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ROAD TRAFFIC NOISE AND SCHOOLS

J W SARGENT AND W A UTLEY

BUILDING RESEARCH STATION, GARSTON, WATFORD

Introduction

During the last decade a considerable amount of research has been carried out both in the United Kingdom and elsewhere to determine the effects of noise on the occupants of dwellings(eg 1,2). Considerably less effort has been devoted to assessing the disturbance caused to occupants of other types of buildings.

The Building Research Establishment has carried out an investigation to determine the disturbance caused to secondary school teachers by noise. Although the investigation was concerned mainly with noise from road traffic it has also produced useful information on the disturbance caused by aircraft noise and noise generated within the school. The principal object of the study was to provide information on noise disturbance to assist in the design of new schools and in the selection of a basis for possible remedial treatment to classrooms in existing schools exposed to high levels of noise.

A questionnaire survey of teachers and noise level measurements just outside the classrooms in which they taught were used to establish relationships between noise disturbance and the level of road traffic noise.

The survey

A self completion questionnaire was distributed to teachers during the summer term. Teachers to be surveyed were selected using an estimate of the traffic noise level outside the classroom in which they taught. The sample was chosen to try to include equal numbers of classrooms in noise bands 5 dB(A) wide from under 50 dB(A) to over 70 dB(A) and a control sample of classrooms on the quiet side of each school.

After the questionnaire had been returned noise measurements were made at each school in the sample. These measurements were made during the school holidays and therefore were in general free from noise generated within the school.

A road traffic noise level was required for each classroom on the road side of each school and a level representative of the external noise at classrooms to the rear of each school. Where there were many classrooms on the same facade measurements were obtained for a representative sample of rooms.

Calibrated tape recordings were made at each school on a weekday during normal school hours. From these recordings the traffic noise level outside each classroom was determined in terms of L_{10}, L_{50} and L_{eq}.

When the questionnaire and traffic noise data had been linked together complete data was available for 999 respondents in 73 schools teaching in classrooms with external L_{10} traffic noise levels from 35 dB(A) to 78 dB(A). 331

questionnaires were completed by teachers who taught in classrooms with a direct view of a road. A further 336 questionnaires related to classrooms in the same schools on the side away from the road. Most of the remainder were completed by teachers in classrooms with an oblique view of the road. Approximately equal numbers of male and female teachers completed questionnaires. They taught a wide variety of subjects.

Teachers response to traffic noise

On the questionnaire individual noise sources are only separated in one question. This asked:

'When you are teaching in the room during the summer term how much are you bothered by noise from the sources listed below?' The list was: children playing outside, aircraft, lessons in adjacent rooms, doors banging, road traffic, noise from factories, children in passages and on stairs, the classroom above, and lawn mowers or tractors. The reply for each was a tick against one of the following: 'not at all', 'a little', 'quite a lot', 'very much', or 'does not apply'.

It is the analysis of the answers to this question that provides the most important relationships between teachers response to noise and the noise levels causing that response.

To carry out this analysis the degree of bother is scored by assigning a number to each box as follows:

1 'not at all'
2 'a little'
3 'quite a lot'
4 'very much'

Those responding 'does not apply' were also scored as 1 since they obviously were not bothered and so were those failing to make any response to the question. Only 29 of the 331 teachers in classrooms on the road side of schools came into the last two categories.

The regression of the bother score for each teacher on the L_{10} traffic noise level outside the classrooms for all the rooms on the road side of schools gives the relationship

$$\text{Bother score} = -4.72 + 0.114\, L_{10}$$

The correlation between L_{10} and bother is highly significant with a coefficient of 0.66.

A more useful presentation of the results can be found by relating the percentage of teachers responding at a given level of bother to the noise level. This gives a sigmoid shaped curve and a statistical fit and evaluation can be obtained by probit analysis using the principle of maximum likelihood(3). For the sample of 331 teachers with a direct view of a road Fig 1 shows a plot of the percent-

age of teachers bothered 'quite a lot' and 'very much' by road traffic noise related to L_{10} road traffic noise levels. The curve shown is the probit regression of bother on L_{10} transformed back into percentages.

Similar lines can be drawn at other levels of bother. Comparison of the three probit lines for L_{10} against bother show that the three lines are parallel and there is about 5½ dB(A) between each line. A more detailed comparison is shown in Table 1.

Table 1

Percentage of teachers bothered	External road traffic noise level L_{10} dB(A)		
	'A little bothered' plus	'quite a lot' bothered plus	'very much' bothered
10	49	55	61
30	54	60	66
50	58	64	69
70	62	67	73
90	67	72	78

The total data sample of 999 gives curves which are not significantly different from those in the figure which suggests that the teachers who have a clear view of the road respond in the same way as those who do not.

Probit fits of other noise indices show that for the bother scores of 3 and 4 L_{eq} is about 3 dB(A) lower than L_{10} for the same response and L_{50} is about 5 dB(A) lower than L_{10}.

In the questionnaire teachers were asked to rate their general sensitivity to noise as one of the following: 'sensitive to noise', 'noise doesn't bother me' or 'neither'. The 19.3% who indicated that they were not sensitive to noise were found to be significantly less bothered by traffic noise than the rest of the sample.

References

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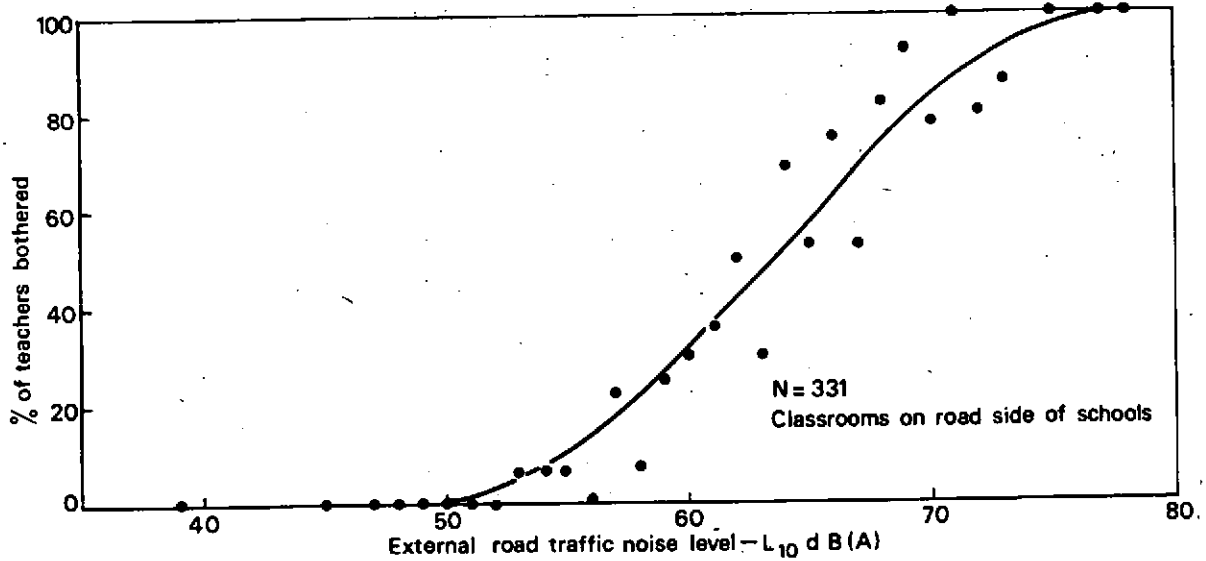

Figure 1 The percentage of teachers bothered 'quite a lot' and 'very much' by road traffic noise related to L_{10} road traffic noise level