

THE GLOBE AND MAIL

How poverty shapes the brain



Dr. Amedeo D'Angiulli with his research equipment at his Carleton University lab in Ottawa.

Bill Grimshaw for the Globe and Mail


Scientists hope bold new research will help poor children succeed

Anne McIlroy

From Saturday's Globe and Mail

Using sophisticated imaging, Canadian James Swain will soon begin to peer inside the brains of people who grew up in poverty.

Over the past four decades, researchers have established how poverty shapes lives, that low socioeconomic status is associated with poor academic performance, poor mental and physical health and other negative outcomes. Dr. Swain is part of a new generation of neuroscientists investigating how poverty shapes the brain.

The University of Michigan  researcher will use a number of imaging technologies to compare the structure and function of brains of young adults from families with low socioeconomic status to those who are middle-class.

He knows the work has the potential to be controversial, but he hopes it will eventually lead to new teaching methods or early childhood interventions that would help children from low socioeconomic status (SES) families succeed at school and in life.

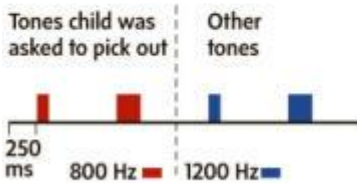
“That would be the dream, to inform social policy,” said Dr. Swain, who is from Toronto.

He and other neuroscientists are building on preliminary evidence that suggests the chronic stress of living in an impoverished household, among other factors, can have an impact on the developing brain.

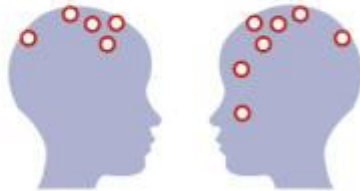
Does poverty change the brain?

To measure how children filter out irrelevant information and focus on what is important, researchers attached electrodes to the heads of 28 youngsters from Grades 6 to 9 and asked them to listen to a random series of four tones and then to press a button every time they heard two of them. Half of the children were from families with low socioeconomic status, the other half were from wealthier homes.

► TONE SEQUENCE

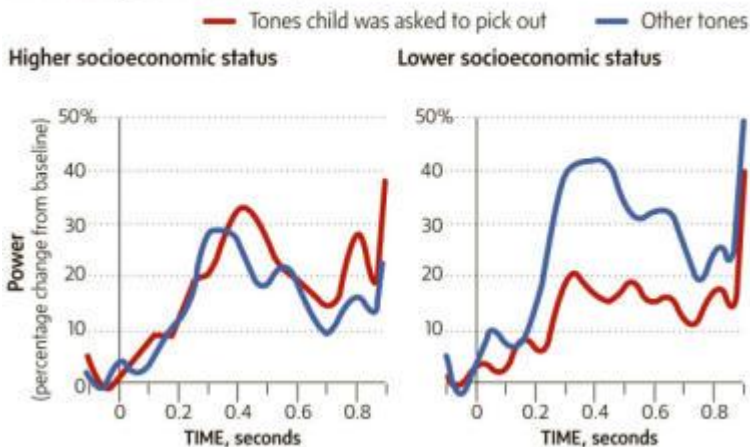


► POSITIONS OF ELECTRODES



► THE RESULTS

This chart shows how the brains of the low SES children used far more energy when listening to the "other tones" than the high SES children. The researchers say it is as if they paid equal attention to every sound and speculate this may be because they are used to coping with chaotic or unpredictable environments in which every sound could be important.



THE GLOBE AND MAIL | SOURCE: AMERICAN PSYCHOLOGICAL ASSOC., NEUROPSYCHOLOGY, 2008

Studies suggest a number of areas of the brain may be affected by low socioeconomic status, including the circuitry involved in language, memory and in executive functions, a set of skills that help us focus on a problem and solve it.

But Amedeo D'Angiulli at Carleton University in Ottawa wants to steer his fellow researchers away from the idea that they should be looking for poverty-related deficits. At an Association for Psychological Science conference in Boston this week, he will urge them to think about any differences they find as potential strengths, not weaknesses.

"I would see this work informing the school system, to exploit some of the strengths that are in these children and introduce curriculum that instead of penalizing them would allow them to function," he said.

Unlike most of his colleagues, Dr. D'Angiulli grew up in relative poverty, in one the poorest cities in Italy. He was raised by a single mother. She was often too ill to care for him, so various

relatives would temporarily take him in. He was the first member of his extended family to attend university, completing his doctorate at Northeastern University in Boston.

His early life has shaped the direction of his research. His idea is that brain changes associated with poverty may somehow be adaptive, and help children cope with chaotic or unpredictable environments.

In one study, he looked at how children filter out irrelevant information and pick up on what is important. To do this, he monitored the electrical activity of their brains when they were asked to listen to a random series of four tones and press a button every time they heard two of those tones.

He found that children from low SES families tend to use far more parts of their brain during the test than kids from middle-income families. It was as if the low SES children paid equal attention to every sound they heard, he says. Children from high-income homes only paid close attention to the two tones they had been asked to identify.

He stresses that the differences were in how they did the task, not how well they performed. All the children had similar reaction times and accuracy rates.

He interprets the results as meaning that low SES children are able to easily divide their attention, and says they might do well in schools that use the Montessori method. It was developed by Maria Montessori in the Lorenzo slum district of Rome in the early 1900s and involves a lot of self-directed learning rather than a teacher getting everyone in the class to focus on the same task at the same time.

At the University of Michigan, Dr. Swain will be looking at many different parts of the brain and the connections between regions.

His volunteers are 52 young adults that one of his colleagues, Gary Evans at Cornell University, has been tracking since they were in their mothers' wombs. Half of them grew up in poverty, the other half in working or middle-class homes.

Starting as early as next month, Dr. Swain will begin two days of brain imaging and tests for each volunteer. He will assess their language skills and memory and study how their brains react to pictures of scary faces, and whether that reaction changes when they are stressed. (He'll stress them by asking them to do mental arithmetic in front of strangers.)

He already has a detailed life history of each volunteer, which will make it possible to look for brain features associated with resilience. Some people, after all, emerge relatively unscathed from difficult childhoods. Dr. Swain wants to see if there is something different about their brains.

Dr. D'Angiulli is also planning studies that will look at the neuropsychology of resilience. He knows that many factors come into play, including the quality and nature of children's relationship with their parents or guardian.

There won't be a quick or easy resiliency training regime for poor kids, he says. But he hopes the work will lead to a greater understanding of how to help them succeed.