

HOW I DO IT ... INTENSITY LEVEL CALIBRATION OF AUDIO RECORDING SYSTEMS FOR CLINICAL VOICE ANALYSIS

Youri Maryn^{1,2,3,4}, Andrzej Zarowski¹

¹Sint-Augustinus Hospital, European Institute for ORL-HNS, Wilrijk/Antwerp, Belgium

²University College Ghent, Department of Speech-Language Therapy, Ghent, Belgium

³University of Antwerp, Faculty of Medicine and Health Sciences, Antwerp, Belgium

⁴Phonanium, Lokeren, Belgium

youry.maryn@gza.be

(Disclosure: Youri Maryn has a financial interest in a website-based company that sells information described/demonstrated in this workshop.)

Sound intensity level (IL) is an essential acoustic aspect of clinical voice signals. First, it is typically reduced in patients with for example unilateral vocal fold paralysis, and it is typically increased in patients with increased vocal effort and vocally abusive behaviors. Second, it is associated with various physiological events across the lower and upper airways and can therefore be regarded as an important diagnostic marker in the clinical voice assessment. At the subglottal level, vocal sound intensity is positively related to subglottal pressure (especially at lower frequencies) and tracheal airflow (especially at higher frequencies). At the level of the glottis, it is positively related to the vibratory phase closure, the velocity quotient, and the amplitude of vocal fold excursions. At the supraglottal level, shape and stiffness of the vocal tract can affect the resonance characteristics and consequently also the intensity of the sound at the glottal source. IL is thus an important aspect of acoustic voice/speech signals, both diagnostically and physiologically. Furthermore, IL is one of the two major aspects in the phonetogram (also known as the voice range profile or the F_0 -IL-covariance plot), a commonly administered method for combining/assessing glottal adjustment capacity and different driving pressures.

Measuring IL is thus clinically relevant, but it is important that measures of IL with clinical audio recording and analysis systems are calibrated. To be considered valid and reliable, this implies that measures of IL should be compared with and adjusted to the output of a sound level meter. However, literature and data regarding the calibration of IL measures for clinical purposes are scarce. Maryn & Zarowski (2015) therefore evaluated the accuracy, validity and feasibility of three straightforward calibration methods including audiometric speech noise signals and human voice signals under typical speech conditions. Their study included twenty-nine recording systems. This workshop will first cover the outcomes of this study and then discuss their reliability and validity. Subsequently, the calibration method using human voice signals will be demonstrated as to be administered in the voice clinic.

This clinically feasible calibration method consists of comparing the data from the measurement microphone-and-computer systems with the data from the sound level meter using signal-specific comparison with natural voice at at least three levels. Intensity measures from the recording systems will then be linearly converted into calibrated data based on this comparison. How to calibrate according to this method and how to interpret the outcomes of the calibration method, will be part of the practical part of the workshop. Finally, additional aspects such as 'How frequently should a clinical recording system be calibrated' will be addressed.