THE UNIVERSITY OF SYDNEY | Voice Lab
Supported by the Dr Liang Voice Program

Acoustic Analysis Normative Data Reference Sheet

Acoustic analysis (adults)

Measure	Explanation	Norms (adults)	Reference
Average Fundamental Frequency (F0)	The natural mean pitch of the voice during conversation.	*Males*: 115 Hz (SD 21) *Females*: 199 Hz (SD 28)	Leung, Y., Oates, J., Papp, V., & Chan, S.P. (2022). Speaking fundamental frequencies of adult speakers of Australian English and effects of sex, age, and geographical location. *Journal of Voice*, 36(3), 434–e1. doi:10.1016/j.jvoice.2020.06.014.
Harmonic-to-Noise Ratio (HNR)	Indicates the clarity of the voice.	20dB and above is non-disordered 25dB and above is rated as clear	Warhurst, S., Madill, C., McCabe, P., Heard, R., & Yiu, E. (2012). The vocal clarity of female speech-language pathology students: an exploratory study. *Journal of Voice*, 26(1), 63–68. doi:10.1016/j.jvoice.2010.10.008.
Pitch Range	The highest and lowest pitch of the voice.	*Males*: 78–698 Hz *Females*: 139–1108 Hz *Please note: This paper involved participants with voice/singing training	Hollien, H., Dew, D., & Philips, P. (1971). Phonational frequency ranges of adults. *Journal of Speech and Hearing Research*, 14(4), 755–760. doi:10.1044/jshr.1404.755.
Maximum Phonation Time (MPT)	Longest period the voice can be sustained. when producing a prolonged ‘ah’.	Adults can typically hold a quiet sound for 15–20 seconds	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(5), 545–555. doi:10.1016/j.jvoice.2013.03.002.

S/Z ratio	The ratio of time a person can sustain a 's' vs. a 'z' sound on a single breath.	Adults typically have a S/Z ratio of 0.99–1.40	Van der Meer, G., Ferreira, Y., Loock, J.W. (2010). The S/Z ratio: A simple and reliable clinical method of evaluating laryngeal function in patients after intubation. *Journal of Critical Care*, 25(3), 489–492. doi:10.1016/j.jcrc.2009.11.009.
Intensity	The volume of voicing produced by an adult speaker.	Available Intensity Range (AIR): 59.81–97.53dB Conversational Intensity Range (CIR): 60.39–77.23dB Conversational Intensity Level (CIL): 68.15dB Maximum intensity: *Males:* Mean: 110dB SD: 7.1 *Females:* Mean: 106dB SD: 3	Gelfer, M.P., & Young, S.R. (1997). Comparisons of intensity measures and their stability in male and female speakers. *Journal of Voice*, 11(2), 178–186. doi:10.1016/s0892-1997(97)80076-8. Casper, J.K., & Leonard, R. (2006). *Understanding voice problems: A physiological perspective for diagnosis and treatment*. Lippincott Williams & Wilkins.

Acoustic analysis (children)

Measure	Explanation	Norms (children)	Reference
Average Fundamental Frequency (F0)	The natural mean pitch of the voice during conversation.	*Age 4:* 277 Hz (range 243–329) (SD 26.42) *Age 5:* 263 Hz (range 220–306) (SD 23.86) *Age 6:* 277 Hz (range 229–320) (SD 27.53) *Age 7:* 260 Hz (range 216–302) (SD 25.73) *Age 8:* 255 Hz (range 203–310) (SD 32.36) *Age 9:* 249 Hz (range 218–293) (SD 27.23) *Age 10:* 270 Hz (range 225–316) (SD 25.06) *Age 11:* 249 Hz (range 218–293) (SD 26.36) *Age 12:* 243 Hz (range 202–275) (SD 19.70) *Age 13:* 227 Hz (range 171–273) (SD 27.08) *Age 14:* 208 Hz (range 162–249) (SD 25.74) *Age 15:* 222 Hz (range 189–247) (SD 20.93) *Age 16:* 220 Hz (range 170–275) (SD 32.07) *Age 17:* 219 Hz (range 181–265) (SD 24.55) *Age 18:* 235 Hz (range 195–267) (SD 28.67)	Maturo, S., Hill, C., Bunting, G., Ballif, C., Maurer, R., & Hartnick, C. (2012). Establishment of a normative pediatric acoustic database. *Archives of Otolaryngology–Head & Neck Surgery*, 138(10), 956–961. doi:10.1001/2013.jamaoto.104.

Harmonic-to-Noise Ratio (HNR)	Indicates the clarity of the voice.	*Age 4–10 years*: *Boys*: Vowel /ʌ/: 2.368 (2.75) Vowel /ai/: -0.295 (2.96) *Girls*: Vowel /ʌ/: 2.346 (3.26) Vowel /ai/: 1.051 (3.46)	Ferrand, C.T. (2000). Harmonics-to-noise ratios in normally speaking prepubescent girls and boys. *Journal of Voice*, 14(1), 17–21. doi:10.1016/s0892-1997(00)80091-0.
Maximum Phonation Time (MPT)	Longest period the voice can be sustained when producing a prolonged 'ah'.	*4–6 years:* Males: 5.97 seconds Females: 6.21 seconds *7–9 years:* Males: 8.07 seconds Females: 7.79 seconds *10–12 years:* Males: 9.05 seconds Females: 8.92 seconds	Tavares, E.L.M., Brasolotto, A.G., Rodrigues, S.A., Pessin, A.B.B., & Martins, R.H.G. (2012). Maximum phonation time and s/z ratio in a large child cohort. *Journal of Voice*, 26(5), 675–e1. doi:10.1016/j.jvoice.2012.03.001
S/Z ratio	The ratio of time a person can sustain a 's' vs a 'z' sound on a single breath.	0.8–1.2 (1.0 for most children)	Tavares, E.L.M., Brasolotto, A.G., Rodrigues, S.A., Pessin, A.B.B., & Martins, R.H.G. (2012). Maximum phonation time and s/z ratio in a large child cohort. *Journal of Voice*, 26(5), 675–e1. doi:10.1016/j.jvoice.2012.03.001.