

A young woman with her arms outstretched is ziplining over a deep, lush green valley. She is wearing a blue t-shirt and colorful, patterned leggings. Below her, a river flows through the valley, surrounded by dense forest and mountains in the distance. The scene is captured from a high angle, looking down at the zipliner.

# THE YOUNG AND THE RISKLESS

Teens tend to make rash decisions,  
and it all comes down to the brain.  
Adults could learn a thing or two from them.

BY KAYT SUKEL





ALEX TREADWAY/GETTY IMAGES

**I**f you came of age in the 1980s, as I did, you're likely familiar with the movie *Lethal Weapon*. Two mismatched police detectives unexpectedly find themselves partnered up: Martin Riggs, the loose cannon with revenge on his mind, and Roger Murtaugh, the older, wiser man of the force, counting the days until retirement. When I saw this film for the first time in high school, I identified with the loonier of the two, Riggs. He might be a little crazy, but man, he was fun. Also, easy on the eyes. When I watched the film recently, however, my sympathies had changed. Today, I'm more in Murtaugh's corner. Mostly because I find myself, as a middle-aged mom, inadvertently quoting his signature line, "I'm too old for this shit," on a regular basis.

I used to be a risk-taker. But now, I just feel too old to bother. The potential negative consequences of a risky decision, like the loss of financial or social stability, seem too great to bear. I have a mortgage to pay, for goodness' sake! I have a kid to raise. And the positive outcomes? Well, they just don't seem as compelling as they once did. But I can't help wondering why my approach has changed so much. Has my age and place in society somehow affected the way I'm perceiving and pursuing risk? What's changed in me since my crazy, risk-taking teenage years?

### THE TEEN SPECIES

Jonathan is not the kid you think of when someone mentions your typical risk-taking teenager. At 18, he's an above-average student, secretary of the

student council and a star player on his school's soccer team. He's friendly and well liked across his school's diverse social strata. Everyone in his life expects him to do great things. And he seems fairly unaffected by the weight of those expectations. He's the kind of kid who makes the teen years look good.

But even for Jonathan, adolescence isn't an easy process. It's a volatile time, both physically and emotionally. Abigail Baird, a brain researcher at Vassar College, says what you see on the outside is happening in the teenage brain as well.

"You see that explosive growth and the gawkiness that comes with it on the outside during adolescence — kids suddenly shooting up with long, clumsy arms and legs," she says. "What shouldn't be surprising, then, is that there's that same gawkiness when we're talking about the brain, too. It's not an exaggeration to say things are exploding in terms of brain growth."

And those changes, neuroscientists argue, make teenagers the ultimate risk-takers.

"The biggest source of morbidity and mortality in young people in industrialized countries isn't medical disease but problems with behavior and emotion," says Ronald Dahl, a researcher at the University of California, Berkeley's School of Public Health. "We're talking about suicide, homicide, car accidents, substance abuse and sexual risk-taking. There is something about the neurobiology of adolescents that makes them more likely to take risks than children or adults. We're only beginning to understand it."

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That includes the so-called good kids like Jonathan. Dahl explains, “Eighty percent of adolescents don’t do wild and crazy things. But even the shy, anxious kids tend to become more exploratory and more likely to experiment during mid- to late adolescence.”

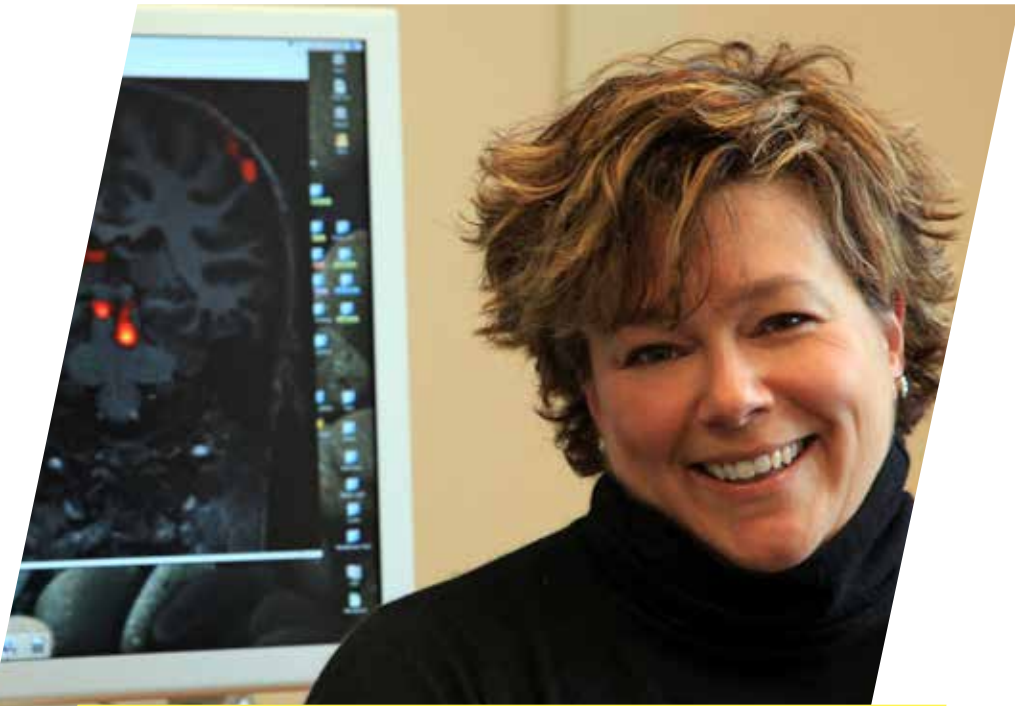
Jonathan may have a good head on his shoulders, but, after a thorough talk, I learn he also has an unapologetic penchant for partying. Some of his and his friends’ exploits include random (and sometimes unprotected) sex, drug use, fistfights, skipping school and home responsibilities, driving under the influence, and jumping off a second-story roof into a neighboring home’s swimming pool.

### A BRAIN DISCONNECT

Jonathan will be the first to admit he knows better. “I mean, I don’t want to say any of that stuff is a good idea — it’s not,” he says. “But it’s fun. Sometimes I think I should have just stayed home and worked on [soccer] drills or studied or something instead of going to the party. But I never think any of that [while I’m partying].”

As many of us remember from our adolescence, when it comes to risky business, it’s not that teens don’t know better. But knowledge isn’t always the most important factor when you’re making a decision in the moment. So, despite the known consequences, teens still often act unwisely. There seems to be some kind of disconnect between knowing and doing in the teenage brain — and new work in neuroscience suggests this disconnect is literal as well as figurative.

Laurence Steinberg, a social neuroscientist at Temple University, posits teens are more likely to indulge in risky business because of the way their brains are maturing. Right around puberty, when sex hormones are working their magic on our reproductive systems, they’re also heralding some pretty dramatic changes in our brains. These alterations result in significant differences in how the brain processes dopamine — which not only affects



Abigail Baird, a brain researcher at Vassar College in Poughkeepsie, N.Y., suggests that our teenage years are akin to a second toddlerhood. The way our brains change and the risks we take as teens help us learn to become adults.

the brain’s risk-and-reward processing circuitry, but also mediates social and emotional behaviors.

At around age 10, spurred by sex steroids and other important growth hormones, the brain starts to prune dopamine receptors in the striatum, an important part of the basal ganglia, and in the prefrontal cortex. This pruning changes the relative density of receptors in the circuit linking the area of the brain involved with processing rewards (the basal ganglia) and the area of the brain implicated in inhibition and control (the prefrontal cortex). The changes in receptors mean that dopamine is flowing somewhat unencumbered. And the result is an out-of-sync mesocortical limbic system, which regulates emotion and motivation. So with emotion and motivation amped up and inhibition and long-term planning capability dampened, basically, you see an increase in gas and a decrease in brakes. Looking back at my teen years, which were fraught with more than a bit of crazy, it makes sense to me.

These dramatic changes to the brain have led Baird to suggest adolescence is much like a second toddlerhood.

When she first tells me this, I laugh. But on further reflection, I see her point. The toddler years are a sensitive period of growth in both the body and brain that helps babies transition into kids. And when I look closer at the behavior, I see the overlap. “That’s not fair”-type tantrums? Check. Pushing boundaries? Of course. A proclivity for hyperbole? Sure. Sensation-seeking? Yep. A “me, me, me” mentality? Oh, yeah.

Studies out of Baird’s lab and others suggest that those out-of-control emotions and bewildering motivations that so many parents wish they could quash are important to all that critical pre-adult learning. “The teen years require a lot of trial and error,” Baird says. “If everything wasn’t so dramatic and important and emotional, adolescents wouldn’t have the motivation they need to get back up and do it again when they fail.”

### PROCESSING RISK AND REWARDS

So why is everything so dramatic and important and emotional? It comes back to the neurotransmitter dopamine. A toned-down prefrontal



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cortex paired with an intensified emotion and motivation circuit is the perfect recipe for risk-taking. But while Dahl says it's easy to suggest hormones make teens temporarily crazy or unable to use their frontal cortices appropriately, those notions are incorrect. Jonathan, for the most part, thinks things through. For example, he has asked me to use a pseudonym. Despite that rationality, his teenage brain strengthens the power of rewards so that he's motivated to gain the experience required to grow and learn. And one way it's doing so is in how rewards are perceived.

Recent work by B.J. Casey and her colleagues at Cornell University suggests the teen brain processes risks the same way adult brains do, but with one important difference: Areas of the brain involved with reward processing are much more active in teens than in younger children or adults.

The implication is that this increased activity results in teens overestimating the value of rewards. When we consider Jonathan's decision to skip using a condom, his brain magnified the reward involved with a hookup. His brain was telling him that he couldn't pass up this encounter: This sex will be the sexiest sex of all time. It became a reward fantastic enough to outdo all other considerations, including the potential consequences of teenage pregnancy or venereal disease.

"Really wanting those rewards is to our advantage when learning," Baird notes. "One thing we do know about adolescence is that it's a really great time to learn new things. And having that incentive to get yourself up, dust yourself off and try it all over again is invaluable. Otherwise,

we might not try again and get the experience we need to actually do that learning we need to move from childhood to adulthood."

### **GOOD IDEAS AND BAD IDEAS**

I first met Vassar's Baird at a neuroscience conference in Washington, D.C., after hearing her present some research on the teen brain in a symposium about how neuroscience should shape the law. As part of her presentation, she queried the audience: "Tell me something," she said. "Do you think swimming with sharks is a good idea or a bad idea?"

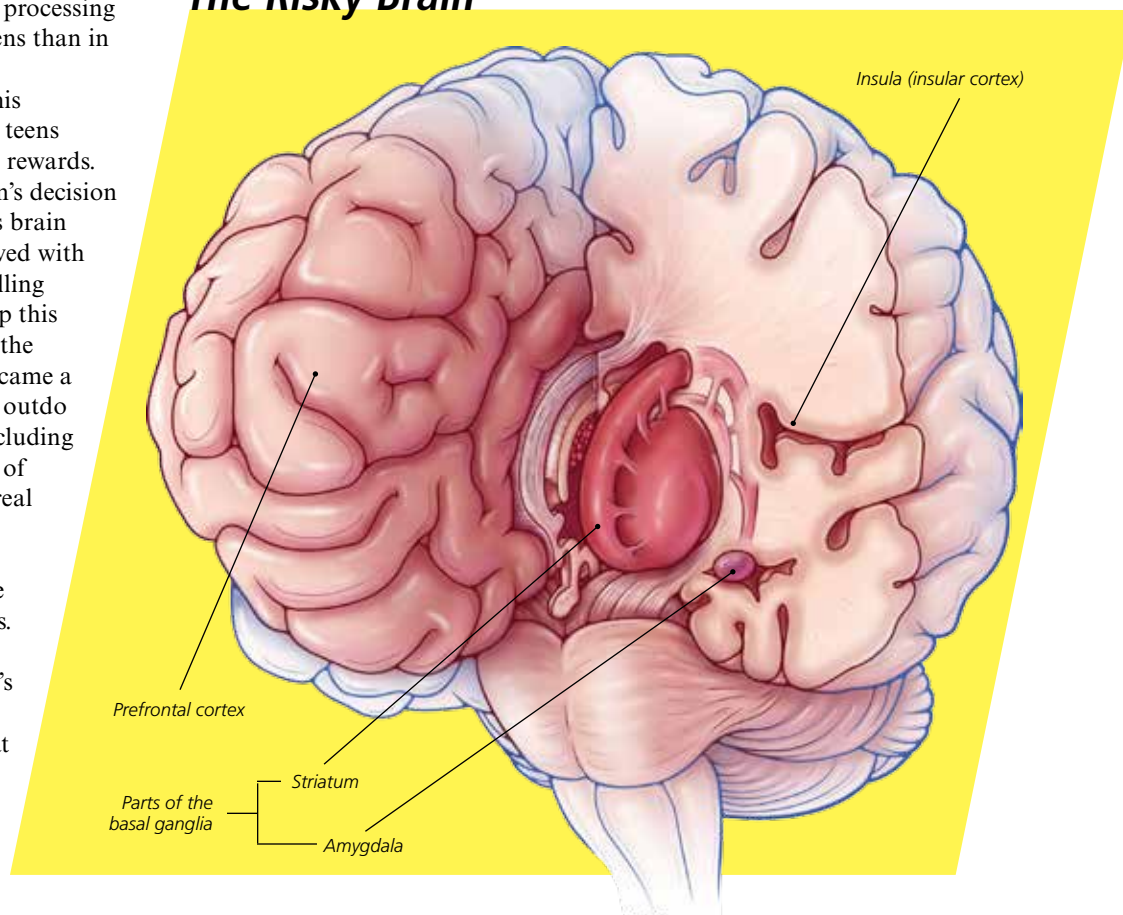
The majority of the audience, mostly adults, instantly yelled back, "Bad idea!"

If any of the adult shark pooh-poo-ers had been having their brains scanned at that moment, scientists would have seen increased activation in the amygdala and insula — two key parts of the brain's limbic system and important inputs to the mesocortical limbic circuit.

You may know the amygdala as the seat of the fight-or-flight response. But Baird tells me that the amygdala is responsible for the four F's. "Fight and flight, everyone knows. The next F is feeding. And that last F stands for reproduction," she jokes.

The amygdala represents the things we need to stay upright, breathing and propagating the species. And, with the basal ganglia, it helps

## **The Risky Brain**



**Experienced rock climbers understand the inherent risks of the sport. And since they are well-practiced at performing this task, they manage them quite well. But it would seem that confidence is age-related. Data have shown that it reduces as you get older.**

manage important rewards. But it's also involved in processing memory and emotional reactions and attaching social salience to objects and events. Baird likens it to the brain's "burglar alarm."

"This is a part of the brain that is very survival-oriented. It's all about keeping you alive," she says. "Not so much about thinking things through."

The insula, like the amygdala, is also implicated in emotion and decision-making. Like the amygdala, it plays a key role in survival. But it does so by helping you form visceral memories about experiences — both good and bad.

"The insula gives you those gut feelings about things — you know, those instant feelings that are critical to your decision-making, to your innate sense of right and wrong," Baird says. "But it is a highly developed structure. You aren't born with these gut feelings about things. You have to learn them."

Adults can rely both on the amygdala and the insula to help inform decision-making. But the teen brain reacts a little differently. When Baird and colleagues used fMRI to scan teenagers' brains as they were asked a variety of "good idea or bad idea" questions, including biting a lightbulb, eating a cockroach and jumping off a roof, they found their insulae weren't as active as the adults'. The majority of activation was occurring in the frontal lobes, where conscious thought occurs — and they were taking much, much longer to answer the questions.

"With adults, we get an answer that is very automatic and fast," Baird says. "But teens don't get that. Instead, they show a frontal lobe response. They actually think about it for a second. They don't have the experience to have built an automatic response. They have to work the idea through

their frontal lobes, and it's just not as efficient."

In fact, they took roughly 300 milliseconds longer than adults to work the idea through. While 300 milliseconds may not seem long, Baird says it's significant. "People don't realize that 300 milliseconds gets people killed on a regular basis," she tells me. "That's a decision to run a red light when you're driving in your car. It's plenty of time to do damage when you're talking about a dangerous situation."

#### **OLD CLIMBERS AND BOLD CLIMBERS**

It's clear teens have a neurobiological predisposition for pushing the envelope. And studies show that this increased risk-taking continues through the teen years and well into young adulthood. Around the age of 25, the prefrontal cortex matures to the point where one is better at applying the brakes when faced with a risky decision.

Radboud University risk researcher Bernd Figner says that studies consistently show that we take fewer risks as we get older. And the reason for that, he argues, is twofold.

"There is a maturation of the prefrontal cortex that is happening well into young adulthood that enables us to be better at inhibiting our most influential responses — that is one important thing," he says. "But you also see these changes because you are more experienced. You now have these experiences, and you start to realize that it's not always a good idea to take so many great risks. You understand the consequences better. You realize what's at stake."

So, it's not that I'm old and boring; it's just that I'm better experienced! My limbic system has picked up enough over the years to help guide

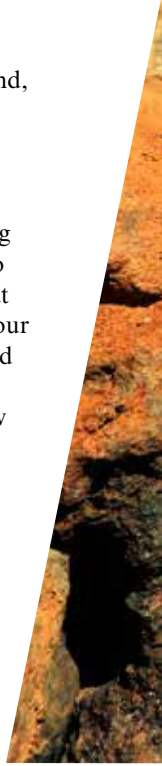
good decision-making. And my frontal lobes have matured enough to actually do something with it all.

It would appear this effect is not limited to suburban moms. A study that looked at risky behaviors in experienced rock climbers found that they tend to scale back on riskier climbs as they age.

Gareth Jones, a researcher at Leeds Beckett University in England, in collaboration with researchers at the University of Cambridge, wondered why some rock climbers are so willing to engage in risky climbs like free soloing, or climbing without ropes, while others stick to ropes and familiar rock faces. What separated those risk-takers from your more play-it-safe types? They found that measures of self-efficacy — a personality trait that underlies how much you believe in your own abilities to accomplish a goal (as well as deal with the stresses that accompany working toward that goal) — were predictive of how risky a climber was willing to get.

The researchers recruited more than 200 active rock climbers, with one to 48 years of experience, from a variety of climbing venues in Great Britain. Participants completed a special questionnaire, called the Climbing Self-Efficacy Scale, to help researchers understand both the participants' self-efficacy levels and the kinds of climbing risks they usually undertook. The researchers found that self-efficacy was significantly correlated with experience, frequency of climbing and the difficulty of behaviors undertaken.

"Climbers who rated as high in self-efficacy engaged in riskier climbs — they do more climbing, too," Jones says. "And, yes, they do take additional risks, attempting harder





climbs when they have that kind of confidence in their abilities.”

“That almost makes it sound like a bad thing,” I say.

“Not necessarily,” he tells me. “What we’ve seen is that experienced rock climbers understand the inherent risks of the sport. And since they are well-practiced at performing this task, they manage them quite well — they have the experience to know what they can do and judge which kinds of climbs are within their capabilities.”

But Jones and company also found another interesting trend in their

data. Age impacted how confident the climbers were in their ability, regardless of experience. The older the climber, the less self-efficacy he or she showed. This was even observed in climbers who were, by all accounts, quite skilled.

“It would seem that self-efficacy is age-related,” he says. “We saw that it reduces as you get older. There’s an old

saying in climbing, ‘There’s old climbers and bold climbers but no old, bold climbers.’ And our research suggests that is probably quite accurate.”

If there are no old, bold climbers, why would one expect there to be old, bold single moms? Even those of us who enjoy riskier hobbies seem to be laying off the gas as we transition from adolescence to adulthood. But is that necessarily a good thing? Figner, the risk researcher from Radboud University, says not always.

“For adults, when you look at these typical decision-making tasks we use in the lab, people are almost too risk-averse,” he says. “We use lotteries [in the lab], typically, and we find that if participants would just be willing to take a few more risks, they would make a lot more money. Of course, whether or not it is a good thing to take a risk always will depend on the situation. But some of us might benefit from taking a few more risks every now and again.”

I can’t help thinking I am one of those people. Alas, it would appear that having fully developed frontal lobes, a few decades of experience and a finely tuned insula does more than just help us make more informed choices. It can also make our decision-making a bit too automatic. It can lead to us doubting our own self-efficacy, even in areas where we have ample skills and ability. And, perhaps, all that brain maturity will result in us going home with less — money, love, fun, know-how, whatever it is we value — because we can’t muster up the same kind of motivation to try new things that we could when we were adolescents. **D**

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