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# Nonauditory Effects of Noise on Children: A Critical Review

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## Nonauditory Effects of Noise on Children: A Critical Review

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Large numbers of children both in the United States and throughout the economically developing world are chronically exposed to high levels of ambient noise. Although a great deal is known about chronic noise exposures and hearing damage, much less is known about the nonauditory effects of chronic ambient noise exposure on children. To estimate the risk of ambient noise exposure to healthy human development, more information about and attention to nonauditory effects such as psychophysiological functioning, motivation, and cognitive processes is needed. This article critically reviews existing research on the nonauditory effects of noise on children; develops several preliminary models of how noise may adversely affect children; and advocates an ecological perspective for a future research agenda.

**Keywords:** noise, stress, nonauditory effects, health, cognitive

### INTRODUCTION

In 1973 nearly 10 million American school children were exposed to ambient noise levels that exceed federal standards for hearing protection in work settings (Environmental Protection Agency, 1974). Recent studies estimate that American children on average are exposed daily to noise levels in the range of 76–80 Leq (unweighted average of decibel levels for 24 hours) (Roche et al., 1982; Schori & McGatha, 1978). To put these figures in perspective, the EPA recommended limit for risk to hearing is 70 Leq daily exposure for children. Since these assessments of childhood noise exposure, there have been marked increases worldwide in the number of children exposed to noise levels loud enough to impair hearing: this is especially true in underdeveloped countries (Evans, 1990; Suter, 1991).

Many *nonauditory* effects of noise on children also have been detected during the past two decades of research. Nonauditory effects of noise refer to impacts not directly related to sound-

induced damage to the auditory system. Nonauditory effects of noise, such as elevated sympathetic nervous system activity or disturbances in attentional processes, are apparent in children exposed to noise levels far below those necessary to induce auditory damage.

Although there is abundant evidence and analysis of the auditory effects of noise on children (Kryter, 1985; Mills, 1975), there has been little systematic, critical analysis of the nonauditory effects of noise exposure among children. This is a critical omission if we are interested in estimating the true risk of noise exposure to healthy human development. The present article critically examines the empirical evidence on the nonauditory effects of noise on children. The work is organized into three general areas of functioning: physiological, motivation, and cognitive. Both conceptual as well as methodological limitations in the extant research are examined.

### Physiological Effects of Noise

Work in animal models and in various occupational settings suggests heightened activation of the cardiovascular system among organisms

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### Abstract

Large numbers of children both in the United States and throughout the economically developing world are chronically exposed to high levels of ambient noise. Although a great deal is known about chronic noise exposures and hearing damage, much less is known about the nonauditory effects of chronic ambient noise exposure on children. To estimate the risk of ambient noise exposure to healthy human development, more information about and attention to nonauditory effects such as psychophysiological functioning, motivation, and cognitive processes is needed. This article critically reviews existing research on the nonauditory effects of noise on children; develops several preliminary models of how noise may adversely affect children; and advocates an ecological perspective for a future research agenda.

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