Combined Qualitative and Quantitative Measurements to Evaluate Noise from Combined Sources

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Abstract: There is a need of different methodical procedures and acoustical parameter sets to identify particular effects of annoyance. In a socio- and psychoacoustical field and laboratory study different combinations of synergistic environmental traffic noise are evaluated. Frames of reference for judging the annoyance and disturbance of a single noise source are compared to the overall annoyance and disturbance in a multi source environment.

INTRODUCTION

An interdisciplinary approach for analyses of individual effects on noise of road traffic, railroad traffic and air traffic in urban residential areas methodically have been developed and tested in a combined field- and laboratory study over the duration of two years in Oldenburg and Schortens, Germany (5). The question for annoyance and disturbance caused by noise effects is explored in three different residential areas, selected as to the social structure feature on the one hand and the quantity of noise from different sources on the other.

The methodological procedure is defined by combining qualitative-explorative and objective-standardized measurements.

The qualitative-explorative procedures: 1. Field analysis through acoustical-ecological explorations to do the structural analysis of the noise fields, 2. Narrative interviews, 3. Acoustical journals - interviewed residents were recording and commenting the noises attracting their attention, 4. Laboratory experiments by Categorical scaling combined with the procedure of Intermittent and Subsequent thinking aloud (CIS- method) of the noises recorded in the environmental area the subjects are living in.


The test persons: In order to compare systematically, persons are selected who differ from status like profession, education, and quality of habitation, status in the neighborhood and from their residential areas that are burdened with one or several noise sources.

It is the goal to estimate the subjective relevance of noise effects in the daily residential - and living area. Noise events will be analyzed regarding the aspect of effects in reference to disturbance and annoyance.

EFFECTS OF COMBINED NOISES IN RESIDENTIAL AREAS

The results presented here in reference to the judgments of disturbance and annoyance of the noises based on the qualitative-explorative procedure in the field study are to be seen against the background of the typical structure of the selected residential areas. The combined laboratory studies carried out on loudness and unpleasantness assessments are focussed on the noises recorded in the environmental areas, where the interviewees are living in.
The raised data to frequency, duration, appearance of the noises to different times of days, to the distance of the residences regarding to noise sources yield in the analysis an ecological-acoustic immission profile, which is described also by the residents.

The analysis of the activities described by the residents like disturbing activity shows the focus on typical activities in the residential and living area. Considering the social situations, which are disturbed, there are mainly different forms of communication, which are of first importance for the interviewed residents. The noise effects that are considered to be annoying and disturbing are not subject of their control, the noise events are distributed over the day and interrupt or limit the own activity frequently, and they call forth for the residents the feeling to be at the mercy of the noises.

From the detailed descriptions emerges that the disturbance of activities causes changing the behavior and the actual activities: behavioral strategies are developed. You can establish for all interviewees, that comparable strategies are formed, to counteract the noise events through masking noises and activities, and training of behavior. A further criterion of subjective processing and behavioral strategies is the so-called habituation to noise. (5).

Social factors like special living conditions and life styles could be identified as correlating with noise annoyance and disturbance.

In the laboratory study for different noise settings there is a one-category difference in the loudness judgments by the interviewees from the chosen areas in Oldenburg compared to the interviewees living in Schortens. The reason for the people to judge differently may be based on their everyday experience with the noises presented in the laboratory. The very first results of a laboratory study on unpleasantness assessments for the same noises and additional decompositions carried out in Toronto seem to validate the complexity and context sensitivity of noise assessments.

CONCLUSION

It is the context of assessments of annoyance and disturbance of noises from different sources, which has to be taken into account for measurement procedures. There is a need for a sufficient measurement to provide insight information that would enhance the understanding of the complex processes that are the cause of annoyance and disturbance, and are inherent in assessments on noise.

The first results of the study presented here show the study to be perceived as a starting point of a new approach to develop an annoyance and disturbance measurement. The results of the laboratory parts of the study indicate that it may be the decomposition of the noise events that should be integrated in such a study on different psychoacoustical parameters. The results of the field study demonstrate the complexity and the complicated context behind annoyance and disturbance assessments. Complications may increase, when an attempt is being made to model the annoyance and disturbance reactions.

REFERENCES

1. Fields, J.M., An analysis of resident's reaction to environmental noise sources within an ambient noise context, DOT/FAA/EE-96/08. US Department of Transportation, Federal Aviation Administration, Washington DC, 1996
2. Rice, C.G., Diamond, I.D.: Models of community reaction to noise from more than one source, University of Southampton, 1986