UNPACKING THE RELATIONSHIP BETWEEN NOISE AND SCHOOL PERFORMANCE: AN EXPERIMENTAL SUBSTUDY IN THE RANCH STUDY

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Introduction The link between chronic noise exposure and reading deficits in junior school children is well established (e.g. Cohen, Glass and Singer, 1973; Haines et al., 2001). This finding has been replicated by the RANCH research project for aircraft noise. Despite effects on reading being perhaps the most reliable of the effects of chronic noise exposure on cognitive performance very few studies have attempted to explain this relationship. A notable exception is a study carried out by Evans and Maxwell (1997). This study aimed to investigate whether the effect of chronic noise exposure on reading was mediated by language acquisition.

The psycholinguistic literature indicates that speech perception generally (Brady, Shankweiler, & Mann, 1983) and phoneme recognition specifically (Mann & Brady, 1988; Wagner & Torgesen, 1987) are important components of learning to read. There is also evidence (Brady et al., 1983) that it is specifically the processing of speech rather than the more general processing of auditory information that is the key element in reading acquisition.

There were three tasks in the Evans and Maxwell (1997) study: a phoneme recognition task, a speech-processing task and a sound-processing control condition. Reading was also assessed using a standardised test.

Evans and Maxwell made a number of predictions. Firstly, they predicted that chronic noise exposure would be positively correlated with reading deficits. They further predicted that this association would largely be accounted for by underlying deficiencies in language acquisition and that the expected adverse impacts of chronic noise exposure on reading skills would be specific to *speech* and not accounted for by general auditory processing. So, speech and phoneme perception, respectively, and not sound perception, would be significantly correlated with chronic noise exposure.

The results were partly consistent with these predictions. Chronic aircraft noise exposure was associated with poorer reading skills. Noise exposure was also associated with impairments in speech perception, which, in turn, were correlated with reading development. The absence of a correlation between sound perception and either noise or reading indicate that this intervening effect of speech perception is specifically language based. It seems that speech, and not sound perception mediates the relation between ambient noise exposure and reading acquisition among young children. Surprisingly, no correlation was found between phoneme perception and either noise exposure or reading. These results therefore give partial support for language acquisition as an underlying, intervening mechanism to account for the noise-reading deficit link.

Methods The present study, although not in the strict sense a replication of Evans and Maxwell's study, aims to further investigate the central question of this earlier work, namely whether language acquisition is a mediator of the effects of noise on reading. The participants are a sub-set of the children who participated in the RANCH field study in West London. As the results from the field study data indicate an effect on reading specifically for aircraft noise exposure (and not road traffic noise) half of the participants are selected from schools exposed to high levels of aircraft noise and half from schools exposed to low levels of aircraft noise.

For the purposes of this study reading is assessed by means of the Graded Word Reading Test and the Non-Word Reading Test. The data from the field research was not suitable for the present study because the reading test used assessed both decoding and comprehension. As an indicator of phoneme recognition a sub-test from the Phonological Assessment Battery is used. The Evans and Maxwell data suggests that speech or phoneme perception only partially mediates the effects of noise on reading. In an attempt to identify another mediator of this effect a test of vocabulary is included: the British Picture Vocabulary Scale (BPVS). The data from the intelligence test administered as part of the field test battery is also included in the analysis as IQ may account for some of the variance. As with the Evans and Maxwell study, a test of sound perception is included as a control.

The results will be described and the implications drawn.

Keywords: Noise exposure, children, reading, language acquisition.

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