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Psychological Determinants of Noise Nuisance: Are There Any?

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1. INTRODUCTION

Many social surveys of noise nuisance and its relation to noise exposure have shown comparatively poor correlations between physical measures and subjective effects. This has frequently been explained as the result of large differences between individual people in their response to the same degree of noise exposure. Langdon (1976) (Ref. 2) for instance, showed that L_{10} explained 72% of the variance in median responses to traffic noise, but only 10% of the variance in individual response. McKennell's earlier study (Ref. 3) of aircraft noise annoyance showed that Noise and Number Index explained 98% of the variation between aircraft noise levels but only 21% of that between individuals across noise levels. Thus variation in response has been much more easily attributable to the influence of variation between individual human beings than to the influence of the physical variable.

Since the variation between individuals is not immediately explicable, a number of studies have focused on the possibility of psychological variables having a strong influence on individual differences in sensitivity to noise, personality differences, and general willingness or susceptibility to make complaints. From time to time explanations have also been tendered in terms of the basic demographic characteristics of populations such as age, sex and socio-economic status. All of these variables have shown significant correlations in some studies but, with the exception of noise sensitivity, none of them has shown a repeatable correlation. These findings suggest problems in the methodology of nuisance measurement. The use of a reliable scale of measurement, i.e. one which gives repeatable results, would not allow a large range of variation in the degree of correlation with other variables. It thus seems that the assessment of the reliability of annoyance measures must be carried out before it is possible to assess the influence of psychological variables on noise annoyance.

2. A STUDY OF THE STABILITY OF INDIVIDUAL ANNOYANCE RATINGS

Two surveys were carried out on the same sample of respondents in suburban residential areas in London and Liverpool (Ref. 1). In both cities two sites were selected according to noise exposure level viz. 70 or 80 dBA 18 hr L_{10} 1 metre from the facade. The initial sample size obtained was 413 which was

reduced by 21% when the interviews were repeated. Questions included noise dissatisfaction semantic differential scales, sensitivity to noise scales, environmental sensitivity scales and classificatory questions. Noise sensitivity had a homogeneous distribution in the population.

The test-retest correlation coefficient for the noise dissatisfaction scale was low but significant ($r = 0.61$). Thus by taking an average of the two scores for each individual, a set of acceptably reliable dissatisfaction scores could be derived. In addition, the range of variation between individual scores on the 7 point dissatisfaction scale could be considerably reduced from a typical standard deviation of about 1.7 to a number approximating to 1.

A sub-sample of 50 people completed the Eysenck Personality Inventory and the Cattell 16 Personality Factor scales and yielded scores which were correlated with noise annoyance. Correlations between personality and annoyance within noise exposure levels were produced which were significant at the 1% level on the intelligence scale of the 16 P.F. and the shyness scale of the same personality test but these were not reproducible. This points to the dangers of using low reliability annoyance scales which encourage non-repeatable findings. On increasing the reliability of our assessments of noise nuisance, by summing the noise annoyance scores for individuals over the two measurements, all such correlations disappeared. Respondents' general statements of annoyance with non-noise factors in the environment and general satisfaction with the environment as a whole did not relate to differences between individuals in dissatisfaction within noise levels indicating that there is no general tendency to complain involved in individual differences in dissatisfaction.

The conclusion to be drawn from this study is that the extent of individual differences in noise dissatisfaction, within the same noise exposure levels, is considerably exaggerated by the use of unreliable measuring instruments. The variation shown is due more to randomness in response to the measuring instrument than to individual differences.

3. THE STUDY OF SEASONAL EFFECTS ON NOISE ANNOYANCE

Studying seasonal effects on noise annoyance gave us the opportunity to investigate the stability of individual annoyance ratings over a longer period of time. In this second study, three repeat surveys were carried out making a total of four surveys on the same individuals at two-month intervals. The coefficient of reliability for the 7 point noise dissatisfaction scale was directly comparable with that found in the

first study and, for a single repeat, was of the same numerical order. It was possible to increase the reliability of the measurement by summing the annoyance scores over the four measures. This raised the reliability coefficient for the dissatisfaction scale to 0.88. With this reliability coefficient and a standard deviation for the average of four dissatisfaction scores of 1.3, it can readily be calculated that the standard deviation of a totally reliable scale would be of the order of 1.14 at a given noise exposure rather than the 1.75 normally experienced in the use of the low reliability scale. A somewhat surprising finding of this study was that although reports by respondents indicated that there was considerable variation between seasons in the methods by which the dwellings were ventilated (and therefore the acoustic insulation value of those dwellings), there was no significant variation in dissatisfaction between the seasons. This would indicate that not all physical changes in noise exposure produce changes in noise annoyance.

4. CONCLUSIONS

The major conclusion is that noise dissatisfaction scales, as most commonly used, are instruments of low reliability. The degree of reliability shown is adequate for the measurement of community response but not for the measurement of individual response. It may well be that investigations of the possible explanations for differences between individuals in their noise annoyance levels of different persons are not at present capable of being measured with sufficient discrimination. Indeed the evidence of our first study is that it is possible to produce significant findings of apparent explanatory power and at high levels of statistical significance which, because of the unreliability of the subjective measurement, are not repeatable even when using exactly the same sample.

5. REFERENCES

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