My Brain Made Me Do It: What Attorneys for Children Need to Know about Adolescent Brain Development

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Attorneys for Children Update

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UNIVERSITY of ROCHESTER MEDICAL CENTER

Normal Stages & Tasks of Adolescence

	Puberty	*Autonomy*	*Identity*	*Thinking*
Early 8-14yo	Onset and tempo variable	Ambivalence	Am I normal?	Concrete operational
Middle 15-16yo	Females > Males	Limit-testing, experimental behavior	Who am I?	Transitional
Late 17+yo	Adult appearance	Ambivalence	Who am I in relation to others?	Formal operational (75%)

Early Adolescence: 10-14 years old

- Puberty: Rapid changes
  - Hormonal milieu
  - Variability in sexual maturation (tempo)
- Identity: Am I normal ?
  - Egocentrism
  - Peer group
- Autonomy: Early struggles
  - Ambivalence
  - Need for "control"
- Cognition: Concrete-to-formal operations
  - Imaginary audience: "everyone will know..."
  - Personal fable: "that can't happen to me..."

Middle Adolescence: 15-17 years old

- Puberty: Stabilization
  - Females more advanced than males
  - Chronic illness effects
- Identity: Who am I ?
  - Uniqueness
  - Self as separate from others
- Autonomy: Challenges maximal
  - Experimental, limit-testing and risk-taking behaviors
  - Need for "control"
- Cognition: Adult thinking in some areas
  - Formal operational if personally meaningful

Late Adolescence: 18-21 years

- Puberty: Adult appearance
  - Chronic illness effects
- Autonomy: Conflict subsiding
  - Ambivalence
  - Need for control
- Identity: Who am I in relation to...?
  - Stable identity vs Role confusion
- Cognition: Formal operations (not universal)
  - Future oriented
  - Abstract thinking

Brain growing branches and shoots

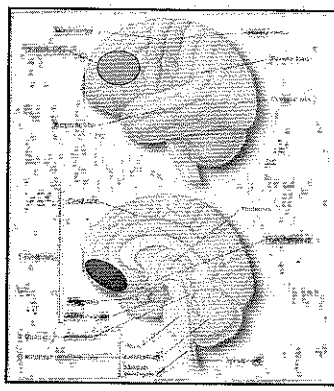
Nerves that fire together Get wired together!!!

Pre/Frontal Lobe Functions

Ventromedial Prefrontal
Regulation of emotions
Weighing risks/ rewards
Learning from experience

Dorsolateral Frontal
Future orientation
Inhibition of impulses

Steinberg L. Committee on Adolescent Health and Development. NAS '04



Brain Anatomy:
Frontal and Prefrontal

Brain Facts: A Primer on the Brain and Nervous System.

www.sfn.org/skins/main/pdf/brainfacts/2008/brain_facts.pdf

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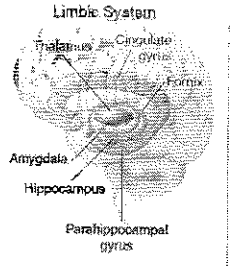
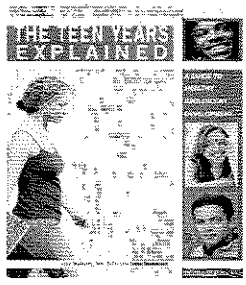
Limbic System: The "Reptile Brain"



www.lovefirstparenting.com/wp-content/uploads/2010/07/Adolescent-Brain-Development.pdf

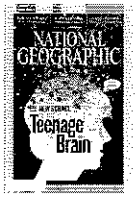


Center for Adolescent Health, Hopkins Bloomberg School of Public Health, 2009
www.jhsph .edu/bin/s/e/Interactive%20Guide.pdf

Frontal/Prefrontal Lobes: Mission Control p16

- Frontal: Reasoning, Planning, Movement, Speech
- Prefrontal: Complex cognitive skills
  - Differentiate among conflicting thoughts
  - Good vs bad and Consequences of behavior
  - Suppress impulses
  - Increasingly connected with limbic area (emotions), with better coordination of reason and emotion

Center for Adolescent Health, Hopkins Bloomberg School of Public Health, 2009
www.jhsph .edu/bin/s/e/Interactive%20Guide.pdf



It was kind of a dare: "If you do it, I'll do it"...she probably wouldn't have had her tongue pierced if her best friend hadn't dragged her along on an "exciting and scary adventure".

D. Dobbs/K. Cahana National Geographic Oct 2011

Limbic System: Seat of Emotions, Memories and Body Regulation p16

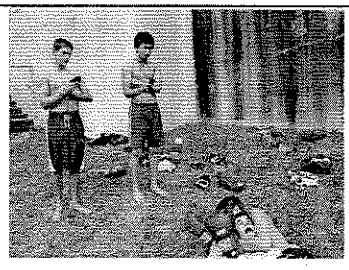
- Temperature, blood pressure, heart rate, etc.
- Memories based in hippocampus and amygdala
- Emotions ⟷ sensory inputs from the external and internal environment in amygdala.
- Rage, fear, aggression, reward, sexual attraction arise from nerve impulses to the amygdala.
- Emotions based in amygdala ⟷ hypothalamus, regulating autonomic nervous system (fight or flight, etc.)

Center for Adolescent Health, Hopkins Bloomberg School of Public Health 2009 www.jhsph .edu/bin/s/c/Interactive%20Guide.pdf

What emotion do you see?

- Different than adults, adolescents:
  - Use the Amygdala (fight/flight response) rather than Frontal Cortex (executive function) to read emotions.
  - Are more likely to "misinterpret" facial expressions.
  - See anger, rather than fear
  - Anger = threat → rapid reptile brain response

www.slideshare.net/brentmack/youth-resiliency-mental-health-workshop-dr-jean-clinton



The boys often used phones to film their contests, posting the videos to a private Facebook group so more friends could admire their prowess. The rush of a headlock, a bond between friends—their fights delivered both excitement and social rewards.

D. Dobbs/K. Cahana National Geographic Oct 2011

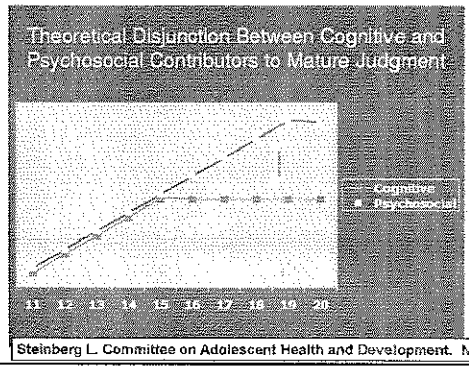
Differential Development: Limbic Earlier/Frontal Later p22

- Limbic system (perception of rewards from risk) develops early in adolescence
- Frontal lobes (impulse control, long-term perspective) develops later
  - Self-control develops as teens are better able to assess cause and effect
  - More areas of the brain become involved in processing emotions → adolescent more accurate interpreting others' emotions

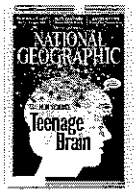
Center for Adolescent Health, Hopkins Bloomberg School of Public Health, 2009
www.jhsph .edu/bin/s/e/Interactive%20Guide.pdf

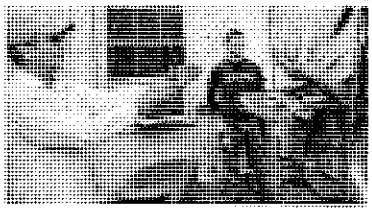
Cars and parties, first cigarettes and first dates, school demands and free time—teens encounter risks both large and small every day, and their choices can be puzzling at times. Think of it as an equation, says Laurence Steinberg, where consequences aren't given the weight they should be. And when teens are around friends, that throws off the equation even more.

D. Dobbs/K. Cahana National Geographic Oct 2011



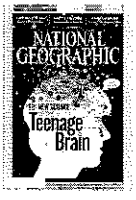
Steinberg L. Committee on Adolescent Health and Development. NAS '04





Teens may choose to hang out with peers, but structured interactions with parents and other adults are also crucial. O'Loughlin returned empty-handed after four days of waiting quietly with a bow and arrow in a tiny camouflage tent. To him the trip was an exercise in patience. Psychologists would call it a rite of passage.

D. Dobbs/K. Cahana National Geographic Oct 2011



Adults can guide teens as conductors, coaches, and cheerleaders. You just have to know when to pull back, says neuroscientist B. J. Casey, and let the teen do the work.

D. Dobbs/K. Cahana National Geographic Oct 2011

Brain, Mind and Relationships

- Mind harnesses the activity of the brain as its "rides along neural firing patterns"
- Structure and function of the brain are highly social and enable the mind to engage with other people in the shaping of development over time, and in shaping activity in the present.

Siegel D. The Mindful Brain. W.W. Norton. 2007

Executive Function, Social Emotional Development and Prefrontal Cortex

- Regulation of balance & coordination of autonomic branches of the parasympathetic (brakes) and sympathetic (accelerator) systems.
- Emotional balance: enabling limbic arousal to be modulated within a tolerable range.
- Flexible responses permitting a pause for reflection before enacting behaviors.
- Empathy: understanding the point of view of another

Sowell ER, Siegel AW, Siegel DJ. *Adolescent Brain and Cognitive Changes.* In *Textbook of Adolescent Health* Care. Fisher M, Alderman E, Kreipe R, Rosenfeld W (Eds). American Academy of Pediatrics, 2011, p 32-38

Executive Function, Social Emotional Development and Prefrontal Cortex

- Insight: connecting awareness of oneself in the past with present experience and anticipated future action.
- Fear modulation: shifting impact of amygdala-based fear responses by prefrontal inhibitory input.
- Intuition: being in touch with "gut responses" and utilizing these to inform rational decision making
- Morality: acting on behalf of larger good, even when alone

Sowell ER, Siegel AW, Siegel DJ. *Adolescent Brain and Cognitive Changes.* In *Textbook of Adolescent Health* Care. Fisher M, Alderman E, Kreipe R, Rosenfeld W (Eds). American Academy of Pediatrics, 2011, p 32-38

Executive Function, Social Emotional Development and Prefrontal Cortex

- Drive towards behaviors in new ways also pushes toward high-risk behaviors (opportunity vs vulnerability)
- Not raging hormones or blindness to risk, but different activation of motivational circuitry: sexual behaviors risk *over-estimated*, but rewards *over-valued* even more.
- Interventions should NOT focus on risk, but support of intuitive sense of "right thing" to do, not right conclusion.
- Support genetic drive to differentiate and socialize in new ways but with emphasis on encouraging thinking.

Sowell ER, Siegel AW, Siegel DJ. *Adolescent Brain and Cognitive Changes.* In *Textbook of Adolescent Health* Care. Fisher M, Alderman E, Kreipe R, Rosenfeld W (Eds). American Academy of Pediatrics, 2011, p 32-38

Summary

- Knowledge of brain development linked to technology, provides a framework to understand adolescent behavior – but should not be used simplistically.
- Brain maturation involves pruning of cell connections to facilitate more rapid transmission on "highways"; Nerves that fire together, get wired together
- The limbic system ("Lizard") develops earlier and is related to emotions, stress, "automatic" responses.
- The prefrontal cortex ("Wizard") develops later and is related to cold and hot cognition modulating the limbic system.

Summary

- Genes and experiences both important in pathway development; past experiences influencing present and future behavior when repeated interpersonally.
- External forces in the environment can have negative or positive influence on neural firing patterns
- Attorneys for Children can have a powerfully positive influence in their client's life by applying knowledge about adolescent development and brain development in determining solutions to common ethical and legal problems that they face in their professional work.

ADOLESCENT BRAIN DEVELOPMENT & JUVENILE JUSTICE FACT SHEET

Why is brain development important for juvenile justice?

Brain imagery now allows us all to see the developmental milestones achieved by the human brain as it grows and matures throughout the early stages of life—confirming in pictures what parents and those who work closely with youth have long found to be true: adolescence is a period of gradual maturation. Hard science demonstrates that teenagers and young adults are not fully mature in their judgment, problem-solving and decision-making capacities.

Adolescence, roughly defined as the period between the onset of puberty and maturity, may last from age 10 to age 25. During this period of rapid growth, American adolescents live in a precarious middle ground between the innocence and immaturity of childhood and the responsibility and accountability of adulthood. On the one hand, the law shields adolescents from their inability to make sound judgments and their natural propensity to be impulsive and reckless. Such societal understanding is expressed in the laws of 29 states where the legal alcohol consumption age is expressly 21 years of age.[1] In 48 states, the marriageable age is set at age 18, unless a minor obtains parental or judicial consent.[2] Nationwide, no one can cast a ballot or join the military until age 18. The intent of such laws is clear—to protect the young from their own immaturity, while providing opportunities for learning and maturation.

On the other hand, some laws—specifically those in some criminal statutes—do not reflect such societal understanding of the nature of child and adolescent development. In fact, there are 15 states that regard children as young as 10 years of age as competent and responsible enough to be put on trial in the juvenile court.[3] Forty-four states and the District of Columbia regard children as young as 14 years of age as mature enough to be held as responsible as adults for wrongdoing and to be sanctioned as adults in the criminal court, without full regard what is know about child and adolescent development or full consideration of the age-appropriate services and supports needed.[4] In addition, treatment approaches used for court-involved youth with substance abuse and mental health problems are often modeled after those used for adults—again, without appropriate regard to what is known about more effective approaches based on the research of adolescent development.

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[1] National Institute on Alcohol Abuse and Alcoholism, Alcohol Policy Information System, "Exceptions to Minimum Age of 21 for Consumption of Alcohol as of January 1, 2005."

[2] Cornell Law School, Legal Information Institute, "Marriage Laws of the Fifty States, District of Columbia and Puerto Rico," Copyright 2006.

[3] Office of Juvenile Justice and Delinquency Prevention, Office of Justice Programs, U.S. Department of Justice, "Trying Juveniles as Adults in Criminal Court: An Analysis of State Transfer Provisions," Dec. 1998.

[4] Griffin, Patrick, National Center for Juvenile Justice,"Trying and Sentencing Juveniles as Adults: An Analysis of State Transfer and Blended Sentencing Laws," Oct. 2003.

KEY FACTS

- During adolescence, the brain begins its final stages of maturation and continues to rapidly develop well into a person's early 20s, concluding around the age of 25.[5]

- The prefrontal cortex, which governs the "executive functions" of reasoning, advanced thought and impulse control, is the final area of the human brain to mature.[6]

- Adolescents generally seek greater risks for various social, emotional and physical reasons, including changes in the brain's neurotransmitters, such as dopamine, which influence memory, concentration, problem-solving and other mental functions. Dopamine is not yet at its most effective level in adolescence.[7]

- Adolescents commonly experience "reward-deficiency syndrome," which means they are no longer stimulated by activities that thrilled them as younger children. Thus, they often engage in activities of greater risk and higher stimulation in efforts to achieve similar levels of excitement.[8]

- Adolescents must rely heavily on the parts of the brain that house the emotional centers when making decisions, because the frontal regions of their brains are not fully developed.

KEY RESEARCH & QUESTIONS

Brain and developmental research conducted over the past 10 to 15 years have opened new pathways to understanding the true developmental differences between adolescents and fully mature adults. The findings highlight the need to conduct more basic and applied research regarding such developmental differences—how they influence motivation, judgment, thinking, feeling and social relationships—and to explore the ways in which intervention and treatment strategies may be changed to incorporate such research, with an ultimate goal of balancing positive outcomes for youth with public safety and individual accountability.

The research also brings difficult questions to the forefront. How does one guide an adolescent to cope in a healthy manner with this tumultuous stage of life? How do we hold young offenders accountable and take advantage of every opportunity to positively influence their development? How can and should common delinquency prevention and juvenile justice practices and laws change to incorporate a more sensible approach to addressing the needs of adolescents, while balancing them with community safety needs?

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[5] Beatrice Luna, Ph.D., "Brain and Cognitive Processes Underlying Cognitive Control of Behavior in Adolescence," University of Pittsburgh, Oct. 2005.
[6] Paul Thompson, Ph.D., "Time-Lapse Imaging Tracks Brain Maturation From Ages 5 to 20," National Institutes of Mental Health, and the University of California Los Angeles, May 2004; also, author interview with Robin Jenkins, Ph.D., June 2006.
[7] Linda Patia Spear, Ph.D., "Neurodevelopment During Adolescence," *Neurodevelopmental Mechanisms in Psychopathology*, Cambridge University Press, Nov. 2003.
[8] Ibid.

At the highest levels of jurisprudence, changes have already begun. In 2005, the U.S. Supreme Court's ruling in *Roper v. Simmons* outlawed the juvenile death penalty. In authoring the majority opinion that the death penalty is not appropriate for youth under age 18, Justice Anthony Kennedy noted that "juveniles are more vulnerable or susceptible [than adults] to negative influences and outside pressures, including peer pressure… This is explained in part by the prevailing circumstance that juveniles have less control, or less experience with control, over their own environment." Justice Kennedy further cited scientific and sociological studies on the "underdeveloped sense of responsibility found in youth." Following the logic of the high court's ruling and its roots in a clearer understanding of the adolescent mind, it becomes important for juvenile court professionals and practitioners engaged in delinquency prevention and rehabilitation to re-examine each point of contact or interaction with adolescents—to ensure that developmentally appropriate responses are in place.

RESOURCES

The following list of Web sites, reports and books provides key resources on the science of adolescent brain development.

Abigail Baird, Ph.D. (http://www.theteenbrain.com/research/projects/). Baird's extensive research on the decision-making processes and social and emotional development of adolescents can be found on this site.

***Adolescent Brain Development: Vulnerabilities and Opportunities*,** by Ronald Dahl and Linda Patia Spear, Annals of the New York Academy of Sciences, 2004. A collection of more than 60 research papers and essays, this book examines the finer points of adolescent brain maturation.

Brain Facts: A Primer on the Brain and Nervous System, Society for Neuroscience, 2005. This extensive, well-illustrated overview of brain functioning and development may be found in a pdf format at http://www.sfn.org/skins/main/pdf/brainfacts/brainfacts.pdf.

Centers for Disease Control (CDC) (www.cdc.gov). The CDC's extensive Web site has a user-friendly search engine. Key words such as "youth," "juvenile," and "youth assets" will lead to reports and surveys on youth risk behavior and adolescent health.

Chapin Hall Center for Children at the University of Chicago (www.chapinhall.org).
Chapin Hall dedicates a large section of its Web site to community, child and youth development. Among the many resources is an issue brief entitled, "Focusing Juvenile Justice on Positive Youth Development."

Cornell Law School (www.law.cornell.edu). The U.S. Supreme Court's opinions—majority, concurrent and dissenting—on *Roper v. Simmons* can be found using this Web site's database.

Diana H. Fishbein, Ph.D. (http://www.rti.org/index.cfm). By searching from the RTI home page on her name, you can locate Fishbein's work. She has applied neuroscience to the evaluation of crime prevention programs and consults regularly with federal, state and local agencies for purposes of expert witnessing in criminal court, training, technical assistance, scientific peer reviews and development of research protocols.

Jeffrey A. Butts, Ph.D. (www.jeffreybutts.net). Butts' presentation at the CJJ-OJJDP conference on the implications of adolescent brain development, "Using Developmental Evidence and Youth Assets to Design Juvenile Justice Systems," is available on this Web site.

Juvenile Law Center (JLC) (www.jlc.org). The JLC Web site has a section devoted to research, publications and fact sheets. In addition, it contains the work of Marsha Levick, the JLC legal director, and Laurence Steinberg, Ph.D., Director of the MacArthur Research Network on Adolescent Development and Juvenile Justice.

The MacArthur Research Network on Adolescent Development and Juvenile Justice (www.mac-adoldev-juvjustice.org). The John D. and Catherine T. MacArthur Foundation has supported the work of the MacArthur Research Network on Adolescent Development and Juvenile Justice, directed by Laurence Steinberg, Ph.D., for many years. The Research Network's Web site is filled with information about ongoing and completed studies that illuminate issues of competence and culpability in the relationships that adolescent offenders have with the juvenile justice system.

National Academies Press (www.nap.edu). More than 3,000 books and reports can be found through the National Academies Web site, including *From Neurons to Neighborhoods: The Science of Early Childhood Development*. *Neurons to Neighborhoods* dedicates a significant section to the stages of brain maturation and considers the impact of other factors on child development.

National Academies' Board on Children, Youth, and Families (www7.nationalacademies.org/bocyf/). The National Academies' Board of Children, Youth and Families provides summaries of adolescent brain development research and a report on emerging issues in the study of adolescence at the above listed Web site.

Office of Juvenile Justice and Delinquency Prevention (OJJDP) (www.ojjdp.ncjrs.org). OJJDP, at the Office of Justice Programs, U.S. Department of Justice, provides a national overview of the latest findings and programs in youth development and the juvenile court system.

Oklahoma Institute for Child Advocacy (OICA) (www.oica.org). With a primary focus on early child development and prevention, OICA conducts the "Youth Asset Study," which involves teens and their parents as participants. The study is funded in part by the CDC and delves into how assets counter risky behavior.

Primal Teen: What the New Discoveries about the Teenage Brain Tell Us about Our Kids**,** by Barbara Strauch, Bantam Doubleday, 2004. Peppered with anecdotes, Strauch provides a layman's guide to the hard science underlying adolescent brain development.

Search Institute (www.search-institute.org). The Search Institute's Web site presents a definitive description of the 40 developmental assets for youth. It also offers strategies and research on positive youth development.

Thomas Grisso, Ph.D., at University of Massachusetts Medical Center, Department of Psychiatry (www.umassmed.edu/cmhsr/faculty). By following the link for Grisso, you will locate several resources of note, including: *Double Jeopardy: Adolescent Offenders With Mental Disorders* by Grisso, 2004; *Evaluating Juveniles Adjudicative Competence: Agenda for Clinical Practice*, by Grisso, 2005; and *Youth on Trial: A Developmental Perspective on Juvenile Justice*, Grisso and Robert Schwartz, editors, 2000.

Wisconsin Council on Children and Families (WCCF) (www.wccf.org). Under projects and topics, WCCF's Web site has a section on juvenile justice where the report "Rethinking the Juvenile in Juvenile Justice" is available. The report discusses adolescent brain development and makes recommendations to improve the juvenile court system.

***Why Do They Act That Way?: A Survival Guide to the Adolescent Brain for You and Your Teen*,** by Dr. David Walsh with Nat Bennett, Simon & Schuster, 2005. Geared toward parents, Walsh's book explains how adolescent brain development affects mood, judgment and communication.

***Your Adolescent: Emotional, Behavioral, and Cognitive Development from Early Adolescence Through the Teen Years*,** by the American Academy of Child and Adolescent Psychiatry, HarperCollins Publisher, 2000. While covering brain development, the book also looks at the physical and social changes of adolescence.

For additional information on adolescent brain development, please also visit the Web site of the Coalition for Juvenile Justice (CJJ) (www.juvjustice.org).