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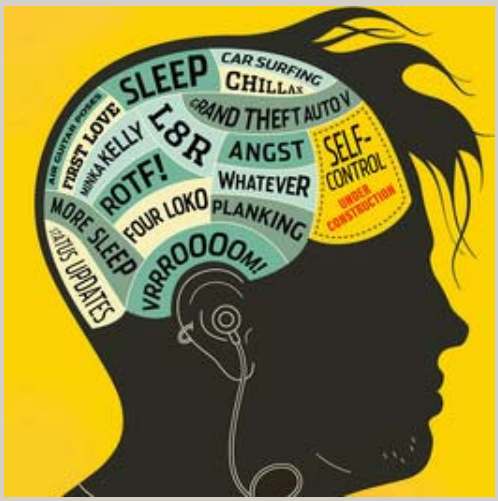
What's Wrong With the Teenage Mind?

Children today reach puberty earlier and adulthood later. The result: A lot of teenage weirdness. Alison Gopnik on how we might readjust adolescence.

By ALISON GOPNIK

"What was he thinking?" It's the familiar cry of bewildered parents trying to understand why their teenagers act the way they do.

How does the boy who can thoughtfully explain the reasons never to drink and drive end up in a drunken crash? Why does the girl who knows all about birth control find herself pregnant by a boy she doesn't even like? What happened to the gifted, imaginative child who excelled through high school but then dropped out of college, drifted from job to job and now lives in his parents' basement?



Harry Campbell

If you think of the teenage brain as a car, today's adolescents acquire an accelerator a long time before they can steer and brake.

Adolescence has always been troubled, but for reasons that are somewhat mysterious, puberty is now kicking in at an earlier and earlier age. A leading theory points to changes in energy balance as children eat more and move less.

At the same time, first with the industrial revolution and then even more dramatically with the information revolution, children have come to take on adult roles later and later. Five hundred years ago, Shakespeare knew that the emotionally intense combination of teenage sexuality and peer-induced risk could be tragic—witness "Romeo and Juliet." But, on the other hand, if not for fate, 13-year-old Juliet would have become a wife and mother within a year or two.

Our Juliets (as parents longing for grandchildren will recognize with a sigh) may experience the tumult of love for 20 years before they settle down into motherhood. And our Romeos may be poetic lunatics under the influence of Queen Mab until they are well into graduate school.

What happens when children reach puberty earlier and adulthood later? The answer is: a good deal of teenage weirdness. Fortunately, developmental psychologists and neuroscientists are starting to explain the foundations of that weirdness.

The crucial new idea is that

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James Dean in the 1955 film 'Rebel Without A Cause'

there are two different neural and psychological systems that interact to turn children into adults. Over the past two centuries, and even more over the past generation, the developmental timing of these two systems has changed. That, in turn, has profoundly changed adolescence and produced new kinds of adolescent woe. The big question for anyone who deals with young people today is how we can go about bringing these cogs of the teenage mind into sync once again.

The first of these systems has to do with emotion and motivation. It is very closely linked to the biological and chemical changes of puberty and involves the areas of the brain that respond to rewards. This is the system that turns placid 10-year-olds into restless, exuberant, emotionally intense teenagers, desperate to attain every goal, fulfill every desire and experience every sensation. Later, it turns them back into relatively placid adults.

Recent studies in the neuroscientist B.J. Casey's lab at Cornell University suggest that adolescents aren't reckless because they underestimate risks, but because they overestimate rewards—or, rather, find rewards more rewarding than adults do. The reward centers of the adolescent brain are much more active than those of either children or adults. Think about the incomparable intensity of first love, the never-to-be-recaptured glory of the high-school basketball championship.

What teenagers want most of all are social rewards, especially the respect of their peers. In a recent study by the developmental psychologist Laurence Steinberg at Temple University, teenagers did a simulated high-risk driving task while they were lying in an fMRI brain-imaging machine. The reward system of their brains lighted up much more when they thought another teenager was watching what they did—and they took more risks.

From an evolutionary point of view, this all makes perfect sense. One of the most distinctive evolutionary features of human beings is our unusually long, protected childhood. Human children depend on adults for much longer than those of any other primate. That long protected period also allows us to learn much more than any other animal. But eventually, we have to leave the safe bubble of family life, take what we learned as children and apply it to the real adult world.

Becoming an adult means leaving the world of your parents and starting to make your way toward the future that you will share with your peers. Puberty not only turns on the motivational and emotional system with new force, it also turns it away from the family and toward the world of equals.

The second crucial system in our brains has to do with control; it channels and harnesses all that seething energy. In particular, the prefrontal cortex reaches out to guide other parts of the brain, including the parts that govern motivation and emotion. This is the system that inhibits impulses and guides decision-making, that encourages long-term planning and delays gratification.

This control system depends much more on learning. It becomes increasingly effective throughout childhood and continues to develop during adolescence and adulthood, as we gain more experience. You come to make better decisions by making not-so-good decisions and then correcting them. You get to be a good planner by making plans, implementing them and seeing the results again and again. Expertise comes with experience. As the old joke has it, the answer to the tourist's question "How do you get to Carnegie Hall?" is "Practice, practice, practice."

In the distant (and even the not-so-distant) historical past, these systems of motivation and control were largely in sync. In gatherer-hunter and farming societies, childhood education involves formal and informal apprenticeship. Children have lots of chances to practice the skills that they need to accomplish their goals as adults, and so to become expert planners and actors. The cultural psychologist Barbara Rogoff studied this kind of informal education in a Guatemalan Indian society, where she found that apprenticeship allowed even young

children to become adept at difficult and dangerous tasks like using a machete.

In the past, to become a good gatherer or hunter, cook or caregiver, you would actually practice gathering, hunting, cooking and taking care of children all through middle childhood and early adolescence—tuning up just the prefrontal wiring you'd need as an adult. But you'd do all that under expert adult supervision and in the protected world of childhood, where the impact of your inevitable failures would be blunted. When the motivational juice of puberty arrived, you'd be ready to go after the real rewards, in the world outside, with new intensity and exuberance, but you'd also have the skill and control to do it effectively and reasonably safely.

In contemporary life, the relationship between these two systems has changed dramatically. Puberty arrives earlier, and the motivational system kicks in earlier too.

At the same time, contemporary children have very little experience with the kinds of tasks that they'll have to perform as grown-ups. Children have increasingly little chance to practice even basic skills like cooking and caregiving. Contemporary adolescents and pre-adolescents often don't do much of anything except go to school. Even the paper route and the baby-sitting job have largely disappeared.

The experience of trying to achieve a real goal in real time in the real world is increasingly delayed, and the growth of the control system depends on just those experiences. The pediatrician and developmental psychologist Ronald Dahl at the University of California, Berkeley, has a good metaphor for the result: Today's adolescents develop an accelerator a long time before they can steer and brake.

This doesn't mean that adolescents are stupider than they used to be. In many ways, they are much smarter. An ever longer protected period of immaturity and dependence—a childhood that extends through college—means that young humans can learn more than ever before. There is strong evidence that IQ has increased dramatically as more children spend more time in school, and there is even some evidence that higher IQ is correlated with delayed frontal lobe development.

All that school means that children know more about more different subjects than they ever did in the days of apprenticeships. Becoming a really expert cook doesn't tell you about the nature of heat or the chemical composition of salt—the sorts of things you learn in school.

But there are different ways of being smart. Knowing physics and chemistry is no help with a soufflé. Wide-ranging, flexible and broad learning, the kind we encourage in high-school and college, may actually be in tension with the ability to develop finely-honed, controlled, focused expertise in a particular skill, the kind of learning that once routinely took place in human societies. For most of our history, children have started their internships when they were seven, not 27.

The old have always complained about the young, of course. But this new explanation based on developmental timing elegantly accounts for the paradoxes of our particular crop of adolescents.

There do seem to be many young adults who are enormously smart and knowledgeable but directionless, who are enthusiastic and exuberant but unable to commit to a particular kind of work or a particular love until well into their 20s or 30s. And there is the graver case of children who are faced with the uncompromising reality of the drive for sex, power and respect, without the expertise and impulse control it takes to ward off unwanted pregnancy or violence.

This new explanation also illustrates two really important and often overlooked facts about the mind and brain. First, experience shapes the brain. People often think that if some ability is located in a particular part of the brain, that must mean that it's "hard-wired" and inflexible. But, in fact, the brain is so powerful precisely because it is so sensitive to experience. It's as true to say that our experience of controlling our impulses make the prefrontal cortex develop as it is to say that prefrontal development makes us better at controlling our impulses. Our social and cultural life shapes our biology.

Second, development plays a crucial role in explaining human nature. The old "evolutionary psychology" picture

was that genes were directly responsible for some particular pattern of adult behavior—a "module." In fact, there is more and more evidence that genes are just the first step in complex developmental sequences, cascades of interactions between organism and environment, and that those developmental processes shape the adult brain. Even small changes in developmental timing can lead to big changes in who we become.

Fortunately, these characteristics of the brain mean that dealing with modern adolescence is not as hopeless as it might sound. Though we aren't likely to return to an agricultural life or to stop feeding our children well and sending them to school, the very flexibility of the developing brain points to solutions.

Brain research is often taken to mean that adolescents are really just defective adults—grown-ups with a missing part. Public policy debates about teenagers thus often turn on the question of when, exactly, certain areas of the brain develop, and so at what age children should be allowed to drive or marry or vote—or be held fully responsible for crimes. But the new view of the adolescent brain isn't that the prefrontal lobes just fail to show up; it's that they aren't properly instructed and exercised.

Simply increasing the driving age by a year or two doesn't have much influence on the accident rate, for example. What does make a difference is having a graduated system in which teenagers slowly acquire both more skill and more freedom—a driving apprenticeship.

Instead of simply giving adolescents more and more school experiences—those extra hours of after-school classes and homework—we could try to arrange more opportunities for apprenticeship. AmeriCorps, the federal community-service program for youth, is an excellent example, since it provides both challenging real-life experiences and a degree of protection and supervision.

"Take your child to work" could become a routine practice rather than a single-day annual event, and college students could spend more time watching and helping scientists and scholars at work rather than just listening to their lectures. Summer enrichment activities like camp and travel, now so common for children whose parents have means, might be usefully alternated with summer jobs, with real responsibilities.

The good news, in short, is that we don't have to just accept the developmental patterns of adolescent brains. We can actually shape and change them.

—Ms. Gopnik is a professor of psychology at the University of California, Berkeley, and the author, most recently, of "The Philosophical Baby: What Children's Minds Tell Us About Truth, Love and the Meaning of Life." Adapted from an essay that she wrote for www.edge.org, in response to the website's 2012 annual question: "What is your favorite deep, elegant or beautiful explanation?"