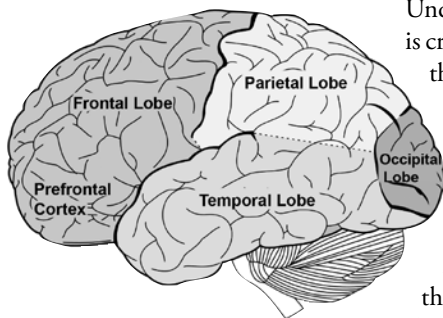


The Changing Adolescent Brain

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The idea that the teenage years are full of change and growth is not new to public health professionals, teachers, parents, or teens themselves, for that matter. Adolescence is often a time of encountering new freedoms and new situations. Many professionals in the political and health care fields still debate just how much responsibility teens should be given and at what age. Over the past few years, strong research has emerged that documents the enormous changes to the brain in the developing years between childhood and adulthood. The more difficult issue is how to apply this research when creating and implementing sound public health policy that affects adolescents. The degree to which adolescents may be limited by normal brain development processes may be a factor in weighing appropriate policy decisions.



Understanding adolescent brain development is crucial to building better programs for teens that allow them to have new experiences and make mistakes in low-risk environments. Programs such as Oregon's Action Research project (*see page 6*) provide a positive forum for teens to learn, acquire new skills, grow, participate in policy making and program designs that affect them, and feel respected in their independence, all under an appropriate level of adult support.

Previously, it was thought that most brain development was complete by adolescence and that teenagers' brains were as fully matured as adult brains. As the result of increasingly sophisticated research and imaging abilities, we now know this is not the case. Just as teens' bodies are maturing and their social skills are expanding, their cognitive centers are also in flux.

During adolescence, the brain adopts a "use-it-or-lose-it" pruning system, resulting in a decreasing number of connections among brain cells even as the speed of these connections increases. Major changes are also underway in the prefrontal cortex (PFC), known as the executive planner of the brain. The PFC is responsible for weighing risks and benefits, strategic thinking, and impulse control. Throughout adolescence,

the PFC is refining its wiring to become more sophisticated. Studies demonstrate that the PFC is among the last parts of the brain to fully develop, in many cases not maturing until well into the third decade of life. Unused branches are sloughed off, and other pathways are refined. As this construction phase progresses, synapses that normally go through the PFC in an adult brain are instead re-directed to the amygdala, known as the emotional center of the brain. When this happens, the response is rooted in emotion—fight, flight, freeze, freak out—rather than rationality. The amygdala can also misinterpret others' facial emotions, perceiving fear or nervousness as anger or hostility.

All these processes can alter the ability of adolescents to harness their decision-making abilities, making them more vulnerable to risk-taking and impulsive behaviors. As a parent, when you sometimes feel your son or daughter is over-reacting or misinterpreting, you have likely met their developing brain in action.

The adolescent brain is especially sensitive to the effects of dopamine, a chemical neurotransmitter that is activated by substance use, exposure to high-intensity media, and gambling, as well as food and sex. When drugs and alcohol are introduced in adolescence, the brain's natural supply of dopamine can be decreased, making teens more vulnerable to addiction. It is still not known how much of brain development is influenced by environment vs. genetics, but some evidence suggests that constructive learning experiences can positively shape teen cognitive development.

As research results have emerged, some public health professionals have voiced concern that the results will be used to squelch teen independence or rights in areas such as reproductive health and health care decisions. Public health policy and science provide us with a few key responses to that concern. First, brain development, as an isolated issue, should be just one of several factors considered when designing good programs and policies. Second, it is important to recognize that successful brain development relies on exercising this organ. From a use-it-or-lose-it perspective of refining maturing brain connections, it would be most productive for caring adults to provide meaningful opportunities for adolescents to exercise brain functions that require analytical, decision-making, and valuing skills, to help teens demonstrate their real and valuable role in making good decisions and advocating for their health. ■

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