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Teenage Brains Seem  
Set for Recklessness,  
Yet Tend to Avoid Risk

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The largest number of adolescents in history is coming of age world-wide. All told, some 1.2 billion people -- one person in five -- are between ages 10 and 19, according to the United Nations Population Fund. In the U.S. alone, there are more than 29 million teenagers, with their numbers growing at twice the rate of the overall population.

For many of them, adolescence will become the time they forge a sense of self with experiments in independence and new experiences. These also are certain to be years of heedless high-risk behavior when social pressure and thrill-seeking override common sense.

By many public-health measures, U.S. teenagers today are more prudent than even five years ago, the U.S. Centers for Disease Control has reported. Yet, adolescence remains a risky business. It is a time when a quarter of U.S. high-school students report binge drinking and half report experimenting with drug use; when pathological gambling first takes hold; when car accidents are the leading cause of death; when half of all new HIV infections occur, as well as half of the 19 million reported cases last year of sexually transmitted diseases in the U.S.

Anatomical changes in the maturing brain could be one cause of so much reckless behavior, according to preliminary research presented recently at the annual meeting of the Society for Neuroscience in San Diego.

The roller-coaster of the adolescent mind rides on an unsteady scaffold of neurons and synapses. More than in childhood or maturity, researchers are discovering, the brain in adolescence is biologically attuned to chemical highs and lows in ways that can easily alter it for life.

Not only do different parts of the brain mature at different rates, but the nerve fibers that connect them all also are changing into higher-speed conduits. The systems that excite and inhibit behavior are in a unique state.

"The adolescent brain is really a different piece of cake," said psychologist Gerry Jager, who studies the effect of drugs on brain development at the Rudolf Magnus Institute of Neuroscience in Utrecht, the Netherlands.

Despite its innate vitality, the unfinished architecture of the young brain seems especially vulnerable to substance abuse and stress -- more prone to addiction, more resistant to the treatment of withdrawal and more susceptible to relapse -- than that of adults, recent studies in animals and humans suggest.

Its heightened susceptibility to substance abuse, for example, may be a consequence of its greater learning capacity. Such adaptable synapses more readily respond to any stimulation. "Just as a teenager will do a much better job than an adult of picking up a language, they will also, sadly, do a better job of becoming addicted," said Harvard University Medical School neurologist Frances Jensen. "Addiction is a form of learning."

More than a cellular flair for knowledge may be at work. Teenagers also appear to be more sensitive to rewards than children and find it harder to shake off their allure.

A recent brain-imaging study of 26 young people conducted at UCLA revealed that a region of the brain called the ventral striatum, which normally responds to a reward or any new, unexpected stimulus, overreacts in teenagers. It responds more quickly, more strongly, and is more attuned to the magnitude of a reward. That may be why teenagers seek experiences they find rewarding, even though they might also be potentially harmful, said UCLA cognitive neuroscientist Jessica Cohen.

But adolescents also perceive risk and uncertainty differently than do adults, psychiatrist Amy Krain and her colleagues at New York University's Institute for Pediatric Neuroscience reported.

In her experiments, Dr. Krain discovered that teenagers tried to avoid risks more than adults did, contrary to conventional wisdom. "It was surprising. We thought they would be more risk-seeking, not less," she said. Even so, teenagers also were more comfortable with ambiguity, she found. Unlike adults, they were more willing to make a choice even when the consequences were unclear.

Teenagers actually tend to overestimate the true risks of events, whether it involves dying in an earthquake or contracting a sexually transmitted disease, researchers at the University of California at San Francisco reported in the *Journal of Research on Adolescence*.

Adolescence may be a global state of mind, recognized as a special stage of life in 176 cultures around the world, but no one is certain yet whether its turmoil is an effect of brain development or a byproduct of the modern youth culture, with its social and legal influences. "We have mapped a lot of what is happening structurally in the brain, but we still don't know the full story," said UCLA psychologist Elizabeth Sowell. "How this all translates into behavior, we just don't know yet."

This new view of the adolescent brain is the product of a unique exercise in introspection.

"This is the first generation that has had access to this information about how their brains developed," said Dr. Jensen. "It may change how they turn out as adults."