Early Signs of School Age IQ

Psychologists find that visual memory and attentiveness in infants are correlated with intelligence—but environment still plays a substantial role in determining IQ

It is an issue that affects every parent and it is a question that many would prefer not be addressed. Is there any way of testing a baby and determining how that child will develop mentally? Are there tests that can be administered to babies that predict the child's IQ or whether he will do well in school? And, if so, what good can come out of the tests?

Several years ago, psychologists would have said such tests simply cannot exist. There is too much variability in normal infant development, they thought, for anyone to make predictions. A child that appears slower than normal in some tests at age 3 months could very likely be a top achiever at age 6 months. But now, some researchers are changing their minds. At a recent conference on continuity in development,* participants heard evidence that certain tests that seem to determine how babies process information in the first 6 months of life correlate with the child's performance on intelligence tests when he reaches school age.

*The meeting on Continuity in Development was held at the Xerox conference center in Leesburg, Virginia, on 19 to 22 April and was sponsored by the National Institute of Child Health and Human Development.

In particular, Marc Bornstein of New York University and, independently, Susan Rose of Albert Einstein College of Medicine in New York reported that tests of visual attentiveness in the first 6 months of life correlate with IQ at ages 4 and 6. The correlation coefficient is 0.5 to 0.6, which means that as much as 25 to 36% of the variance in IQ at age 6 can be attributed to this measure. The predictive value of the visual attentiveness measure is independent of other variables that appear to be related to intelligence, such as the socioeconomic status of the parents or the parents' education.

At the same time, the data indicate that there is a lot of room for environmental influences to act. As much as 64 to 75% of the variance in IQs at age 6 cannot be attributed to this visual attentiveness measure. And no one is saying that a baby's destiny is sealed at birth. In fact, the researchers warned against this sort of interpretation. "I see a kind of danger in trying to demonstrate to the world that we can predict [intelligence]," said Ina Uzgiris of Clark University in Worcester, Massachusetts. "There is no reason to think it's given at birth and then it just stays."

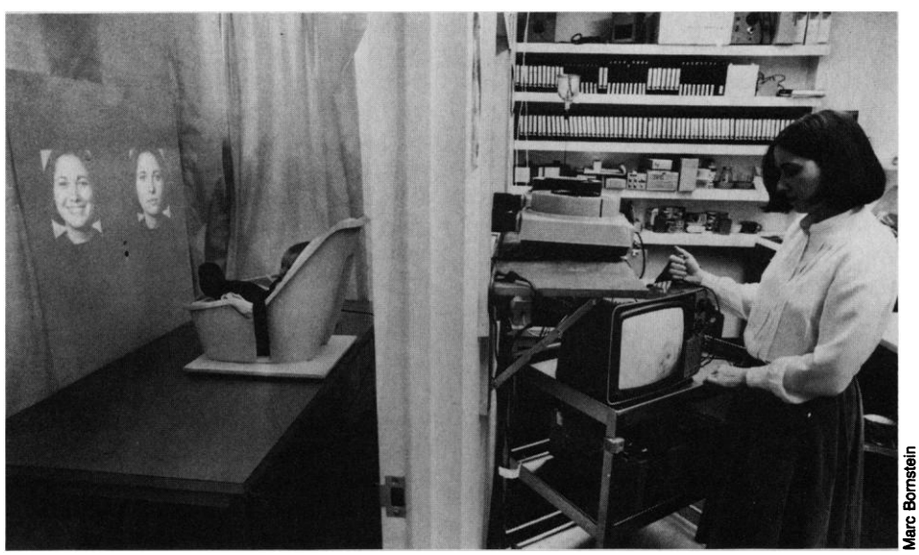
In addition, it is not even clear that intelligence, as measured by intelligence tests, is what psychologists should be focusing on. Heidelise Als of Children's Hospital in Boston gave an example of two children with IQs in the 130s. One must work very hard for everything he achieves and the other finds life easy—he breezes through school and his achievements seem effortless. Als said she would like to know why some children, and adults, must go through life "behind the eight ball."

Moreover, said David Feldman of Tufts University, although intelligence tests are very good at predicting how well children will perform in school, "how well kids do in school is only poorly related to how well they do in life. If your criterion is success or fulfillment or how well you do in a job or marriage, success in school is only poorly correlated."

But despite these caveats, the investigators found the new data enormously intriguing. Their hope is that they may be able to test babies early in life—particularly low birth weight babies or others who may be at risk for poor performance in school—and intervene to improve the child's chances of academic success. "I don't think it's been sufficiently emphasized how exciting this is. I think this is a dramatic turnaround," said Robert Plomin of Pennsylvania State University.

The story of the search for early predictors of school success or intelligence began in the late 1800s when Albert Binet was asked by the Paris school system to find some way to identify children who were falling behind in school. Binet invented a test to do that, and, about 1910, his test was translated into English. During World War I, the U.S. government decided to use the test to identify men who might be potential officer material and, says Bornstein, "suddenly, the word IQ came into everyone's home. The notion of intelligence tests became rooted in the culture of the 1920s."

At about the same time, a group of researchers, including Arnold Gesell of Yale University and Nancy Bayley of the University of California at Berkeley, decided to devise similar intelligence tests for babies and young children. The next obvious question was, Does a baby's test result tell any-



Marc Bornstein

Recognizing faces. *This baby is being shown photographs of two faces—one of which he saw before. A research assistant behind the screen measures how much time the baby spends looking at the old compared to the new photo. Babies that spend comparatively less time on the old photos tend to score higher on intelligence tests when they reach school age.*

thing at all about his intelligence test score as a child or as an adult?

In 1949, Bayley reported the results of a long-term study she had conducted to answer this question. She found no correlation between a baby's test score and the same child's later score on intelligence tests. Psychologists concluded that there is too little continuity in development for anyone to predict the intelligence of babies.

Bornstein points out that Bayley's results coincided well with the philosophy of our democratic society. Everyone can have an equal chance in life and, given the right environment, "anyone can become anything."

At the same time, psychologists continued to study babies, devising ever-better ways to determine what babies know and can do. "Babies used to be considered tabulae rasae," says Norman Krasnegor of the National Institute of Child Health and Human Development. "As techniques for asking questions of babies became more powerful, the notion of the baby as inept went away. Now we know that babies are very very capable."

The new ways to study babies also allowed investigators to ask again whether they can use their test results to make predictions. The methods for studying babies were developed more than a decade ago, but because it is necessary to do long-term follow-ups to look for predictive effects, researchers are only now beginning to accumulate the data they need.

The tests used by Bornstein and Rose were developed by Joseph Fagan and his colleagues at Case Western Reserve University to determine how babies respond to and process visual information. Psychologists show infants photographs of faces or abstract patterns or geometric shapes. Then, after letting the infant see the first picture, they show him a new picture and measure how much time the infant spends looking at the new rather than the old picture. On average, an infant will spend 60% of his time looking at the new picture, but there are substantial individual differences. The reason this test is significant, says Plomin, is that "the babies are telling you they recognize the difference between the old picture and the new—that's the key. They are not just discriminating the two. They are showing you that they remember the old picture."

And the reason that Rose and Bornstein think their correlations between this visual recognition in infancy and IQ at age 4 to 6 may be significant is that they believe they may be picking up mental processes in infancy that are important to learning and thinking in general. "We doubt that what we are seeing is the continuity of visual recognition memory per se," Rose remarked. "Clearly, we think we're into information processing, into capturing how the organism deals with information. Dealing with novelty is what life is all about." So it is not the correlation but the link to the thinking process that is intriguing. "If we had found that toe length was correlated with later IQ, I would not be very interested," Rose said.

Bornstein agrees. "These particular measures represent a way to access the human mind," he says. "First we bore you with stimulus A and then we show you stimulus B. Is it different? How early do you recognize it?"

The findings that visual recognition tests predict, to some degree, intelligence means that psychologists at least have hope of finding a way to focus their efforts to give children who will have academic difficulties extra help early on. But now it is up to the researchers to find good ways to help the children who need it most. ■

GINA KOLATA

Social Life: A Question of Costs and Benefits

Many mammals live in groups and are therefore social to some degree or another. The structure of social groups can, however, be very different between different species: some groups are made up of adults of both sexes, others are sexually segregated; in some groups the adult females are related to each other, in others the males are kin. And so on. The nature of the social structure—or lack of it—in any particular case was once thought to be an inbuilt characteristic of the species, but it is now seen as much more a behavioral response to a multitude of factors in the environment, and these include the type and distribution of food resources, climate, and, of course, other individuals. Socioecology is a way of looking for patterns in social behavior among different species as they relate to the entire range of internal and external influences to which individuals are exposed. A recent meeting in Durham, England, addressed these issues, a sample of which is presented here.*

The Multiple Benefits of Babysitting Duties

Many mammals live in groups for one or more of a spectrum of reasons, which may include the very practical benefits of protection against predation and the optimization of protecting and gathering food resources. Once a species adopts group living the individuals within the group necessarily become social to some degree, and this affords the opportunity for individuals to help each other, a key area of which is in the rearing of young. Phyllis Lee of the University of Cambridge, England, described the extent to which vervet monkey and elephant mothers might benefit from communal care in the rearing of offspring.

Although various aspects of communal care are quite common among mammals—a recent review of the subject listed 120 species in which such behavior has been observed—the full range of caring activities occurs in only a few species. "A common theme amongst these species," notes Lee, "is that they live in small, stable groups of familiar individuals and typically the groups are composed of kin of varying degrees of relatedness."

Related individuals will clearly have a vested genetic interest in ensuring the survival of each others' offspring, as long as the group does not reach a size at which competition for limited resources becomes critical. In fact, the network of helpers within a group can become quite complex, but this depends on the precise social structure—in terms of numbers of adult males to females, for instance—within the group. The nature of the social structure will depend on the species involved and the ecological conditions in which its members find themselves.

Vervet monkeys and elephants are similar in that they live in groups made up of females—and their offspring—who were born in that group: they are known as matrilineal kin groups. The two species differ, however, in that the monkey groups include (unrelated) adult males while the elephant groups do not. The range of potential caretakers is therefore different among the two species.

*"Comparative Socioecology of Animals and Humans," University of Durham, 13 to 16 April.