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Research Links Poor Kids' Stress, Brain Impairment

By Rob Stein
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Children raised in poverty suffer many ill effects: They often have health problems and tend to struggle in school, which can create a cycle of poverty across generations.

Now, research is providing what could be crucial clues to explain how childhood poverty translates into dimmer chances of success: Chronic stress from growing up poor appears to have a direct impact on the brain, leaving children with impairment in at least one key area -- working memory.

"There's been lots of evidence that low-income families are under tremendous amounts of stress, and we know that stress has many implications," said Gary W. Evans, a professor of human ecology at Cornell University in Ithaca, N.Y., who led the research. "What this data raises is the possibility that it's also related to cognitive development."

With the economic crisis threatening to plunge more children into poverty, other researchers said the work offers insight into how poverty affects long-term achievement and underscores the potential ramifications of chronic stress early in life.

"This is a significant advance," said Bruce S. McEwen, who heads the laboratory of neuroendocrinology at Rockefeller University in New York. "It's part of a growing pattern of understanding how early life experiences can have an influence on the brain and the body."

Previous research into the possible causes of the achievement gap between poor and well-off children has focused on genetic factors that influence intelligence, on environmental exposure to toxins such as lead, and on the idea that disadvantaged children tend to grow up with less intellectual stimulation.

"People have hypothesized both genetic and environmental factors play a role in why poor children don't do as well in school," said Martha Farah, director of the center for cognitive neuroscience at the University of Pennsylvania. "Experiential factors can include things like having fewer trips to museums, having fewer toys, having parents who don't have as much time or energy to engage with them intellectually -- to read to them or talk to them."

But Evans, who has been gathering detailed data about 195 children from households above and below the poverty line for 14 years, decided to examine whether chronic stress might also be playing a role.

"We know low-socioeconomic-status families are under a lot of stress -- all kinds of stress. When you are poor, when it rains it pours. You may have housing problems. You may have more conflict in the family.

There's a lot more pressure in paying the bills. You'll probably end up moving more often. There's a lot more demands on low-income families. We know that produces stress in families, including on the children," Evans said.

For the new study, Evans and a colleague rated the level of stress each child experienced using a scale known as "allostatic load." The score was based on the results of tests the children were given when they were ages 9 and 13 to measure their levels of the stress hormones cortisol, epinephrine and norepinephrine, as well as their blood pressure and body mass index.

"These are all physiological indicators of stress," said Evans, whose findings were published online last week by the Proceedings of the National Academy of Sciences. "The basic idea is this allows you to look at dysregulation resulting from stress across multiple physiological systems."

The subjects also underwent tests at age 17 to measure their working memory, which is the ability to remember information in the short term. Working memory is crucial for everyday activities as well as for forming long-term memories.

"It's critical for learning," Evans said. "If you don't have good working memory, you can't do things like hold a phone number in your head or develop a vocabulary."

When the researchers analyzed the relationships among how long the children lived in poverty, their allostatic load and their later working memory, they found a clear relationship: The longer they lived in poverty, the higher their allostatic load and the lower they tended to score on working-memory tests. Those who spent their entire childhood in poverty scored about 20 percent lower on working memory than those who were never poor, Evans said.

"The greater proportion of your childhood that your family spent in poverty, the poorer your working memory, and that link is largely explained by this chronic physiologic stress," Evans said. "We put these things together and can say the reason we get this link between poverty and deficits in working memory is this chronic elevated stress."

McEwen said the findings are consistent with earlier research in animals and brain imaging studies in people indicating that the body's response to stress, such as chronically elevated levels of cortisol, can adversely affect the brain, including the regions involved in working memory.

"This fits into a whole network of research," McEwen said. "It's a really exciting story."

Other researchers cautioned that more work is needed to explore and confirm the findings, and that chronic stress is probably one of the many factors affecting a child's development. But they said the results provided insight into the connection between poverty and achievement.

"One of the questions that health psychologists have been very interested in exploring is how is it that something outside the body literally gets under the skin and into the brain," said Avshalom Caspi, a professor of psychology and neuroscience at Duke University. "What this article says is that one of the reasons that poverty does make such an important difference is that it affects many physiological systems, and those systems, once stressed, may compromise brain development."

The findings indicate that education standards and other government policies that aim to improve poor

children's performance in school should consider the stress they are experiencing at home, Evans said.

"It's not just 'Read to our kids and take them to the library,' " he said. "We need to take into account that chronic stress takes a toll not only on their health, but it may take a toll on their cognitive functioning."

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