

Primal Teen Notes

P 8. It's the brains of the teenagers, after all, that begin to grapple with our knottiest, most abstract concepts with honesty and justice. In the neuronal nooks and crannies of their evolving brains, teenagers, for the first time, develop true empathy.

p. 13-14 John Mazziotta, a pioneer in brain scanning at UCLA "We wanted to study babies and teenagers because it now seems that those are the times of greatest change in the brain's structure and function...it might be at those times that we can have the most influence."

p. 15 Many believe that in periods of such exuberance (overproduction of brain cells) the brain may be highly receptive to new information or primed to acquire new skills, particularly those related to basic survival.

p. 16 (summary) Key development during adolescence in:

- cerebral cortex, including parietal lobe, associated with logic and spatial reasoning
- temporal areas, associated with language
- frontal lobe, the pre-frontal cortex, helps us plan ahead, resist impulses, perhaps not in full development until the 20's
- frontal lobes continue to grow, peaking at puberty
- after this massive growth, it is 'pruned back', where we 'use it or lose it', as if the brain says its 'time to specialize'

p.17 The teenage brain is not only incredibly interesting but appears to be still wildly exuberant and receptive.

p. 21 Adolescence, some neuroscientists warn, may be one of the worst times to expose a brain to drugs and alcohol or even a steady dose of violent video games. "if that teenage brain is still changing so much, we have to think about what kinds of experiences we want that growing brain to have."

The teenage years rival the terrible twos as a time of general brain discombobulation.

p. 31-2 John Mazziotta "We're creatures of imitation, that's how we learn. But the brain has to be able to inhibit inappropriate actions, including imitation...Development is progressive inhibition"

p. 33 As Jay Giedd puts it "they have the passion and the strength, but no brakes (referring to the prefrontal cortex) and they may not get good brakes until they are 25"

p. 34 “learning may not count so much until the underlying brain structures are in place” Peter Jensen, form head of child and adolescent research at the National Institutes of Mental Health (NIMH)

p. 34-35 Jensen says parents of teenagers often have to ‘walk a tightrope.’ ON the one hand, they have to respect and encourage their teenagers’ need for autonomy, because, in adolescence, ‘that’s where the action is.’ But sometimes they also need to step in, offer a road map, and help those teenagers point their size ten feet down the right path...you have to help them figure out things themselves.

p. 36 An average teenager gains 50 pounds and grows a foot in the space of four to five years. At the end of that growth spurt that teenager may outwardly look like a mountain of maturity to us. But it’s an illusion.

p. 39 Complex environments made rats’ brains grow and change.

“Think about the tasks of an adolescent child. They’re developing social coordination and language capacity and cognitive function”

After adolescence, it’s rare to find a person who can learn and speak a language that is accent free.

p. 44 What if they brain grows best when it’s allowed to play?

p. 46 Giedd says that any classical critical brain period in adolescence might very well be connected to tone of the most classically critical of human activities, one that clearly blossoms in the teenage years- mating.

The chore of adolescence is to figure out complicated social hierarchies, and obviously culture has a lot to do with that. But a lot of the activity could be seen through the filter of trying to be popular

p. 49 To develop properly, the brain must have certain experiences: good diet, exercise for good blood flow, challenges, and love- according to Marian Diamond at UC Berkeley

p. 53 The brains of teenagers are still being enveloped in myelin. Myelin jumped a whopping 100 percent during the teenage years. (summary) brain areas that involve memory, and emotion are being myelinated significantly.

p. 57 the two sides of Wernicke’s area, a major language area in the brain, are not fully toed together across the vital corpus collusm during parts of adolescence, what does that mean?

p. 59 No one is sure yet whether this progressive myelination is due to a preprogrammed genetic plan or is pushed by use. ...After neurons are completely

myelinated, they are more efficient and faster. But there's a tradeoff. They also become more rigid.

p. 62 The teenage brain undergoes changes in nearly every area that scientists have looked at.

p. 63. (summary) an area of the brain that deals with 'unconscious, mechanistic motor movements' (like playing a piano, riding a bike, etc) undergoes pruning during adolescence, making

p.68 Adults respond with the part of their brains, the frontal cortex, that helps them halt impulses, apply emotional brakes, and reason logically, while teenagers often don't.Teens often get the emotion (of others) wrong, labeling fear as anger for instance. They misread facial expressions; they get mixed up....Such discoveries raise the very real possibility that teenagers simply see the world differently from adults. Lack sufficient experience that would help them correctly sort out social cues and lacking a fully developed and functioning prefrontal cortex that can provide context.

p. 80 (In reference to adolescence in monkeys) "there are long periods when sex hormones are circulating and changing their behavior long before they are considered adults"

P 81 At the turn of the century, young girls began to menstruate at age 15 on average, and those averages are now down to 13.

p. 82 According to Barry Bogin, an anthropologist at University of Michigan, it is this lengthy and specifically timed adolescence that makes us human.

p. 85 Successful adolescent seems to be based on 'having at least one adult who cares about them and being connected to their school'

p. 86 Teenagers themselves, particularly the younger ones, are stunningly inarticulate when trying to explain why they do risky things.

p. 90 That leaves modern teenagers at the mercy of their own judgment, or that of their peers.

p. 92-3 (summary) Puberty is a time when 'passions are ignited', not just romantic ones. Emotions are ramped up...we've evolved to seek rewards (dopamine in the brain) that better our chances of survival.

p. 94 Dopamine declines overall between childhood and adulthood,...but it's still considerably higher than levels in most grown ups.

pp. 95 Dopamine is also known to work on areas of the cortex that are crucial for what neuroscientists call 'salience', that is our ability to recognize when something

is important and take action....Dopamine increases when we encounter something new, a novelty, something we have to sort out.it's been shown that recent high levels of stress- a frequent characteristic of the teenage years- can also reduce dopamine receptors.

P .96 Puberty is 'Not one thing, but a number of changes in the body and brain''

p. 100 Studying Rats... Spear says this odd mixture of greater willingness to take risks, but at the same time, in truly frightening situations, more caution, is typical of adolescent rats...If the situation is moderately risky, they will take many more chances than grown ups.

p. 107 "I see kids who are cracking up because of the stress of the workload and because they only see one way to success, to getting a good job. They don't take many real risks because they are afraid. But, maybe because of that, they have not learned to make their own decisions. That worries me.

p. 116 In a study of cognition...."the biggest shift towards mature thinking occurred between 8th and 10th grades...girls matured faster than boys on a trajectory that remained steady from the 8th to the 11th grade."

p. 118 Younger teens aren't that good at 'coming up with alternate hypotheses for things that occur...their minds, instead, work more along concrete and simplistic lines.

p. 128 Males have roughly 10 times as much testosterone as females and females make about 10 times as much estrogen...IN males, testosterone fluctuates during the day, sometimes as much as 150 percent, with lowest levels recorded at noon. It has been shown to rise abruptly when they're faced with a challenge. ...a more lengthy cycle in females, ebbs and flows on a monthly schedule. By some estimates, estrogen increases anywhere for 650 to 4,900 percent during a month, reaching its peak around ovulation.

p. 130 Puberty takes a lot of energy and body needs a certain level of fat reserves before it launches into this next big developmental stage.

p. 131 Girls grow an average of 10 inches and boys 11 inches during adolescence.

p. 133 Teenagers, because of dopamine, may be dealing with a 'more vibrant world' just at a time when they are trying to figure out their place in the world.

p. 135 Generally IQ scores are relatively even between the sexes. But there are persistent reports that males and females handle certain tasks differently...females start outperforming males at certain verbal tests around the age of puberty...and males beginning in adolescence to begin to outperform females on certain spatial tests....this might be a difference in strategy, not performance....

p. 159 Teenagers have a natural tendency to stay up later and sleep later. And for this too, we can blame the brain...teenagers start to secrete melatonin up to two hours later than when they were younger....(most often around 10:30)...and also lingers later in the morning....

p. 159 A TEENAGERS'S SLEEP NEED FAR EXCEEDS THAT OF ADULTS. (my emphasis) In a controlled lab setting, teenagers happily slept a bit over 9 hours per day, and then were sleepy in the middle of the day.

p.161-2 We're producing a group of students with sleep disorders....Sleep deprived teenagers could no longer process emotions and think effectively at the same time, which means either activity, controlling emotions or remembering, could be impaired

p. 186 (moving on to drugs) Researchers are particularly interested in how nicotine acts in a mid-brain area-the ventral tegmental area- which is rich in neurons that produce dopamine, one of the main chemicals involved in the reward systems of the brain (and that's so pleasing to rats and cocaine addicts that they will self-stimulate this area rather than eat or have sex).

p. 187 Since most (studies) assumed that teenagers were similar to adults, they have long been ignored by researchers. No one yet knows the long-term impact of antidepressants...or on the girl who starts taking estrogen in birth control pills at 14 instead of 25

Nice Summary of changes in brain in book page 203-4

As we've seen, the remodeling of the adolescent brain- a brain that science had considered largely finished- spreads over such a wide range of systems that we need to rethink how we think of teenagers altogether. Over a span of roughly ten to twelve years, this adolescent brain, through a series of sometimes subtle and sometimes breathtakingly dramatic shifts, is transformed from child to adult. The gray matter of an adolescent's frontal lobes grows denser and then abruptly scales back, molding a leaner thinking machine. The teenage brain fine-tunes its most human part, the prefrontal cortex, the place that helps us cast a wary eye, link cause to effect, decide 'maybe not'- the part, in fact, that acts grown up.

The brain of a teenager undergoes a proliferation of connections for dopamine, a neurotransmitter important for movement, alertness, pleasure- high levels that may have evolved to help adolescents of many species take the necessary risks for survival, from exploring new fields for food to asking that saucy young girl to the dance. The long, thin arms that connect brain cell to brain cell are coated with insulation that speeds signals in brain regions devoted to such fundamental capacities as emotions and language. The cerebellum, associated with understanding social cues and even jokes, blossoms and then consolidates. Brain chemicals that help determine sleep patterns shift in adolescence. ..