Existing human early experience theories assume a linear model relating amount of stimulation to development: i.e., the more stimulation, the more rapid development. Our research suggests that a linear model is incorrect particularly insofar as background noise in the home is concerned. Our predictor variable is a thirty item inventory of the physical environment. Two items in this inventory define a factor characterizing the amount of noise-confusion in the home. Our results consistently indicate a negative and significant relationship between noise confusion in the home and level of cognitive development between 6 and 30 months of age. Our results also indicate that the relationship of noise confusion to development is mediated by individual difference factors such as infant's sex or temperature. The negative relationship between noise-confusion and development may be due to delays in the development of critical mediators such as exploration or language. In terms of intervention, our infrahuman research indicates that the detrimental effects of noise may be minimized by early handling; at the human level the presence of a "stimulus shelter" in the home may serve a similar function.

3:20

UU5. Aircraft noise and the health and behavior of children. Sheldon Cohen (Department of Psychology, University of Oregon, Eugene, OR 97403), David Krantz (Department of Medical Psychology, Uniformed Services School of Medicine, Washington, DC 10014), Gary Evans and Daniel Stokols (Program in Social Ecology, University of California, Irvine, CA 92717)

The subjects were children with normal hearing attending the four noisiest elementary schools under a busy urban air corridor (LAX) and children attending three similar (matched on social class and race) quiet schools. Children were tested on the same measures twice with a one year interval between sessions. Cross-sectional data from the first session indicated that noisy school children had higher blood pressures than quiet school children. Noisy school children were also more likely to fail on a cognitive task and more likely to *give up* before the time to complete the task had elapsed. Longitudinal data were used to determine whether children *adapt* to the aircraft noise over the one-year period and to assess the effectiveness of noise abatement interventions introduced in a number of noise impacted classrooms. Additional cross-sectional data from the first session provided further information on the utility of noise abatement. There was little evidence for adaptation to noise over the one-year period. Abatement had small ameliorative effects on cognitive performance, children's ability to hear their teachers and school achievement. [Work supported by NSF and NIEHS.]

3:40

UU6. Effect of aircraft noise on children's reading and hearing levels in Brooklyn and Queens. Kendall Green, Bernard Pasternack, and Roy Shore (Institute of Environmental Medicine, New York University Medical Center, New York, NY 10016)

The percent of students reading below grade level from 1972 to 1976 was regressed on racial, socioeconomic, educational, and noise variables for each school. Schools were assigned noise exposure scores based on Noise Exposure Forecast (NEF) contours. After adjustment for confounding factors, an additional 5% of the students in the noisiest schools read at least one year below grade level with 95% confidence limits from 2% to 8%. In a companion study, 201 cases of permanent bilateral high-frequency hearing loss and 208 controls with normal hearing were identified from school records. Information on residence and confounding factors was obtained from birth certificates and questionnaires. Noise exposure was estimated for each residence from NEF contours and other noise sources. No statistically significant association between noise exposure and the risk or severity of hearing loss was observed. The point estimate of the effect suggested a doubling of risk for residents of the noisiest region with 95% confidence limits from 0.7 to 7.

4:00

UU7. Effects of freeway noise on academic achievement of elementary school children. Jerome S. Lukas and Russell B. DuPree (Department of Health Services, Office of Noise Control, Berkeley, CA 94704)

California law requires noise abatement for classrooms in which noise levels from a freeway exceed 50 dBA. In contrast, the Federal Highway Administration's criterion level is $L_{10} = 55$ dBA. This discrepancy reflects, in part, a lack of hard data regarding how noise from external sources affects the educational process. About 100 classrooms in 15 schools comparable with respect to certain socioeconomic variables but at different distances from freeways were studied. Noise levels inside the third and sixth grade classrooms with and without children were measured. In addition, teachers' voice levels and certain indications of classroom performance were obtained during three days of observation in each classroom. The Los Angeles Unified School District and the California Department of Education provided scores for each classroom on standardized tests of academic achievement in reading and mathematics. Preliminary analysis of the data indicates that achievement in reading and mathematics is poorer as noise levels increase, a finding consistent with previous studies. However, our data indicate that the coefficients of correlations between noise levels without children and achievement are higher if the levels are C-weighted rather than A-weighted, and that L_1 and L_5 are better predictors of achievement than are the other L_n's. [Work supported by F.H.W.A. and California Departments of Transportation and Health.]

Session UU. Noise V: Effect of Noise on the Young

David M. Deloy, Chairman

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J. Andrew Cook, Vice Chairman

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SOURCE (Conference Proceedings)

Invited Papers

2:00

UU1. Critical periods of susceptibility to acoustic trauma in animals. James C. Saunders (Department of Otorhinolaryngology and Human Communication, University of Pennsylvania, Philadelphia, PA 19104)

In recent years the possibility that a maturing cochlea passes through a period of time in which it is unusually susceptible to acoustic trauma from noise exposure has been studied in a number of species. The conclusion from several sources suggests that the critical period for susceptibility to acoustic trauma is associated with developmental events within the cochlea. The data that support this conclusion will be reviewed. Evidence will also be presented to show the long-term maturation of middle-ear admittance in certain species. This phenomenon indicates that cochlear input may continue to develop over an extended period, and the implications of this for susceptibility to acoustic trauma in young ears will be considered. [Work supported by the Deafness Research Foundation.]

2:20

UU2. Longitudinal study of children's hearing: Its relationship to noise and other factors. Alex F. Roche and Roger M. Siervogel (Fels Research Institute, Wright State University School of Medicine, Yellow Springs, OH 45387)

Six-month auditory threshold levels (ATL) have been obtained from children aged 6 to 18 years over a 4-year period. The means decrease with age especially at lower frequencies. Past otological problems are associated with poorer hearing. Stature and thresholds are not associated in boys, but taller girls tend to have worse hearing at younger ages and better at older ages. After the effects of stature are removed, rapid maturation is associated with lower thresholds in boys from 10 to 18 years and in girls at 8 and 9 years. Mean thresholds are significantly higher in those reporting higher noise exposure, especially from loud TV and power tools. High thresholds are associated with elevated systolic pressures in boys but with low pressures in girls. There are no associations with diastolic pressure or between noise exposure and blood pressure. $Leq(24)$ levels have been obtained using General Radio and Metrosonics dosimeters. The mean $Leq(24)$ for these children is between 77 and 84 dB with no significant age or sex effects; $Leq(24)$ was correlated with ATL in girls but not boys. [Work supported by USAF and EPA.]

2:40

UU3. The effect of airport noise upon human prenatal growth. Lawrence M. Schell (Department of Anthropology, State University of New York-Albany, Albany, NY 12222)

The effect of mother's exposure to aircraft noise and social factors on birthweight and length of gestation was studied in a sample of births drawn from a circum-airport community where noise levels had been measured. Mother's exposure was based upon known noise levels near her residence(s) in the community. Data from 116 births were used, these being from mothers whose noise exposure history was complete. Means of high, medium, and low exposure groups differed in birthweight by almost 200 g and in gestation length by nearly 10 days in favor of the low exposure group, but the differences were not statistically significant. Using regression analysis to correct for social factors, the partial correlation coefficient of noise exposure and gestation length was significant in girls ($r = -0.48$, $p < 0.001$), but not in boys ($r = -0.18$, $p = 0.11$). Partial correlations of noise exposure and birthweight were negative but not statistically significant in either boys or girls. These results agree best with previous studies which suggest that noise may have a depressing influence upon growth. [Work supported by U.S.P.H.S.]

3:00

UU4. Noise in the nursery: Background stimulation and infant cognitive development. Theodore D. Wachs (Department of Psychological Sciences, Purdue University, West Lafayette, IN 47907)