

# Brain Development During Childhood and Adolescence Fact Sheet

In recent years, powerful new imaging technologies and other approaches have allowed scientists to track the development of the brain during childhood. These studies offer a way to understand how the intellectual abilities and behavioral maturity of children at various ages are rooted in the developing brain. Studies of the developing brain also offer the best possibility for understanding the origins of mental illnesses. Research suggests that vulnerability to mental illness—and resilience—is rooted in development. Both risk and resilience are shaped by genes and environment interacting together, through childhood and adolescence. Research can show how.

## YESTERDAY

- Thirty years ago, it was thought that children did not experience mood disorders like depression.
- In the 1980s and 1990s, national surveys revealed that many adults with mental illness recall having had their first symptoms in youth. Subsequent work confirmed that early signs of psychiatric disorders are often present years before a diagnosis is made.
- Studies tracking the maturation of the brain showed that different parts of the brain grow at different times. There are growth spurts as well as periods of more gradual growth. Imaging studies have also shown that youth diagnosed with mental disorders show patterns of development different than in unaffected youth.
- Research in animals has shown that early experience, including the quality of early parental nurturing, has measurable effects on the brain and

later behavior. Early experiences shape how the brain-based stress response system develops and can influence later stress resilience.

## TODAY

- Scientists are continually refining imaging techniques to provide more detailed information on brain development, even in very young children. Researchers are tracing how changes in the developing brain underlie milestones in a child's mental and physical abilities, and behavior.
- Scientists are conducting studies to determine what individual genes do in the brain and how changes in genes disrupt brain function. Already this work has led to the identification of candidate compounds to correct deficits associated with neurodevelopmental disorders like Fragile X syndrome; clinical trials are underway.
- Research on early childhood stress is showing how early trauma can alter the brain's stress response system and contribute to future risk of anxiety and mood disorders.
- Scientists are also studying how genes that convey vulnerability to stress may increase risk.
- Studies of how the environment can turn genes on and off—a field called epigenetics—are providing clues to how early experience can have lasting effects on behavior, even across generations. Epigenetic changes are likely to be involved in the effects of the environment on development of the nervous system. Knowledge of epigenetic processes may offer targets for the development of new medications.

## TOMORROW

- Ongoing research will clarify the relationship between genes and risk for mental illness. Rather than finding genes that cause a particular disorder—for example, a gene for bipolar disorder—it is more likely that genes will be identified that contribute to behavioral, emotional, and social tendencies, including responses to stress. The mosaic of these traits will contribute to vulnerability or resilience to illness.
- Scientists are increasingly focusing on neural circuits in the brain and how they develop during childhood. Research will map neural circuits in the brain, clarify how genes and environmental factors shape them, and determine how they become disrupted in mental illness.
- One of the major goals of research is to identify biomarkers of disease to enable early and accurate diagnosis of mental illness. In diseases like schizophrenia, for example, early identification of risk may make it possible to intervene early and prevent the lasting disability associated with this disease. The genetics of mental illness is complex; still, knowledge of how genes shape brain function should make it possible to determine whether particular genes increase or protect against risk. Research also suggests that genes may help determine how a person will respond to treatment.
- Research on the effects of early stress on the brain will help inform efforts to support the healthy emotional and intellectual development of children.

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