Talkative Parents Make Kids Smarter

An exhaustive study of how "typical" parents talk with their children during the youngsters' first few years of life has yielded a mountain of valuable data and some initial findings with serious social implications.

Striking class differences in the nature and extent of parental interaction with children between the ages of 9 months and 3 years result in a hefty intellectual boost for kids in white-collar families, a modest lift for those in blue-collar households, and a disturbingly weak assist for youngsters in welfare families. Young children whose parents talk extensively to them score much higher on later IQ tests than those exposed to minimal amounts of parental talk, assert study codirectors Betty Hart of the University of Kansas in Lawrence and Todd Risley of the University of Alaska, Anchorage.

"The more parents talk with their young children, the more good things happen intellectually for those kids later on," Risley contends. "But the massive class differences in this parental behavior surprised us and suggest that children in welfare families face problems that cannot be reversed by a few hours of Head Start classes every week."

Hart and Risley presented their findings, based on at-home observations of 42 families in the Kansas City area, at the annual meeting of the American Psychological Association in Toronto last week.

The study enlivens an already intense debate over the relative influence of genes and environment on IQ and intellectual potential, both in individuals and racial groups (SN: 4/8/95, p. 220).

But the scope of the 2½-year investigation, which was followed by 3 years during which researchers analyzed reams of written and tape-recorded observations, adds a new wrinkle to the nurture side of the controversy.

Families in Hart and Risley's study functioned well and exhibited no serious problems, such as child abuse or psychiatric illness. Thirteen professional families included at least one parent who worked in a white-collar occupation; in 23 working-class families, jobs included electrician and plumber; six families subsisted mainly on welfare.

Families represented a range of racial and ethnic groups; eight were headed by a single parent. Children in the study had from zero to six siblings.

Trained observers spent 1 hour every 2 months tape-recording and writing down the nature of all at-home interactions with a designated child in each family beginning at 9 months of age. Observers focused only on that child and whoever talked or interacted with him or her. They never offered advice to parents, even when asked, Risley notes.

The parent or parents in each family displayed a characteristic level of talk with their young children, month after month, Risley asserts. Overall, parents in professional families proved most talkative; they made nearly twice as many statements per hour to their kids as working-class parents did and about four times as many as welfare parents.

Parents in all the families devoted approximately equal effort to controlling children and keeping them out of trouble and danger, Risley says. But those parents who talked to children the most added critical elements to those interactions, such as affirming the child's efforts, responding to questions, providing guidance, and using a diverse vocabulary.

Children exposed to high levels of talk from their parents performed markedly better on a measure of developmental IQ at age 3, even controlling for socioeconomic and other influences. Follow-up at age 9 found that those children had maintained their IQ advantage.

Although genes affect intellectual ability, the new data indicate that the ways in which parents talk to their kids and communicate expectations about learning also loom large, holds psychologist Frances D. Horowitz of the City University of New York.

"This remarkable report represents a giant step toward a better understanding of normal child development," Horowitz argues. — *B. Bower*

DNA links gold into new materials

Much as a sculptor might add bits of clay together to form a statue, scientists are trying to build materials from nanometer-size particles. Constructing a material from the most basic components gives the scientist ultimate control over all of its properties.

Now, two research teams have found a way to build a material out of tiny gold beads by using DNA to link them. The result is a composite of inorganic particles and organic molecules that has potential applications in biological sensing and electronics.

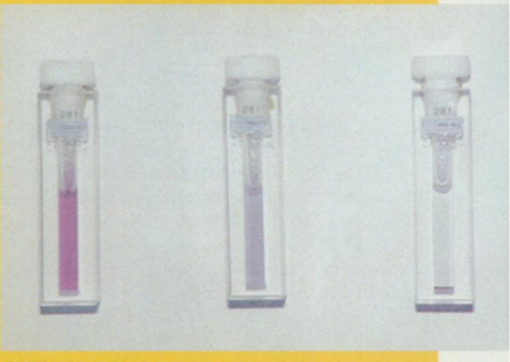
Both groups' methods take advantage of DNA's base-pairing properties. Chad A. Mirkin, Robert L. Letsinger, and their colleagues at Northwestern University in Evanston, Ill., attached DNA strands of two different sequences to gold particles 13 nanometers in diameter suspended in water. The DNA stuck out in all directions, making the particles look like furballs.

Then they added to the solution strands of DNA whose ends had sequences that complemented the strands on the gold particles. Like Velcro, the DNA hooked the individual furballs together, forming larger aggregates. This process changed the color of the solution.

Peter G. Schultz, A. Paul Alivisatos, and their colleagues at the University of California, Berkeley took a slightly different approach. They attached a single DNA strand to each gold particle. Allowing those modified particles to connect to a long DNA template produced microscopic daisy chains of two or three gold particles each. Both reports appear in the Aug. 15 NATURE.

One powerful application of this research may be in detection of microbes or identification of organisms. "You could design a series of [particles] that can latch onto a biological sequence," Mirkin says. By changing color, probes based on this technique would signal the presence of a specific DNA or RNA sequence.

The unusual composite material may have desirable electronic properties as well. Jacqueline Barton, a chemist at the California Institute of Technology in Pasadena, demonstrated several years ago that electricity can flow through single strands of DNA. The new work, she says, "establishes a scheme for constructing large arrays [of metal particles]." — *C. Wu*



Mirkin et al./NATURE

DNA-modified gold suspensions at 80°C (left) change color when they aggregate at room temperature (center), and precipitate out of the solution after several hours (right).