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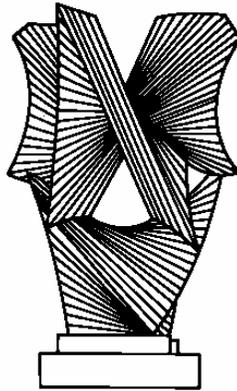
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ADOLESCENT RISK-TAKING AND SOCIAL MEANING: A COMMENTARY

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Adolescent Risk-Taking and Social Meaning: A Commentary

Cass R. Sunstein*

Abstract

*Why do adolescents take risks? What is the appropriate response to adolescent risk-taking? This Commentary for a special issue of *Developmental Review*, discussing a set of papers in that issue, explores these questions with attention to changes in the adolescent brain, to dual-processing theory, to social influences, and to fuzzy-trace theory. It contends that adolescent risk-taking is often driven by the social meaning of risk and caution, and that social meaning operates as a tax on or a subsidy to behavior. Changes in social meaning present a serious collective action problem, but also a valuable opportunity for both law and policy.*

Adolescents take many risks; they drink, use drugs, have unsafe sex, smoke cigarettes, and drive recklessly. Much of the time, adolescent risk-taking leads to seriously impaired lives and even premature deaths. For public policy, it is indispensable to know why adolescents take (unwise) risks, and also to know what kinds of policies will steer young people in good directions.

In many fields, including law, it has become common to distinguish between two families of cognitive operations, often called System 1 and System II (see Gerrard et al., this issue, for an overview). System I is faster, simpler, and more intuitive, and it reflects the use of heuristics. When people are automatically afraid of flying in airplanes and large dogs, and when they are tempted to kiss an attractive stranger or to eat a large piece of chocolate cake, System I is at work. System II is slower and more effortful, and it approaches problems in a more analytical fashion. System II might suggest that airplane travel and large dogs are unlikely to be dangerous, and that it might be best to get to know the stranger first and to avoid chocolate cake. In the domain of risk-taking behavior, it seems natural to think that adolescents are especially influenced by System 1,

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and that their System II is ill-developed or impotent. When teenagers drive too fast, smoke cigarettes, or engage in unsafe sex, System I might seem to be the culprit.

But these statements raise many questions. What, exactly, are Systems I and II? Do they have physical locations in the brain, or are they themselves heuristics or mere metaphors? Is intuitive thinking always inferior to the more analytical kind? Experienced lawyers and engineers often rely on their intuitions; young lawyers and engineers operate more analytically, in a way that can produce worse decisions, not better ones. Perhaps older people have well-developed intuitive systems, steering them away from unwise risks; perhaps adolescent risk-taking is driven by an absence of (good) heuristics. And when people take risks, or refuse to take risks, it is often because of the social meaning of risk-taking -- of the social signals that are sent by their behavior. But social meaning is not constant; it varies across persons, groups, and time.

The essays in this issue offer fascinating perspectives on these questions. In this Commentary, I offer brief discussions of the neurobiological perspective offered by two of the papers and the more broadly cognitive approaches offered by the three others. I conclude with a few remarks on the topic of social meaning. I suggest that an understanding of meaning and its malleability helps to supplement the picture of adolescent risk-taking – and also suggests some tools that policymakers might use if they seek to move adolescents in better directions.

The Teenage Brain

Might adolescent risk-taking have something to do with the development of the adolescent brain? Laurence Sternberg thinks so. He offers a neurobiological perspective on adolescent behavior, based on a distinction between two brain systems. His key claim is that at the time of puberty, teenagers seek greater rewards, above all because of changes in the brain's dopaminergic system (which we might understand as System I). That system, the "socio-emotional system," includes the amygdala, nucleus accumbens, medial prefrontal cortex, superior temporal cortex, and other regions of the brain that are associated with judgments of attractiveness, recognition of relevant stimuli (such as faces), and other forms of "social processing." As adolescents grow into adults, the cognitive control system (System II) improves, so that people can engage in better self-

regulation. For adolescents, the problem is the different timetables of the relevant changes – with an early and abrupt increase in sensation-seeking and reward-seeking, alongside a slower increase in people’s ability to engage in self-regulation.

Sternberg offers a great deal of evidence in support of his general conclusion. Changes in neural oxytocin at puberty suggest that as compared with children and adults, adolescents will be highly responsive to social and emotional stimuli. People’s scores on scales involving risk preference and sensation-seeking jump from the age of ten until mid-adolescence and decline thereafter. It is at the time of adolescence that the scores are increasing rapidly, while scores on impulse control are increasing slowly.

Sternberg also emphasizes the important fact that adolescent risk-taking is especially likely to occur in groups. His own experimental evidence, involving driving decisions, found that the presence of friends actually doubled risk-taking by adolescents (while having no effect on adults). The neurobiological explanation is that peers activate the neural circuitry that is involved in reward processing, and this activation increases sensation-seeking.

As people become older, risk-taking decreases. One reason may be that further changes in the dopaminergic system may lead to greater caution; another reason, and Sternberg’s preferred account, is that higher-level cognition, including the lateral prefrontal and parietal association cortices, develops and imposes a check. As teenagers become young adults, the cognitive control system matures; connections within the brain increase coordination between cognition and affect; and developmental changes may reduce reward-seeking. Resistance to peer influence can be explained in this way. Such resistance is produced, in Sternberg’s view, by cognitive control of more impulsive risk-taking behavior.

In this light, Sternberg is not surprised that educational programs often have so little effect in reducing adolescent risk-taking. The problem is not what adolescents know, but what they do. Indeed, adolescents often know plenty. They have relevant information about relevant risks. They act recklessly not because they are ill-informed, but because their dopaminergic system is developing more rapidly than their cognitive control system. Sternberg goes so far as to suggest an evolutionary explanation for the

asymmetry, because natural selection would favor preservation of an inclination to take risks at the time of adolescence, which is when sexual reproduction starts.

In Sternberg's view, increased risk-taking by adolescents "is likely to be normative, biologically driven, and, to some extent, inevitable." The developmental shift that occurs at puberty cannot be prevented. Sternberg's account, and his own apparent pessimism, raise an obvious puzzle: What are the best ways to help teenagers to avoid recklessness?

B.J. Casey, Sarah Getz, and Adriana Galvan also attempt to explain suboptimal adolescent decisions in biological terms. In their view, the problem lies in a lack of impulse control, produced by a relatively developed limbic reward system and a relatively undeveloped top-down control system. Adolescent risk-taking is not adequately characterized as a lack of control; if it were, young children would be taking plenty of risks, because they would have the least self-control of all. Building on rodent models, Casey, Getz, and Galvan argue that the problem for adolescents is that the limbic system is developing quite rapidly while the control system is not. Risk-taking behavior in adolescence may well follow from this developmental difference.

Casey, Getz, and Galvan invoke fMRI studies to establish this difference. During risky choices, increases in subcortical activation are exaggerated for adolescents as compared to adults. Like Sternberg, Casey, Getz, and Galvan even suggest a possible evolutionary explanation for why the systems mature at a different pace: Adolescence is a time when people need to be able to leave their families and villages, which is risky, in order to find a mate. Seeking novelty, and taking risks, may be rewarded by having an opportunity to have children.

This analysis is extremely close to that offered by Sternberg. If the general account is correct, we have a simple and quite striking explanation of why teenagers are especially likely to take risks. But it is obvious that some teenagers run risks that others are able to avoid, and that different periods reflect different "waves" of enthusiasm for certain kinds of risky behavior. In some times and places, many teenagers use cocaine; in other times and places, cocaine has no appeal at all. Culture matters; so does the social meaning of certain risks. An obvious challenge is to bring the neurobiological evidence in contact with heterogeneity in risk-taking behavior among teenagers and over time.

Fuzzy Trace Theory and Dual Processing

Susan Rivers, Valerie Reyna, and Britain Mills attempt to explain adolescent risk-taking by reference to fuzzy-trace theory. The key idea here is that people's decisions are based on simple mental representations of the "gist" of social situations, rather than on more quantitative or detailed information. What matters, on this view, is the *meaning* of the information, rather than verbatim details or statistical analysis. Their most striking claim is that adults and experts engage in gist-based reasoning, and that adolescents often go wrong because they are unable to do so, or to do so well.

Rivers, Reyna, and Mills invoke empirical findings to the effect to that people's decisions are a product of the gist, that reliance on gist-based proceeding actually increases with development, and that when people rely on such processing, they are less likely to engage in unhealthy risk-taking. They contend, and refer to a great deal of evidence to show, that the two different kinds of representations – gist-based vs. verbatim and more detailed – are actually stored separately in the brain and are retrieved independently. As people grow older, they shift away from quantitative, analytic processing, and toward more simplified representations of information. For example, doctors are specialists, and one might think that they would avoid simple processing; but in fact their method of processing information is both cruder and more accurate than that of those with less experience. More generally, development involves a greater reliance on simplified representations of information and a shift away from more analytical, quantitative processing relying on verbatim facts. In short, advanced reasoning "reflects the fuzzy processes of intuition."

How do adolescents fit into this picture? Rivers, Reyna, and Mills urge that adolescents operate at multiple levels, teetering between complex weighing of pros and cons on the one hand and gist-based intuition on the other. For example, adolescents might think hard about whether (a) to confess to skipping school and risk punishment or (b) to refuse to confess and risk being found out. A more mature person, focused on the gist, would go to class and avoid both options.

Rivers, Reyna, and Mill emphasize the importance of emotion to people's decisions. What people choose is often influenced by the "valence," positive or negative, of a stimulus. With people, activities, and products, human beings frequently have a

rapid, intuitive, affective reaction, and that reaction may determine the ultimate course of action (Slovic et al., 2002). A decision whether to screen for prostate cancer is influenced by the valence of the screening, and factual information may not much affect the valence. Experience, by contrast, can create a “knowledge store” that produces a negative or positive valence. Teenage smoking can be understood in this light. The bad consequences of smoking are not much associated with the behavior, and the meaning of smoking – as fun, exciting, and social – is what affects behavior. It should not be surprising in this light that emotional arousal can overwhelm efforts to engage in self-regulation.

Rivers, Reyna, and Mills believe that their approach has important implications for public policy. For example, it would be possible to alter the gist of risk stimuli, not by providing information, but by suggesting a negative valence. If the goal is to stop teenagers from smoking, it might be best to cue a negative gist, rather than to provide detailed information about the health risks. Similarly, steps might be taken to educate adolescents’ intuitions -- for example by helping them to make an automatic connection between a bad situation and risk avoidance. If alcohol abuse has an automatic negative valence, we should expect teenagers not to abuse alcohol.

Meg Gerrard, Frederick Gibbons, Amy Houlihan, Michelle Stock, and Elizabeth Pomery offer a dual-process approach, specifically focused on health-related decisions. Building on the conventional distinction between System I and System II, while also referring to other approaches (including fuzzy-trace theory), their distinctive contribution lies in their emphasis on the importance of “risk prototypes” to adolescent behavior. The prototype model finds two paths to adolescent risk behavior. The first is reasoned and analytic; the second is based on images and heuristic processing. According to Gerrard et al., the social reaction path helps to explain apparently unintended behavior by adolescents, in particular their unplanned decisions to engage in risky behavior.

Gerrard et al. contend that much of adolescent behavior is unplanned and in a sense even unintentional. In so contending, they point to the fact that adolescents say that they do not intend to engage in self-destructive behavior, even if they end up doing so. Their behavior is ultimately a product of “image-based decision-making.” Certain favorable images, or prototypes, attract corresponding behavior, including smoking and drinking; these images involve the prototypical smoker or driver. The more favorable the

image, the more likely it is that teenagers will engage in the relevant activity. Feelings of personal invulnerability also matter a great deal. Adolescents may know, in the abstract, that it is dangerous to drink and drive, without knowing that they personally are at risk if they drink and drive.

Gerard et al. offer considerable evidence that the analytic system operates consciously, whereas the image-based system works outside of explicit awareness. They also show that prototypes have emphatically social roots. Media presentations, the behavior of friends, and parental behavior can affect the valence associated with various prototypes. Some social influences appear to affect people's conscious intentions, but do not affect their actual behavior, because they work on the more analytic or deliberative system. Gerard et al. urge that as people grow older, decision-making becomes more reasoned, and the link between intention and behavior becomes stronger. As the deliberative system imposes stronger checks, the impact of image-based processing weakens. These points suggest possible interventions to reduce dangerous behavior by adolescents. An obvious approach would be to work on prototypes. Gerard et al. believe that a heuristic approach, working directly on mental images, might help to steer teenagers in better directions.

Baruch Fischhoff is interested in a different topic: the decisionmaking competence of teenagers. Emphasizing that human beings are subject to systematic biases, he thinks that on balance, teenagers do "surprisingly well." In many domains, teenagers make sensible judgments about risks, in the sense that their assessments mirror social reality. In assessing risks, teenagers are responsive to the particulars of their own situations. For example, those who report neighborhood gang activity give higher probabilities for being arrested or dying in the next year. But in some cases, teenagers make serious mistakes. Teenage girls seriously underestimate the likelihood that they will become pregnant. Teenagers generally overestimate their risk of death in the near future – and also exaggerate the likelihood that they will be working over twenty hours per week in the following year.

Fischhoff also finds that when asked about hard decisions, teenagers do not much reflect on the full range of variables. Instead they tend to focus on some statement of resolve, such as "eat more healthfully." Fischhoff urges that teenagers could be helped to

see the range of possible options and to think better about them. Notably, Fischhoff focuses on what teenagers think, not on what they do. It is possible that teenagers have an accurate sense of certain risks, and know fairly well how to respond to them, while also behaving pretty recklessly. Indeed, this possibility is strongly signaled by several of the papers in this issue.

An interesting puzzle here involves the overlapping but in some ways quite different approaches of Rivers et al. on the one hand and Gerrard et al. on the other. Rivers et al. think that as people mature, they become less analytic and less intuitive, whereas Gerrard et al. believe that the opposite is true. Rivers et al. are clearly right to suggest that experts often do have intuitions that are both rapid and highly reliable. Compare, for example, an adult driver with a teenager driver. Because of her experience, an adult driver can make rapid, even automatic judgments about what to do in a difficult situation. Lacking experience, teenage drivers have to engage in the appropriate analysis, which can lead them into trouble. The teenager may have internalized the rules and may be capable of a careful analysis of various situations. What marks the experienced driver is an educated intuition, ensuring judgments that are good as well as rapid. These are points for Rivers et al.; experienced people do rely on their intuitions, and their intuitions generally lead them in the right directions.

But we have to be careful with this point. Doctors' intuitions are often inaccurate; statistical analysis, based on the numbers, is significantly better (Meadow and Sunstein, 2003). Or consider the question of risk regulation in general. No one thinks that government should make decisions about arsenic levels in drinking water or ozone levels in the ambient air by asking for the intuitions of experts. For regulation of the risks associated with particulate matter or acid deposition, it makes no sense to consult heuristic-based judgments. The best approach is instead highly quantitative, based on an analysis of the costs and benefits of various possible approaches (Sunstein, 2002). Many doctors, lawyers, and engineers will have good intuitions about how to proceed, but at least in hard cases, they will probably do best if they are highly deliberative and consult not the gist but relevant facts and figures. The whole idea of evidence-based medicine is designed to correct medical judgments that are based on heuristics that generally work well but that also misfire. Or consider the domain of baseball, where the intuitive

judgments of experts are far inferior to what emerges from statistical analysis (Sunstein and Thaler, 2005).

The more particular question is whether adolescent risk-taking is typically or generally driven by analysis or by careful examination of the costs and benefits of engaging in certain activities. Rivers et al. convincingly show that experienced people have and use heuristics; but they do not demonstrate that adolescents always or generally operate as statisticians, carefully weighing quantitative evidence. When teenagers engage in unsafe sex, abuse drugs, or drive recklessly, it is probably because they use heuristics that misfire, are excessively optimistic, or are impulsive and lacking self-control (especially, as Sternberg suggests, in groups). One problem is that their more deliberative system is comparatively weak.

What Might Be Done?

The papers in this issue offer a great deal of instructive material on adolescent risk-taking. Their emphasis, of course, is on why adolescents take risks; the policy questions are not the primary concern. But suppose that public officials seek to promote better decisions by adolescents – to steer them away from reckless behavior. Educational efforts will apparently have a limited effect. As Fischhoff shows, many adolescents already have a great deal of information. A simple lesson, emerging from several of the papers and compatible with the neuroscience, is that private and public institutions might be able to have a significant impact if they are able to alter the social meaning of reckless behavior.

To understand this point, we need to say a bit more about social meaning. Consider smoking, drinking, using illegal drugs, committing violent acts, driving without seatbelts, littering, singing in public, wearing jeans, eating too little, eating excessively. In most settings, the social meaning operates as a kind of tax on certain behavior; it can operate as a kind of subsidy as well. In some parts of the world, those who refuse to drink, or who buckle their seatbelts, are taxed; in other parts of the world, the same conduct is subsidized. Sometimes the social meaning “tax” or “subsidy” is the most important determinant of people’s behavior. For teenagers, everything may depend, in the

end, on whether the prevailing meaning operates as a tax or a subsidy. Even life itself may depend on the sign and magnitude of the social meaning.

A key problem is that social meaning is not within the control of any single individual (Lessig, 1996). Changes in social meaning require solution of a collective action problem. Teenagers, like adults, live in accordance with social meanings for which they are not responsible and which they may deplore. Consider, for example, the teenager who uses drugs, or engages in criminal behavior, not because he likes doing these things, but because failing to do so is heavily taxed by the prevailing meaning. Or consider the teenager who takes a certain risk only because of the meaning of doing so, when that very teenager would be willing to agree that things would be much better if the meaning were otherwise. Often teenagers run risks because they believe that other teenagers think that it is cowardly or pathetic to be cautious.

To put the point in terms used by Rivers et al., the most obvious remedy here is to alter gist-based processing on the part of adolescents, in large part by working on the “valence,” or meaning, of various options. In some times and places, smoking has signaled a kind of daring, an indifference to convention, a willingness to follow one’s own path. In other communities, smoking has signaled a kind of foolishness, or a willingness to offend and even endanger others, or a capitulation to the machinations of the cigarette companies. If teenagers’ decisions are affected by images, or prototypes, of people who engage in the relevant behavior, then private and public institutions have a real opportunity to provide some help. “Meaning entrepreneurs,” in the private and public sectors, often have a real influence in altering the social meaning of risk-taking.

In the 1970s and 1980s, there was a dramatic drop in smoking among African-American teenagers, to the point where only about 4.4% of African-American teenagers smoked – a percentage far below the corresponding number for whites (Sunstein, 1997). What accounts for this difference? Part of the explanation appears to lie in differing understandings of the social meaning of smoking, which came to be seen as a “white thing.” And part of that difference is captured by a private antismoking campaign in the African-American community, symbolized most dramatically by posters in Harlem subways showing a skeleton resembling the Marlboro man and lighting a cigarette for an

African-American child. The caption read: “They used to make us pick it. Now they want us to smoke it.”

Teenagers may be biologically inclined to take risks, but in some communities, social pressures and prevailing meanings cut hard against (certain kinds of) risk-taking behavior. Policymakers have a real opportunity here. They also face some practical problems. If Nancy Reagan (or Laura Bush) tells teenagers that they should “Just Say No” to drugs, they might be all the more inclined to say yes. If high school teachers tell students that unsafe sex “really isn’t cool,” high school students might just roll their eyes. (If a teenage girl’s request for the use of a condom counts as a confession or an accusation, we might not have many requests for condom use.) Recall that individuals, including teenagers, live with meanings that they did not construct – and that once those meanings are place, they must live by them.

Nonetheless, communities often do find ways to change meanings, as “meaning entrepreneurs” alter the valence associated with one or another risk-taking activity. A major task for public policy, as well as for social science, is to investigate the processes by which the meanings of risky behavior change over time.

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