

# EPIDEMIOLOGICAL RESEARCH ON STRESS CAUSED BY TRAFFIC NOISE AND ITS EFFECTS ON HIGH BLOOD PRESSURE AND PSYCHIC DISTURBANCES

C. Maschke

Mueller BBM, Nollendorfpplatz 3-4, 10777 Berlin, Germany  
++49 89 85602-335, ++49 89 85602 111, CMaschke@muellerbbm.de

**Abstract** Within a cohort study the effect of independent calculated nightly and daily road noise exposure on cardiovascular disorders as well as on psychic disturbances were analysed. The study shows a significant and relevant rise in the risk of medical treatments (e.g. for hypertension) for those residence effected by higher nightly equivalent sound levels. However, the medical treatments did not show a significant relation with the daytime noise exposure as well as with the subjective disturbance by noise during the daytime or at night. In contrast to cardiovascular disorders, a significant correspondence was found between noise-induced disturbance during the day and treatments of psychic disturbances.

**Method** The "Spandau health survey" has been carried out by the Robert Koch-institute in close cooperation with the local health authority ever since 1982. In the follow-up study, the health status of the participants was periodically examined in steps of every two years. The medical and case history data collected during the study comprised among other things of social economic data (age, sex, education, profession, marital status etc.); nutrition (e.g. fat balance, fluid balance); alcohol and tobacco intake; health status; active health prevention; sleep experience as well as measurements of blood pressure; urine examination; size and weight; breath function and blood values. All participants received a medical evaluation from their "health check" and were requested to go to a doctor if there had been clear diagnostic findings.

The minimum age of the test persons was 16 years; no maximum age limit was established. Altogether 1718 test persons were examined. In addition to the standard inventory, the disturbances by noise and the equivalent sound level were collected in the 9th repetition cycle of the test persons.

## **The sound level outside the place of residence and noise disturbance in the apartment**

The exposure to noise by road traffic was gathered from a database which was provided by the Berlin council. The database contains noise levels calculated from traffic census data. Based on spatial information, distance adjustments were calculated for each residential address. Additional location categories were formed based on the orientation of the apartment windows (at the front, side, rear). For every location category augmenters were calculated from 24 hour level measurements at a sub-sample. Finally, the data base levels were adjusted according to distance and the augmenters.

With the questions "How much do you "feel" disturbed by the following sources of noise in your apartment during the day (at night)?" the disturbance by noise was simultaneously questioned for day and night time. In this way it was possible to analyze the effect of health effect of both the subjective disturbance by noise in the apartment, as well as in the equivalent sound level at the place of residence.

**Statistics** The prevalence of medical treatments was evaluated for the 9th repetition cycle as well as in the course of the lifetime (lifetime prevalence). Logistical regressions were used for

a multiple statistical analysis. As point estimators, relative risks (Odds ratios = OR) were calculated. The relative risks were adjusted according to the effects of "age", "alcohol intake", "body mass index", "hearing ability", "loss of spouse", "noise sensitivity", "professional mobility", "sex", "socio economic index", "sporting activity", "tobacco intake" and "season of the examination".

**Results** It was noted, that the risk of medical treatment for hypertension increased significantly with advancing age and with increasing body mass index; the risk of psychic disorders increased with advancing age, higher noise sensitivity and loss of spouse. This result concurs with other examinations.

**Equivalent Sound Level at the Place of Residence and Hypertension** The medical treatment of hypertension shows a small but not significant correlation with the equivalent sound level by road traffic during the daytime.

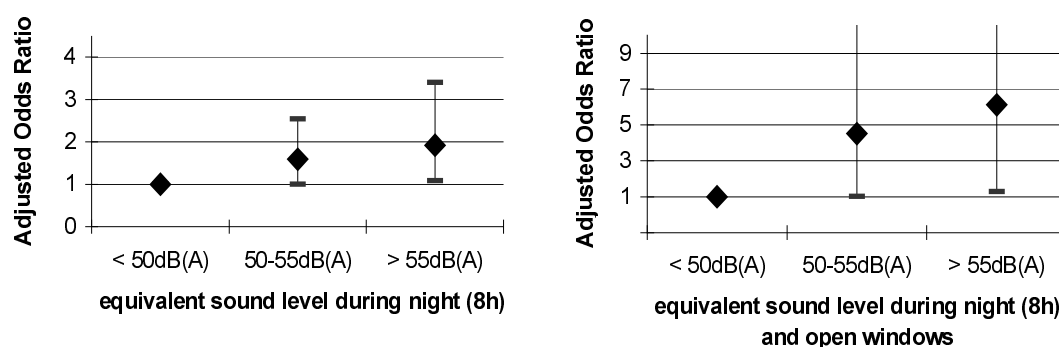


Fig. 1: Statistical relation between daytime and night time road traffic noise and treatments of hypertension in the 9<sup>th</sup> repetition cycle (N=1351)

In contrast to the daytime results, the relative risk of medical treatment due to nightly sound exposure with more than 55dB(A) rises to 1.9 in comparison to the reference category (equivalent sound level below 50dB(A)). The relative risk increased to 6.1 ( $p=0.023$ ) at an outdoor level of 55dB (A) and open bedroom windows (see figure 1). This result supports the thesis that the nightly sound exposure is directly responsible for the rise of medical treatments.

**Disturbance by noise in the place of dwelling and psychic disturbances** The medical treatment of psychic disturbances shows a dose effect relationship but no significant increased risks due to the nightly equivalent sound level of road traffic. The statistics formed on the noise-induced disturbance during the day was in contrast to the sound level significant for road traffic ( $p=0.006$ ), air traffic ( $p=0.027$ ) and the combined effect ( $p=0.005$ ) (see figure 2). It is to be assumed that for psychic disturbance an independent pathogenesis mechanism exist.

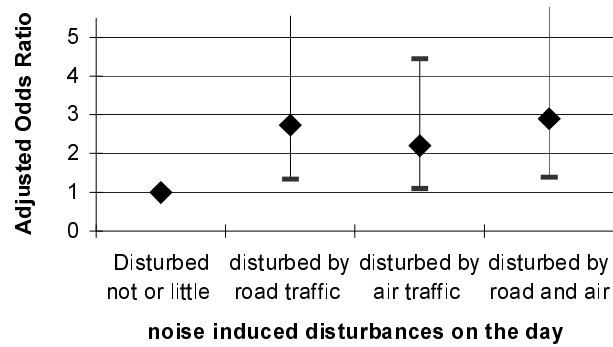


Fig. 2: Statistical relation between noise induced disturbances and treatments of psychic disturbances in the 9<sup>th</sup> repetition cycle (N=1056)

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