

Noise Pollution: What the Scientific Community Can Do?

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Abstract

The modern urbanization course and the expansion of industry and in a large part of the world have been accompanied by several environmental difficulties such as waste management, greenhouse gas emissions, wastewater and environmental noise pollution.

A study made by the World Health Organization (WHO) underlines that noise pollution is second among a series of environmental “stressors” for their public health effects, having it auditory and non-auditory high health impacts.

The question is: what can do the scientific community for the control of noise exposure?

Keywords: Noise pollution; Health; Environment; Noise control

Introduction

Noise pollution health effects

Noise is derived from the Latin word “nausea” implying ‘unwanted sound’ or ‘sound that is loud, unpleasant or unexpected’. Public health specialists agree that environmental risks constitute 24% of the disease responsibility [1]. Extensive exposure to environmental noise pollutions derived for example from roads, rails, airports and industrial plants contribute to this. On the basis of the available scientific evidence and on the results collected in WHO report [1], the following main noise pollution outcomes were briefly introduced, with the aim of focusing the noise pollution effects on the public health:

- Cardiovascular disease
- Endocrine effects from noise
- Cognitive disablement (in children)
- Sleep disturbance
- Annoyance

Cardiovascular disease

Epidemiological investigations on the connection between vehicular traffic and/or aircraft noise and cardiovascular effects were carried out both on adults and on children. The researches focused their attention on the hypertension, blood pressure and ischaemic heart diseases. These evidences of this association were increased in the last years [2-4].

There is scientific evidence that vehicular noise pollutions increase the danger of ischaemic heart disease; there is less evidence for an association with aircraft noise but this is only because few researches on this are available; however there is increasing evidence that the road traffic and aircraft noise pollution have an important influence on hypertension. A little amount of studies on the cardiovascular effects of other environmental noise sources, including rail and high velocity trains traffic are known, but it is logical to guess the same situation.

Endocrine responses to noise

In many studies the exposure to high sound pressure levels was connected to the increase of the levels of adrenaline and noradrenaline [5]. Other researches showed a correlation between the increase of cortisol and the noise exposure [6]. Generally the endocrine response

to noise is indicative of noise as a stressor exciting short-term physiological responses.

Cognitive disablement (in children)

It is well reported by WHO and Basner et al. [1,7] that noise effects on children’s cognition include communication problems, weakened attention, increased excitements, learning difficulties, disappointment, sleep disturbance due to noise annoyance. Some investigators pointed the attention on the effect on children of noise pollutions due to aircraft noise [8,9] while in road traffic noise [10] with reference to young (9–10 years old) children, was reported the comparison on the effect of vehicular traffic and aircraft noise finding some correlations between long-term exposure and impaired comprehension reading and recognition memory.

Sleep disturbance

Sleep is a physiological mind state and needs its integrality to allow for recuperation of the organism. Its decrease or interruption is detrimental in the long term and it can have big impact on quality of life and health. Researches showed that sleep interruption causes chronic sleep stage changes, body movements during the sleep, sudden awakenings, daytime performance, sleepiness, deterioration of the cognitive functions [1].

Annoyance

Since annoyance varies with persons and situations it can be asserted that what makes a sound a noise is connected with psychology rather than acoustics.

In determining whether a sound is a noise, mental attitude and environment are of major importance and it is interesting to note that groups of people with different backgrounds of work experience have

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differing annoyance thresholds. Then, noise annoyance may be affected by psychological mainly on subjective noise sensitivity due to the attitude to suffer noise, to the health status, age, etc.

The assessment of the acoustical factors like sound pressure levels, spectrum, time history and distribution of the events is also well-documented [11] and was included into the Directive 2002/49/EC of the European Parliament and of the Council relating to the management of environmental noise pollution [12].

Noise annoyance encloses broad psychological feelings like distress, nervousness, discomfort, frustration, when noise interrupts one's psychological state or normal life activities [13] and could interfere with the life quality, causing increased blood pressure, heart rate and endocrine problems [14].

What We Can Do?

In this framework a contribution of the scientific/academic community is necessary on several points. First, in my opinion, could be desirable a strong improvement, from international point of view, of the educational approaches to our environmental problems. They could include scientific papers on journals, international conferences and symposia, demonstrations, and scholarships. The aim of a comprehensive educational program should be to create a number of experts in each country with a deep knowledge of the subject, capable of "managing" the topic and directing noise abatement activities in the respect of environment. They could be able to apply all that the research activities propose in order to improve the benefit-cost ratio of their interventions. On the other hand, the scientific community has to strongly cooperate on research programs with the aim to investigate (both theoretically, both experimentally) on the three basic elements of the phenomena: the noise source (equipment or process directly responsible for sound generation), the noise path (media sound waves encounter as they travel from the source) and the receiver (final destination of concern for the sound). This approach to the problem underlines the multidisciplinary of the "noise pollution" subject, that includes, for example, researches on dynamics and vibrations [15], fluid-structures interaction [16], waves propagation and software modeling [17] acoustic characterization of materials and new materials development, noise measurements instrumentation and procedures [18-22], etc. From this point of view, this editorial represents a very first step in the above direction.

Nemo solus satis sapit (Plauto).

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