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EFFECTS OF TRAFFIC NOISE ON HEALTH

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INTRODUCTION

Noise is a serious problem for a large proportion of urban populations. During the last 30 years, many noise surveys have been conducted in order to investigate the magnitude of the problem in various cities throughout the world (1). In an effort to define acceptable limits of noise exposure, some of these studies have added a social survey of the community reaction to traffic noise (2).

It is generally believed that continued exposure to noise in real life can be a source of psychophysiological stress possibly causing health disorders. The degree to which noise can lead to harm the auditory and nonauditory physiological systems is a question of utmost importance for the assessment of the need of noise control. Exposure to high levels of noise over long periods of time can cause permanent hearing loss. This fact is known already for many centuries and has been extensively studied in the last decades. The population group at risk consists mainly of millions of workers from industrialized countries who are exposed to specially high noise levels. In addition to this specific effect, there are numerous other effects of noise on man (3)(4).

The noise levels in the daily life are usually lower than those in work environment, so that one might expect that the risk should also be lower. In fact, it is very difficult to be conclusive about the physiological effects of traffic noise, since the physiological changes of a pathological nature are very slight in this case. Such harmful effects may appear only gradually over a long period of time and be manifested only by aged and fragile individuals (5).

The present paper summarizes the first results of a investigation on the effects of traffic noise on the public health. A total of 240 housewives have been interviewed in order to determine if there is a relationship between the

incidence of physical and/or emotional disturbances and long term exposure to noise in this group of population.

HEALTH SURVEY

Our sample has included only housewives living in the city of Valencia who are not employed outside their home (randomly selected). A total of 240 health questionnaires based in the Cornell Medical Index (CMI) were distributed and collected from October 1987 to June 1988. The CMI was originally designed as a screening procedure in clinical diagnosis, and subsequently it was developed for use in epidemiology (6).

The questionnaire used consists of 19 sections totalizing 195 questions. Twelve of the sections are concerned with pathological symptoms related to, respectively, eyes and ears (11 questions), respiratory system (19), cardiovascular system (14), digestive system (20), musculoskeletal system (8), skin (8), nervous system (16), urogenital system (15), fatigue (7), frequency of illness (7), miscellaneous diseases (15) and habits (10). Seven sections are concerned with questions about mood and emotional patterns, including feelings of inadequacy (8), depression (4), anxiety (8), sensitivity (5), anger (5), tension (9) and concentration (6). All these questions have "yes" or "no" responses exclusively; each affirmative response indicates that the stated symptom or disorder is present or, in some instances, has occurred in the past.

NOISE MEASUREMENTS

A precision integrating sound level meter (BK2221) has been used to measure the equivalent sound level Leq in each location (women dwellings). The microphone was positioned at a height of 1.2 m above the street level and besides the exposed facade of the building. All measurements were carried out in weekdays (from Monday to Friday), during daytime (from 9.00 to 20.00 hours) and under good weather conditions (not rain or wind). The noise levels in each site were sampled over 10-15 minutes; this recording period was chosen as a good compromise between sampling errors and practicability and was considered quite satisfactory for a general purpose survey.

The values of equivalent sound levels found out in all locations range from 53 to 84 dBA, with a mean value of 69.0 dBA and a standard deviation of 5.4 dBA; about 38% of the Leq data exceeded of 70 dBA. These results are very similar to those obtained in a series of noise measurements carried out in Valencia some years ago and covering a total of 380 different sites regularly distributed over all the city (7).

RESULTS AND DISCUSSION

The age of the interviewed housewives range from 19 to 82 years, with a mean value of 43.6 years. Most of the sample are married women (76%) and the mean number of sons are 2.4. About 56% of these women are living in their

present residences during more than 10 years. Half of the women have a "mean" socioeconomic status; the rest of the sample distributes nearly equally between "low" and "high" categories. About 73% of the interviewed women declare that their health condition is "good" or "very good".

The number of positive responses in each questionnaire has been computed. The number range from 7 to 101, with a mean of 41.9, corresponding to 21% of all the questions. This result is higher than obtained in a similar research carried out some years ago in Japan and related to the noise and vibration produced in residential areas by the Shinkansen super express train, where the number of positive responses in a Cornell based questionnaire was only 16% (8).

Eight questions were answered positively by more than 70% of the sample ("do you need glasses to read?", "do you always gulp your food in a hurry?", "have you ever had rectal hemorrhoids?", "are you usually very tired in the evenings?", "are you easily awakened from sleep?", "do you often dream?", "do you wish you always had someone at your side to advise you?", and "does criticism always upset you?"). Most of the questions with a very low number of positive responses are related to specific disorders such as tuberculosis, asthma, epilepsy, diabetes, etc.

The number of positive responses is significantly correlated with the subjective evaluation of the health condition (Pearson correlation coefficient $r=-0.43$), and moderately correlated with the educational level ($r=-0.15$) and the socioeconomic status ($r=-0.12$). There is no correlation at all with the age ($r=0.04$) and with the number of sons ($r=-0.04$) of the interviewed women.

Surprisingly, the total number of positive responses in our questionnaires decreases when the corresponding noise level increases; in other words, the general health condition of the interviewed housewives seems to be better when the noise pollution in the area where they live is higher. This result is contradictory with that obtained by Yamanaka et al. (8) who found that the number of positive responses in the Cornell questionnaires (1060 respondents) increased with increasing noise level.

How explain these differences? In first place, we should remark that the correlations between CMI positive responses and noise levels are not high (the values found out in these two surveys are -0.11 and $+0.19$, respectively). Second, the characteristics of the noise and vibration produced by the bullet train (regarding to time patterns and peak levels) are very different to the road traffic noise in urban areas. Third, both surveys have been based on the noise levels measured externally and the possibility of different transmissions into houses should not be discarded. Fourth, a substantial part of the responses variance is probably attributable to factors related with the individual differences in susceptibility to noise and vibration or to specific diseases. And fifth, the correlation between the number of positive responses and

noise level is influenced in the Valencia survey by the trend shown by the high status people (i.e. the people with better health condition) to live in the noisiest locations.

There is no doubt that the road traffic annoys many people, can produce stress and therefore affect health in the broadest sense. Man produces a number of physiological responses to noise, but there is no clear evidence that repeated elicitation of these responses leads to permanent health effects at the noise levels existing in urban areas. Obviously, much more research will be needed to clarify the situation.

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