Demonstration 2.2

Pressure to Decibels

Illustration of the relationship between increasing pressure an increases in dB.

Consider the following stimuli:

1. A sound with rms pressure of 0.0002 Pa
2. A sound with rms pressure of 0.002 Pa
3. A sound with rms pressure of 0.02 Pa

Using the equation 20log(P1/Pref), we calculate the dB SPL values of these three sounds. Recall that Pref = 20μPa, or $2x10^{-5}$ Pa, which is also 0.00002 Pa.

1. 20log(0.0002 Pa/0.00002 Pa) = 20log(10) = 20 dB SPL
2. 20log(0.002 Pa/0.00002 Pa) = 20log(100) = 40 dB SPL
3. 20log(0.02 Pa/0.00002 Pa) = 20log(1000) = 60 dB SPL

In this way, we can see that multiplying the pressure by 10 leads to a 20 dB increase to the sound level of these stimuli. Note also that the frequency of the sound does not matter – these relationships will hold true for sounds with any frequency content. dB SPL is not dependent on frequency.