

Units of Measurement

Decibel

dB Sound Pressure Level (dB SPL)

dB Hearing Level (dB HL)

dB Sensation Level (dB SL)

dB Intensity Level (dB IL)

In order to describe how loud a sound is, or what the magnitude and intensity of a sound is, the decibel (dB) scale is used. The unit decibel is derived from the Bel, since it is a tenth of a Bel. The dB scale expresses a ratio between two physical quantities using logarithms. The formula used to determine a dB is $(dB = 10\log[I_x/I_r])$, with the I_x being the intensity power/area and I_r being the reference intensity of 20 micropascals, which is the softest sound a normal hearing individual can hear.

Sound pressure level (dB SPL) is the pressure exerted by a sound in reference to the lowest level a non-impaired ear can hear and it can be expressed as $(10\log[P_x/P_r])^2$ or $20\log[P_x/P_r]$. To convert dB SPL to dB HL you divide the dB SPL by the reference of 20 micro pascals and the ratio gives you the dB HL. Gelfand et al, shows us how dB SPL varies by frequencies, for example for an individual to hear a 250 Hz tone, it must be presented at 25.5dB SPL, while hearing a 1000 Hz tone requires a 7.5dB SPL.

In the clinic we use dB HL which refers to the dB hearing level and it is based on the normative values relative to the average threshold of normal hearing listeners in dB SPL, which is now termed 0 dB HL. This unit is commonly used in audiology because audiometers use dB HL.

Another unit used clinically is dB sensation level which refers to the amount above an individual's threshold in dB HL. For example, a 40 dB SL means 40 dB above a threshold, so if a person's threshold is 10 dB HL, 40 dB SL is 50 dB HL. Audiologists use this unit of measurement to help calculate a person's speech recognition threshold (SRT) and speech recognition scores (SRS). In order to obtain SRT, the audiologist must familiarize the patient with a closed set of words at 25dB SL in regard to their pure tone average. And in addition, SRS is conducted at 35/40 dB SL re:SRT, this is done so that we are sure the words are loud enough for the patient to hear so they can perform to the best of their ability.