Reviewer's report

Title: Does transportation noise cause neurobehavioral effects in primary school children? A cross-sectional study

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Reviewer: Julie E Dockrell

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This paper reports the result of a large study in the Netherlands that examines the relationship between children’s exposure to noise at home and at school and their performance on ‘paper and pencil tasks’ and an online cognitive battery. Data for 498 pupils were analysed. Noise levels were were modelled. There were small relationships between noise exposure at school and one of the cognitive measures. The data is an important addition to the field but further work is required to ensure that the main messages are clear.

I consider each of the sections of the paper in detail

Study aims

The study has two aims a) designed to expand traditional paper and pencil tests by using the neurobehavioral evaluation system and b) examine the possible relation between aircraft and traffic noise exposure and children’s performance.

If a) is the main objective a more detailed analysis of the rationale for the tests needs to be constructed which is linked directly to psychological theory and data.

If it is b) then there is a need to significantly improve the review of the literature and develop theoretically motivated hypotheses about the effects of different noise sources.

The paper would be strengthened by addressing one or other of these aims.

Introduction

1. The authors provide a selective review of the work relating to the effects of noise on pupils learning which limits the originality and significance of their own work. For example, there is a recent paper relating magnitude of noise exposure on children’s academic attainments [1] but in addition there is a fairly recent review of the effects of low intensity noise [4] and a number or recent studies looking at classroom learning environments from an acoustic perspective [3,2] . Discussion of these would situate the current study, highlighting its uniqueness.

2. The second major limitation in the literature review is the focus on external noise alone without discussing noise in classrooms which can override the effect of traffic noise [5] but possibly not aircraft noise. These studies and others would lead to a more theoretically motivated set of hypotheses and awareness of the extensive literature about school children and acoustics.

3. On page 2 the authors suggest that night time noise levels might be a better exposure indicator. It is not clear why this would be better – certainly it would be
different. There are lots of physiological and psychological factors which affect learning – e.g. diet. A much stronger case needs to be made for the importance of this statement

4. Pages 3 a number of studies have examined non-verbal ability, speech perception, Maths and science etc. The authors need to develop this section more coherently to justify the significance and originality of their new measure.

5. Page 3 academic tests related to developmental phases have been examined in this way [1]

6. Page 3 section 2 – a stronger case is needed as to why it would ‘interesting’ to consider neurobehavioral tests

7. Page 6 figure 1 does not provide an overview of the tests used – it is the testing timeline. (see below for more questions about the measures)

Methods
1. Page 7 why were these specific tests included from the NES. Again a more systematic and critical review of the relevant literature might lead to this choice but the authors have not done this

2. Page 8 more details are needed about the sub tests including numbers of items, reliability and validity of the measures etc.

3. Page 9 what is an up and down procedure?

4. Paper and pencil tests also require details about reliability and validity and the rationale for their choice

5. Authors should indicate where the parent questionnaire can be retrieved from and how indicators of SES were computed.

6. Reference is made in the latter part of the paper to a child questionnaire 9 (page 13) but it is not in the methods section

7. The inclusion and analysis of children with ADHD and dyslexia is never justified. Why only these difficulties? We know that pupils with additional learning difficulties are differentially negatively affected by noise [6, 7]

Statistical analysis
1. Page 10 It is not clear what ‘on the basis of age’ means

2. It would be useful to have appropriate references for the claims about the oblique rotation in the FA

Results
1. The factor analysis is potentially very informative but it is not used in the data analysis. It would be useful to know whether noise differentially affects the factors identified. Neither is the factor analysis interpreted for the reader. In sum this is an interesting and potentially important analysis but currently adds nothing of substance to the paper and could replace the analysis of the individual tests and lead to more coherent conclusions.

2. Page 13 paragraph 1 – what does it mean to say that “... was not related to one of the other cognitive measures”
3. The authors should note that changing the alpha level can address, to some extent, the difficulties with multiple measures.

Discussion

There are a number of interpretations of the results which should be linked to our current understanding of the effects of noise. Firstly given that effects are only evident for noise levels in schools this might reflect the impact of noise at time of testing. Secondly the authors conclude that the effects were for more complex tasks, but at no time is the notion of complexity addressed. What makes a complex verbal or not verbal task? Indeed the authors have only child performance levels so the key question is how does noise mediate performance on the specific tasks? Which cognitive mechanisms are compromised?

Thirdly in the discussion the authors discuss conclusions that are unwarranted from their data. Specifically the advantages of the NES are not established and no attempt is made to link these statements to evidence about children’s performance or preferences (page 15). Again I think if the factor analysis could be used and interpreted in systematic fashion this would significantly develop the argument here.

The authors attempt to interpret the results of the switching task (page 16). As suggested above it may simply be that the noisier schools were noisier when the assessments were done and that this task is more vulnerable to such interference [6].

The first paragraph in the interpretation of the results section is not comprehensible and often not related to the aims of the study e.g. neurotoxic effects.

Figures and tables

1. Titles for the figures 3 & 4 are too long
2. Table 1 we need to know how some of these variables were measured – what is the reliability and validity for the child self report scale
3. Table 2 needs to include the measurement scale for each variable


**Level of interest:** An article of importance in its field

**Quality of written English:** Needs some language corrections before being published

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**

'I declare that I have no competing interests'