356–360.

- Hyde, K., Zatorre, R., Griffiths, T., D., Lerch, J. P., & Peretz, I. (2006). Morphometry of the amusic brain: a two-site study. *Brain*, 129, 2562–2570.
- Hyde, K., Zatorre, R., & Peretz, I. (2011). Functional MRI evidence of an abnormal neural network for pitch processing in congenital amusia. *Cerebral Cortex*, 21(2), 292–299.
- Iversen, J. R., & Patel, A. D. (2008). The Beat Alignment Test (BAT): Surveying beat processing abilities in the general population. *Proceedings of the 10th International Conference on Music Perception and Cognition*, 465–468.
- Iverson, P. (2012). Measuring phonetic perception in adults, in *The Oxford Handbook of Laboratory Phonology*, eds. A. C. Cohn, C. Fougeron & M. Huffman. Oxford: Oxford University Press, 572–580.
- Jasmin, K., Dick, F., Holt, L. L., & Tierney, A. (2019). Tailored perception: Individuals' speech and music perception strategies fit their perceptual abilities. *Journal of Experimental Psychology: General*. Advance online publication.
- Jessen, M. (1993). Stress conditions on vowel quality and quantity in German. *Working Papers of the Cornell Phonetics Laboratory*, 8, 1–27.
- Jessen, M., Marasek, K., Schneider, K., & Classen, K. (1995). Acoustic correlates of word stress and the tense/lax opposition in the vowel system of German. *Proceedings of the International Congress of Phonetic Sciences*, 4, 428–431.
- Jiang, C., Hamm, J. P., Lim, V. K., Kirk, I. J., Chen, X., & Yang, Y. (2012a). Amusia results in abnormal brain activity following inappropriate intonation during speech comprehension. *PLoS ONE*, 7, e41411.
- Jiang, C., Hamm, J. P., Lim, V. K., Kirk, I. J., & Yang, Y. (2010). Processing melodic contour and speech intonation in congenital amusics with Mandarin Chinese. *Neuropsychologia*, 48, 2630–2639.
- Jiang, C., Hamm, J. P., Lim, V. K., Kirk, I. J., & Yang, Y. (2012b). Impaired categorical perception of lexical tones in Mandarin-speaking congenital amusics. *Memory & Cognition*, 40, 1109–1121.
- Jiang, C., Lim, V. K., Wang, H., & Hamm, J. P. (2013). Difficulties with pitch discrimination influences pitch memory performance: Evidence from congenital amusia. *PLoS ONE*, 8, e79216.
- Kalmus, H. (1948). Tune deafness and its inheritance. *Proceedings of the Eighth International Congress of Genetics*, Paper 605.
- Kalmus, H., & Fry, D. B. (1980). On tune deafness (dysmelodia): Frequency, development, genetics and musical background. *Annals of Human Genetics*, 43, 369–383.
- Kang, S., Johnson, K., & Finley, G. (2016). Effects of native language on compensation for coarticulation. *Speech Communication*, 77, 84–100.

References

- Kirmse, U., Ylinen, S., Tervaniemi, M., Vainio, M., Schröger, E., & Jacobsen, T. (2008). Modulation of the mismatch negativity (MMN) to vowel duration changes in native speakers of Finnish and German as a result of language experience. *International Journal of Psychophysiology*, 67(2), 131–143.
- Koerner, T. K., & Zhang, Y. (2017). Application of Linear Mixed-Effects Models in human neuroscience research: A comparison with pearson correlation in two auditory electrophysiology studies. *Brain sciences*, 7(3), 26.
- Kohler, K. J. (1990). German. *Journal of the International Phonetic Association*, 20(1), 48–50.
- Krantz, J. H., & Dalal, R. (2000). Validity of web-based psychological research, in *Psychological Experiments on the Internet*, ed. M.H. Birnbaum. San Diego: Academic Press, 35–60.
- Kujala, T., & Näätänen, R. (2001). The mismatch negativity in evaluating central auditory dysfunction in dyslexia. *Neuroscience & Biobehavioral Reviews*, 25(6), 535–543.
- Launay, J., Grube, M., & Stewart, L. (2014). Dysrhythmia: a specific congenital rhythm perception deficit. *Frontiers in Psychology*, 5, 1–18.
- Lebrun, M.-A., Moreau, P., McNally-Gagnon, A., Mignault Goulet, G., & Peretz, I. (2012). Congenital amusia in childhood: A case study. *Cortex*, 48(6), 683–688.
- Leconte, J. (1887). Sound-Blindness. *Science*, 10(250), 244–245.
- Leong, V., Hämäläinen, J., Soltész, F., & Goswami, U. (2011). Rise time perception and detection of syllable stress in adults with developmental dyslexia. *Journal of Memory and Language*, 64, 59–73.
- Lintfert, B. (2010). *Phonetic and phonological development of stress in German*. PhD dissertation, Universität Stuttgart, Stuttgart.
- Liu, F., Jiang, C., Pfördresher, P. Q., Mantell, J. T., Xu, Y., Yang, Y., & Stewart, L. (2013). Individuals with congenital amusia imitate pitches more accurately in singing than in speaking: Implications for music and language processing. *Attention, Perception, & Psychophysics*, 75, 1783–1798.
- Liu, F., Jiang, C., Thompson, W. F., Xu, Y., Yang, Y., & Stewart, L. (2012a). The mechanism of speech processing in congenital amusia: Evidence from Mandarin speakers. *PLoS ONE*, 7, e30374.
- Liu, F., Jiang, C., Wang, B., Xu, Y., & Patel, A. D. (2015). A music perception disorder (congenital amusia) influences speech comprehension. *Neuropsychologia*, 66, 111–118.

- Liu, F., Maggu, A. R., Lau, J. C. Y., & Wong, P. C. M. (2015). Brainstem encoding of speech and musical stimuli in congenital amusia: evidence from Cantonese speakers. *Frontiers in Human Neurosciences*, 8, 1–19.
- Liu, F., Patel, A. D., Fourcin, A., & Stewart, L. (2010). Intonation processing in congenital amusia: discrimination, identification and imitation. *Brain*, 133(6), 1682–1693.
- Liu, F., Xu, Y., Patel, A. D., Francart, T., & Jiang, C. (2012b). Differential recognition of pitch patterns in discrete and gliding stimuli in congenital amusia: Evidence from Mandarin speakers. *Brain and Cognition*, 79, 209–215.
- Lolli, S. L., Lewenstein, A. D., Basurto, J., Winnik, S., & Loui, P. (2015). Sound frequency affects speech emotion perception: Results from congenital amusia. *Frontiers in Psychology*, 6, 1–10.
- Loui, P., Alsop, D., & Schlaug, G. (2009). Tone deafness: A new disconnection syndrome? *The Journal of Neuroscience*, 29, 10215–10220.
- Loui, P., Guenther, F.H., Mathys, C., & Schlaug, G. (2008). Action–perception mismatch in tone-deafness. *Current Biology*, 18, R331–R332.
- Loui, P., Kroog, K., Zuk, J., Winner, E., & Schlaug, G. (2011). Relating pitch awareness to phonemic awareness in children: Implications for tone-deafness and dyslexia. *Frontiers in Psychology*, 2(111).
- Loui, P., & Schlaug, G. (2009). Investigating musical disorders with diffusion tensor imaging. *Annals of the New York Academy of Sciences*, 1169(1), 121–125.
- Loui, P., & Schlaug, G. (2012). Impaired learning of event frequencies in tone deafness. *Annals of the New York Academy of Sciences*, 1252, 354–360.
- Lu, X., Ho, H. T., Sun, Y., Johnson, B. W., & Thompson, W. F. (2016). The influence of visual information on auditory processing in individuals with congenital amusia: An ERP study. *NeuroImage*, 135, 142–151.
- Macmillan, N. A., & Creelman, C. D. (2005). *Detection Theory: A User's Guide*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Mandell, J., Schulze, K., & Schlaug, G. (2007). Congenital amusia: An auditory-motor feedback disorder? *Restorative Neurology and Neuroscience*, 25, 323–334.
- Marin, M. M., Gingras, B., & Stewart, L. (2012). Perception of musical timbre in congenital amusia: Categorization, discrimination and short-term memory. *Neuropsychologia*, 50(3), 367–378.

References

- Marin, M. M., Thompson, W. F., & Stewart, L. (2012). Emotion perception of dyads and triads in congenital amusia. *Proceedings of the 12th International Conference on Music Perception and Cognition (ICMPC) and 8th Triennial Conference of the European Society for the Cognitive Sciences of Music (ESCOM)*.
- McDonald, C., & Stewart, L. (2007). Uses and functions of music in Congenital Amusia. *Music Perception*, 25, 345–356.
- McGraw, K., Tew, M. D., & Williams, J. E. (2000). The integrity of web-delivered experiments: Can you trust the data? *Psychological Science*, 11, 502–506.
- McWhinney, S. R. (2018). *A comparison of statistical methods for relating individual differences to event-related potential components*. PhD dissertation, Dalhousie University Halifax, Nova Scotia.
- Mehler, J. (1999). Editorial. *Cognition*, 71, 187–189.
- Mignault Goulet, G., Moreau, P., Robitaille, N., & Peretz, I. (2012). Congenital Amusia persists in the developing brain after daily music listening. *PLoS ONE*, 7, e36860.
- Milner, B. (1971). Interhemispheric differences in the localization of psychological processes in man. *British Medical Bulletin*, 27, 272–277.
- Moon, I. J., & Hong, S. H. (2014). What is temporal fine structure and why is it important? *Korean Journal of Audiology*, 18(1), 1–7.
- Moreau, P., Jolicœur, P., & Peretz, I. (2009). Automatic brain responses to pitch changes in Congenital Amusia. *Annals of the New York Academy of Sciences*, 1169, 191–194.
- Moreau, P., Jolicœur, P., & Peretz, I. (2013). Pitch discrimination without awareness in congenital amusia: Evidence from event-related potentials. *Brain and Cognition*, 81, 337–344.
- Mosing, M. A., Pedersen, N. L., Madison, G., & Ullén F. (2014). Genetic pleiotropy explains associations between musical auditory discrimination and intelligence. *PLoS ONE*, 9(11), e113874.
- Moulton, W. G. (1962). *The Sounds of English and German*. Chicago: University of Chicago Press.
- Müllensiefen, D., Gingras, B., Musil, J., & Stewart, L. (2014). The musicality of non-musicians: An index for assessing musical sophistication in the general population. *PLoS ONE*, 9(2), e89642.
- Näätänen, R. (1990). The role of attention in auditory information processing as revealed by event-related potentials and other brain measures of cognitive function. *Behavioral and Brain Sciences*, 13(2), 201–233.
- Näätänen, R. (2001). The perception of speech sounds by the human brain as reflected by the mismatch negativity (MMN) and its magnetic equivalent (MMNm). *Psychophysiology*, 38(1), 1–21.

- Näätänen, R., Gaillard, A. W. K., & Mäntysalo, S. (1978). Early selective-attention effect on evoked potential reinterpreted. *Acta Psychologica*, 42(4), 313–329.
- Näätänen, R., Paavilainen, P., Rinne, T., & Alho, K. (2007). The mismatch negativity (MMN) in basic research of central auditory processing: A review. *Clinical Neurophysiology*, 118(12), 2544–2590.
- Näätänen, R., Sussmann, E.S., Salisbury D., & Shafer V. L. (2014). Mismatch negativity (MMN) as an index of cognitive dysfunction. *Brain Topography*, 27(4), 451–66.
- Nan, Y., Huang, W.-t., Wang, W.-j., Liu, C., & Dong, Q. (2016). Subgroup differences in the lexical tone mismatch negativity (MMN) among Mandarin speakers with congenital amusia. *Biological Psychology*, 113, 59–67.
- Nan, Y., Sun, Y., & Peretz, I. (2010). Congenital amusia in speakers of a tone language: Association with lexical tone agnosia. *Brain*, 133, 2635–2642.
- Nguyen, S., Tillmann, B., Gosselin, N., & Peretz, I. (2009). Tonal language processing in Congenital Amusia. *Annals of the New York Academy of Sciences*, 1169, 490–493.
- Omigie, D., Müllensiefen, D., & Stewart, L. (2012a). The experience of music in congenital amusia. *Music Perception: An Interdisciplinary Journal*, 30, 1–18.
- Omigie, D., Pearce, M. T., & Stewart, L. (2012b). Tracking of pitch probabilities in congenital amusia. *Neuropsychologia*, 50, 1483–1493.
- Omigie, D., Pearce, M.T., Williamson, V.J., & Stewart, L. (2013). Electrophysiological correlates of melodic processing in congenital amusia. *Neuropsychologia*, 51, 1749–1762.
- Omigie, D., & Stewart, L. (2011). Preserved statistical learning of tonal and linguistic material in Congenital Amusia. *Frontiers in Psychology*, 2(109).
- Partanen, E., Vainio, M., Kujala, T., & Huotilainen, M. (2011). Linguistic multifeature MMN paradigm for extensive recording of auditory discrimination profiles. *Psychophysiology*, 48(10), 1372–1380.
- Patel, A. D., Foxton, J. M., & Griffiths, T. D. (2005). Musically tone-deaf individuals have difficulty discriminating intonation contours extracted from speech. *Brain and Cognition*, 59, 310–313.
- Patel, A. D., Wong, M., Foxton, J. M., Lochy, A., & Peretz, I. (2008). Speech intonation perception deficits in musical tone deafness (congenital amusia). *Music Perception*, 25, 357–368.

References

- Pätzold, M., & Simpson, A. P. 1997. Acoustic analysis of German vowels in the Kiel corpus of read speech. *Arbeitsbreichte des Instituts für Phonetik und digitale Sprachverarbeitung der Universität Kiel*, 32, 215–247.
- Peretz, I. (2001). Brain specialization for music: New evidence from congenital amusia. In: Biological foundations of music. *Annals of the New York Academy of Sciences*, 930, 153–165.
- Peretz, I., Ayotte, J., Zatorre, R., Mehler, J., Ahad, P., Penhune, V., & Jutras, B. (2002). Congenital amusia: A disorder of fine-grained pitch discrimination. *Neuron*, 33, 185–191.
- Peretz, I., Blood, A. J., Penhune, V., & Zaror, R. (2001). Cortical deafness to dissonance. *Brain*, 124, 928–940.
- Peretz, I., Brattico, E., Järvenpää, M., & Tervaniemi, M. (2009). The amusic brain: In tune, out of key, and unaware. *Brain*, 132, 1277–1286.
- Peretz, I., Brattico, E., & Tervaniemi, M. (2005). Abnormal electrical brain responses to pitch in Congenital Amusia. *Annals of Neurology*, 58, 478–482.
- Peretz, I., Champod, S., & Hyde, K. (2003). Varieties of musical disorders: The Montreal Battery of Evaluation of Amusia. *Annals of the New York Academy of Sciences*, 999, 58–75.
- Peretz, I., Cummings, S., & Dube, M.-P. (2007). The genetics of congenital amusia (Tone Deafness): A family-aggregation study. *The American Journal of Human Genetics*, 81, 582–588.
- Peretz, I., Gosselin, N., Tillmann, B., Cuddy, L. L., Gagnon, B., Trimmer, C. G., Paquette, S., & Bouchard, B. (2008). On-line identification of congenital amusia. *Music Perception*, 25, 331–343.
- Peretz, I., Saffran, J., Schön, D., & Gosselin, N. (2012). Statistical learning of speech, not music, in congenital amusia. *Annals of the New York Academy of Sciences*, 1252, 361–366.
- Peretz, I., & Vuvan, D. T. (2017). Prevalence of congenital amusia. *European Journal of Human Genetics*, 25(5), 625–630.
- Pettinato, M., & Verhoeven, J. (2008). Production and perception of word stress in children and adolescents with Down syndrome. *Down Syndrome Research and Practice*.
- Pfeifer, J., & Hamann, S. (2014). Congenital Amusia in linguistic and non-linguistic pitch perception - What behavior and reaction times reveal. *Proceedings of Speech Prosody* 7, eds. Campbell, N. Gibbon, D., & Hirst, D., 438–442.
- Pfeifer, J., & Hamann, S. (2015). Revising the diagnosis of congenital amusia with the Montreal Battery of Evaluation of Amusia. *Frontiers in Human Neurosciences*, 9, 1–15.

- Pfeifer, J. & Hamann, S. (2015). Web-based testing of congenital amusia with the Montreal Battery of Evaluation of Amusia. *Proceedings of the Ninth Triennial Conference of the European Society for the Cognitive Sciences of Music*, eds. Ginsborg, J., Lamont, A., Phillips, M., Bramley, S.
- Pfeifer, J., & Hamann, S. (2018). The Nature and Nurture of Congenital Amusia: A Twin Case Study. *Frontiers in Behavioural Neurosciences* 12: 120.
- Pfeifer, J., & Hamann, S. (in preparation). Dutch word stress perception by congenital amusics.
- Pfeifer, J., & Lüthy, K. A. (in preparation). A whole genome analysis of an amusic family.
- Phillips-Silver, J., Toiviainen, P., Gosselin, N., & Peretz, I. (2013). Amusic does not mean unmusical: Beat perception and synchronization ability despite pitch deafness. *Cognitive Neuropsychology*, 30, 311–331.
- Phillips-Silver, J., Toiviainen, P., Gosselin, N., Piché, O., Nozaradan, S., Palmer, C., & Peretz, I. (2011). Born to dance but beat deaf: A new form of congenital amusia. *Neuropsychologia*, 49, 961–969.
- Picton, T. W., Alain, C., Otten, L., Ritter, W., & Achim, A. (2000). Mismatch Negativity: Different water in the same river. *Audiology and Neurotology*, 5(3–4), 111–139.
- Polka, L., & Bohn, O.-S. (2003). Asymmetries in vowel perception. *Speech Communication*, 41(1), 221–231.
- Provost, M. (2011). *The Prevalence of congenital amusia*. Master's thesis, Université de Montréal.
- R Core Team (2016). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. See www.R-project.org/.
- Reips, U.-D. (2000). The web experiment method: Advantages, disadvantages, and solutions, in *Psychological Experiments on the Internet*, ed. M.H. Birnbaum, San Diego: Academic Press, 89–117.
- Reips, U.-D. (2000). Standards for internet-based experimenting. *Experimental Psychology*, 49, 243–256.
- Repp, B. H., & Su, Y.-H. (2013). Sensorimotor synchronization: A review of recent research (2006–2012). *Psychonomic Bulletin & Review*, 20(3), 403–452.
- Schaal, N. K., Bauer, A.-K. R., & Müllensiefen, D. (2014). Der Gold-MSI: Replikation und Validierung eines Fragebogeninstrumentes zur Messung Musikalischer Erfahrenheit anhand einer deutschen Stichprobe. *Musicae Scientiae*, 18(4), 423–447.

References

- Schaal, N. K., Pfeifer, J., Krause, V., & Pollok, B. (2015). From amusic to musical? – Improving pitch memory in congenital amusia with transcranial alternating current stimulation. *Behavioural Brain Research*, 294, 141–148.
- Schröger, E. (1997). On the detection of auditory deviations: A pre-attentive activation model. *Psychophysiology*, 34(3), 245–257.
- Seesjärvi, E., Särkämö, T., Vuoksimaa, E., Tervaniemi, M., Peretz, I., & Kaprio, J. (2016). The nature and nurture of melody: A twin study of musical pitch and rhythm perception. *Behavior Genetics*, 46(4), 506–515.
- Seifart, F., Meyer, J., Grawunder, S., & Dentel, L. (2018). Reducing language to rhythm: Amazonian Bora drummed language exploits speech rhythm for long-distance communication. *Royal Society Open Science*, 5(4), 170354.
- Shepard, R. N., & Metzler, D. (1971). Mental rotation of three-dimensional objects. *Science*, 171, 701–703.
- Shinozaki, J., Hiroe, N., Sato, M.-a., Nagamine, T., & Sekiyama, K. (2016). Impact of language on functional connectivity for audiovisual speech integration. *Scientific Reports*, 6, 31388.
- Shtyrov, Y., Kujala, T., Palva, S., Ilmoniemi, R. J., & Näätänen, R. (2000). Discrimination of speech and of complex nonspeech sounds of different temporal structure in the left and right cerebral hemispheres. *NeuroImage*, 12(6), 657–663.
- Sorokin, A., Alku, P., & Kujala, T. (2010). Change and novelty detection in speech and non-speech sound streams. *Brain Research*, 1327, 77–90.
- Sowiński, J., & Dalla Bella, S. (2013). Poor synchronization to the beat may result from deficient auditory-motor mapping. *Neuropsychologia*, 51, 1952–1963.
- Stewart, L. (2008). Fractionating the musical mind: insights from congenital amusia. *Current Opinion in Neurobiology*, 18, 127–130.
- Sun, Y., Lu, X., Ho, H. T., Johnson, B. W., Sammler, D., & Thompson, W. F. (2018). Syntactic processing in music and language: Parallel abnormalities observed in congenital amusia. *NeuroImage: Clinical*, 19, 640–651.
- Tal, I., Large, E. W., Rabinovitch, E., Wei, Y., Schroeder, C. E., Poeppel, D., & Zion Golumbic, E. (2017). Neural entrainment to the beat: The “missing-pulse” phenomenon. *Journal of Neuroscience*, 37(26), 6331–6341.
- Tang, W., Wang, X.-j., Li, J.-q., Liu, C., Dong, Q., & Nan, Y. (2018). Vowel and tone recognition in quiet and in noise among Mandarin-speaking amusics. *Hearing Research*, 363, 62–69.

- Thompson, W. F. (2007). Exploring variants of amusia: Tone deafness, rhythm impairment, and intonation insensitivity. *Proceedings of the International Conference on Music Communication Science*, 2159–2063.
- Thompson, W. F., Marin, M. M., & Stewart, L. (2012). Reduced sensitivity to emotional prosody in congenital amusia rekindles the musical protolanguage hypothesis. *Proceedings of the National Academy of Sciences*, 109, 19027–19032.
- Tillmann, B., Burnham, D., Nguyen, S., Grimault, N., Gosselin, N., & Peretz, I. (2011a). Congenital Amusia (or Tone-Deafness) interferes with pitch processing in tone languages. *Frontiers in Psychology*, 2(120).
- Tillmann, B., Gosselin, N., Bigand, E., & Peretz, I. (2012). Priming paradigm reveals harmonic structure processing in congenital amusia. *Cortex*, 48, 1073–1078.
- Tillmann, B., Jolicoeur, P., Ishihara, M., Bertrand, O., Rossetti, Y., & Peretz, I. (2010). The amusic brain: Lost in music, but not in space. *Plos ONE*, 5, 1–6.
- Tillmann, B., Lalitte, P., Albouy, P., Caclin, A. & Bigand, E. (2016). Discrimination of tonal and atonal music in congenital amusia: The advantage of implicit tasks. *Neuropsychologia*, 85, 10–18.
- Tillmann, B., Rusconi, E., Traube, C., Butterworth, B., Umiltà, C., & Peretz, I. (2011b). Fine-grained pitch processing of music and speech in congenital amusia. *The Journal of the Acoustical Society of America*, 130, 4089–4096.
- Tillmann, B., Schulze, K., & Foxton, J. M. (2009). Congenital amusia: A short-term memory deficit for non-verbal, but not verbal sounds. *Brain and Cognition*, 71, 259–264.
- Toledo-Fernández, A., Villalobos-Gallegos, L., García-Gómez, L., & Salvador-Cruz, J. (2018). Validity of the Montreal Battery of Evaluation of Amusia: An analysis using structural equation modeling. *Studia Psychologica*, 60(1), 42–56.
- Vuvan, D. T., Paquette, S., Mignault Goulet, G., Royal, I., Felezeu, M., & Peretz, I. (2018). The Montreal Protocol for Identification of Amusia. *Behavior Research Methods*, 50(2), 662–672.
- Weber, C., Hahne, A., Friedrich, M., & Friederici, A. D. (2004). Discrimination of word stress in early infant perception: Electrophysiological evidence. *Cognitive Brain Research*, 18, 149–161.
- Weber, C., Hahne, A., Friedrich, M., & Friederici, A. D. (2005). Reduced stress pattern discrimination in 5-month-olds as a marker of risk for later language impairment: Neurophysiological evidence. *Cognitive Brain Research*, 25, 180–187.

References

- Wechsler, D. (1964). *Hamburg-Wechsler-Intelligenztest fuer Erwachsene: HAWIE* 3rd ed., Bern: Huber.
- Werker, J. F., & Logan, J. S. (1985). Cross-language evidence for three factors in speech perception. *Perception & Psychophysics*, 37(1), 35–44.
- Whiteford, K. L., & Oxenham, A. J. (2017). Auditory deficits in amusia extend beyond poor pitch perception. *Neuropsychologia*, 99, 213–224.
- Wiese, R. (1996). *The Phonology of German*. Oxford: Clarendon Press.
- Williamson, V. J., & Stewart, L. (2010). Memory for pitch in congenital amusia: Beyond a fine-grained pitch discrimination problem. *Memory*, 18(6), 657–669.
- Williamson, V. J., Cocchini, G., & Stewart, L. (2011). The relationship between pitch and space in congenital amusia. *Brain and Cognition*, 76(1), 70–76.
- Williamson, V. J., Liu, F., Peryer, G., Grierson, M., & Stewart, L. (2012). Perception and action de-coupling in congenital amusia: Sensitivity to task demands. *Neuropsychologia*, 50, 172–180.
- Williamson, V. J., McDonald, C., Deutsch, D., Griffiths, T. D., & Stewart, L. (2010). Faster decline of pitch memory over time in congenital amusia. *Advances in Cognitive Psychology*, 6(6), 15–22.
- Winsler, K., Midgley, K. J., Grainger, J., & Holcomb, P. J. (2018). An electrophysiological megastudy of spoken word recognition. *Language, Cognition and Neuroscience*, 33(8), 1063–1082.
- Wise, K. (2009). *Understanding “tone deafness”: A multi-componential analysis of perception, cognition, singing and self-perception in adults reporting musical difficulties*. PhD dissertation, Keele University.
- Ylinen, S., Huotilainen, M., & Näätänen, R. (2005). Phoneme quality and quantity are processed independently in the human brain. *NeuroReport*, 16(16), 1857–1860.
- Ylinen, S., Shestakova, A., Huotilainen, M., Alku, P., & Näätänen, R. (2006). Mismatch negativity (MMN) elicited by changes in phoneme length: A cross-linguistic study. *Brain Research*, 1072(1), 175–185.
- Zhang, C., Shao, J., & Huang, X. (2017). Deficits of congenital amusia beyond pitch: Evidence from impaired categorical perception of vowels in Cantonese-speaking congenital amusics. *PLoS ONE*, 12(8): e0183151.
- Zhou, L., Liu, F., Jiang, J., & Jiang, C. (2019). Impaired emotional processing of chords in congenital amusia: Electrophysiological and behavioral evidence. *Brain and Cognition*, 135, 103577.

- Zhou, L., Liu, F., Jiang, J., Jiang, H., & Jiang, C. (2019). Abnormal neural responses to harmonic syntactic structures in congenital amusia. *Psychophysiology*, 56, e13394.
- Zhou, L., Liu, F., Jing, X., & Jiang, C. (2017). Neural differences between the processing of musical meaning conveyed by direction of pitch change and natural music in congenital amusia. *Neuropsychologia*, 96, 29–38.