

DOSE-RESPONSE MODEL FOR ANNOYANCE PERCEPTION OF TONAL NOISE

BACKGROUND

The tonal noises can cause unpleasant evaluation of spaces and potentially increase complaints by mental workers. So far, however, there has been limited research on the effects of tones on human annoyance that can be used to set objective guidelines or limits on tones in noise. Current indoor noise evaluation methods do not directly account for tonal characteristics of the noise. The annoyance thresholds experienced by the general population with regards to the degree of tones in noise is a significant piece of knowledge that has not been well-established.

OBJECTIVES

The projects addresses three complementary research objectives:

- to develop a clear and uniform testing procedure for examining relationship between tonality perception and noise induced complaint by tones
- to examine the relationship between associated tonal noise metrics and annoyance perception
- to determine upper limits of acceptability for tonality with the goal of developing a dose response relationship that can be used to set guidelines for tones in noise

The results of research will be compared and analyzed in order to propose acceptable noise levels for tonal noise applied to workstations of mental workers that require concentration - for example in administrative rooms, design offices, theoretical work, data preparation and other for similar purposes.

DELIVERABLES

Joint scientific paper about dose-response model for annoyance perception of tonal noise. Conference presentation summarizing project results.

To determine relations between noise metrics and annoyance work performance test commonly used in psychology experiments will be used (Vienna Test System) with exposure to variety of test signals. The results will be analyzed to show the highest correlation coefficients with annoyance ratings across all signals described by acoustical parameters: 1/3 octave method, Prominence Ratio (PR), Tone-to-Noise Ratio (TNR) and Tonal Audibility (ΔL_{ta}), and others depending on the result of the literature analysis.

RESEARCH METHODS

Subjective testing procedure for dose-response model. After the hearing threshold screening test, study participants will be informed about how annoyance is defined in this study and the purpose of the project. After each trial, the participants will be asked to fill out a subjective questionnaire to indicate how annoyed they were by the noise, and whether or not they would complain about the noise. Tests will be performed for all frequency bands of interest by each institute, using identical setups (questionnaire, hardware, headphone or speaker layout, test-signals, etc).

A dose-response model will be developed from the collected responses to determine thresholds of acceptability for tonality, using a binary logistic regression model. Based on the analysis of relationship between associated tonal noise metrics and annoyance perception, maximum two prediction variables will be chosen for the regression model.

After literature study other methods can be applied e.g. the influence of tonal noise on the cognitive performance of the subjects, the delta between annoyance perception of tonal noise and decrease in cognitive performance, 'serial recall', as a dual task paradigm. Test methods will be discussed during first meeting directly after the literature study phase.

SCIENTIFIC RELEVANCE

A review of previous research on noise-induced annoyance and the investigation on the effects of noises on task performance suggest that the tonality in noise is one of the primary factors in annoyance perception and there is a possibility to develop Dose-response relationship between tonality perception and noise induced complaint by tones. However, more research is necessary to determine acceptable levels of tones in noises. The impact on task performance of tonal signals that are commonly found in the built environment is not as clear. The cooperation on research objectives between the project partners will allow for synergistic effects. The PEROSH institutes can further exchange knowledge based on the project results. They can fill in the gaps and create solutions for noise annoyance assessment in work environment.

PRACTICAL/SOCIETAL RELEVANCE

- Expert knowledge exchange
- Online access to key data sources
- Establishment of criteria for tonal noise in work environment
- Improvement of working conditions

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