NORAH
Lärmwirkungsstudie

Central results of the child study:

An overview



What impact does aviation noise have on childhood development and quality of life? The NORAH Child Study attempted to find an answer to this question. To do this, the scientists on the NORAH team conducted tests, surveys and measurements at 29 schools, in 85 school classes, with 1,243 children, 1,185 parents and teachers in the Rhine-Main Region.
The study focuses on learning to read, the health and wellbeing at school of the children as well as the noise exposure when learning at home and in school. It thus builds directly on earlier studies at other locations and attempts to answer some as yet open questions.

The scientists in the Child Study tried to answer the following questions:

- Is it possible to identify a negative impact of aviation noise on intellectual abilities such as reading acquisition, linguistic skills, attention or memory of children in the Rhine-Main Region?
- How exactly does aviation noise at school affect lessons?

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- To what extent does aviation noise affect the wellbeing of the children at home and at school?
- How large is the influence of aviation noise relative to other factors?

Results

Aviation noise reduces reading performance

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In areas with high exposure to aviation noise, primary school children learn to read more slowly than children in quiet areas. In the second grade children examined, an increase of the continuous sound level (L Glossary) by ten decibels (L Glossary) delayed acquisition of reading skills by one month. The connection is linear: the higher the exposure, the greater the negative effect on development. NORAH was unable to verify direct effects of aviation noise on precursor skills for reading acquisition such as phonological awareness or listening comprehension.

More (https://www.laermstudie.de/en/results/results-of-the-child-study/reading-ability/)

Quality of life in terms of school and health slightly affected

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The overall quality of life of the children surveyed in the Rhine-Main Region is high – most of the second-grade children feel very well; they are healthy and enjoy going to school. Children in areas with high exposure to noise do not feel quite as well as children in quieter areas. In addition to this, parents surveyed in areas with relatively high aviation noise exposure stated more frequently that their child was taking prescribed medication or had been diagnosed with a speech or language disorder. The children concerned were no different, however, to the other children in terms of their ability to learn to read.

More (https://www.laermstudie.de/en/results/results-of-the-sleep-study/the-quality-of-sleep-in-the-rhine-main-region/)

Aviation noise disturbs lessons

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Teachers from areas with relatively high aviation noise exposure reported unanimously that the noise causes considerable disturbances to lessons. Classes are interrupted in various ways by aviation, often distracting the children's attention. More than one third of the children from these schools are sometimes unable to hear the teacher properly due to aviation noise.

More (https://www.laermstudie.de/en/results/results-of-the-child-study/noise-related-annoyance/)

Background

If children are permanently exposed to aviation noise, this can have a negative impact on their intellectual development and their learning performance. Various previous studies have come to

this conclusion. In particular, the ability to read appeared to suffer under the influence of aviation noise. However, these older studies did not take into account several confounding factors (L Glossary) that might have influenced the result. Also, they were carried out in areas with very different and considerably higher noise exposure.
The greatest difficulty in the investigation of learning performance under the influence of aviation noise: we know from numerous educational studies that learning performance is determined by a wide range of different factors. Among other things, the socioeconomic status (L Glossary), for example the educational standard and the income of the parents, as well as their origins, can have a clear statistical influence on the learning performance of the children. The scientists have to take all of these factors into account and filter them out if they want to find out what impact aviation noise has on learning to read.

Methods

NORAH Knowledge No. 1 (https://www.laermstudie.de/media/norah_knowledge_1.pdf) provides information about the methods of the NORAH child study.

The selection of schools and children

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The scientists first divided up the Rhine-Main Region into different "noise level classes", i.e. into regions where a certain continuous noise level (L Glossary) prevails during the day. Schools in all four areas were asked to participate.
A total of 1,243 second-grade boys and girls took part in the investigation, around the same number in each sound level class. The schools with the lowest level of aviation noise exposure had a continuous noise level during the day of 39 decibels (L Glossary). In the schools with the highest level of exposure, the continuous noise level was 59 decibels. At the time of the investigation, there were no primary schools in the Rhine-Main Region with higher exposure to aviation noise than the primary schools in the highest sound level class.
In order to investigate how well the children can read, the scientists used standardized tests which are also used in other learning studies. The study also wanted to examine the thesis that exposure of children to aviation noise has an effect on the precursor skills for reading acquisition which normally develop at a pre-school age. These skills – for example listening comprehension – are important for learning to read later.
The NORAH team also asked the children, their parents and the teachers about the wellbeing and the quality of life of the children and about the extent of the negative effect they feel aviation noise has on them.

Individual noise calculations

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In order to identify a connection between the performance of the children and the noise exposure, it is important to know as precisely as possible which noise level each individual child is exposed to at home and at school. This is why the NORAH acoustics team carried out extensive noise calculations for the Child Study. This was based on the radar records of all flight movements in the Rhine-Main Region for the last 15 years. These were used to calculate the individual aviation noise exposures in the twelve months before the data collection for all the residential and school addresses of the children in anonymized form.
In their evaluations the NORAH scientists also took into account the existing sound insulation and the reverberation times in the classrooms. The acoustic team also calculated the noise exposure due to rail and road noise where the children live and at school.

Overview: What did the Child Study investigate and how?

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What was investigated?	Method
Aviation, rail and road noise exposure at school and at home	Data calculated by the NORAH acoustics team
Building and room acoustics of the classrooms	Estimation methods for determination of the reverberation time and the noise insulation
Reading ability and precursor skills Reading skills Short and long-term memory for linguistic information Phonological awareness Speech perception Attention Non-language skills	Standardized group tests in the class
Quality of life and environment Wellbeing at school and at home, classroom atmosphere, socioeconomic status	Child survey, parent questionnaire, teacher questionnaire
Noise exposure at school and at home	Child survey, parent questionnaire, teacher questionnaire

(https://www.laermstudie.de/media/3-5_kinderstudie_grafik-3_what-did-the-child-study-investigate.jpg)

More information about the results of the NORAH child study are presented in NORAH Knowledge No. 1. (https://www.laermstudie.de/media/norah_knowledge_1.pdf)

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