EFFECT OF DISTANCE ON ROAD TRAFFIC AND RAILWAY NOISE ANNOYANCE

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Introduction A number of social surveys on community responses to various environmental noises have been carried out throughout the world. Based on the secondary analysis of data sets on community responses to environmental noises, Miedema *et al*. [1] found that annoyance caused by railway noise was lower than road traffic noise. This finding is reflected as the "railway bonus" in noise regulations in some European countries. However, Kaku *et al*. [2] and the authors [3] reported that in Japan there was no difference in community response between road traffic and railway noise and that the response to railway noise was a little more than road traffic noise, respectively. It is very important to verify the cause of the difference in trends between Europe and Japan if the difference exists. Although some reasons for the difference between Europe and Japan have been hypothesized [4], no clear evidence has been found. This study focuses on the effect of the distance from sources to houses on road traffic and railway noise annoyance, since it may be hypothesized that not only noise exposure levels but also the influence of other factors (vibration etc.) become smaller if distance from sources to houses is larger.

Social surveys and noise measurements Social surveys on community responses to road traffic and railway noises were carried out in Hokkaido, a colder area of Japan, and Kyushu, a warmer area, with the self-administered method from 1994 to 2001. Long-term noise measurements were made at reference points near the railways and roads and short-term noise measurements were also made at the reference points and several other points for the estimations of distance reduction.

Table 1. Distance data from sources to houses (m)

		Railway	Road Traffic
N (Sample sizes)		958	783
Mean		43	10
Std Deviation		56	12
Mode		10	5
Per-centile (%)	100	414	84
	90	94	18
	50	23	7
	10	8	3
	0	1	0

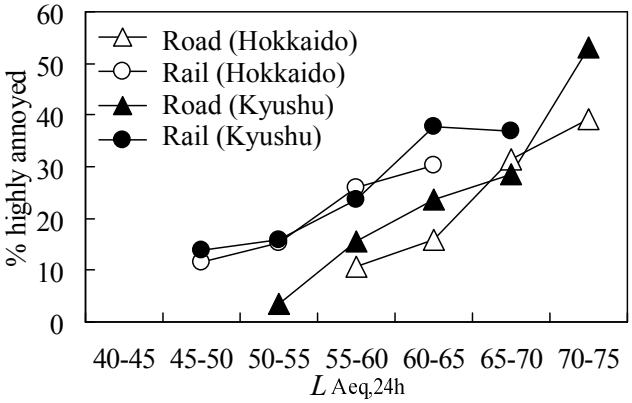

Figure 1. Dose-response relationships for general annoyance

Results Since there was no significant difference in noise annoyance between both areas as shown in Figure 1, we assembled the data collected in Hokkaido and Kyushu for each type of noise source. The statistical values of the distance data from noise sources to houses are shown in Table 1. The mean distances in our railway and road traffic noise surveys are 43 and 10 m, respectively. On the other hand, in a German survey carried out by R. Schuemer *et al*. [5] the mean values are 106 and 35 m, respectively. Japanese houses were closer to the sources than the German houses. Since such a difference in the house locations between Japan and Germany may cause the difference in community response, the responses were classified into two groups by distance: one group is in the 0-20 m range from the source and the other is in the 20-90 m range. Regression analysis was applied to each group (Figure 2). There was no statistically significant difference between 0-20 m and 20-90 m for both noise sources when the two regression lines were tested for homogeneity. Figure 3 shows the dose-response relationships for general annoyance of each distance group. No significant difference in % highly annoyed rate was found between the 0-20 m and 20-90 m groups using the Chi square test. However, it can be seen that the responses of the 0-20 m groups are a little higher than the 20-90 m groups.

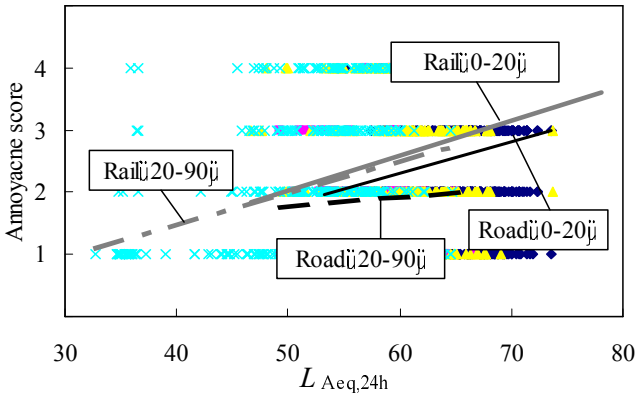

Figure 2. Scatter diagram for general annoyance

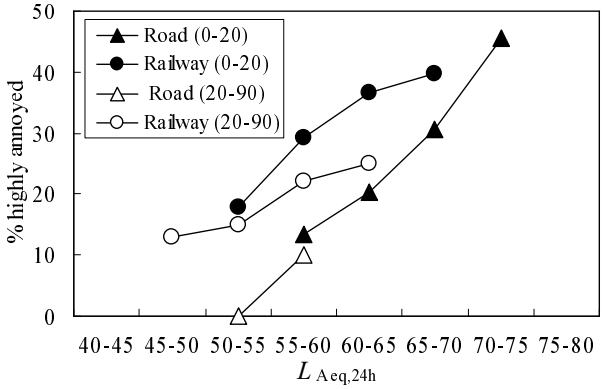

Figure 3. Dose-response relationships

Discussion In this study the following hypotheses were considered: (1) not only noise exposure levels but also the psychological influence of vibration may become smaller when the distance from noise sources to houses is larger; (2) noise annoyance may be reduced due to an increased impression of safety caused by visual observation of distance; and (3) the effect of distance for railway noise may be more than that for road traffic noise because vibration due to railway traffic is generally more than that of road traffic. However, there is no statistically significant difference in response between near and far groups in this study. To elucidate the cause of the difference between Japan and Europe, it may be necessary to conduct surveys with the same method in both areas and compare the data directly in order to analyze the structure of noise annoyance in more detail.

References

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