Spotlight on Juvenile Justice: Understanding Neurodevelopment

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Julian was 12 years old the first time he shoplifted food with a group of friends. His friends were a few years older and occasionally asked him to be the "lookout" while breaking into homes. Julian's father was incarcerated, and his mother worked two jobs until late at night. Julian's mother didn't know what her son had been doing as he'd never been caught by the police. By the time Julian was 16, many of his older friends had been to juvenile detention and/or jail. These friends felt like family to Julian despite his fears of getting into similar trouble.

It has long been known that risk taking is common among adolescents. Data also suggests that delinquency and violence are relatively common experiences for American youth. For instance, 696,620[1] of the roughly 25 million youth aged 12-17 living in the United States[2] were arrested in 2019. However, survey data suggest delinquency and violence among youth is even more widespread. According to the Youth Risk Behavior Surveillance – United States 2019, 21.9% of high school students were in physical fights, 8.2% experienced sexual dating violence, and 4.4% carried a gun. In the same study, 29.2% of high school students reported current alcohol consumption, 13.7% reported current binge drinking, 5.4% reported driving under the influence of alcohol, 8.9% attempted suicide, 11.9% did not use any method to prevent pregnancy during last sexual intercourse, and 6.5% rarely or never wore a seat belt.[3] Mortality data reflects broad risk-taking behavior; for the same year, the leading causes of death among US adolescents aged 15-19 were accidents, suicide, and homicide.[4]

These data are not surprising given our understanding of neurodevelopment. Imaging studies provide more definitive evidence to support what developmental theorists (and parents) have known for decades – that the adolescent brain is different than the more fully matured adult brain. Adolescents' vulnerability to risk-taking behaviors is best explained by a mismatch in brain development between the fully developed structures (eg, nucleus accumbens, amygdala, etc.) responsible for social and emotional development and reward seeking (ie, "the gas" that fuels risky behavior) and the still-developing structures involved in cognitive control (eg, prefrontal cortex and related cortical regions) responsible for the executive functioning skills needed for planning and making decisions related to taking risks (ie, "the breaks" that foster emotional regulation and prudent decision making).[5,6,7] See Table 1 for features of adolescent decision making.

Table 1: Features of Adolescent Decision-Making[5]

Future orientation	As adolescents mature, they become more future oriented, demonstrating increased capacity when considering future consequences, future concerns, and future planning.
Self-regulation	Adolescents show differences in their capacity towards self-regulation, particularly in managing impulsive decisions and behaviors. Impulsivity has been shown to have a linear decline between the high school years and young adulthood.
Reward sensitivity	As compared to adults, adolescents are more prone to reward-seeking behaviors, particularly immediate rewards. While both adults and adolescents recognize the risks of their behavior similarly, they assess the benefit of the reward differently, in that adolescents may assign greater worth to the potential immediate reward associated with their risky decision.
Peer influence	Adolescents are more susceptible to peer influence than adults. They may take risks, motivated by peer acceptance and fear of rejection. Studies suggest that adolescents' increasing resistance to peer influence with age is linked to integration between cortical and subcortical brain areas.

Trauma, mental health, and other environmental factors also impact neurodevelopment. This is especially relevant when we consider that trauma exposure and mental health disorders are vastly overrepresented in juvenile justice-involved youth.[8] Youth with trauma exposure and PTSD symptoms demonstrate distinct differences in the development of brain structures involved in cognitive control.[9] Adolescent-onset depression is associated with structural changes in limbic and striatal regions of the brain.[10] Frequent alcohol use in adolescence may impair behavior control by disrupting normative neurodevelopment.[11] Cannabis – the most frequently misused illicit substance in adolescence – can lead to executive functioning, memory, and learning decline in long-term adolescent users as well as decreased IQ in heavy and regular adolescent users.[12] The traumatic impact of racism in society and the structural inadequacies of our adult criminal justice system on families, particularly people of color and the poor, must also be considered when thinking about a child's neurodevelopment. For instance, paternal incarceration, which is known to disproportionately impact Black men, has multiple negative impacts on children's mental health and physical wellbeing. Such negative impacts, in turn, widen disparities in our nation along racial/ethnic and social classes.[13]

Neurodevelopmental research has been critical in informing the US Supreme Court in a series of cases involving juvenile sentencing and culpability. In 2005, the Court held in *Roper v Simmons*[14] that it was cruel and unusual punishment to execute a person who committed a capital crime (one that carries the possibility of the death penalty) under the age of 18. The Court found that a child under 18 years lacks the cognitive maturity to be held as morally culpable as an adult who has committed a similar offense. In the opinion, Justice Anthony Kennedy identified 3 general differences between juveniles under 18 and adults that demonstrate "juvenile offenders cannot with reliability be classified among the worst offenders." He wrote, "First... [a] lack of maturity and an underdeveloped sense of responsibility are found in youth more often than in adults... These qualities often result in impetuous and ill-considered actions and decisions." Second, "juveniles are more vulnerable or susceptible to negative influences and outside pressures..." Third, "The personality traits of juveniles are more transitory, less fixed." The Court concluded that "[t]hese differences render suspect any conclusion that a juvenile falls among the worst offenders. The susceptibility of juveniles to immature and irresponsible behavior means 'their irresponsible conduct is not as morally reprehensible as that of an adult.'"

In 2012, in *Miller v Alabama*,[15] the US Supreme Court held that mandatory sentencing of Juveniles Life Without Parole (JLWOP) also violated the Eighth Amendment's ban against cruel and unusual punishment. In another 5-4 opinion, Justice Elena Kagan wrote that JLWOP's mandatory sentencing was unconstitutional because it fails "to take into account how children are different, and how those differences counsel against irrevocably sentencing them to a lifetime in prison." Despite the Court's ruling in *Miller*, minors younger than 18 years may still be sentenced to JLWOP if the sentencing judge deems appropriate after evaluating the minor's psychosocial history and the specific details of the crime. Earlier this year, Justice Kavanaugh delivered a 6-3 opinion in *Jones v Mississippi*,[16] which stated all that is constitutionally required is for the sentencing judge to have discretion and consider the defendant's youth.

Juvenile sentencing remains a critical issue particularly when considering that juveniles sentenced to LWOP are disproportionately of racial and ethnic minoritized backgrounds.[17] For instance, Black youth, particularly Black boys, are more likely to be misidentified as adults and subsequently considered more criminally culpable.[18,19] A small study examining the role of race in perceptions of criminal innocence found that Black juvenile felony suspects were misperceived as more than 4.5 years older than their actual age. By the age of 14, they were characterized as legal adults.[18] Both the overestimation of a Black youth's age and the inappropriate influence of race often results in Black juveniles receiving more punitive sentences, including JLWOP.[18,19] Thus, even the concept of "maturity" can be influenced by racial bias.

Gains in our understanding of child development have clearly shown that many features distinguish an adolescent from an adult. For example, most youth diagnosed with conduct disorder do not go on to develop the pervasive patterns of unlawful behavior associated with antisocial personality disorder.[20] In one large study examining juvenile desistence from criminal behavior by following over 1,300 serious juvenile offenders over 7 years, only 7.5% persistently offended at a high rate by adulthood (age 25), 13.5% consistently offended at a moderate rate, and the vast majority of serious juvenile offenders desisted by adulthood. The authors found that maturation was the most significant variable that predicted desistence. Of note, those youth who persisted along the path of unlawful behavior were less developmentally mature in adolescence and demonstrated deficits in their development of maturity.[21] Most importantly, the fact that adolescents continue to develop well into adulthood indicates that this is the time period when evidence-based intervention still has the potential to profoundly impact adolescent development in a positive way and improve outcomes.

Returning to Julian, his past delinquent behaviors are concerning though must be understood in the context of his age and developmental immaturity. In our first article of this series,[22] we learned that Julian committed an armed robbery with two adult peers. There is no doubt that this is an extremely serious crime. However, this act does not define Julian as a person. In other words, an adolescent's identity is certainly not fixed and may not represent the future adult they become. Scientific findings indicate that we cannot definitively predict an adolescent's future behavior, including in an adolescent who has committed a serious criminal act. What we can do is understand juvenile offending through the appropriate developmental lens. We will continue to learn of the additional factors that shaped Julian's pathway into the justice system in future articles as well as the specific evidence-based interventions that lower the risk of recidivism, rehabilitate, and optimize prosocial development and maturation.

Take Home Summary

Gains in our understanding of child development have clearly shown that the adolescent brain is different from the more fully matured adult brain. Risk factors for juvenile justice involvement including trauma, mental health, and other environmental factors also impact neurodevelopment. Neurodevelopmental research has been critical in informing the US Supreme Court in a series of cases involving juvenile sentencing and culpability. Child and adolescent psychiatrists should understand juvenile offending through the appropriate developmental lens.

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