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SUBJECTIVE EVALUATION OF NOISE IN AREAS WITH LOW AMBIENT LEVELS

M.M. HAWKINS

INSTITUTE OF SOUND AND VIBRATION RESEARCH, UNIVERSITY OF SOUTHAMPTON

Introduction and Aims

A social survey and noise survey were carried out aimed at gathering information on the subjective evaluation of sounds in general, and road traffic noise in particular, heard by individuals living in 'rural' areas, characterized acoustically by low ambient noise levels. The surveys were designed so that it would be possible to compare relationships found with those obtained in a National survey carried out on a representative (epsem) sample of adults resident in England. Descriptions of the National studies' sample (1), noise survey (2) and results (3) may be found elsewhere; as far as we are concerned the main feature of interest is that the acoustical environments of those interviewed were for the most part typically urban environments, acoustically characterized by relatively high ambient levels. Our underlying objective here, is given that the two samples are exposed, on the whole, to acoustical environments of dissimilar character, does this have any consequences with regard to the subjective evaluation of the noises mentioned above.

When comparing data from two different surveys there are invariably confounding influences present, due to inherent differences between the surveys other than the variables or characteristics of interest. The Rural study was designed so as to keep confounding sources of variation to a minimum.

The Rural sample was selected in the following manner: initially a list was drawn up of all villages: within approximately 25 miles of Southampton University; not contiguous to an urban area; and containing at least 100 dwellings clustered in groups of at least 10 each. On the basis of a preliminary noise survey of the villages, dwellings were classified into one of 3 broad noise categories. The list of eligible villages was rather small, and of these there were a few villages with very unusual acoustical environments compared to the majority of villages visited. Briefly, we selected villages and dwellings within village purposively to obtain the spread across noise levels needed to reach our research objectives, and to represent the more common acoustical environments encountered in the study area. Eventually we obtained 756 interviews from the 10 selected villages.

Noise Measurement Procedures

Initially in the Rural study we stratified the measurement day into what were considered a priori, 6 reasonably homogeneous time periods with regard to the acoustical environment viz:- 7:30 → 9:30; 9:30 → 12:00; 12:00 → 14:00; 14:00 → 16:30; 16:30 → 18:30; 18:30 → 22:00. Within each of these 3 x 10 minutes noise samples were measured. In practice though, noise monitoring rarely began before 8:00 or continued after 20:00; thus in reality we have a measurement day of approximately 12 hours. For comparison purposes we need to estimate the 18 hour value of L_{10} from our data. Of course the 6 hours not

sampled may well be relatively more quiet than the remainder of the 18 hour period, thus our estimate of L_{10} (18 hour) could be biased upwards. In fact at present a 24 hour survey is being carried out; this will enable us to examine our earlier assumptions and quantify any bias introduced.

There is another confounding source of variation concerned with the measurement of road traffic noise. In both studies the noise levels measured were due to all sounds incident upon the monitoring equipment, and since the acoustical attributes of the two studies are known to be dissimilar, the non-road traffic noise sources may well have had differential effects. Noise data from our 24 hour survey will yield information to help us examine this regarding the Rural sample. In fact an examination of the National data revealed only a small number of dwellings (6%) were exposed to noise environments such that a non-road traffic source affected the levels systematically over the 18 hour period; thus the problem was not very widespread. Furthermore insufficient respondents were affected to enable us to examine their noise level/subjective evaluation of road traffic noise relationship, separately, with any confidence.

Subjective Evaluation Measurement

Very similar methods were used in both studies, for example, an identical rating scale was used in both questionnaires consisting of a 7 point numerical scale running from 'definitely satisfactory' to 'definitely unsatisfactory'. The only known difference being within the National questionnaire the rating scale questions were preceded by several questions concerning the roads in the respondent's locality but they are not concerned with the noise specifically, so it is considered this is a relatively unimportant discrepancy.

Comparison of Noise/Satisfaction Relationships:-

Road Traffic: The relationships are plotted in Fig. 1. The points represent the mean value of L_{10} (18 hour), against mean value of satisfaction (7 point scale) for respondents falling into the following 5 noise categories measured in dB(A), viz:- $L_{10} \leq 50$, $50 < L_{10} \leq 55$, $55 < L_{10} \leq 65$, $65 < L_{10}$.

General Noise Environment: The relationships are plotted Fig. 2, constructed as for road traffic.

Conclusions

Initially an evaluation of the main confounding sources of variation seems necessary.

There are some confounding influences whose effect we are unable to quantify, since there is no relevant data available. The two studies were carried out during different years and at different times of year. The National and Rural studies being carried out during July to October 1972, and October

1977 to January 1978 respectively.

There are other confounding influences whose effect we shall be able to quantify when further acoustical data is available from the Rural sites. Firstly different noise measurement strategies were followed - the Rural measurement day was 12 hours long. It is possible that this has inflated our estimates of L_{10} (18 hour). Secondly, concerning the comparison of the relationships for road traffic noise - there is the problem of other sound sources affecting the L_{10} values to which the Rural respondents are exposed.

If we assume that the confounding influences just enumerated have, when considered as a whole, a negligible cumulative effect on the relationships of interest then we may conclude:

(a) There is no evidence in the data to suggest that the noise/satisfaction relation for road traffic is any different in the two types of acoustical environments considered, that is 'rural' low ambient noise level areas and 'urban' high ambient noise level areas.

(b) There is evidence in the data to suggest that the respondents in the Rural sample have, consistently across all noise levels, a tendency to rate their general acoustical environment as more satisfactory than respondents in the National sample. Furthermore, the data suggest that this effect is greater above an L_{10} of around 55 dB(A) than below.

Although these two conclusions are of a preliminary nature, it is considered unlikely that they will be substantially affected by analysis of the further acoustical data being gathered on the Rural sites.

References:

(1) B. HEDGES; 1973, SCPR P230/2: Road Traffic and the Environment - Methodology Report.

(2) D.G. HARLAND and P.G. ABBOTT; 1977, TRRL Laboratory Report 770: Noise and Road Traffic Outside Homes in England.

(3) B. HEDGES, J. MORTON-WILLIAMS and E. FERNANDO; 1978, SCPR report: Road Traffic and the Environment.

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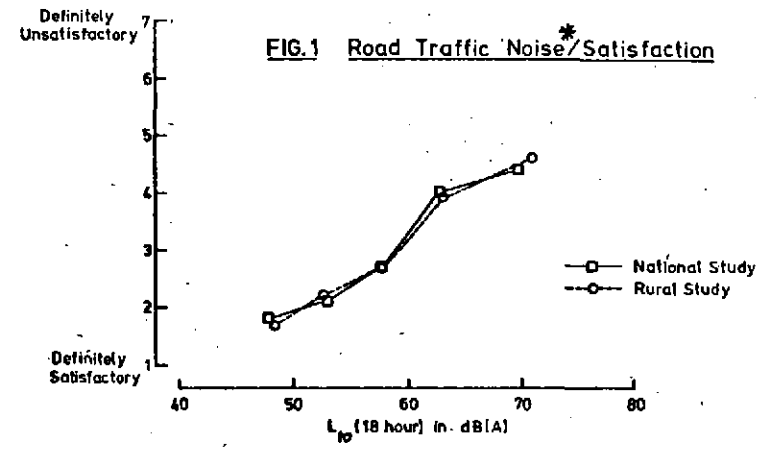

FIG.1 Road Traffic Noise*/Satisfaction

No. of interviews :						
	National	190	250	223	97	141
	Rural	111	352	81	98	110

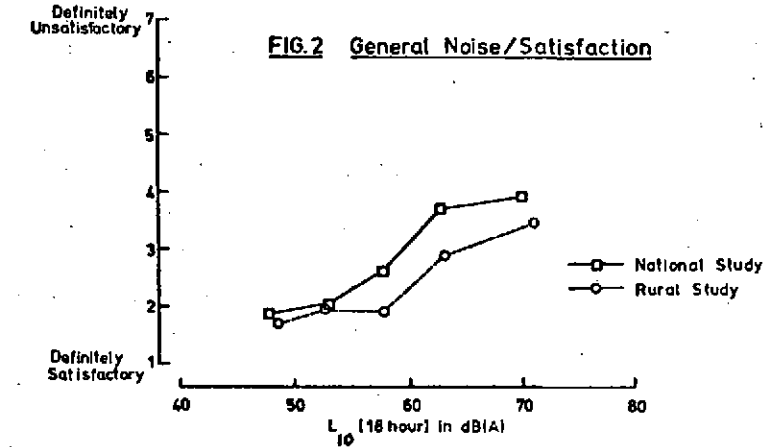

FIG.2 General Noise/Satisfaction

No. of interviews :						
	National	190	250	223	97	141
	Rural	110	352	80	98	110

* Remember measured noise levels were not exclusively due to road traffic.