Proceedings of The Institute of Acoustics

NOISE LEVELS AND RESIDENTS' REACTIONS AROUND A MOTOR RACE CIRCUIT

M.E. Bryan, D.J. Saunders and D.W. Templeton *

University of Salford, Salford. *Building Design Partnership

Introduction

Much work has been done to predict subjective response to noise from freely flowing traffic and a number of units, L10, Leq, TNI, NPL, have been suggested as objective predictors. The general assumption throughout has been that the greater the density and noise level of vehicles, the more annoying and less acceptable the noise source. However, situations where there are irregular but noisy occurrences as, for example, presented by a motor race circuit or vehicle test track, have received less attention. Although the introduction of new race circuits and testing facilities is not frequent, it is still essential that the environmental impact of either should be predictable. This paper describes the first study of a larger programme to gather information on the noise climate around such circuits and to measure general community reaction to the area and to the circuit in particular.

Description of Site

Aintree race circuit was chosen for the initial study due to its proximity to Salford and because of extensive local housing. The race track is 1.64 miles long, 11 metres wide and has a tarmacadam surface. There are 4 corners on the circuit and the course is essentially flat. Apart from the track the remainder of the circuit area is grass covered with a few trees and shrubs at the boundary. The boundary fence is constructed from part concrete plank, part verticle timber sleeper and is 2 metres in height.

The housing is to the north-east of the track and is mostly semi-detached and in private ownership. The housing closest to the track was built about 5 years ago while the rest of the area was built between 1930 and 1960.

Noise Measurements

Racing took place on Saturday afternoons, with from 6 to 20 races while practice took place on Saturday mornings and in the evening during the preceeding week. Noise recordings were made on 4 race days, two motor cycle meetings and two motor car meetings being covered. A total of 12 sites were chosen at varying distances from the track and a recording made at one of them during each race. Recording locations were randomised rather than progressing to-wards or away from track, as earlier heats tended to have a different noise character from the later finals. The noise was recorded on a UHER report 4000L tape recorder using a Bruel & Kjaer 225mm condenser microphone (type 4145) and precision sound level meter (type 2204) as signal detector and amplifier. The tapes were analysed using a CEL noise average meter (type 144) and a Bruel & Kjaer statistical analysis set up (types 2603, 4420, 2305) to give an 'A' weighted value of Leq, L10 and L90 for each recording session. Figure 1 shows the variation in Leq with distance from the race track. L10 levels showed a similar decline with distance (-8 dB between 100m and 200m, -10 dB between 200m and 400m) while L90 levels dropped more rapidly(-12 dB between 100m and 200m, -16 dB between 200m and 400m).

Proceedings of The Institute of Acoustics

NOISE LEVELS AND RESIDENTS' REACTIONS AROUND A MOTOR RACE CIRCUIT

Social Survey

A postal form of survey was chosen to measure the community response. Respondents were obtained by selecting one household in 6 from the Register of Electors. The total response was 142 questionnaires returned out of 166 sent out (85.5%) with the useable response being 128 (77.1%).
The questions asked for a) general environmental attitudes, b) annoyance to the specific noise source and c) personal details. There were a total of 21 questions, 6 questions were taken from a study by Ludlaw (1) and 5 from a previous study by Templeton (2). Response to the Templeton questions indicated that as a group the respondents in the present study were more sensitive than those in the previous study.
The questionnaires were scored with a scale of weighted numbers rather than direct Guttman, to give a good differential to those registering extreme reactions. The responses were divided into three sub-groups representing areas at different distances from the track (figure 1). The annoyance response to the race track is shown in figure 2 and table 1. There was a significant ($1\% > p > 0.1\%$) increase in annoyance from residents living near the track. However, the general response (score to whole questionnaire) indicated that annoyance caused by the presence of the race track does not cause an overall shift in noise sensitivity or annoyance. Questions relating to people rating of the area show that the noise does not on the whole affect their judgement of the place. However, people did feel that as a source of annoyance, track noise was more preventable than say from local traffic or aircraft.

Discussion

As may have been expected, there was a wide range of individual response to the question relating to annoyance caused by the race track. This, together with a limited noise range, made it difficult to get a meaningful relationship between annoyance and noise level. A significant increase in the strength of reaction to the noise was apparent within 200 metres of the track (65% of respondents reporting extreme annoyance) (figure 1) but none of the noise units considered reflected this increase. Near to the track, the noise has a 'peaky' characteristic due to the passage of individual vehicles, while further back the noise has a more even pattern as noise from the whole of the track is experienced. This suggests that perhaps the average peak level or the L1 value might correlate better with annoyance. The increase in annoyance within 200 metres of the track agrees with a similar earlier Belgian study (3).

In his study of construction noise Ludlow suggested that because of its specific nature this type of noise was more annoying than tr affic noise of similar levels estimating that this difference was 10 dB(A). In the present study the % of respondents to reporting a given level of annoyance at a given Leq level was greater than the % found by Ludlow, suggesting that race track noise is even more annoying than construction noise for the same Leq level. However, perhaps the high sensitivity of the present group causes this degree of reaction.

(1) J.E. Ludlow, 1976 PhD Thesis, Inst. of Sound & Vib Res, Univ. of Southampton Assessment and Prediction of Noise from Construction Sites.
(2) R.J.Mudford and D W Templeton, 1971 Report Univ. of Liverpool(school of Architecture) Community Reactions to Noise Around Liverpool Airport.
(3) A Cops and H Myncke 1977 Appl.Acous.(10) 223-233 Study of Noise during car and motorcycle Speed and Cross Country Races.

NOISE LEVELS AND RESIDENTS' REACTIONS AROUND A MOTOR RACE CIRCUIT

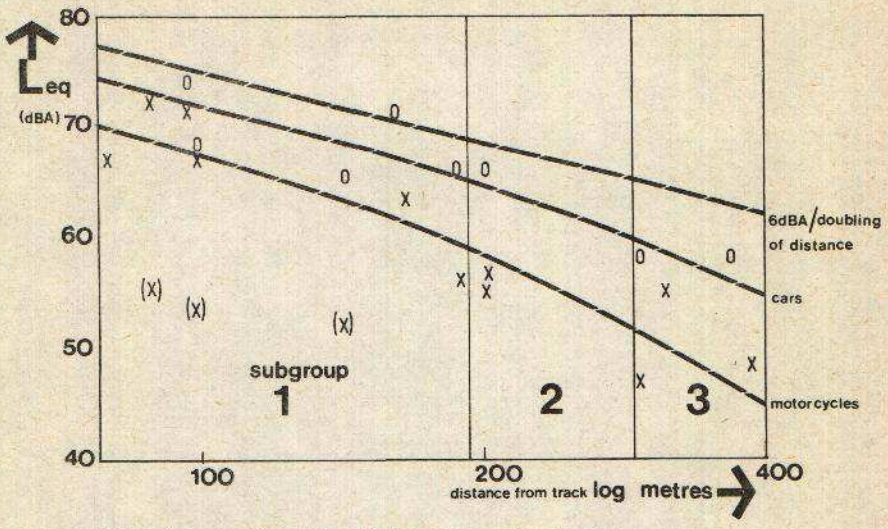

Fig. 1 Variation with distance from track of L_{eq}

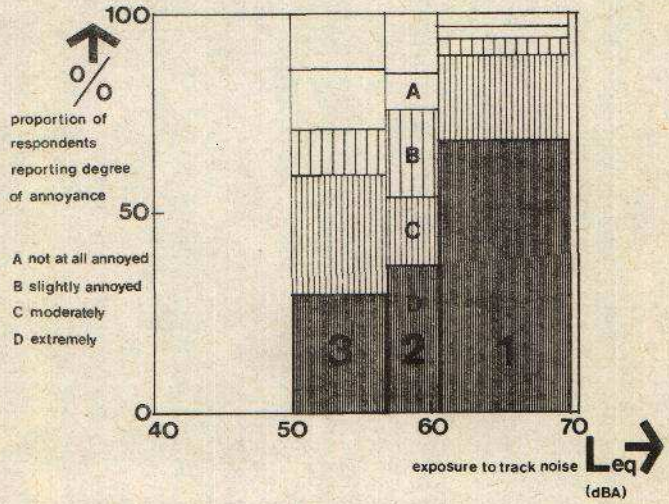

Fig. 2 Proportion of respondents reporting degree of annoyance as a function of noise exposure.

NOISE LEVELS AND RESIDENTS' REACTIONS AROUND A MOTOR RACE CIRCUIT

Sub Group	1	2	3
Degree of Annoyance			
Extreme	25 (67%)	13 (38%)	17 (30%)
Moderate	8 (8%)	5 (15%)	17 (30%)
Slight	2 (2%)	8 (23%)	7 (12%)
Not at all	1 (1%)	3 (9%)	8 (14%)
Not heard	1 (1%)	5 (15%)	8 (14%)
Average Annoyance Score	3.82	2.14	1.93

Table 1. Annoyance Response to Racetrack