Journal of Sound and Vibration (2002) **250**(1), 145–149
doi:10.1006/jsvi.2001.3895, available online at http://www.idealibrary.com on IDEAL®

DISTRIBUTION OF BLOOD PRESSURE DATA FROM PEOPLE LIVING NEAR AN AIRPORT

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(*Received* 5 *September* 2001)

We observed blood pressure in general health examination data around a city airport and compared the data with those from a calm suburban area of the city. Information was also collected on the short-term history of medication and lifestyle including smoking, drinking and eating salty foods. This cross-sectional study on 469 women showed that systolic and diastolic blood pressure was not associated with aircraft noise levels in the area, even after controlling for variables regarding anti-hypertension treatment and lifestyle factors. A comparative study on 469 women from an area around an airport and 1177 women from a suburban control area showed no significant differences between blood pressure and other medical tests controlling for the variables of medication and lifestyle. Changes in blood pressure after 8 years were observed in 183 women around the airport. No significant differences among three zones with different levels of aircraft noise were found.

1. INTRODUCTION

Since the introduction of the B707 in Tokyo in 1959, jetliners have become the main carriers in civil aviation. As aircraft noise became a serious problem, health assessments of inhabitants around airports became a major concern. As occupational noise had been pointed out as a stressor in industries that could potentially induce hypertension [1–3], fears arose concerning adverse health effects such as cardiovascular disease in areas exposed to aircraft noise. Some reports have suggested elevated blood pressure, a high incidence of hypertension, pathological heart shape and other risks in areas with high aircraft noise [4, 5]. In the past two decades, environmental noise conditions have improved considerably around airports.

The recent cohort study in Caerphilly and Speedwell reported only a marginal effect of traffic noise on ischemic heart disease [6]. There is thus a need to evaluate again the effect of environmental noise under current conditions. This paper reports the result of a comparative study of blood pressure of those around an airport in Japan.

2. SUBJECTS AND METHODS

General health check data were collected around Fukuoka airport. Data from 469 women around the airport and 1177 women in a suburban area of the same city were

0022-460X/02/060145 + 05 $35.00/0

analysed. A questionnaire on lifestyle including smoking, drinking and food preferences was distributed at a health examination. Data from 183 women who received the health examination in 1980 were selected from the examinee lists from 1988 to 1989.

The subjects around the airport were divided into three groups—I, II and 0—according to the zoning of governmental countermeasures against aircraft noise.

The zoning class I for group I was originally defined as the area of over 75 WECPNL and class II for group II as the area with more than 90 WECPNL according to the rule established in 1974. The noise exposure level in group II is still higher than in group I now although the current noise levels have decreased in comparison to previous levels.

Group 0 in the outer area of class I zone was defined as the control group for the airport area. The SAS and HALBAU statistical analysis package program was used for statistics.

3. RESULTS

3.1. CROSS-SECTIONAL ANALYSIS

The statistical means with standard deviations for age and medical tests in each group are shown in Table 1. When the three groups were compared, age was found to be significantly lower in group 0 than in others. Statistical differences were also detected in the data on total cholesterol and triglycerides but not in blood pressure.

The differences in these test data disappeared after controlling for smoking, drinking and eating salty foods. Blood pressure did not show any difference among the areas even after a control of medication for hypertension.

3.2. COMPARATIVE OBSERVATIONS ON TWO POPULATIONS

The data from another population in a suburban area of the same city were used for a comparison with the data around the airport. The result revealed that the ratios of habitual smokers and daily drinkers around the airport were statistically higher than in the suburban area (Table 2). The ratios of people using medication for hypertension in the two groups were on the same level. The data on blood pressure without taking account of confounding variables such as drinking, smoking or medication showed no differences between the two populations (Table 3).

3.3. OBSERVATIONS ON CHANGES OVER YEARS

The distributions of age in the three groups did not differ from each other statistically. The changes in blood pressure after 8–9 years among female examinees around the airport showed no statistical difference between group 0 and group I or II in terms of either systolic or diastolic pressure (Figure 1).

4. DISCUSSION

A number of lifestyle factors are known to affect the health status, such as blood pressure. It is necessary to control for these confounding variables in investigations on the effects of environmental noise, although it is still possible to regard the lifestyle change itself as a result of noise exposure. To evaluate the cumulative effects of environmental noise, a comparative study on a cohort would be a useful investigation design. In longitudinal

TABLE 1

Health check data in three areas with different levels of aircraft noise

		High aircraft noise area			Low aircraft noise area			Control area			Total			
Zone		*N*	Mean	S.D.	*N*	Mean	S.D.	*N*	Mean	S.D.	*N*	Mean	S.D.	Anova
Age	All	142	55·9	11·3	216	54·6	11·5	49	45·8	13·1	407	54·0	12·0	$p < 0{\cdot}00$
Age	Without	84	54·5	10·7	132	54·5	11·8	30	44·9	12·5	246	53·3	11·9	$p < 0{\cdot}00$
Height	With	142	151.49	5·75	216	151·87	5·70	49	153·73	4·90	407	151·96	5·65	
Height	Without	84	151·35	5·56	132	152·44	5·83	30	153·51	4·63	246	152·20	5·63	
Weight	With	142	52·89	8·32	216	52·60	7·39	49	51·72	7·27	407	52·60	7·70	
Weight	Without	84	53·45	7·76	132	53·00	7·03	30	52·47	8·39	246	53·09	7·43	
SBP	With	142	127·9	18·0	216	128·6	19·7	49	122·9	17·4	407	127·7	18·9	
SBP	Without	84	128·3	18·1	132	128·2	20·0	30	124·2	17·8	246	127·8	19·1	
DBP	With	142	75·1	11·7	216	75·8	10·9	49	73·8	10·7	407	75·3	11·2	
DBP	Without	84	75·2	12·3	132	75·6	10·4	30	75·4	12·3	246	75·4	11·3	
TCHO	With	142	224·6	41·6	215	222·0	36·3	49	207·4	39·5	406	221·2	38·8	$p < 0{\cdot}05$
TCHO	Without	84	226·9	46·2	132	223·1	35·9	30	211·1	37·1	246	222·9	40·0	
TG	With	142	113·9	73·7	215	126·7	98·8	49	86·6	42·7	406	117·4	86·2	$p < 0{\cdot}05$
TG	Without	84	119·6	83·6	132	122·7	88·5	30	87·3	42·5	246	117·3	83·1	

Note: With: all subjects; without: subjects without smokers, drinkers, people who like salty foods and people with antihypertention treatments; SBP: systolic blood pressure; DBP: diastolic blood pressure; TCHO: total cholesterol; TG: triglycerides.

TABLE 2

Health behaviors among people around an airport and control area[†]

Smoking habits	Non-smoker	Smoker	Total	
Airport area	413 (91·0%)	41 (9·0%)	454 (100·0%)	
Control area	1080 (94·2%)	66 (5·8%)	1146 (100·0%)	
All	1493 (93·3%)	107 (6·7%)	1600 (100·0%)	
Drinking habits	Non-drinker	Drink often	Drink daily	Total
Airport area	310 (69·2%)	106 (23·7%)	32 (7·1%)	448 (100·0%)
Control area	908 (79·5%)	161 (14·1%)	73 (6·3%)	1142 (100·0%)
All	1218 (76·6%)	267 (16·8%)	105 (6·6%)	1590 (100·0%)

[†]Statistically significant: $p < 0{\cdot}001$ by χ^2 test.

TABLE 3

Systlic and diastolic blood pressure among people around an airport and in control area

	SBP						DBP					
	Airport area			Control area			Airport area			Control area		
	N	Mean	S.D.	*N*	Mean	S.D.	*N*	Mean	S.D.	*N*	Mean	S.D.
All	468	127·7	21·2	1176	129·2	19·5	468	75·6	11·2	1176	75·5	11·0
Non-med.	425	125·4	20·0	1058	127·1	17·8	425	74·1	10·9	1059	76·2	10·6
Non-Sm.Dr.	289	129·2	21·3	865	129·7	19·3	289	76·7	10·9	865	75·6	10·8
Non-Sl.Fd.	408	129·2	20·8	1032	129·6	19·4	408	75·3	11·0	1032	75·5	10·8

Note: Non-med.: Subjects without medical care for hypertension; non-Sm.Dr.: Subjects without smokers and habitual drinkers; non-Sl.Fd.: Subjects without people who like salty foods.

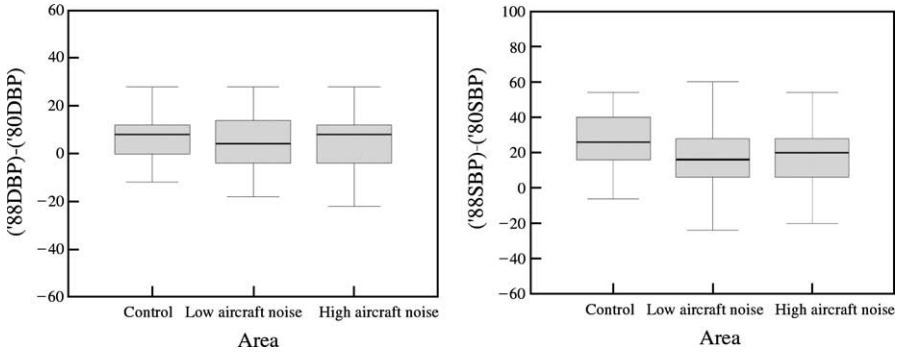

Figure 1. Changes of blood pressure after 8 years duration among the people from three classes with the different levels of aircraft noise. Systolic blood pressure on the left, and diastoric blood pressure on the right figure.

studies, there is a possibility to consider many modifiers like socio-behavioral factors in daily life.

The results reported here showed that no significant differences in blood pressure could be detected among groups or areas even after excluding subjects with anti-hypertension

treatment. Multi-regression analysis was also done on the cohort data. The calculation with the estimated average value of WECPNL in each zone extracted the noise level as a predictor of negative value for the blood pressure in 1988. This negative correlation of noise levels with blood pressure resembles the results of the Speedwell study reported in 1993 [7].

Our earlier study on the incidence of hypertension around another airport reported no significant difference among areas with different levels of aircraft noise [8]. In an industrial environment, the association of blood pressure with noise level was reported to be very weak, even in the cases with hearing loss [3], although the effects of environmental noise should not be extrapolated from occupational studies [9] as there are many other stressors in an occupational environment.

Almost all the health effects from environmental noise are the result of stress if the noise is under the level that causes hearing loss. Environmental noise of a moderate level cannot be a major contributor for the elevation of blood pressure. It is very difficult to detect the health effect of noise from a single source such as aircraft noise as many noise sources are present in daily life, especially in urban environments where the background noise masks the target noise and its effect.

The conditions for humans in the host-environment system, factors concerning health behavior and medication were considered in this study. As suggested in the data on smokers and habitual drinkers around the airport, the change in socio-behavioral factors might reflect the daily exposure to noise. From the viewpoint of susceptibility or synergism of stressors, some kind of predisposition such as those caused by life events or shift work might also be an important factor in determining the noise effect.

Here, we conclude that there was no obvious difference in blood pressure caused by aircraft noise at this time around the Fukuoka airports. However, we should still investigate the potential health risks in physical, mental and social conditions relating to aircraft noise exposure.

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