Brain Development Study May Provide Some Help for Educators

by Gargi Talukder

It is well known that, compared to adults, children tend to have a much easier time learning new languages and acquiring new skills, such as playing an instrument. A recent study of brain development in children suggests that there may be an anatomical reason for the ease with which children are able to acquire these abilities.

Mapping Growth

A group of brain imaging researchers at UCLA has used magnetic resonance imaging (MRI) to obtain brain scans from children of ages 3 to 15 years. These children were all of normal health and mental function, and were screened for learning or psychological disabilities. The researchers scanned the children's brains at intervals ranging from two weeks to four years, which allowed them to follow changes in their brains and construct "growth maps" of the children's brain development. They have published the results of their study in the March 9 issue of the journal Nature.

Dr. Paul Thompson and his colleagues found that the children's brains develop in a specific pattern, with a spurt of growth that starts in the front of the brain from ages 3 to 6. Between the ages 6 and 13, the researchers found that the pattern of rapid growth moves from the front to the back, toward the areas of the brain that are specialized for language skills.

Dr. Thompson, the lead investigator in this study, expressed surprise at the results. "The simplest model of brain development would be that all areas of the brain grow at the same rate. What we found instead was that there is a dynamic wave of growth in the brain," he said.

When to Learn a Second Language?

Thompson suggests that the ages from 6 to 13 might be the "most efficient" time to learn a second language, because the language systems are developing so rapidly during this time. The researchers found that there is a sharp cutoff in the growth of the language areas of the brain after age 13, so the pre-pubescent years may be a critical period for acquisition of a new language.

Dr. Thompson emphasizes that the results are not meant to suggest that languages cannot be learned at older ages, but that "it is simply a lot easier during those early pre-pubescent years." Dr. Thompson points out that these imaging results are supported by a number of surgical studies with patients suffering from brain injuries or tumors. These studies have

shown that if the language cortex is removed before puberty, the brain is plastic enough to compensate for the loss. However, if the language cortex is removed after puberty, patients find it very difficult to reclaim their language skills.

Another finding from the imaging study is that from age 13 to 15 about 50% of the brain tissue that controls motor skills are pruned away, "Giving the impression of a much more hardwired brain," said Thompson. Thus, activities that require motor skills, such as playing an instrument or a sport, may also have a critical period during childhood in which it is easiest to acquire the necessary abilities.

Practical Applications

The researchers hope that their maps of brain development will enable educators to tailor programs to teach specific skills at the most biologically advantageous times.

The group plans to use their findings on the development of normal brains to help in the detection of developmental disorders such as early-onset schizophrenia, autism, and attention deficit hyperactivity disorder. Their idea is that these disorders may manifest themselves as aberrant growth rates in the developing brain, and that their brain mapping technique could one day provide some clues toward treatment of these illnesses.

Dr. Thompson also hopes to extend the group's research to include adult patients that have Alzheimer's disease or have the gene that predisposes them to the disease. He says that his brain mapping technique could provide early detection by revealing structural changes in the brain due to the disease. Such early detection would result in early treatment, possibly preventing the more debilitating aspects of the disease. With current methods, the disease can usually not be diagnosed until the brain has deteriorated to an advanced degree.

Ms. Talukder is a graduate student in the Neuroscience Program at Stanford University. Her research focuses on the biophysical properties of the gene product Slowpoke, which has been shown to play a role in the timing of electrical signals in the auditory system.

Images from this study can be obtained at
http://www.loni.ucla.edu/~thompson/MEDIA/press_release.html

References:

Thompson, P.M. et al. March 9, 2000. "Growth patterns in the developing brain detected by using continuum mechanical tensor maps." Nature. Vol 404, pp 190-193.

Related articles can be found at http://www.BrainConnection.com