

PSYCHOLOGICAL RESTORATION IN NOISE-EXPOSED CHILDREN

A. G. Gunnarsson¹, B. Berglund¹, M. Haines², M.E. Nilsson¹, S. A. Stansfeld²

¹Institute of Environmental Medicine, Karolinska Institutet & Department of Psychology, Stockholm University, SE-106 91 Stockholm, Sweden, and

²Queen Mary, University of London, London E1 4NS, UK

Introduction Chronic exposure of children to high levels of noise (e.g., near airports) affects school performance (e.g., poor sustained attention and concentration problems), physiological function (e.g., elevated blood pressure), and contributes to psychological stress (e.g., annoyance and learned helplessness), (e.g., Evans & Lepore, 1993; Evans, Hygge, & Bullinger, 1995; Haines, Stansfeld, Job, Berglund, & Head, 2001). These types of effects may be counteracted by children's ability to appreciate "restorative environments" (e.g., Kaplan & Kaplan, 1989), for instance, by creating feelings of pleasantness and tranquillity and by triggering other mental "restorative" processes or states (Hartig, Böök, Garvill, Olsson, & Gärling, 1996). Such "psychological restoration" is here assumed to protect against adverse (health) effects in chronic-noise exposed children, for example, by reducing or modifying annoyance. Our goal is therefore to explore the association between children's opportunities and abilities for psychological restoration and their feelings of annoyance due to noise exposures in their school and home environments.

Method As part of the EU FP5 funded RANCH-project (Contract No: QLRT-2000-00197), twenty-nine schools around Heathrow Airport were selected including 1182 children (10-11 years old). These school buildings were exposed to combinations of four levels of aircraft noise (A1-A4) and four levels of road-traffic noise (R1-R4). Areas 1 to 4 were <50.4; up to 56.5; up to 62.5; >62.5 dB LAeq,16h, respectively, for aircraft noise and <48.5; up to 54.5; up to 60.5; & >61 dB LAeq,16h for road-traffic noise. *Psychological restoration* was assessed by the scale Children's Perceived Qualities of Restorative Environments Indoors and Outdoors (Gidlöf Gunnarsson, Berglund, & Nilsson, 2002) which consists of 8 items (e.g., calm, relaxing, disturbing) to be scaled on a 4-point scale (never, sometimes, often, always). Sum scores were created with higher scores indicating greater restoration. For a sample of 100 school children (9-11 years old), this scale's reliability has been shown to be high (Cronbach α = 0.81; Gidlöf Gunnarsson et al., 2002). *Noise annoyance* was assessed by two sets of six items (the same 4-point scale): one set referring to aircraft and road-traffic noise in the school environment, the other set to the same noises in the home environment. The two noise annoyance indices were formed by adding scale values separately for the school and the home. The two noise annoyance indices (NA-school, NA-home) and the psychological restoration scale were assessed with a questionnaire, administered to the children in their classrooms. Table 1 gives the three scales' internal consistencies (Cronbach α) as obtained for 1140 responding school children (internal response loss is 215 children for the 20 items involved).

Table 1. Reliability of psychological scales.

Variables	Number of Items	Internal Consistency*
Psychological Restoration	8	0.69
Noise Annoyance at School (NA-School)	6	0.86
Noise Annoyance at Home (NA-Home)	6	0.76

Footnote. *Cronbach α .

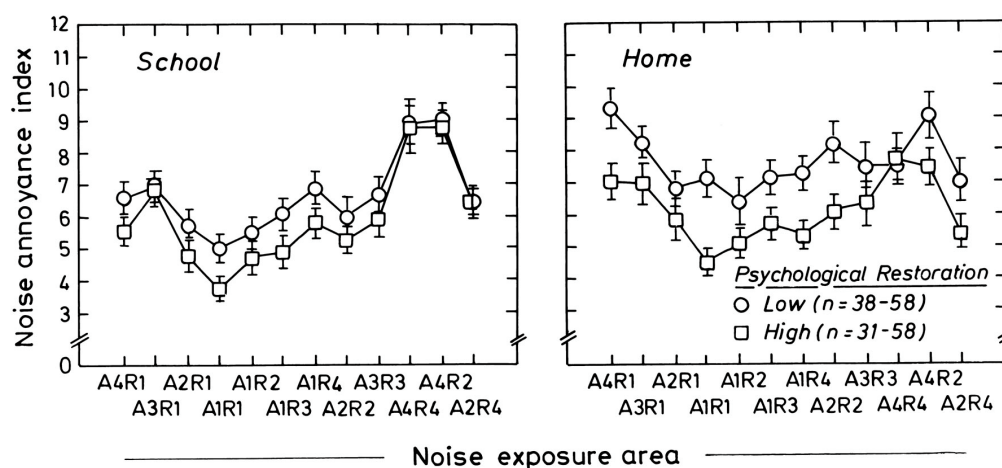


Fig. 1. Noise annoyance at school (left) and at home (right) in children low or high in psychological restoration [A = aircraft; R = road traffic; 1 to 4 = low to high noise exposure].

Results and Discussion The mean score of psychological restoration was 12.5 (SD=3.82) on a scale from 0 to 24; thus, a score of < 13 or ≥ 13 identified children with low or great psychological restoration. Fig. 1 shows that children high in psychological restoration reported systematically less noise annoyance, both at school and at home, than children low in psychological restoration (sign test for trend; $p < 0.01$). This agrees with the hypothesis that psychological restoration (based on a restorative home environment) would avert attention from environmental stressors (e.g., noise), or conversely, direct attention to restorative qualities of the environment. Moreover, psychological restoration seems to protect less against noise annoyance at schools exposed to combinations of medium to high aircraft and road-traffic noise (e.g., A4R4, A4R2, A2R4) as compared to combinations with one dominating noise source (e.g., A4R1, A1R3, A1R4). As expected, this finding is less obvious in the at-home data, which was not classified separately with regard to noise exposure. Alternatively, other variables may more strongly affect noise annoyance at school than at home (e.g., high noise interferes with school activities or requires extensive coping or is accompanied by louder classroom noise). Although the present data show that children's psychological restoration may modify their noise annoyance, this new construct has yet to be discriminated from other constructs that also modify annoyance, for instance, noise sensitivity. This warrants further study of protective and aggravating factors in children's health and development in educational environments.

Keywords: children, psychological restoration, noise annoyance

References

- Evans, G.W., Hygge, S., & Bullinger, M. (1995). Chronic noise and psychological stress. *Psychological Science*, 6, 333-338.
- Evans, G.W., & Lepore, S.J. (1993). Nonauditory effects of noise on children: A critical review. *Children's Environments*, 10, 31-51.
- Gidlöf Gunnarsson, A., Berglund, B., & Nilsson, M.E. (2002). Development of new scales for assessing "psychological restoration" in children exposed to noise. RANCH-Report, Feb. 2002.
- Haines, M.M., Stansfeld, S.A., Job, R.F.S., Berglund, B., & Head, J. (2001). A follow-up study of effects of chronic aircraft noise exposure on child stress responses and cognition. *International Journal of Epidemiology*, 30, 839-845.
- Hartig, T., Böök, A., Garvill, J., Olsson, T., & Gärling, T. (1996). Environmental influences on psychological restoration. *Scandinavian Journal of Psychology*, 37, 378-393.
- Kaplan, R., & Kaplan, S. (1989). *The experience of nature: A psychological perspective*. New York: Cambridge University Press.