Tactile perception of auditory roughness

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Abstract

Roughness is a perceptual attribute associated with several of our senses. Usually, roughness is a perceptual attribute that relates to touch and characterizes the surface of a texture. Interestingly within the auditory domain, roughness relates to very fast fluctuations in sounds. It is closely related to the perception of dissonance in musical sounds. It also plays a crucial role in animal and human vocalizations to convey aversiveness or alarm signals. It is often studied by summing two pure tones with close frequencies which results in sounds amplitude modulations. However, there is a clear distinction between auditory roughness and surface roughness: auditory roughness is a temporally based perceptual property experienced through hearing whereas surface roughness is spatiotemporal and assessed by touch In contrast to previous studies, here we show that the sensation of auditory roughness can also be experienced through touch by means of vibrations from the same two-tone signals used in the auditory domain. With two psychophysical experiments, we showed that the degree of perceived roughness varies with respect to the modulation frequency similarly for hearing and touch. This suggests that auditory and tactile sensory systems shared similar processing in the perception of modulations. It attests to the relevance of such stimuli for future work on multisensory integration.

Keywords: Roughness, Tactile perception, Audition, mMltisensory integration

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