

BRAIN DEVELOPMENT, CULPABILITY AND THE DEATH PENALTY

The International Justice Project

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For many years, science had assumed that the adolescent brain was fully developed by the age of 14. It was thought that developmental changes in the brain occurred in the first few “formative” years of life. However recent scientific advancements indicate that the adolescent brain undergoes rapid change and does not fully develop adult capacity until the early twenties.¹ It should be emphasized that this development and change occur in all adolescents.

The importance of this discovery should not be understated. The National Research Council's 1999 Forum on Adolescence states that "*one (of) the most remarkable findings in neuro-biology of the last decade is the extent of change that can occur in the (adolescent) brain . . .*"² This indicates (for the first time) that the adult brain and teenage brain are physiologically different.

Neuro scientist Jay Giedd (National Institute of Mental Health) and neurologist Paul Thompson (University of California) found one of the most significant changes to be in the frontal lobes or prefrontal cortex.³ It is these areas, among other things, which control impulses, calm emotions, provide an understanding of the consequences of behavior and allow reasoned, logical and rational decision making processes. These “executive functions” do not fully develop until the early twenties.⁴

Jordan Graffman (cognitive neuro scientist) explains "*the prefrontal cortex denotes social behavior and knowledge; the ability to infer the mental states of others and to have insight and reflect on your own behavior.*"⁵ Daniel Weinberger (Director of the Clinical Brain Disorders Laboratory, National Institute of Health) continues: "*It allows us to act on the basis of reason. It can preclude an overwhelming tendency for action (for example to run from a fire..)because an abstract memory (don't panic)makes more sense. It also allows us to consciously control our tendency to have impulsive behavior. Without a prefrontal cortex, it would be impossible to have societies based on moral and legal codes.*"⁶

In conjunction with the development of the pre-frontal cortex during adolescence, other studies show that throughout this period adolescents use an alternative part of the brain in their thought processing: the amygdala.⁷ This area of the brain is associated with emotional and gut responses. Studies by Dr. Deborah Yurgelun-Todd and colleagues at Harvard Medical School using

¹Giedd, Thompson, [Http://www.ioni.ucla.edu/_thompson/MEDIA/ct.html](http://www.ioni.ucla.edu/_thompson/MEDIA/ct.html) , Teichner, Harvard http://134.174.17.116/focus/2000/Apr21_2000/psychiatry.html

²Adolescent Development and the Biology of Puberty, National Research Council, National Academy Press, 1999

³Giedd, Thompson, [Http://www.ioni.ucla.edu/_thompson/MEDIA/ct.html](http://www.ioni.ucla.edu/_thompson/MEDIA/ct.html)

⁴ Giedd, [Http://www.pbs.org/wgbh/pages/frontline/shows/teenbrain](http://www.pbs.org/wgbh/pages/frontline/shows/teenbrain)

⁵Vedantam,S *The Washington Post*, June 3, 2001

⁶<http://web.mit.edu/aram/www/writing/reference/maturity-1.txt>

⁷[Http://www.forouryouth.org/juvejustice/reformissues/devpsych/2002_frontend_itb_todd.html](http://www.forouryouth.org/juvejustice/reformissues/devpsych/2002_frontend_itb_todd.html)

functional MRI scans show that teenagers when interpreting emotional information use this part of the brain rather than the rational decision making region: the prefrontal cortex.⁸ Conversely, adults in the same experiment relied more heavily on the frontal cortex. In assessing the results of the tasks set to the two groups, Dr. Yurgelun-Todd found that all of the adult participants interpreted the emotional information correctly in comparison to under half of the adolescents.⁹

“These results suggest that adolescents are more prone to react with ‘gut instinct’ when they process emotions but as they mature into early adulthood, they are able to temper their instinctive ‘gut reaction’ response with rational, reasoned responses” . . . “Adult brains use the frontal lobe to rationalize or apply brakes to emotional responses. Adolescent brains are just beginning to develop that ability.”¹⁰

It is clear therefore, that the normal adolescent brain is far from mature or operating at full adult capacity. The physiological structure of the adolescent brain is similar therefore to the manifestation of mental disability within an adult brain.

These are not however the sole developments within the adolescent brain. It has further been found that cable of nerves (the corpus callosum) that connects the two sides of the brain appears to grow and change significantly through adolescence.¹¹ This cable of nerves is involved further in creativity and problem solving. The lack of a properly formed prefrontal cortex and corpus callosum indicates an impairment of the rational decision and thought making process instead placing heavy reliance upon the emotional and gut response area (amygdala).

The ability to regulate emotions is therefore impaired and this can result in quite severe acts with little regard for the consequences. As Daniel Weinberger concludes *“I doubt that most school shooters intended to kill, in the adult sense of permanently ending a life and paying the consequences for the rest of their lives. Such intention would require a mature prefrontal cortex, which could anticipate the future and rationally appreciate cause and effect. The often reported lack of apparent remorse illustrates how unreal the reality is to these teenagers. Adolescents need people or institutions to prevent them from being in a potentially deadly situation where an immature brain is left to its own devices. If a gun is put in the control of the prefrontal cortex of a hurt and vengeful 15 year old, and it is pointed at a human target, it will very likely go off.”¹²*

Brain trauma: exacerbation and physical effects.

The problems associated with adolescent brain development are further exacerbated by trauma and shocking experiences. It has been accepted for some time that psychological consequences arise from exposure to violence, abuse, neglect, abandonment and other childhood trauma. However now it has been found that these experiences may cause physical changes in the brain

⁸*Id.*

⁹*Id.*

¹⁰Yurgelun-Todd, www.sosparents.org/flash10.html

¹¹<http://www.pbs.org/wgbh/pages/frontline/shows/teenbrain/work/adolescent.html>

¹²March 10, 2001, <http://web.mit.edu/aram/www/writing/reference/maturity-1.txt>

structure and fundamentally alter brain development.¹³ The malleability of the juvenile brain therefore has disturbing implications in such scenarios.

Teichner and his colleagues carried out a comprehensive study on the effects of abuse and the brain¹⁴. Using EEG and MRI techniques they documented the physiological changes in the brain structure. They found changes in the left hemisphere of the brain, the corpus callosum (the fibrous band connecting the two halves of the brain) and the cerebellar vermis. The latter is intimately connected and sensitive to stress hormones. Teichner is now currently examining the effects of verbal abuse, preliminary findings indicate that such abuse has long-lasting implications. The abuse effecting the limbic system and stress pathways. Teichner is adamant that society underestimates and does not have “a clue as to the severity of verbal aggression; it’s a huge factor. You don’t have to lay a hand on anybody at all . . . it has potentially enduring biological effects.”¹⁵

Teichner further found that adults who had experienced sexual or physical abuse were far more likely to experience feelings of jamais vu or deja vu, visual disturbances and olfactory hallucinations¹⁶. These symptoms are found in temporal lobe epilepsy and associated with abnormal limbic system activity¹⁷.

The physical connections within the brain are also affected by trauma of this nature. During adolescent brain development, the brain undergoes a second huge regeneration of new tissues and excess connections.¹⁸ This was previously believed to happen only once within the early years of life. Over time this overproduction of cells is pruned down. The selection of connections and matter to discard and conversely that to remain is sensitive to external experience. The “use it or lose it” principle is applicable.¹⁹ It is widely accepted that “the brain develops and modifies itself in response to experience. Neurons and neuronal connections (synapses) change in an activity dependent fashion.”²⁰

Previously it was thought that the impact of trauma on the developing brain was of most significance in the early formative years, however the recent discovery of parallel brain development indicates that it may also be of importance during the adolescent formative years.

Bruce Perry, Neuroscientist and Senior Fellow at the Child Trauma Academy, Houston, Texas found the impact of trauma on neuro-development (in the early years) to be “devastating.”²¹

¹³[Http://www.fouryouth.org/juvejustice/reformissues/devpsych/042100_harvardmed_teichnertodd.html](http://www.fouryouth.org/juvejustice/reformissues/devpsych/042100_harvardmed_teichnertodd.html), Teichner, Harvard http://134.174.17.116/focus/2000/Apr21_2000/psychiatry.html

¹⁴http://134.174.17.116/focus/2000/Apr21_2000/psychiatry.html

¹⁵Teichner, Harvard http://134.174.17.116/focus/2000/Apr21_2000/psychiatry.html

¹⁶[Http://www.fouryouth.org/juvejustice/reformissues/devpsych/042100_harvardmed_teichnertodd.html](http://www.fouryouth.org/juvejustice/reformissues/devpsych/042100_harvardmed_teichnertodd.html)

¹⁷ *Id.*

¹⁸Giedd, [Http://www.bbs.org/wgbh/pages/frontline/shows/teenbrain](http://www.bbs.org/wgbh/pages/frontline/shows/teenbrain)

¹⁹ *Id.*

²⁰Perry, B, Marcellus, J. [Http://www.bcm.tmc.edu/civitas/abusebrain.htm](http://www.bcm.tmc.edu/civitas/abusebrain.htm)

²¹ *Id.*

Logic would indicate similar findings in respect to the adolescent brain. During traumatic experiences the brain adapts a state of fear related activation: This leads to an adaptation in emotional, behavioural and cognitive functioning to ensure survival.²² Persistent trauma results in a state of hypervigilance, anxiety and impulsivity.²³ Logically, therefore, abuse will impact upon the nature of the cells selected to remain. “The activities of the teen may help guide the hard wiring, actual physical connections in their brain”²⁴ Such abuse becomes ingrained and an integral part of the adolescent’s physical, biological makeup and consequently determines behavior and responses.

There is a wealth of research that conclusively shows a correlation between abuse, mental health and deviance²⁵:

- Numerous studies have documented that most violent criminals were physically or sexually abused as children (Groth, 1979, Seghorn et al. 1987)
- Children from violent homes are 24 times more likely to commit sexual assault than their counterparts from non-violent homes. (Dinzinger, 1996)
- Of 14 juveniles condemned to death in the U.S. in 1987, 12 had been brutally physically abused and 5 had been sodomized by relatives as children. (Lewis et al. 1988)
- 83.8% of convicted killers suffered severe physical and emotional abuse and 32.2% were sexually violated as children. (Blake, 1995)
- 85% of boys and girls committed to the Maine Youth Center report a history of childhood trauma. (MAYSI Assessment, Sept,1999)
- Without help, one-third of those abused in childhood may abuse or neglect their own children. (Kaufmann, 1987)

- Violence is a significant causal factor in 10 - 25% of all developmental disabilities. (Sobsey, 1994; Valenti-Hein & Swartz, 1995)
- Between 20 -50% of all children will have some degree of permanent disability as a result of abuse. (Rose & Hardman, 1981)
- Severe and prolonged childhood sexual abuse causes damage to the brain structure resulting in impaired memory, disassociation and PTSD symptoms. (Briere, 1997; Van dre Kolk, 1996; Perry, 1994)
- Studies have shown that as high as 81% of men and women in psychiatric hospitals with a variety of mental illness have experienced sexual and physical abuse. Primarily this abuse was childhood related. (Maine DMHRSAS, 1998;Jacobson & Richardson, 1987, Herman et al, 1989;Ross et al, 1990)

Legal implications of Adolescent Brain Development

It is apparent that the advances in modern scientific knowledge, as implicitly recognized above, have wide reaching ramifications within the legal system. This is particularly true within the criminal justice system. The inability of adolescents’ to fully understand the consequences of their actions in the adult sense impacts upon their culpability in committing the deviant act.

²² *Id.*

²³ *Id.*

²⁴ Giedd, [Http://www.bbs.org/wgbh/pages/frontline/shos/teenbrain](http://www.bbs.org/wgbh/pages/frontline/shos/teenbrain)

²⁵ Statistics from [Http://www.state.sc.us/dmh/abused_children.htm](http://www.state.sc.us/dmh/abused_children.htm)

Teenagers look only to the immediate future, with a time horizon of 1-3 days.²⁶ The lack of capacity to plan ahead exemplifies the problems in treating the culpability of adults in the same way as that of a fully mature adult. *“The brain does not have the biological machinery to inhibit impulses in the service of long term planning...”*²⁷

This does not necessarily negate their knowledge of right or wrong, however, the magnitude and subsequent ramifications of that course of action are beyond the capability of the adolescent. As Paul Thompson emphatically states: it “can help us to understand teens better, it cannot be used to excuse their violent or homicidal behavior. But it can be used as evidence that teenagers are not yet adults and shouldn’t be treated as such.”²⁸

The implications are thus threefold. First, in relation to the actual legal process, second; the principles surrounding punishment and third; the culpability of the offender and the appropriate punishment.

The participation of the adolescent within the criminal justice process is severely hindered by his inability to communicate effectively and judge a situation. These problems permeate all stages of the legal process from pre-trial to appeal. Problems in relation to police interviews, the waiving of *Miranda* rights and confessions have been expertly documented for many years and can be seen as a direct consequence of immature brain functioning. These problems are compounded further in the ability of the juvenile to communicate with his lawyer and express himself articulately within a court room. The apparent lack of remorse, as identified by leading scientists above, will, because of a lack of understanding, be damning evidence in the eyes of a jury.

*“There is a tendency to want to try kids in court as adults. Yet they are far from being adults. For some kids their brains are just not capable of controlling their desires to act on the spur of the moment. So they often need treatment more than jail”*²⁹ These studies provide powerful justification for the existence of juvenile courts, within which all of the factors can be examined and specialist expertise in brain development, a groundbreaking discovery, can be developed.

The second issue is the basis and principles of punishment. The imposition of a punishment to act as a deterrent will not have the desired effect. The immaturity of the developing adolescent brain prevents reasoned rational thought and appreciation of the consequences. The delayed brain development negatively impacts on impulse control. The theory of deterrence, in direct contrast, assumes an ability to conduct an immediate cost/benefit analysis, a physical impossibility for an adolescent. Correspondingly the only legitimate explanation settles upon retribution and punishment commensurate with culpability.

On the basis of the scientific evidence above it becomes apparent that a grave injustice is done in treating juveniles as adults. A central tenet of the U.S justice system is that punishment is to be commensurate with the personal culpability of the offender. Juveniles’ simply cannot and do not have a sufficient level of personal culpability to fully deserve the maximum adult punishment. As Associate Dean and biochemistry professor Doug Rushing³⁰ concludes *“we don’t tend to hold an adult who has damaged pre-frontal cortex responsible for his behavior...(so) why do we send teenagers to death row when the teenage pre-frontal cortex has not yet matured into*

²⁶ Thompson, [Http://www.loni.ucla.edu/_Thompson/MEDIA/ct.html](http://www.loni.ucla.edu/_Thompson/MEDIA/ct.html)

²⁷ Dr. D R Weinberger, *American Psychological Association, Monitor*, Vol.29, No.98, August 1998

²⁸ Thompson, [Http://www.loni.ucla.edu](http://www.loni.ucla.edu)

²⁹ Wilson, W, *Buzzed*

³⁰ University of Health and Sciences, Kansas City.

*adulthood.*³¹ In drawing this interesting parallel, Rushing highlights the current inadequacies and failings of the system. Dr Mark S Wright, President of the Kentucky Psychiatric Association notes the magnitude of “*brain development research (making the case against putting teens to death.*”³²

The effects of trauma have also been underestimated within the criminal justice system. Whilst it has generally been accepted that such abuse may result in psychological impairment and damage, research shows that the manifestation of trauma extends far beyond this. Actual physical changes in the brain occur as a result and this gives rise to similar issues of culpability as discussed above.

These studies also indicate however that an adolescent is capable of change and reform. The malleability of the adolescent brain whilst having disturbing implications also possesses a great capacity to be reprogrammed. The opportunity for reform is potentially at its greatest, both in regard to mental health and physiological change. A suitable environment, education and support are likely to enable such change alongside stability.

As a result of these and other dramatic findings, the American Psychiatric Association and the American Academy of Child and Adolescent Psychiatry³³, two highly influential institutions, have joined the American Society of Adolescent Psychiatry³⁴ in adopting policies opposing the death penalty for offenders under the age of 18. Further the United States of America stands with just three other countries in the world in continuing to execute juvenile offenders.

³¹ *Kansas City Star* (Op-ed), March 9, 2002

³² *Lexington (Kentucky) Herald Leader* (op-ed), January 28, 2002

³³ [Http://www.aacap.org/legislation/articles/everything6.pdf](http://www.aacap.org/legislation/articles/everything6.pdf)

³⁴ Amicus Brief, *Stanford v Kentucky*, *Criminal Law Series*, Vo. 20, No. 19, pt. 2