

## Helen Neville



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## Neuroscience exposes pernicious effects of poverty

*At the 2010 Society for Neuroscience meeting in San Diego, a group of scientists held a session on how poverty changes the brain. Neuroscientist Helen Neville of the University of Oregon in Eugene joined the discussion and described some of her group's studies on the brains of 3- to 5-year-old children who grow up poor. She met with Science News neuroscience writer Laura Sanders after the November 14 session to discuss some of the Oregon group's findings about what a low socioeconomic status does to the brain, and how intervention can help counter those effects.*

### How does poverty affect the brain?

Children growing up in poverty, for various reasons, have much poorer brain development and cognitive development than children growing up in not-poor environments. This has been shown by many people around the world for many decades. We now have animal models showing some key characteristics of an impoverished environment, for example, parental neglect. Rats that neglect their offspring create differences in brains and learning that are very parallel to those in humans.

### What is different in the brains of kids brought up in lower socioeconomic environments?

Executive function and self-control is lower, language skills are lower, IQ is lower, attention — the ability to focus on one thing and ignore distracting information — is poorer and working memory is poorer. Those cognitive skills are different.

When we look at electrophysiological and MRI studies of their brains we can see differences between higher and lower SES [socioeconomic status] children. We've also observed, it's important to note, these same differences in adults. Most people focus just on kids. But ... in our lab we've gone beyond the

university community to look at adults from lower socioeconomic status backgrounds, and their brains and cognition look really different too. So these effects are long-lasting.

### What can be done?

After several training studies targeting different processes, we observed that the two most effective [interventions] we could do is to train attention in kids — low SES kids, Head Start kids — so we've developed little games and puzzles for kids to do that they enjoy doing, to target self-control and attention. And the other training we're doing at the same time is with the parents of those children, who we talk to about parent skills, the importance of talking to your child and using consistent discipline, giving choices and the importance of attention and self-regulation. So it's a two-pronged program.

### How well is this approach working?

With over 100 kids now with this particular program, we see that the parents' behavior changes with their children, their stress levels go down, the children's problem behaviors diminish and their social skills improve, as rated by their teachers. In terms of language and IQ and preliteracy, all those tests show marked improvements. Their brain function improves, so they look like high SES kids.

### How long do you follow these kids?

After the end of the intervention, we've been following them for about two years. And they're hanging on to their gains.

And we're not doing any more; we're not boosting them. We think it's working.... We have one more year to go before we have all the data we're hoping to get.

### What's next?

All the kids we've been working with are monolingual, typically developing, mostly white kids. Because we know

bilingual brains look different in a way, the next step is to adapt this for Latino families, because Latino families make up 40 percent of the Head Start population in Oregon. In California, it's more like 80. The Latino population is the fastest growing segment of the U.S. population. And they're at high risk. They're failing school at enormously high rates.

We're doing structural imaging of white matter and gray matter in 4-year-olds and 3-year-olds.... We're getting structural and functional imaging and we'll continue to analyze it. We're looking at gene-environment interaction effects. That's very

important and we're looking at more data there.

### Your group runs an educational website ([changingbrains.org](http://changingbrains.org)) and made a DVD about how the brain changes. Why?

I want people to have evidence about the importance of the brain. Most people don't even know it does everything. They need to know the importance of the brain; they need to know that it develops over 25, 30 years. They need to know it's changed by experience. They need to know that genes are not destiny. They need to know what's going on. ■



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