PROCEEDINGS of the
23rd International Congress on Acoustics

9 to 13 September 2019 in Aachen, Germany

Short-term annoyance from nocturnal aircraft noise in children: the influence of acoustical and non-acoustical factors

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EXTENDED ABSTRACT

Background: The acute psychological effects of aircraft noise have mostly been investigated in healthy adults so far. Recent noise effects research is increasingly focusing on individuals particularly sensitive to harmful noise effects. These vulnerable groups include, above all, children. Children are seen to be more at risk to the negative effects of noise due to a sensitive developmental period (1), and they have less-developed coping strategies (1,2). Almost no studies exist on effects of nocturnal aircraft noise on short-term annoyance response in children. We aimed at closing this research gap by means of the present field study.

Methods: We studied the impact of nocturnal aircraft noise on short-term annoyance in a field study conducted around Cologne/Bonn Airport in 51 children aged 8 to 10 years. Children were examined at home during four consecutive nights. During all nights, aircraft noise exposure was recorded inside the children`s bedrooms. Aircraft noise metrics such as number of aircraft noise events per night were calculated based on these measurements. Short-term annoyance ratings were carried out retrospectively each morning, 30 min after wake-up. It was measured by a question recommended by the International Commission on Biological Effects of Noise (ICBEN) (3, 4). Information on relevant psychological factors which may have a moderating effect on the relation between noise exposure and annoyance was obtained in personal interviews with the children on the first study day. Besides demographical data, questions referred to perception and evaluation of air traffic in the residential area, to attitudes towards air traffic, and to personal variables such as children`s sensitivity to noise. Children received a detailed explanation of all scales.

Results: A short-term annoyance model for children was developed by using random effects logistic regression. The categories 3 (“moderately disturbed or annoyed”) to 5 (“very disturbed or annoyed”) of the original five-point annoyance scale were combined into one value according to a binary variable (1 = annoyed, 0 = not annoyed). In this way, children feeling moderately annoyed by aircraft noise were regarded in addition to the proportion of highly annoyed (5-7). As noise-induced annoyance response in children was hypothesized to be based on the same psychological concept as in adults (2,8), it was assumed that both acoustical and non-acoustical factors have an effect. The pre-selection of potential predictors for the new children`s annoyance model was based on both own experience from studies in adults and literature review. The decision as to whether a variable was included in the model was based on the p-value and the AIC (Akaike Information Criterion). Only factors were included that showed at least a trend for an effect on annoyance ($p \leq .10$). Forward selection was conducted until there was no improvement of the AIC. For none of the aircraft noise metrics including number of aircraft noise events an effect on noise annoyance was found (all $p \geq 0.6$). Odds ratios of all noise metrics were close to 1, i.e. there was almost no effect of noise exposure on odds of annoyance response. A variety of psychological factors were also tested for a contribution to annoyance. As a first psychological variable, noise sensitivity was included as ample evidence exists for its influence on traffic noise-induced annoyance (for a review cf. 9,10). In a second step, attitudes were regarded

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as important factor, since attitudes towards air traffic have also been described as relevant predictors of noise annoyance (for a review cf. 9,10). Further non-acoustical factors were tested for significance and improvement of the model fit. The best annoyance model included noise sensitivity (p=0.019, OR=2.099, 95% CI 1.131-3.897), attitude "aircrafts are dangerous" (p=0.066, OR=1.718, 95% CI 0.965-3.058), and coping behavior in the presence of aircraft noise (p=0.094, OR=1.438, 95% CI 0.939-2.202). The attempt to integrate established aircraft noise metrics such as number of nocturnal flyovers in the final annoyance model failed since model quality was not improved in terms of AIC.

Conclusions: In noise effects research it is well known that the influence of psychosocial moderator variables in adult`s annoyance reactions is at least as important as the noise exposure itself (5,6,10-13). However, according to the present data, this rule of thumb obviously does not apply to children since their aircraft noise-induced short-term annoyance response was not influenced by any noise metric such as number of nocturnal overflights. Noise sensitivity and attitudes towards air traffic, however, had a significant effect.

Keywords: aircraft noise, children, annoyance, field study

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