Editorial

Noise pollution and children

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Sounds are created when a vibrating source causes waves of acoustic energy to travel through air. Sound pressure waves move out from the vibrating source and become weaker, the further they travel. The waves may be reflected or scattered by objects so that the sound reaching the ear may be different from the sound originally generated[1].

Sounds can be characterised by their frequency (pitch) and intensity (loudness). The vibrations producing the sound are cyclical and are measured in hertz (Hz), which gives the number of cycles that occur per second. An adult with good hearing can hear frequencies in the range 20-15,000 Hz, while children can hear frequencies above 20,000 Hz[1].

Sound pressure level (volume) is measured in decibels (dB). A whisper is between 20-30 dB, normal conversation around 60 dB and someone shouting in your face over 80 dB[1]. Many stereo systems at maximum level are over 100 dB whilst rock concerts and firecrackers can exceed 140 dB.

A sound level meter is used to measure the decibel levels of sound. Usually the sound level meter has a filter with a frequency response similar to the human ear. These levels are known as dB (A) or A-weighted decibels[1]. Like the ear, this filter reduces the sound levels in the lower frequencies (<1000 Hz) and in the higher frequencies (>5000 Hz)[1].

The correspondence between decibel levels and perceived loudness is fairly simple. A difference of 3 dB in noise level is barely noticeable but represents a doubling of the acoustic energy involved[1]. For a noise to sound twice (or half) as loud, a difference of about 10 dB is required[1]. For example, a lawn mower measured at 80 dB will sound about twice as loud as a hair dryer at 70 dB[1].

Noise pollution can be defined as any unwanted or offensive sounds that unreasonably intrude into and disturb our daily lives[1].

Noise originates in all sorts of ways, but, in general, increasing noise pollution is primarily the result of the increasing population of cities[1]. More people mean more road, rail and air traffic, more industrial noise, and more neighbourhood and recreational noise[1].

Although we recognise noise pollution as a major environmental problem, it is difficult to quantify the effects it has on human health[1]. Exposure to excessive noise has been shown to cause hearing problems, stress, poor concentration, communication difficulties, fatigue from lack of sleep, and a loss of psychological well-being[1].

At its most extreme, sudden loud noise can cause instant and permanent hearing loss. The inner ear is the most susceptible to damage by loud noises. It contains thousands of tiny hair cells that transmit sound impulses to the auditory nerve. Explosive sounds with peak noise levels of 140 dB or more (e.g. blast of a firecracker at close range) can destroy these cells and cause permanent deafness[1]. Prolonged exposure to sounds louder than 85 dB (e.g. repeated exposures to loud engines like motorcycles or long hours spent listening to loud portable music players) can also lead to long-term hearing loss[1]. Thus, we should encourage children to wear hearing protection in noisy environments and take the time to show them how to prevent hearing damage from other portable music players.

Often it is not the pitch or the loudness but the repetitive nature of the sound and our inability to control it that makes a sound an annoying noise[1]. Car alarms and the seemingly endless barking of a dog are good examples[1].

Traffic noise is probably the most serious and pervasive type of noise pollution[1]. At low speeds, most traffic noise is caused by vehicle engines, transmissions, exhausts and brakes. The stop-start braking and acceleration during peak-hour congestion also increases noise levels[1]. Trucks and motorcycles are largely responsible for the peak noises that stand out from the steady background rumble[1]. It is these sharp and intermittent noises that are more likely to cause sleep disturbances and to contribute to other physical and psychological problems[1]. A combination

of strategies that include noise barriers, lower vehicle noise levels and better urban planning will help reduce the impact of traffic noise in the future[1].

A landmark 1975 study by Arlene Bronzaft[2], found that students at a New York City school whose classrooms faced elevated train tracks suffered significant reading delays, when measured against students not exposed to the same exterior noise. Six years later, after the school installed soundproofing and rubber resilient pads were placed on the train tracks, a follow-up study revealed that children's reading deficits had been eliminated[2].

Airport noise also can have negative effects on children's health and development. A 1995 study found a link between chronic noise exposure at Munich's International Airport and elevated nervous system activity and cardiovascular levels in children living nearby[3]. A 1996 study found a link between noise exposure and delays in reading proficiency[4]. The study, comparing first and second-grade students in a quiet neighbourhood school with those attending a school in the flight path of a major airport, found that kids in the noisier classrooms learned to tune out speech. This, in turn, affected their reading and language skills[4]. A 2005 study published in the *Lancet* found that kids living near airports in Britain, Holland and Spain lagged behind their classmates in reading by two months for every five decibel increase above average noise levels in their surroundings. The study also associated aircraft noise with lowered reading comprehension, even after socio-economic differences were considered.

While most studies link noise pollution with impaired cognitive development, there is some evidence that excessive noise affects kids physically. In a study published in 1998, Evans found that children living near busy airports had elevated blood pressure and stress hormone levels, compared with kids living in quieter areas[6].

Exposure to excessive noise during pregnancy may result in high-frequency hearing loss in newborns, and may be associated with prematurity and intrauterine growth retardation[7]. Exposure to noise in the neonatal intensive care unit may result in cochlear damage and disrupt normal growth and development of premature infants[7].

In Sri Lanka, a study by M P Senanayake, published in 2002, showed the impact of noise from power generators on the health of 5 children below 2 years of age[8]. A case filed by the Public Interest Law Foundation in the names of these children was upheld by court, with an order for immediate cessation of the noise and payment of compensation to each of the five minor petitioners[8]. More recently, in November 2007, the Supreme Court of Sri Lanka, in a landmark judgment, issued an interim order to limit the use of amplifiers, loudspeakers or other sources of sound emission between the hours of 10 p.m. and 6 a.m.

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