

UNDERSTANDING HOW HUMANS PERCEIVE HIGH-FREQUENCY VIBRATIONS

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Background: Modern interfaces have diminished the haptic interactions found in various devices, favouring visual or auditory stimuli instead. However, users seem to prefer receiving haptic feedback when interacting with interfaces, as this feedback is a natural and simple way of receiving and processing information. Moreover, haptic feedback is a more inclusive interaction modality, available to both blind and deaf people. For these reasons, in recent years, research and technology companies have begun to once again turn their attention to the integration of haptic feedback, such as vibrations, in their human-machine interfaces. Importantly, these vibrations are only worthwhile and fruitful for human interaction when users can actually perceive and interpret them, regardless of their own individual characteristics, the context of use, and the technology used to generate them. This requires a profound knowledge about the way humans perceive haptic stimuli from different vibrations, or vibrations with different frequencies and amplitudes. One of the aspects involved in vibration perception is the Vibration Perception Threshold (VPT), i.e., the minimum amount of amplitude needed for the conscious perception of a vibration stimulus of a given frequency. This project intends to characterize VPT for high-frequency vibrations in the human hand.

Aims: To assess psychophysical characteristics of the perception of vibrations with high frequencies (250 to 500 Hz) on the hand on a normative sample; create design guidelines and recommendations for the use of high frequency (250 to 500 Hz) vibrotactile actuation on devices with haptic feedback.

Method: Three experimental studies, following different psychophysical methodologies. Study 1 will measure and compare VPTs using the Staircase and the von Békésy methods. Study 2 will establish normative values for the perception of high frequency vibrations in healthy adults. Study 3 will test the ability to discriminate two simultaneous high frequency vibrations with the same amplitudes.

Preliminary results: One published journal paper showing how vibrations are perceived by riders in a motorcycle simulator. Two PRISMA reviews, one focusing on the methodological aspects of various VPT studies, and the other focusing on the VPT results obtained from those same studies, are currently under submission and under preparation, respectively, for publication in a scientific journal. Study 1 is currently underway.

Keywords: Touch, Psychophysics, Haptic, Vibration perception threshold, Psychophysiology

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