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Adolescence

What's the Brain Got to Do with It?

HAROLD KOPLEWICZ

President, Child Mind Institute

Mark Twain famously said, “When I was a boy of 14, my father was so ignorant I could hardly stand to have the old man around. But when I got to be 21, I was astonished at how much the old man had learned in seven years.”

Teenagers, as many a beleaguered parent can testify, often seem to inhabit a slightly parallel universe, populated only by their peers. Filled with their own passion, conviction and certitude, they can be notoriously deaf to the voice of reason or caution. This makes them prone to exuberant overconfidence, on the one hand, and profound angst on the other. This emotional roller coaster led Anna Freud, Sigmund Freud’s daughter, to claim that having depression is part of being an adolescent.

Freud was not quite right about that, but she was on to something. Adolescence is a truly challenging period that is, because of what’s happening in a growing brain, very different from both the childhood years that come before it and the young adult period that follows.

The Upheaval That is Adolescence

As their brains change and move towards maturity, teenagers begin to feel more in control. Developmentally, they begin to associate with peers in a richer and more complicated way; they begin the natural and necessary process of separating from parents; and their budding self-awareness leads them to strive for mastery in a new

world that they increasingly understand they can shape and control. And this involves taking risks—testing themselves and their relationship to the environment.

But unfortunately—or just naturally—teens are spreading their wings, as it were, while the brain is still far from fully developed. The brain changes that begin in adolescence have as a goal the development of all of the executive functions: planning, consideration, analytical thought. But this process won't be complete until about age 25. In the meantime, adolescents are developing and even demanding the freedom to follow their impulses—before they have the brain structures to rein in emotion and regulate behavior. And so, amid the wonder of the changing brain we also see grave danger.

From Plasticity to Pruning

To understand what's happening, and even how you as a parent or teacher can be a guide through this period of stress and wonder, it helps to know what's going on in your child's head. All during childhood the brain is growing, adding pathway upon pathway in all areas. The childhood brain is what we call “plastic”—easily adaptable to any new experience.

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This plasticity is what makes learning things like languages so natural, and effortless, for young children. Or look at great Olympic athletes: they all learned the basics of their sports very early on—certainly before 13.

But at around age 13 another process kicks in, a consolidation of lines of communication in the brain that allows it to function more efficiently. This is known in the neuroscience community as “pruning”: ancillary and superfluous connections are abandoned for more robust and direct ones. We often describe this as

building “superhighways,” routes for information to move more quickly and effectively between different parts of the brain. All those little roads that aren’t seeing heavy traffic—those circuitous routes that a younger child might deploy to learn to play chess, or to learn to speak Italian—get eliminated. It’s a use-it-or-lose-it process. The superhighways allow the brain to get much better at the skills it’s actively using and to tackle more complex, sophisticated thought, but they eliminate some of that amazing plasticity of the young child’s brain.

What is the brain moving towards? Studies show that the volume of grey matter—the sort of computational part of the brain—peaks around the time of puberty and then begins to decrease, while white matter, which connects brain regions so they can coordinate, inform and regulate each other, keeps increasing until adulthood. And neuroimaging has shown that the development of more robust, faster connections proceeds roughly from the back to the front. The last part of the brain to get tied in to the new network, as it were, is the prefrontal cortex—the region responsible for impulse control, modulation of behavior, forming strategies, planning towards a goal. Knowing that what you do today may have a consequence tomorrow.

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Taking Control—But Out of Control

You can probably guess where this is going. By eighth or ninth grade, children are able to engage in more intellectual pursuits,

cognitive experiences that are the gateway to mature reasoning and goal-oriented planning. But the brain renovation isn't done, and during the time of restructuring, when not all parts of the brain are effectively linked, teenagers are characteristically susceptible to moodiness, impulsivity and risky behavior. The brain's emotional and reward centers have hijacked teenagers while the reasonable prefrontal cortex can only stand mutely by, at the end of a telephone line that hasn't been activated.

The result is that during this crucial period, when teenagers are asserting their independence and becoming more peer-oriented, their ability to put their feelings in perspective, to rein in impulses, to resist stress, and to stay focused on their goals is underdeveloped. This makes sense evolutionarily and developmentally—this is the period, in the past, when young people had to strike out on their own, find a mate, learn to be self-sufficient in the world. But, of course, we don't live in the wild anymore. The modern environment mixed with

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this ancient biology leads to binge drinking, reckless driving, sexting of naked photos—all the familiar behaviors of “out of control” teens we get a steady stream of in the news.

A Prime Time for Psychiatric Disorders

Still, most kids get through their teens without too much trouble. But a significant minority run into a huge barrier in adolescence—mental illness. This is the prime period for the onset of a great variety of psychiatric disorders. And many experts theorize that it is precisely because of how dynamic and changing the brain is between the ages of 13 and 25. The first peak of depression typically

occurs around ages 13 to 14; schizophrenia first appears around 18 to 19; and adult-onset bipolar disorder, or manic depression, tends to begin suddenly around 19 to 20.

Adolescence is stressful in part because it involves daunting developmental tasks: separating from parents, accepting one's sexual identity, forming a social network, establishing educational and vocational goals, and gaining mastery and self-sufficiency. Struggling on all these fronts leads even resilient teenagers to become demoralized and moody at times, especially when they lack the skills they

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will develop later to regulate their own emotions. But, while the consequences of normal adolescent demoralization can be pretty tough, dealing with these experiences can also lead to a healthy sense of self and a new wisdom concerning interpersonal relations and personal goals.

Those children who aren't resilient, however, are prone to develop real clinical depression. We know that certain people are genetically at risk to develop the disorder, and that depression can have multiple causes or triggers. We often talk about environmental factors, and in the case of adolescence a young person's *own brain* becomes a new and alien environment, just as his or her social environment is changing rapidly. So it should come as no surprise that adolescence is the developmental stage of life when one is at highest risk for getting the disorder. And the consequences of teenage depression can be disastrous.

Depression can cause a young person to miss out on many of the key experiences of adolescence, and make the developmental tasks of the period more difficult to complete. In a very real way that I have seen firsthand, teen depression causes developmental delays. And

untreated depression has been tied to a much increased risk of self-medication, which can lead to lifelong substance abuse problems.

Untreated depression is also a leading cause of suicide, suicide attempts, and suicidal ideation. Every year for the past 50 years approximately 5,000 young people have committed suicide, and more than 600,000 make serious attempts that result in trips to the emergency room.

Security in an Unsure Time

Adolescence is a risky time for a variety of reasons, though most stem from necessary and eventually beneficial developmental processes and brain changes. But that certainly does not mean we ignore the risks and the dangers. Reckless driving and unsafe sex can be just as disastrous as depression. The leading cause of death for this age group is accidents, followed by homicide and suicide. When teens bully and are bullied, which has tragically led to a

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string of suicides recently, there appears to be a complex interplay between the callousness made possible by an incompletely developed brain and the vulnerabilities of another adolescent mind.

What can you do to help insure safe passage for your child through adolescence?

Closely monitoring your teen's activities, and making a real effort to know him and his friends and engage in his pursuits, are proven—and common sense—parenting methods that can provide security in an unsure time, even while he strives for independence. If your child is depressed, on the other

hand—symptoms include an abrupt change in mood, a lack of interest in things he once enjoyed, changing sleep patterns, and irritability—the solution is careful diagnosis and treatment by a mental health professional.

But it all starts with understanding what teens are going through, and how they are in some ways limited by their circumstances. Teenagers want desperately to get away from you, but desperately need their parents. We have to understand that this is part of a social and biological development that is years away from being complete. They still need your help. To misquote the Talmud, try letting them go with the left hand and, with the right hand, draw them closer.

Harold Koplewicz, M.D., is a child and adolescent psychiatrist. He is the president of the Child Mind Institute, a nonprofit organization dedicated to transforming mental health care for the world's children. A clinician and advocate for children and teens with psychiatric disorders, Dr. Koplewicz is the editor-in-chief of the Journal of Child and Adolescent Psychopharmacology. His books include It's Nobody's Fault: New Hope and Help for