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Perturbation effect of noise on overall feeling of discomfort from vertical whole-body vibration in vibro-acoustic environment

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Abstract
The human discomfort from combined noise and vibration has been investigated with a new perspective. The concept in perturbation effect has been adopted to formulate a new novel predictive model of human discomfort from noise and vibration. A psycho-physics experiment has been designed to identify the perturbation effect which caused by noise stimulus. The experiment involved twelve (12) subjects. Each subject was imposed in random order with a total of 42 combinations of seven (7) levels of noise (X, 61, 71, 77, 84, 87, 89 dBA) where the X is no noise stimulus, and six (6) levels of vibration dose values (V1 = 0.2079, V2 = 0.3242 V3 = 0.6388 V4 = 0.8803 V5 = 1.4947 and V6 = 1.8624 m/s1.75). Initially, the subject would be imposed with a reference combination of noise and vibration which was assumed to have a value of 100. The assigned combination for reference was chosen at sound exposure level, LAE of 71 dB(A) and the vibration dose value, VDV of 0.2079 ms−1.75. Then the subject was imposed with other combinations of noise and vibration in a duration of 5 s and 5 s break in between the stimuli combination. After each exposure to each combination of noise and vibration, the subject is required to state the discomfort caused by the noise and vibration in the form of a number relative to the reference stimuli of 100. The subject was asked to be seated in a relaxed position, holding a handphone and used it to record all the response values after each stimulation. The finding suggested that the discomfort from vibration can be predicted with equation $\psi_v = 170.6082 a_{vdv}^{0.6662}$ and the overall discomfort from noise and vibration is given by $\psi_{v-n} = \psi_v + \psi_v \varepsilon$ where the ε is the perturbation effect caused by noise stimulus. © 2021 Elsevier B.V.

Author Keywords
Combined noise and vibration; Overall discomfort; Perturbation theory

Index Keywords
Predictive analytics; Noise and vibration, Overall discomforts, Perturbation effect, Physics experiments, Predictive modeling, Sound exposure levels, Vibroacoustics, Whole body vibration; Acoustic noise; adult, article, controlled study, female, human, human experiment, male, noise, psychophysics, whole body vibration

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