Key:

K: Dr. Kinscherff

K: Good day. My name is Dr. Robert Kinscherff, and I'm here to talk to you about what behavioral science is showing us about differences between adolescents and young adults and adults. We are informed in this conversation by almost 30 years now of developmental science on how children grow through adolescence into adulthood but a very exciting 10 to 15 years in adolescent developmental neuroscience where we've actually been able to see the differences between children's brains, adolescents' brains, young adult brains and fully grown brains of adults and what that means for the behaviors that we see. So, we've long known that there are behavioral differences between adolescents and adults. Some of them include their tendency to be more impetuous, more vulnerable to peer influences, more vulnerable to the events in their circumstances, and we'll talk about that specifically a little bit later, and the differences between their ability to perceive risks and then apply risks to their own situations at precisely the time in their development when they are more novelty and risk-seeking than adults will be. Adolescents and young adults are more likely than are adults to engage in risky behaviors. One of the reasons for that is that neuroscience has shown us that, at the beginning of puberty, the human brain goes through an immense reconstruction not only in its function but also literally its structure, but in the meantime, an adolescent's brain is a work in progress. One of the ways in which we've been able to track that progress is through neuroimaging that allows us to take photographs literally of the growing brains of multiple children and average them so that we can see trajectories of growth that begin at puberty and extend until about the mid-20s. One of the things that we see is that there are asymmetries in the growth of the adolescent's brain. What that means is all of this growth is not occurring in all of the same places at the same time. In fact, what we know is that adolescent brain development, the reconstruction of the brain from a child's brain to an adult's brain, begins at the back of the brain and moves forward. What this means is we tend to see in most children first the signs of puberty, the signs of the physical maturation of the brain, followed by the differential activation, the hyperactivation if you will of the emotional centers of the brain, and only later starting in mid-adolescence and into early young adulthood do we see the regulation of those emotional centers with the decision-making and judgment centers of the brain that are contained in the frontal lobe. What that means is we first see the trajectory of growth towards physical maturity. Then we see the activation of the mid-brain, the amygdala, the hippocampus and so forth, the parts of the brain that respond to emotion, assign emotion to the world around the adolescent. Anybody who has spent some time around early adolescents, for example, knows the highs and lows of a 13-year-old or a 14-year-old in response to the events in

their world. It's only later that we begin to see that the frontal lobes, the parts of the brain which we sometimes refer to as executive functioning, begins to insert more and more control over the functioning of the mid-brain to allow children to remove themselves from the immediacy of their emotions, the immediacy of their novelty seeking, the immediacy of the feedback that they're getting from their environment and especially their peers in order to slow down long enough to make decisions and to consider what the outcomes would be of different decisions that they may make. During adolescence, there is a preferential sensitivity if you will for the dopamine centers of the brain, that is to say, the parts of the brain that give the individual feedback with pleasure and with thrill and which will lead them to prefer novel and risk-taking behavior. In fact, in mid-adolescence, at the point when adolescents are most likely to prefer novelty and risk taking, they are least likely to be able to actually look at the consequences of that for their own situation, and this is an interesting phenomenon. By the time an adolescent is 16 or so, most adolescents will be able to tell you, you are safer if you're wearing seat belts than if you are not. You are healthier if you are not smoking cigarettes than if you are smoking cigarettes. They can make all kinds of determinations like that, and yet, in every one of those kinds of circumstances, they're much less likely than are adults to actually wear a seat belt. They're much more likely to actually experiment with tobacco or become a tobacco product user and much more likely than are adults to have a period of time in which they experiment broadly with drugs and alcohol. Most of them will self-remit as their brain matures, and they begin to appreciate the impact on their lives, but some will also unfortunately develop patterns of addiction. The point is that, without the full maturation of the frontal lobe, adolescents are less well situationed than are adults to actually predict the consequences of their behavior, see the immediacy of the decisions that they're making on their own circumstances now, and they're particularly vulnerable to peer and other social influences that might guide them in the direction of more impetuous, risky or reckless behaviors. This behavioral science research may impact juvenile justice policy in the United States in a variety of ways, and in fact, it already has, so this kind of behavioral and neuroscience research was relied upon in the Roper v. Simmons decision in 2005 which determined that it was unconstitutional to impose capital punishment for a capital crime committed under the age of 18. The court in that particular case did a very interesting thing. It sort of wed together the doctrines of death is different, the death-penalty jurisprudence, and children are different into asking whether or not the Constitution would view children differently than adults for even the most heinous kinds of crimes, and the court in Roper v. Simmons said, "Absolutely yes," and one of the reasons is the court determined that, because of the way children develop, literally their brains as well, that they were less morally culpable, and so they took capital punishment off the table. Their reasoning went something like this. If capital punishment is the most severe penalty to be reserved for the most heinous crimes committed by the most

culpable perpetrators, then children and adolescents could never fall within that category precisely because of their developmental immaturity and the vulnerabilities that we've just been discussing. The Roper case was followed a couple of years later by Graham v. Florida, and in that case, the US Supreme Court found that life without possibly of parole was impermissible for a nonhomicide infraction, and a court used exactly the same reasoning. At the core of that reasoning is this developmental immaturity which also mitigates their moral culpability. The next step was taken in 2012, Miller v. Alabama, and in that case, the US Supreme Court determined that it was not permissible to have a mandatory scheme of imposing life without possibility of parole in capital offenses committed by persons under the age of 18, and again, the court pointed to that core developmental immaturity that the social-science research, the developmental research and the adolescent-neuroscience research tells us is a core characteristic of children as they develop. Unlike the prior two cases, Roper and Graham, in which the court thought that the risk of error was too great and that there really was no scientific reliable basis to predict who in adolescence would continue to be beyond rehabilitation, the court and Miller created an opportunity after an individualized sentencing to impose life without possibility of parole for a juvenile who had committed a homicide but noted that this should be rare and uncommon and reserved for children who were described as irretrievably depraved. Often the conversation turns on the age of 18 as though there is a line drawn by the law that corresponds to a developmental trajectory that is described in the research. Unfortunately, it's not that easy, and even the law recognizes that adolescents are a little difficult to know how to draw the line for what purpose, so for example, we in many jurisdictions have different ages of sexual consent than we have for ages for voting and ages for purchasing alcohol. Some states allow driver's licenses and learner's permits below the age of 16. Others not only want you to be at least 16, but they have legislation that requires that you not drive after certain hours or when you're with your peers for a year or so after you first get your license. The laws always had difficulty knowing where precisely to draw an age for whatever purpose on the part of still developing adolescents. What we do know from a research point of view is two things. First, the age of 18 while it's an easily recognizable bright line legally does not actually map onto adolescent development. In fact, adolescent development, as we mentioned earlier in this talk, starts at puberty, and goes up to the mid-20s for most persons. The other issue that arises from a developmental point of view is that almost everything that we know about adolescents and their development, including their brain development, is what we think of as group data. It's on average, so every one of us knows an adolescent who has shown excellent judgment, has been very self-contained, who's very responsive and very responsible sometimes much earlier in adolescence, 13, 14, 15. We also know probably every one of us someone who we could look at them and say, "Ha, this person is 23 going on 12," and everyone in the room would know exactly what

you're talking about. So, part of the challenge for the law is drawing a line that will allow us to take into account that kind of variability, so that's one kind of variability. Just on average, adolescents move differently through these developmental trajectories. The other challenge is that the research tells us that exposure in childhood to adverse childhood experiences, that includes extreme poverty, food scarcity, exposure to violence and dislocation, other kinds of disadvantages, actually will shape brain development in a way that prolongs that period of development and in a way that is very difficult to predict in the individual case. So we know that children who are in so-called conditions of toxic stress where they are hyperaroused due to exposure to violence or uncertainties or domestic violence or whatever else it might be, that their bodies begin to react to the constant presence of stress hormones as they development, cortisol in particular, and that this kind of chronic toxic stress actually has shaping influences on the structure and the function of the mid-brain as we've been talking about, the amygdala, and also has important impacts on the hippocampus, which is the part of the brain which allows us to learn by helping to code memory. So,, children with higher adverse experiences, more chronic, more intense, tend to be a higher risk group for a lot of things that complicate but don't doom their development. Now it's important to realize that children have resiliencies as well. They have individual resiliencies. Some of them are charming. Some of them are stress resistant. Some of them are highly intelligent. They also have social resiliencies around them. They have families that care for them or communities that help buffer them against resiliencies. So, having these adversities is not a fate, but it is a developmental challenge to children which has the impact in many of them of delaying their maturation, their social maturation but also their neurodevelopmental maturation. The good news for us is that most children have enough resiliency or get enough resiliency that even seriously substance-abusing adolescents have significantly dropped off in their patterns of substance use by the time they hit their early to mid-20s. Even chronically violent delinquents in mid-adolescence tend to have self-desisted by the time they hit their early 20s to mid-20s or a little bit further out. So choosing a line at 18 because it's easy to recognize creates a certain clarity and efficiency, but it ignores both the variability of children in normal development and even greater variability amongst children who have experienced significant adversities during their childhoods. I think that it's possible to educate juries in thoughtful expert testimony, and I think as this becomes more a part of our conversation within the law and our jurisprudence, we may even see the opportunity to build in what the Roper Supreme Court decision clearly contemplated, which is there would come a time when we may even have jury instructions about the developmental immaturity of adolescents and young adults before the courts and the fundamental differences in their moral culpability for crimes they may commit as we consider guilt, innocence, punishment and rehabilitation. Thank you for the opportunity to have this conversation.