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Aircraft and road traffic noise and children's cognition and health: a cross-national study

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Abstract

Background: Exposure to environmental stressors can impair children's health and their cognitive development. The effects of air pollution, lead, and chemicals have been studied, but there has been less emphasis on the effects of noise. Our aim, therefore, was to assess the effect of exposure to aircraft and road traffic noise on cognitive performance and health in children.

Methods: We did a cross-national, cross-sectional study in which we assessed 2844 of 3207 children aged 9-10 years who were attending 89 schools of 77 approached in the Netherlands, 27 in Spain, and 30 in the UK located in local authority areas around three major airports. We selected children by extent of exposure to external aircraft and road traffic noise at school as predicted from noise contour maps, modelling, and on-site measurements, and matched schools within countries for socioeconomic status. We measured cognitive and health outcomes with standardised tests and questionnaires administered in the classroom. We also used a questionnaire to obtain information from parents about socioeconomic status, their education, and ethnic origin.

Findings: We identified linear exposure-effect associations between exposure to chronic aircraft noise and impairment of reading comprehension (p=0.0097) and recognition memory (p=0.0141), and a non-linear association with annoyance (p<0.0001) maintained after adjustment for mother's education, socioeconomic status, longstanding illness, and extent of classroom insulation against noise. Exposure to road traffic noise was linearly associated with increases in episodic memory (conceptual recall: p=0.0066; information recall: p=0.0489), but also with annoyance (p=0.0047). Neither aircraft noise nor traffic noise affected sustained attention, self-reported health, or overall mental health.

Interpretation: Our findings indicate that a chronic environmental stressor-aircraft noise-could impair cognitive development in children, specifically reading comprehension. Schools exposed to high levels of aircraft noise are not healthy educational environments.

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