The Evolution of Adolescent Risky Behavior

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I stand in the halls of my daughter's middle school and shudder. Kids lounge in the corridor, arms wrapped around each other, staring into each other's eyes or off into space. Others are dressed all in black and sporting nose rings, and they shuffle past me cutting out the world with iPod's blasting in their ears. Smaller, less “out there” kids in geeky clothes hurry to class, heads down, as if they want to escape the teen chaos of the halls or because they are afraid of their classmates. I imagine the drugs and alcohol hidden in lockers, the unprotected sex that must be going on in the woods outside the school, and I begin to slide into an anxiety attack as I mentally list all manners of impulsive behavior that might put my daughter in harm's way.

In other words, I am the parent of a 12-year-old girl, and I am quaking in my boots as my child steps forward into her teen years.

And I am scared for good reason. The rate of drug use, alcohol abuse, unprotected sex, unwanted pregnancy, sexually transmitted diseases, accident, and death is higher for teens than for any life stage. This is where our kids get their first taste of everything risky that life has to offer, and they seem destined to try everything out – at once. Teenagers also act impulsively, and they apparently give no thought at all to the long-term consequences of their behavior. Scariest of all, teens feel they are invincible. Moreover, no amount of parental attention, education, and social policy seems to keep these kids from acting in risky ways.

All these fears were recently addressed during a workshop on adolescent risky behavior organized by the Evolution Institute, the first think tank to use evolutionary science to solve real-world problems. Last fall, 12 researchers gathered at the John & Doris Norton School of the Francis McClelland Institute at the University of Arizona in Tucson to discuss how evolutionary theory might explain why teens behave in ways that put themselves or others at-risk. The workshop's other goal was to suggest ways in which parents and community members might help our kids make it through the often dangerous teen years.

As the workshop showed, an evolutionary view of teen behavior is not just about theory. It also involves understanding ancient human history, genetics, and biology along with the influence of upbringing, environment, and culture on the thought processes, decisions, and behaviors of our adolescents. In general, an evolutionary view of teen behavior suggests that what our culture calls "risky behavior" might, in fact, often be satisfying, evolutionarily driven needs and goals of adolescents – needs and goals that we, as adults, have forgotten about or never understood. And we need to keep those goals in mind as we figure out ways to pull our kids out of harm's way.

How has evolution molded adolescent behavior? For that answer, we have to go back millions of years. Humans are the big-brained, long-lived, upright walkers who use language and learning to develop complex cultural traditions. We are also a species that was selected to take a path that concentrates its reproduction on one offspring at a time, with intense parental investment into each offspring. In other words, we have a very slow life history trajectory, as Aurelio Figueredo of the University of Arizona pointed out during the workshop. That trajectory means we have time to optimize learning and interpersonal interaction to aid in passing on genes.

It is also essential to recognize that human thought and behavior was shaped during our long hunter and gatherer past. Humans evolved in Africa, moving in small kin groups from forest patch to forest patch, where our ancestors utilized the resources of both the savannah and the forest. This past haunts the behavior of modern humans. In fact, anthropologists suggest that our responses and actions today are better suited to those ancient hunter gatherer times, which means there is often a mismatch between modern situations and our evolved responses.

What does this evolutionary history mean to modern teens? Parents and society think of the teen years as an aberration along the way to adulthood, but this stage actually serves many evolutionary purposes. Given the long human life history, adolescence is the necessary staging ground from which little humans begin to navigate their own relationships. It is also is the time during the life cycle in which the human animal matures sexually. Humans are designed to pass on genes – as all organisms are – and they begin to do that during the ado-

lescent years as the brain is reorganizing, the body is becoming reproductively active, and young adults are building social networks for themselves. The workshop participants claim that although the responses of modern teens might sometimes be culturally incorrect, even harmful, those responses could also be evolutionarily advantageous – at least from a teen's point of view. As Ronald Dahl of the University of Pittsburgh pointed out, adolescence is a time of both risk and opportunity.

But what was adaptation in the past may translate into increased morbidity and mortality today, and that is the paradox that modern culture has to address to keep our teens safe.

The evolutionary view also takes into account the biology of adolescents, which affects behavior. Research on pre-adult brain growth and reorganization has been primarily focused on how infants and young children learn, but adolescence is also a time of vast and complicated brain changes. These changes affect how teens take in stimuli and how they respond. And it doesn't happen overnight or by simple rules. As one researcher put it, "Adolescence is an ongoing conflict between the primitive, reactive limbic system of the brain and the more thoughtful prefrontal cortex." Most important, the human emotional system matures very quickly during puberty, but the cognitive control systems develop much later. As such, most behavior problems of the adolescent years are problems of self-regulation. And of course, kids who show signs of early pubertal maturation are at highest risk for a mismatch between emotions and thoughtful reflection.

In essence: The adolescent brain is not a child's brain, and it's not an adult brain either; that's how evolution has designed the system. As Dahl explained, not all impulsive behavior leads to stimulation, and not all sensation-seeking is impulsive. In fact, teens might be naturally drawn to "turbo-charged" situations because that emotional roller-coaster helps them learn how to tolerate and manage intense feelings. An evolutionary perspective might be that igniting passions for anything and everything is a positive fact about adolescence if those passions are directed away from harm.

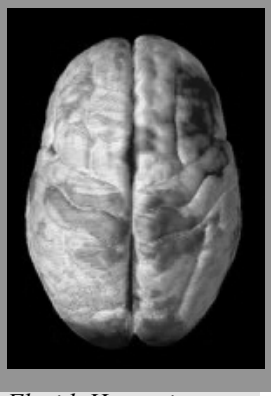
New and exciting research presented at the workshop is also showing that teen thoughts, decisions, and actions are influenced by genetic make-up. For example, Jay Belsky of Birkbeck College, London, England, presented information about the DRD-4 allele, which codes for a dopamine receptor. This gene apparently makes some teens greatly susceptible to a wide variety of environments; the world is rockier to them, no matter their environment. Researchers have discovered that with all the stability that parents can muster, the kids with the DRD-4 allele still have trouble with motivation and attention. Additionally, they can't manage stress well. Other teens without this genetic variant are less pushed about by the outside world – even if that world is unpredictable. Genes, in other words, play a major role in what we think of as "resilience" among teens, and knowing this puts much less pressure on our kids.

Puberty: Igniting Passions in the Developing Brain
With Changes in Motivation & Emotion

Strongest direct links to puberty:

- Changes in romantic motivation, sexual interest
- Emotional reactivity/intensity
- Sleep/arousal regulation
- Appetite
- Risk for affective disorders
- Increase in sensation- (status?) seeking

Animal studies show an increase in exploratory behaviors, novelty-seeking, dopamine . . .



View Ronald Dahl's and other presentations: www.FloridaHumanist.org

Teens are also subject to a hormonal storm that affects kids in a variety of ways. Various hormonal changes alter sleep patterns, attention and concentration, appetite, the urge to seek out new sensations, and the trajectory of aggressive behavior.

Most important, the evolutionary approach is showing that we can't assume the developmental biology of the teen years is the same for all kids because they each have a personal history that affects their biology. There is, for example, a disconnect between biological pubertal age and chronological age in teenagers. They might be adults reproductively, but they are not yet adults socially. The same is true for nonhuman primate juveniles, which suggest this disconnect is an evolutionary adaptation. Most importantly, research has found that pubertal age – not chronological age – is critical to risky teen behavior because kids tend to exhibit more risky behavior when their bodies mature sexually and they enter "the game of reproductive success." Also, some kids seem to be more resilient than others, and research has been able to identify why. Evolutionary work suggests that the vague quality of "resilience" is actually a reac-

tion to stress, and some kids apparently have the genes to weather bad times, no matter their home life.

From an evolutionary point of view, that complex individual topography is exactly what we should expect for humans and, in particular, for the adolescent life-cycle stage. Variation, from an evolutionary standpoint, is always good. In the case of our offspring, variety means that adults can hedge their evolutionary bets. If we produce offspring that all acted the same way no matter the circumstances, many wouldn't make it past childhood and adolescence. Instead, humans have kids who are highly flexible in their reactions and good at shifting tracks throughout life.

The evolutionary view also means we need to recognize that teens are becoming reproductive animals, and that development influences how they behave in other arenas besides sex. Mating is really a competition. Males are designed to mate with as many females as possible, and females need to be more choosey because they bear the greater burden of parental investment. Our teens are deeply influenced by the game of reproductive success, even if that goal is not immediately apparent to their parents. Boys show off and act in risky ways to compete with other boys and to attract girls. And girls often choose boys based on their behavior. Both sexes are answering to the deep pull of passing on genes.

From where we stand in adulthood, teens also seem short sighted – oblivious of the long-term consequences of their behavior. They take recreational drugs, abuse alcohol, and act in impulsive ways that land them in trouble, jail, or dead. They are inordinately victims of accident, violent acts, unplanned pregnancy, socially-transmitted sexual diseases, and homicide. But it's not mindless risky behavior. From the teen's point of view, risky behavior often makes sense in terms of status, attention from the opposite sex, or belonging. And it appears that teens are not as fearless as they appear. Evolutionarily based research shows that teens are just more motivated than adults to take risks in spite of their growing fears about the world. They apparently focus more on the benefits of their behavior rather than the risks. Some researchers also believe teenagers seek novel situations and experiences because they are drawn to learn how to manage and tolerate highly charged feelings.

Of course, environment has a big impact on producing risky behavior. We primates do best when we can predict our environments, but many teens are living in unpredictable situations. With a 50% divorce rate – the consequential solo parent households and often remarriage and blended families – many teens have to ride out whatever family arrangement comes their way. Those arrangements are fraught with new responsibilities, new roles, and often much interpersonal conflict. For many teens, they simply don't know who to count on – or who to fear – under their own roofs. The economic situation for those households – especially during these threatening economic times – also makes for hard times, and kids within these household are forced to move from their homes, schools, and cities.

These kids are trying to navigate the social dance of the teen years riding in a rocky, and often leaky, boat. And the way to help them may not be the traditional approach that sends mentors or more formal education their way. The evolutionary approach suggests we need to make the boat less rocky and more predictable.

Adolescents also differ behaviorally from children because they are navigating social relationships all by themselves. As young humans branch out into the adult world, they are faced with all sorts of social situations with no immediate adult guidance. But evolution has prepared them well for this launch. Even as children, little humans are designed to take in the actions of other humans and figure out how to navigate through a sea of interpersonal interactions. Patrician Hawley of the University of Kansas and Anthony Volk of Brock University, Toronto, Canada, each addressed the issue of bullying. Although we consider the behavior of these unpleasant, intimidating kids as pathological because it seems so asocial, they are actually socially adept. Taking the evolutionary view, bullying and being

ing and being nasty is all about social status, and it works from the bully's point of view. Research has shown that socially dominant teens are both feared and considered attractive. But bullying is still destructive in the long term – and for the victims – so we need to provide better social outlets for these kids that achieve the same goals without putting others in harm's way. For example, conflict resolution might work much better than empathy training in bullying situations because it deals with the social consequences for both the bully and the victim.

Teenagers are so absorbed by social interactions, positive and negative, because they are primates – animals that have been selected to depend on each other for survival. Humans form families, groups, and communities that provide support in the hard times, and we make alliances and coalitions to gain status or resources. Why would teens be any different? Mark Flinn of the University of Missouri, using his data on the teens and children from a Caribbean island, demonstrated that stress for young humans is physiologically most destructive when it comes as social stress – especially family stress. Teens need predictable social networks to get by, and so they will create them when none are forthcoming. For example, joining a gang makes evolutionary sense when family life is unpredictable because that group provides social support and loyalty. But gangs are very high risk for teens, and so our job is to supplant those gangs with other, safer, non-family support systems.

We also have to recognize that there are significant gender differences in risk among teens. Boys are, of course, especially in danger because they are more often impulsive, show offs, risk takers, and they often seem only interested in sex no matter the consequences. But if we accept that teen males are evolutionarily designed animals out to pass on genes, it makes more sense that boys often discount the future and live for today. Boys actually have a much greater chance of dying earlier than girls, and their sexual possibilities can be highly variable. Much of male teen behavior is all about mate competition, which blossoms into all sorts of dangerous, or fatal, behavior. But of course, those unconscious evolutionary urges can be tempered, or increased, by home and culture. Anthropologists have suggested that males who grow up without fathers or male figures end up being more aggressive than boys who have positive paternal influences. Apparently, these males need to become hyper-aggressive and competitive to reject their matrilineal upbringing and enter the male-mate competition game.

Many girls are also at risk. In this culture, we view teen pregnancy as an unfortunate situation – and for good reason. Girls with babies are less likely to finish high school, and they cope with poverty. But taking the evolutionary view for a moment, rather than the cultural or social one, teen pregnancy might make perfect sense as Belsky and others have pointed out. For example, girls experiencing harsh mothering at 4.5 years of age reach puberty early. Additionally, girls growing up in households without fathers see that single mothers can raise a child, even if it's extremely difficult. That household might also be anti-male, empowering girls to be on their own, even as parents. And girls from destructive homes might be urged by their evolutionary voices to move into adulthood as soon as possible, and nothing changes a girl into a woman more dramatically than having a baby to care for. But winning evolutionarily might not be winning in life. Teen mothers lead difficult lives because they don't really have the long-term support systems that human infants, by nature, also need. Ad so what seems to be an evolutionarily inspired move is, in the end, a mistake by any measure.

Taking the evolutionary view also means we need to understand how culture interacts with the evolutionary expectation of teenagers. Western culture, in fact, specifically works against how teens are designed. In school and extracurricular activities, we separate teens by age – ignoring the long human history of mixed age groups and how well it works when older teens are responsible for younger kids. We also separate the sexes as if that would delay their sexual interest in each other. Our Western life trajectory also demands that adolescents who are not yet cognitively able must focus on the far future rather than the present.

Aurelio Figueredo and Bruce Ellis of the University of Arizona also pointed out that our culture traditionally ascribes to the Mental Health Model of adolescent behavior, which states that risky behavior is pathological and must be a consequence of teens growing up in hard environments. The Mental Health Model looks only at the losses that risky behavior entails without any thought about the possibility that there might be some gains for teens. This model overvalues the losses and suggests the

only way to help teens at risk is to intervene with preventative measures. The Mental Health Model also states that long-term goals are desirable and short-term planning is undesirable – culturally wiping out the very view of teenagers.

In contrast, the evolutionary view suggests the novel idea that much of teen behavior can better be explained as evolved responses to unpredictable environments, or responses that actually fit with the adolescent life-history stage. In fact, Ellis explained that risky behavior is often a response to risky environments, and thus adaptive. Responses might be culturally unacceptable, even dangerous, but they might also make evolutionary sense from a teen's point of view. That perspective also suggests there might be more productive ways of helping teens act in more positive pro-social ways that put them less at-risk.

In fact, teens in less economically developed cultures have it better. Their home lives are often more predictable, even if it means one parent is off working somewhere else. In those cultures, an absent father is not considered deviant but just part of a normal life. These fathers might be gone, but they are still responsible for a household, economically and psychologically. Kids in other cultures can grow up respecting the absent father rather than hearing women derogate males and do without them. Also, these teens are part of large extended households, and they have many relatives nearby.

In Western culture, our teens are at such risk because we don't recognize the power of evolutionary expectations or urges. Instead, we usually view teenagers as fools set on a path of self-destruction. But we might look at life from an evolutionary point of view. In doing so, parents, community, and society might be able to show adolescents that "boring" pro-social behaviors can actually help them get what they want in terms of mates, status, and resources without putting themselves or others at risk.

For my part, as I look down the school hallway and see my young daughter close her locker and throw me a grin, I need to give up the picture in my head of the baby I carried and recognize that she is a not-so-little human with social and reproductive interests of her own.

Now if I can only keep that in mind when she comes home past curfew.

Meredith Small is a professor of anthropology at Cornell University. Trained as a primate behaviorist, she is presently interested in the intersection of biology and culture and the evolution of human behavior. For the past few years, she has focused on how biology and culture influence parenting styles. Although Dr. Small is widely published in academic journals, she works most often with the popular media and is a regular contributor for Discover *and* Scientific American*, among others, as well as a contributor to NPR's "All Things Considered." An author of four trade books, she has contracted with the Evolution Institute to write a book about risky adolescent behavior based, in part, on discussions from the fall workshop at the University of Arizona.*