

The Civic Column

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Report from the Mercyhurst College Civic Institute

Vol.2, Issue 2

September 2010



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Wednesday, October 20, 2010

Speaker: Laurence Steinberg, Ph.D.

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Less Capable Brain, Less Culpable Teen?

By: Kristen Burillo

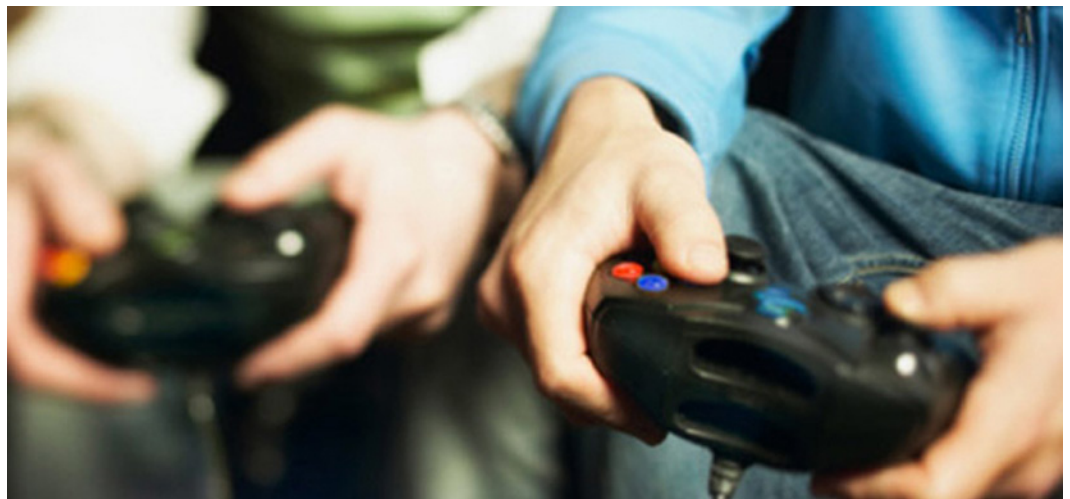
There may be perfectly good, scientific, research-based, biological, developmental explanations for why those teenagers you know are impulsive, emotional, giving into peer pressure, not thinking about the future, unconcerned with consequences, and taking a lot of risks¹. Blame it on their brains. Research is increasingly showing that adolescent behaviors such as those mentioned above can be explained, at least in part, by the way the brain is functioning and developing during the teenage years. Sex-related hormones, which are often associated with emotional and behavioral changes during adolescence, only account for some of the changes². Rather, as studies using magnetic resonance imaging (MRI) have shown, the fact that different parts of the brain mature at different times is a key factor^{3,4,5}. The brain regions and systems that play a large role in regulating emotion and behavior, as well as those that are involved in evaluating risks and rewards, are the ones most impacted during adolescence⁶.

The research on adolescent brain development has been utilized to inform decisions within the criminal justice system. Adolescents' developing cognitive abilities have raised questions about their culpability, competence, and amenability. Key court decisions have been informed from the research in this area. For example, a 2005 Supreme Court decision (*Roper v Simmons*) ruled that capital punishment for juvenile offenders was cruel and unusual punishment^{7,8}. More recently, in the Supreme Court case of *Graham v Florida* (2010), life without parole was determined to be unconstitutional for adolescents committing a non-murder crime⁹. Adolescent brain development has also been taken into consideration in regards to state transfer laws for non-capital offenses, which set the criteria for automatic transfer of youth from the juvenile to the adult criminal system.

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The purpose of the Mercyhurst Civic Institute

- Enhance and facilitate citizen participation in decision-making.
- Provide high-quality, objective information to assist local decision-making.
- Convene community forums that encourage reasoned reflection and free and open discussion of regional issues.
- Educate the Erie community and Commonwealth of Pennsylvania about various issues through Institute reports and publications.
- Foster human networks that enhance communication, link resources, strengthen community participation and build social capital.
- Promote research, learning, teaching and service opportunities for the Mercyhurst community.



Less Capable Brain, Less Culpable Teen? *continued*

Adolescent Brain Development

While the brain's size changes little after age six, the brain continues to mature and develop until the mid-20s ^{10, 11, 12}. The development increases the speed and capacity of information processing and improves the degree of cognitive control of behavior ¹³. One of the changes that occurs in the brain is the process known as synaptic pruning and myelination. The brain's gray matter (neurons and their dendrites, or the brain tissue that does the "thinking") thickens between the ages of approximately six and twelve, but thins out during adolescence ^{12, 14, 15, 16}. In this synaptic pruning, the unused synapses (the connections between neurons) are eliminated. In turn, the connections that are used frequently become stronger. The process has been summarized by the phrase "use it or lose it." While gray matter is being pruned, the brain's white matter develops. The white matter, or myelin, is a fatty tissue that wraps around and insulates the neuron's axons, thus making communication between cells faster. Overall, the brain's function becomes more efficient and precise, with fewer but faster connections between brain cells ^{12, 16}.

Among the brain areas that undergo a great deal of change during adolescence is the frontal lobe, and particularly the pre-frontal cortex. This area of the

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brain, which controls the higher-order cognitive functions known as the executive functions, is the last brain area to mature ^{5, 17, 18}. This "CEO" of the brain controls activities related to planning, judgment, insight, working memory, self-evaluation, and emotional regulation ^{6, 19}. As the area matures, individuals are better able to reason, control impulses, make judgments, and regulate mood and behavior ⁴.

Because the pre-frontal cortex, and therefore the executive functions, is not yet fully developed, adolescents rely more heavily on other areas of the brain ¹¹. The limbic system, which plays a role in processing and managing emotions, often takes over for the frontal lobe. The sex hormones are already especially active in this brain area ¹². Studies using functional magnetic resonance imaging (fMRI) have examined how adolescents and adults compare on their perception of emotion ¹⁹. Participants were

shown pictures of faces depicting a certain emotion. Adults correctly identified the emotion as fear, but teens reported the emotion as shocked, surprised, or angry. Also, the adults utilized the frontal lobe (reason, planning) to identify the emotion, but the teens used the amygdala (gut reaction). The gut reaction, rather than a rational one, led researchers to conclude that an immature brain leads to impulsivity.

The competition between the socioemotional network (i.e. limbic system) and the cognitive-control network (i.e. prefrontal cortex) leads to increased risk-taking ¹⁰. The network that prevails may depend on environmental factors. The socioemotional network is not highly activated when individuals are not emotionally aroused or are alone. During these times, the cognitive-control network is typically developed enough to regulate impulsive or risky behavior. Under conditions of emotional arousal or the presence of peers, however, the socioemotional network overtakes the cognitive-control network, and impulsive, risky behavior is more likely to occur.

Gardner and Steinberg conducted a study that examined the relationship between age and risk-taking as well as the effect of peers on risk-taking ²⁰. Participants played a computer game that had opportunities to take driving risks, either alone or in the presence of peers. The results indicated that risk-taking decreased with age. Also, the presence of peers led participants to take more risks and to focus on the benefits of the risk as opposed to the cost. These peer effects were especially pronounced for adolescents. In other words, adolescents (as compared to adults) are more susceptible to the influence of peers in risky situations. One explanation for why this occurs is that the brain regions activated by emotional and social stimuli (i.e. peer presence) overlap with brain regions sensitive to reward magnitude ¹⁰. In other words, there are neurological reasons why adolescents pay more attention to rewards than risks when surrounded by peers. It is also noteworthy that adolescence is a time



Less Capable Brain, Less Culpable Teen? *continued*



when increasingly more time is spent in the presence of peers, thus making the risk-taking more common. These findings are consistent with the data showing most youth crimes are committed when with peers ¹².

Similarly, research has shown that the socioemotional network is also activated when making decisions about immediately available rewards ²¹. Immediate rewards are hypothesized as more emotionally arousing, and in turn, activation of this network is related to preference for smaller, immediate rewards as opposed to larger, delayed rewards ¹⁰. Without a strongly developed cognitive-control network to overtake the socioemotional network, adolescents often choose the immediate reward.

Changes in dopamine production have also been suggested as contributing reasons for increased risk-taking behavior in adolescence. The mesolimbic pathway and the mesocortical pathway are two neural pathways that transmit dopamine within the brain. During adolescence, dopamine activity shifts from the mesolimbic pathway, which is associated

Adolescents (as compared to adults) are more susceptible to the influence of peers in risky situations.

with reward and desire, to the mesocortical pathway ². Decreased amounts of mesolimbic dopamine have been connected with reward deficiency syndrome, often implicated in drug use and addiction. In the case of reward deficiency syndrome, individuals may find reinforcing stimuli less pleasurable, and thus engage in increasingly risky behavior in order to seek excitement ^{2,11}. It has been suggested that adolescents may experience a transient and less intense reward deficiency syndrome ²².

The bottom line is that the brain is still developing throughout adolescence, and the fact that different parts of the brain develop at different times can greatly impact how a teenager behaves. Many

factors, including some that are related to brain development, propel adolescents to be more emotional and to engage in riskier behavior. Even factors that are generally viewed to be social in nature have biological underpinnings. Part of the reason adolescents act differently around peers than when alone is because of the way their brains are functioning. Furthermore, the prefrontal cortex is the last part of the brain to develop and cannot inhibit, control, reason, and plan the way it would in a fully-developed adult.

Want to learn more about juvenile crime and youth responsibility? Interested in hearing from a leading researcher in the area of adolescent brain development?

Minor Problems, Major Impact: Juveniles in the Adult System

Mercyhurst College Criminal Justice Conference and James V. Kinnane Awards Luncheon

Wednesday, October 20, 2010

Ambassador Banquet and Conference Center, Erie, PA

Keynote speaker: Laurence Steinberg, PhD

Reservations are required and space is limited.

Register online at www.civicinstitute.org



Laurence Steinberg, Ph.D.

Laurence Steinberg, Ph.D., is the Distinguished University Professor and Laura H. Carnell Professor of Psychology at Temple University. Dr. Steinberg is a former President of the Division of Developmental Psychology of the American Psychological Association and of the Society for Research on Adolescence, and was Director of the MacArthur Foundation Research Network on Adolescent Development and Juvenile Justice. A nationally and internationally renowned expert on psychological development during adolescence, Dr. Steinberg's research has focused on a range of topics in the study of contemporary adolescence, including adolescent brain development, risk-taking and decision-making, parent-adolescent relationships, adolescent employment, high school reform, and juvenile justice. He is the author or co-author of more than 300 articles and a dozen book on growth and development during the teenage years, including *Adolescence*, the leading college textbook on adolescent development, now in its 9th edition; *You and Your Adolescent: The Essential Guide for Ages 10 to 25* (Simon & Schuster); *Rethinking Juvenile Justice*; and *The Ten Basic Principles of Good Parenting* (Simon & Schuster), which has been published in ten languages.

Adolescent Brain Development and the Criminal Justice System

The findings regarding adolescent brain development have raised questions in regards to what happens when an adolescent enters the justice system. The initial development of the juvenile justice system was based on the recognition that children and adults are developmentally different and that youth were in need of a system to reflect the differences^{23, 24, 25}. Youth offenders were considered to be cognitively and morally immature yet responsive to intervention²⁵. The juvenile justice system, therefore, was intended to provide treatment and programs in order to prevent future criminal behavior²³. There was a focus on protection and rehabilitation rather than punishment as well as on the offender rather than on the offense²⁶. Due to violent crime rates increasing in the mid-1990s, policymakers made youth violence one of the top priorities on their agenda²⁷.

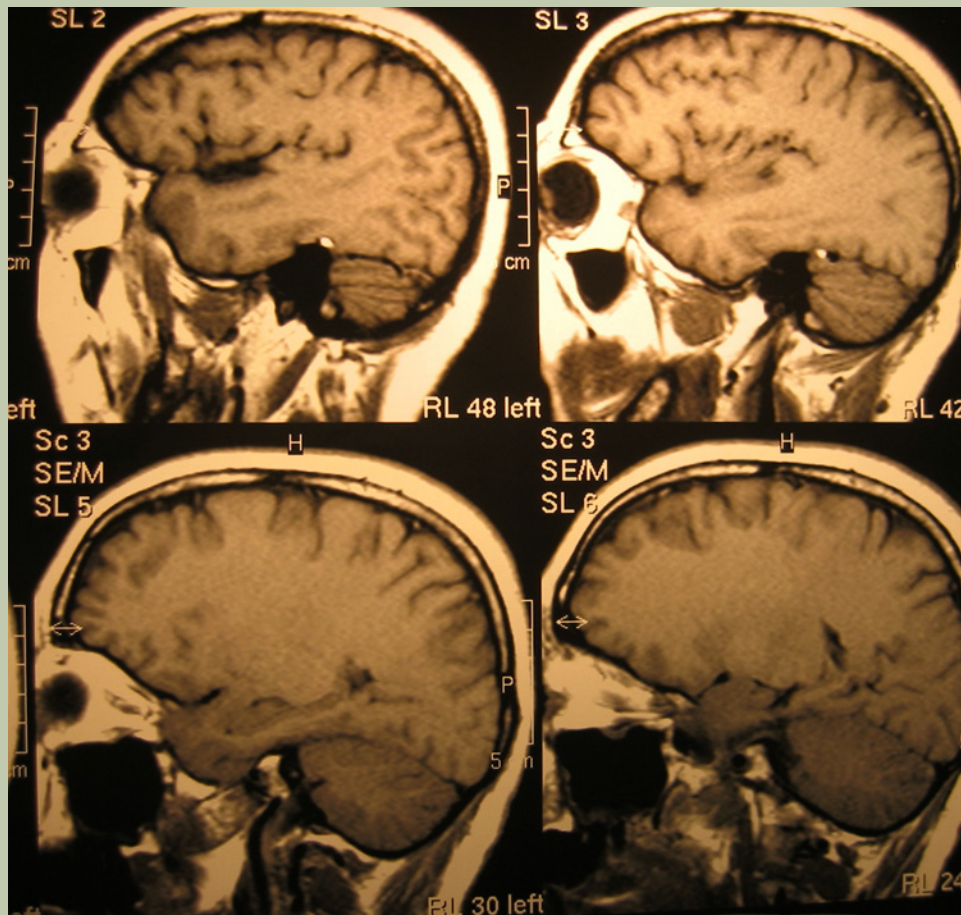
With the goals of increasing community protection and decreasing juvenile offending, legislatures enacted what came to be known as "get tough" policies. These policies tended to move youth away from the juvenile justice system and into the adult justice system, most often by making it easier to transfer youth into adult criminal court²⁸. The movement toward stricter policies and harsher punishments has led some people to question whether the principles of the juvenile justice system have been compromised. The most commonly cited criticism of such policies is the disregard of the developmental differences.

Culpability

The first way in which developmental factors are relevant to juvenile justice is in regards to culpability. The legal system is set-up in a way that takes the blameworthiness of the offender into consideration when determining guilt and punishment. The following three categories of mitigating factors have been identified²⁹: 1) impaired decision-making capacity, usually due to mental illness or disability; 2) circumstances of the crime, such as whether it was committed under duress; and 3) individual's personal character, which may suggest a low risk of committing another crime. Based on the research on adolescent brain development, it has been suggested that developmental immaturity should be considered a mitigating factor²⁹.

A study conducted by the MacArthur Foundation Research Network on Adolescent Development

and Juvenile Justice examined age differences on characteristics that underlie decision making and that are relevant to mitigation²⁹. The findings were consistent with neurological research regarding adolescent brain development. Adolescents who participated in the study were less likely to consider the future consequences of their actions and were more prone to choosing smaller, immediate rewards rather than larger, longer-term rewards. The lack of foresight and attention to immediate gratification led to poor decision making. Adolescent participants also demonstrated more impulsive behavior, spending less time planning out the first move in a game requiring as few moves as possible. It was also suggested that adolescents paid more attention to reward rather than risk, which contributed to increased risk-taking behaviors. The study also supplied evidence that peer pressure was more



influential for younger individuals. Peer pressure may be considered a type of coercion, which is a mitigating factor in some cases.

Adolescents' brains are not wired to plan ahead or to be future-oriented. Engaging in impulsive actions and not fully considering the risks involved may lead youth to commit illegal behaviors. They are unable to focus on the long-term consequences of a crime. Adolescents are also greatly influenced by peer presence. Leading researchers have thus utilized the neurological and psychosocial evidence to argue that one's developmental stage should be taken into account when determining culpability^{29,30}, leading to questions such as "when do individuals meet the criteria for adult blameworthiness?" One perspective is that youth cannot be expected to demonstrate behaviors that their brain does not yet have control over, and in the case of the justice system, the offender becomes less blameworthy and subsequently less punishable³⁰.

Competence

In addition to considering how adolescent development influences the act of criminal offending and subsequent responsibility, developmental level is important in regards to participation in the criminal proceeding, or competence³⁰. In order to have adjudicative competence, the defendant needs to be able to engage in activities such as assisting counsel in preparing a defense, entering pleas and considering plea agreements, and making decisions about retaining or dismissing counsel^{24,30}. The following skills that have been deemed necessary in order to have adjudicative competence are still being developed throughout adolescence³⁰: "engage in hypothetical and logical decision-making (in order to weigh the costs and benefits of different pleas), demonstrate reliable episodic memory (in order to provide accurate information about the offense in question), extend thinking into the future (in order to envision the consequences of different pleas), engage in advanced social perspective-taking

(in order to understand the roles and motives of different participants in the adversarial process), and understand and articulate one's own motives and psychological state (in order to assist counsel in mounting a defense)." In addition, juveniles are easily led during cross examination and are prone to protecting family and friends. Furthermore, criminal court judges are not specifically trained to interact with children or to understand their cognitive level³¹.

The MacArthur Foundation's Network on Adolescent Development and Juvenile Justice conducted a juvenile adjudicative competence study, which measured 1400 youth and adults on measures linked to competence. The research showed that the youth were more likely to defer to authority figures and were less likely to think about the risks or long-term consequences associated with decisions. This means they are more apt to accept a plea agreement, even if it is not the best long-term option, and they are more apt to confess even when not guilty if they believe it may lead to a more immediate reward such as going home²⁴. Overall, approximately one-third of youth ages 11 to 13 and one-fifth of youth ages 14 to 15 were determined to be as impaired in the abilities needed to stand trial as adults with mental illness who would likely be ruled incompetent³².

Key Points

Adolescent Brain Development

- Areas of the brain that control higher-order cognitive functions are the last to mature.
- The cognitive-control network is not able to regulate the socioemotional parts of the brain, particularly when in the presence of peers or when under emotional stress.
- Dopamine levels in the brain impact the perception of risks and rewards.

Adolescent Brain Development and the Criminal Justice System

- Some people argue that "get tough" policies have compromised the principles of the juvenile justice system.
- The disregard for developmental differences is the most commonly cited criticism.
- Brain development is relevant to discussions regarding youth culpability, competence, and amenability.

Amenability

A founding principle of the juvenile justice system is that youth are malleable and have the potential to change, thus placing a focus on rehabilitation and treatment. This approach is in contrast to the adult court, which presumes that adult offenders are unlikely to change^{25,30}. These beliefs regarding juvenile offenders' amenability are supported by the fact that adolescents' brains are still developing.

Judgments regarding a youth's amenability are used when determining whether an offender should be handled in the juvenile or adult justice system. Proponents of keeping youth in the juvenile justice system have cited numerous reasons why it is important to keep adolescents out of the adult criminal system. Being confined with adult offenders during such a critical time places juveniles in an environment that lends them to being negatively



influenced, either directly by interacting with and observing inmates or indirectly by seeing no other alternatives. The adolescents are not exposed to acceptable social norms and are not given the normal opportunities young adults have for learning appropriate socialization³³. Furthermore, the lack of education, treatment, and rehabilitative services the adolescents receive in the adult system limits their ability to move onto a positive pathway. Opportunities for positive relationship-building are further inhibited by higher staff ratios as compared to those required in juvenile facilities³⁴. Placement with adult offenders also puts the transferred youth at risk in terms of physical well-being. Compared to youth held in juvenile detention centers, youth held in adult jails are five times more likely to be sexually assaulted; twice as likely to be beaten by staff; 50 percent more likely to be attacked with a weapon; and almost eight times more likely to commit suicide³¹. These issues surrounding housing adolescents in the same locations as chronic adult offenders have been suggested as possible explanations for recidivism among transferred youth.

Conclusion

Adolescents' brains are not fully developed and therefore do not work the same way as adults' brains. The underdeveloped cognitive-control network is

not able to regulate the socioemotional parts of the brain, particularly when in the presence of peers or when under emotional stress. Furthermore, synaptic pruning and myelination affects the communication between brain cells, and dopamine levels impact the perception of risks and rewards. Among the behavioral manifestations of these neurological underpinnings are increased impulsive, risk-taking behaviors with little regard for long-term consequences. For juveniles that become involved in the justice system, the research on adolescent brain development provides important information that impacts policies regarding their treatment. The

findings have raised questions about culpability (i.e. should they be held as responsible for their offense as adults if their brain is not developed enough to control all of their behavior or should developmental immaturity be a mitigating factor?), competence (i.e. are adolescents able to understand the processes of the court and do they have the cognitive ability to participate in their defense and make decisions regarding plea agreements?), and amenability (i.e. at what point is an adolescent offender no longer considered amenable and thus handled in the adult justice system?).

The findings regarding adolescent brain development have raised questions in regards to what happens when an adolescent enters the justice system.

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The Civic Column

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