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Global loudness of ramped and damped sounds

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ABSTRACT

How does listeners judge the global loudness of non-stationary sounds ? For sounds of long durations (dozens of seconds), different results were found. Some authors shown that the global loudness is mainly influenced by the louder part of a sound sequence. Others have found that the end of the signal has a prominent action on the global loudness perception, specially if the louder part is located at the end of the sound sequence. In this study, shorter sounds (1.8s) were tested varying linearly in intensity with either an increasing or decreasing ramp. Global loudness of 1-kHz tones, synthetic vowel sounds and white noises was judged by participants using a magnitude estimation procedure. Several ramp ranges were tested of either two sizes (15 and 30 dB). Moreover, the loudness functions were measured for 500ms stationary sounds (tone, vowel and white noise). It has been shown that global judgments of ramped sounds are close, but always slightly lower mainly for the synthetic vowel sounds and the white noises, to the loudness estimates of stationary sounds with amplitudes equal to those at the end of the ramps. In addition, the global loudness for ramp sizes of 15 dB was louder that for ramp sizes of 30 dB showing a loudness integration process over time. Therefore these results show that global loudness is largely dependant on the loudness at the end of the sound and to a lesser extent on the dynamic of the ramp. For ramp ranges of lower intensities, the global loudness estimates for ramp sizes of 15 dB is equal to the loudness estimates at the end of the sound. Thus, it seems that the integrating window depends on the ramp range. For damped sounds, the global loudness is close to the loudness of the beginning of the sound. Similarly to ramped sounds, the global judgments were higher for ramp sizes of 15 dB than for ramp sizes of 30 dB. For ramp sizes of 15 dB, and for lower intensities, the global loudness estimates are equal to the loudness at the beginning of the sound. Finally, at a given ramp range and a given ramp size, the global loudness of ramped sound is slightly greater than the global loudness of damped sound confirming previous result obtained for 1-kHz pure tones with a similar duration (2 sec). However the effect is reversed for ramp range of higher intensities for the white noise and ramp sizes of 30 dB. Further investigations are needed to examine this asymmetry for longer durations.