

Study shows importance of early childhood education ^[1]

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EXCERPTS

An enhanced learning environment in the first five years of life shapes the brain in a way that appears four decades later, wrote a scientist from Virginia Tech and the University of Pennsylvania in the June edition of the *Journal of Cognitive Neuroscience* said.

The researchers used structural brain imaging to detect the developmental effects of linguistic and cognitive stimulation starting at six weeks in infants. The influence of an enriched environment on the structure of the brain had previously been demonstrated in animal studies, but this is the first experimental study to find a similar result in humans.

“Our research shows a relationship between the structure of the brain and five years of high-quality educational and social experiences,” said Craig Ramey, professor and distinguished researcher at the Fralin Biomedical Research Institute at VTC and principal investigator of the study. “We have shown that in vulnerable children who have received stimulating and emotionally supportive learning experiences, statistically significant changes in brain structure appear in middle age.”

The findings support the idea that the early environment influences the brain structure of individuals growing up with multi-risk socio-economic challenges, said Martha Farah, director of the Center for Neuroscience & Society at Penn and the study’s first author. .

“This has exciting implications for the basic science of brain development, as well as for the theories of social stratification and social policy,” Farah said.

The study follows children who have participated continuously in the ABC Project, an early intervention program initiated by Ramey in Chapel Hill, North Carolina in 1971 to study the effects of educational, social, health, and family support services on high-risk infants.

The comparison and treatment groups received additional health care, nutrition and family support services. However, from the age of six weeks, the treatment group also received five years of high-quality educational support, five days a week, 50 weeks a year.

When scanned, participants in the Abecedarian study were between their late 30s and early 40s, giving researchers a unique look at how childhood factors affect the adult brain.

“People are generally aware of the potentially significant benefits of early education for children from very limited resource situations,” said co-author Sharon Landesman Ramey, professor and distinguished researcher at Fralin Biomedical Research Institute and Virginia Tech College of Science. “The new results reveal that biological effects accompany the many behavioral, social, health and economic benefits reported in the Abecedarian project. This confirms the idea that positive experiences early in life contribute to a later positive adjustment through a combination of behavioral, social and brain pathways.”

During follow-up exams, structural brain MRI scans of 47 study participants were performed in the human neuroimaging laboratory of the Fralin Biomedical Research Institute. Of these, 29 people were part of the group that received the educational enrichment focused on promoting language, cognition and interactive learning.

The other 18 people received the same strong health, nutrition and social service supports provided to the educational treatment group, as well as community child care or other learning provided by their parents. The two groups were well matched on a variety of factors such as mother’s education, head circumference at birth, and age at time of scintigraphy.

By analyzing the scans, the researchers looked at the size of the brain as a whole, including the cortex, the outermost layer of the brain, as well as five regions selected for their expected link with stimulation of children’s language and cognitive development. by intervention.

These included the left inferior frontal gyrus and the left superior temporal gyrus, which may be relevant for language, and the right inferior frontal gyrus and bilateral anterior cingulate cortex, relevant for cognitive control. A fifth, the bilateral hippocampus, was added because its size is frequently associated with adversity and socioeconomic status early in life.

The researchers determined that people in the preschool treatment group had an increased size of the entire brain, including the cortex.

Several specific cortical regions also appeared larger, according to study co-authors Read Montague, professor and director of the Human Neuroimaging Laboratory and the Computational Psychiatry Unit at the Fralin Biomedical Research Institute, and Terry Lohrenz. ,

research assistant professor and member of the Institute of Human Neuroimaging. Laboratory.

Scientists noted that the results of group intervention treatment for the brain were significantly higher for men than for women. The reasons for this are not known and were surprising, as boys and girls showed generally comparable positive behavioral and educational effects from their enriched early education. This study cannot adequately explain the differences between the sexes.

“When we started this project in the 1970s, the field knew more about how to assess behavior than how to assess brain structure,” said Craig Ramey, also a professor at the Virginia Tech College of Science. “Thanks to advances in neuroimaging technology and thanks to strong interdisciplinary collaborations, we have been able to measure the structural characteristics of the brain. The prefrontal cortex and areas associated with language were permanently affected; and to our knowledge, this is the first experimental evidence of a link between the earliest known educational experiences and long-term changes in humans.

“We believe these findings merit careful consideration and reinforce the value of ensuring positive learning and socio-emotional support for all children – especially to improve outcomes for children vulnerable to inadequate stimulation and care in the community. the first years of life,” he said.

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