

The Human Brain

Relaxation

Low-Level Noise is an Insidious Stressor

Not just **loud or sudden noises** provoke a stress response. Chronic low-level noise also negatively influences the brain and behavior. Whether from the road or in the office, low-intensity noise has a subtle yet insidious effect on our health and well-being.

Noise at home or school can affect children's ability to learn. Compared to kids from quieter neighborhoods, children living near airports or busy highways tend to have lower reading scores and develop language skills more slowly. Psychiatric hospitalizations are higher in noisy communities. Bad moods, lack of concentration, fatigue, and poor work performance can result from continual exposure to unpleasant noise. [Family Circle, November 1991]

According to Dr. Alice H. Suter, an audiologist at the National Institute for Occupational Safety and Health: "Included in noise-related problems are high blood pressure, peptic ulcers, cardiovascular deaths, strokes, suicides, degradation of the immune system, and impairment of learning. Noise is also associated with an increase in aggression and a decrease in cooperation." [New York Times, March 6, 1990]

Since a drug approach is not a likely solution to noise, pharmaceutical companies are not currently researching the problem. But, science is starting to verify the severity of low-level noise.

Traffic Stress at Home

Even everyday traffic noise can harm the health and well-being of children. In the first study to look at the non-auditory health effects of typical ambient community noise, it was shown that chronic low-level noise from local traffic raised levels of stress hormones in children, as well as their blood pressure and heart rates.

"We found that even low-level noise can be a stressor. It elevates psychophysiological factors and triggers more symptoms of anxiety and nervousness," says environmental psychologist Gary Evans of Cornell University, an international expert on environmental stress, such as noise, crowding, and air pollution.

Evans and his European colleagues analyzed data on 115 fourth-graders in Austria. Half the children lived in quiet areas – below 50 decibels (dB), the sound level of a clothes dryer or a quiet office. Half lived in a noisier residential area – above 60 dB, about the intensity of an average dishwasher or raised voices.

"We are really not looking at loud kinds of noise. They are typical levels found throughout neighborhoods in Europe," says Evans. The non-auditory effects of noise, however, appear to occur at levels far below those required to damage hearing.

The children in noisier neighborhoods experienced higher overnight levels of the stress hormone cortisol, marginally higher resting systolic blood pressure, and greater heart rate reactivity to a stress test – all signs of modestly elevated physiological stress.

"Anything that increases blood pressure, for example, has negative implications for long-term health effects," says co-author Peter Lercher, M.D., an epidemiologist at the Institute of Hygiene and Social Medicine at the University of Innsbruck. Elevated blood pressure in childhood is thought to predict higher blood pressure later in life.

Background noise had a significant effect on stress levels, said Lercher. Therefore, chronic exposure to nearby sounds from roads and train lines are a concern.

The study adds evidence to Evans' previous research showing that noise can have serious health, learning, and task-motivation effects in children and adults exposed to chronic noise. "The findings suggest that children living in noisier areas are subject to stress, which may have serious health implications," conclude the researchers. [Journal of the Acoustical Society of America, March 2001]

Females at Higher Risk from Noise Stress

When children have no control over prolonged exposure to noise, it can lead to "learned helplessness" syndrome – a condition linked to forms of depression and to poverty. "It's a pretty pervasive phenomenon," says Evans. He found that "girls exposed to the traffic noise become less motivated, presumably from the sense of helplessness that can develop from noise they couldn't control."

Women respond differently to loud noise, too. A study at Texas A&M University found that "women have a lower threshold to experience noise as stressful," according to psychologist Dr. Mary W. Meagher. "Our data suggest that women may be more sensitive to noise stress than men." (While the women in the study were more easily "frightened" by a loud unexpected noise, the men were only more "startled.") [The Journal of Pain, February 2001]

Noise Annoys Neighborhoods

"The U.S. Census Bureau reports that Americans cite noise – more than crime, litter, traffic, or inefficient government – as the biggest problem affecting their neighborhoods. One-hundred thirty-eight million people are regularly exposed to noise levels labeled as excessive by the Environmental Protection Agency." [ABC News, August 27, 2001]

British investigators found that a greater amount of neighborhood problems, including noise, was associated with residents being three

times as likely to say their physical function was impaired and twice as likely to report poorer health. "What we think is happening is that neighborhood stress influences the biological processes that promote disease risk," said Dr. Andrew Steptoe of University College London. [Annals of Behavioral of Medicine, August 2001]

Office Noise

In another low-intensity study, Gary Evans and environmental psychologists at Cornell found that low-level noise in open-style offices seems to result in higher levels of stress, and lower task motivation.

Forty experienced female clerical workers (average age 37) were assigned for three hours to either a quiet office or one with low-intensity office noise (including speech). The workers in the noisy office experienced significantly higher levels of stress (as measured by urinary epinephrine, a stress hormone), made 40% fewer attempts to solve an unsolvable puzzle, and made only half as many ergonomic adjustments to their workstations, compared to their colleagues in quiet offices.

Interestingly, however, the workers themselves did not report higher levels of stress in the noisy office. "But just because people fail to report that environmental conditions are negative, we can't assume that there are no adverse impacts," Evans says.

"Our findings resemble those in studies of very noisy environments in that we found that realistic, open-office noise has modest but adverse effects on physiological stress and motivation," says Evans, and might contribute significantly to health problems such as heart disease (due to elevated levels of epinephrine) and musculoskeletal problems. "Even low levels of noise can have a potentially stressful effect." [Journal of Applied Psychology, October 2000]