



Laboratory Experiments for Noise Impact Assessments

Swedish researchers have investigated whether there are differences in the effects of road traffic noise on sleep between studies performed in the laboratory and in field settings. The results suggest that laboratory experiments do not exaggerate the effects of sleep disturbances from road traffic noise.

Various studies in Europe suggest that about half of all EU residents live in zones that do not ensure acoustical comfort. At night, it is estimated that over 30% of EU residents are exposed to noise levels that are sufficient to disturb sleep. Indeed, sleep disturbance is a major effect of environmental noise, but the present state of knowledge on the effects of noise from experiments performed in the field and laboratory do not constitute a sufficient base for the establishment of a reliable exposure-effect relationship.

In the past, studies on the effects of noise on sleep were performed only in the laboratory. Nowadays, the development of new technical equipment allows observations of sleep disturbances induced by noise in the home environment. However, discrepancies between the results of field studies and laboratory experiments have raised the question about the accuracy of results from laboratory experiments. They have also put in to question the usefulness of laboratory experiments in evaluation of the impacts of possible abatement strategies that aim to reduce the noise pollution effects on human and environmental health.

As a part of a large research programme, a team of Swedish researchers have assessed the effects of noise on the sleep of individuals who were chronically exposed to road traffic noise. The aim of the study was to investigate whether there are any differences in effects between sleep studies performed in the laboratory and in the home environment with equal road traffic noise exposure.

To this end, fourteen persons, living along the same street with a relatively high load of road traffic, slept four nights at home and four nights in a "sleep laboratory" where they were exposed to played back "home road traffic noise". The average exposure level was $L(A)_{eq}$ 33 dB with maximum levels of $L(A)_{max}$ 50 dB which is above the WHO guidelines for sound level inside bedrooms (30 and 45 dB, respectively). The effects on sleep were evaluated by questionnaires and wrist-actigraphy, a method used to evaluate sleep efficiency by recording movement made during sleeping hours.

The results show that with subjects used to sleeping with noise from road traffic noise, no significant differences were found between sleep in the laboratory and at home with the same traffic noise exposure when sleep was assessed by questionnaires and actigraphy. According to the authors, a plausible interpretation of the results from this study is that laboratory experiments do not exaggerate the effects of road traffic noise on sleep provided that sleep is assessed with the same methods and that a homelike environment is created in the laboratory.

Consequently, the laboratory experiments conducted in such homelike environment could play an important role in assessing the efficiency of different noise abatement strategies used to achieve a more acceptable acoustic environment in residential areas.

Source: Skånberg, A and Öhrström E. (2006) "Sleep disturbances from road traffic: A comparison between laboratory and field settings", *Journal of Sound and Vibration*, 271(1-2): 279-296

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