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Perceptual Weights for Loudness Judgments of 6-Tone Complexes

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In a series of studies, 6 subjects with normal hearing (NH) and 3 with sensorineural hearing loss (SNHL) judged the overall loudness of 6-tone complexes comprised of octave frequencies from 0.25 to 8 kHz. In two tasks, tones were equated in level in dB SPL or in sensation level (SL) and a range of SPL or SL values was tested. Both tasks used two-interval forced-choice trials, with level "jitter" introduced by selecting the level of each tone from a normal distribution with specified mean level and standard deviation of 5 dB. Subjects were instructed to indicate which complex was louder. In the "loudness" task there was no difference in mean level across the two intervals. In the "sample discrimination" task, the two complexes differed by an average of 5 dB. For both tasks, perceptual weights were derived by correlating the differences in level between matched-frequency tones in the complexes and the loudness decision on each trial. Weights derived from the loudness task (no mean level difference) were highly correlated with weights derived from the sample discrimination task (5-dB difference). For SPL conditions, both NH and SNHL subjects placed less weight on the lowest frequency and greater weight on higher frequencies with increasing intensity of the complexes, with larger effects for NH subjects. This effect was not observed in conditions where levels were equated in SL. Weights derived from a single-interval categorical loudness scaling task, where subjects judged the overall loudness of 6-tone complexes, were highly correlated with those from the other tasks. Simulation of these experiments using a model of loudness perception [Moore and Glasberg, J. Hear Res. 188 (70-88)] yielded weights for these stimuli that were highly correlated with specific loudness, but the observed weights did not agree with predicted weights. This suggests that model assumptions regarding specific loudness are not correct. [Supported by R01 DC006648 and T32DC000013]