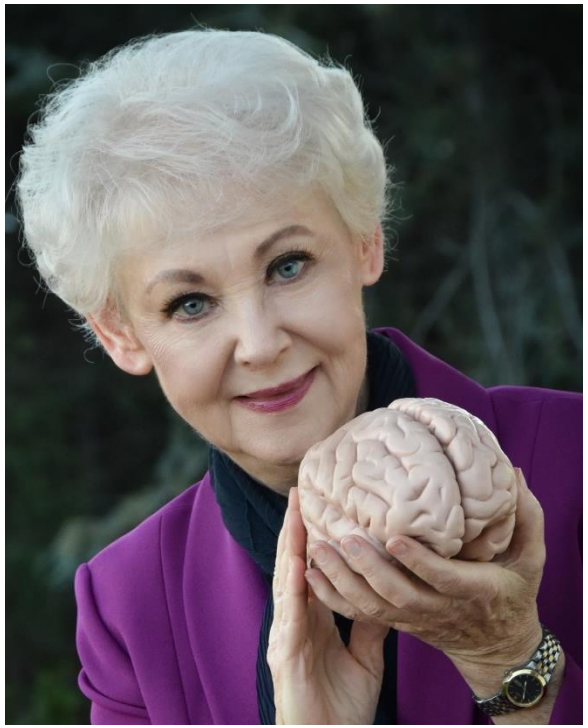

When Brains and Technology Collide

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Brain References

Realizations Inc
Success Resources International
Since 1983

1 ’18

Technology is here to stay! It provides positive options for learning anywhere (cloud storage), global communication, almost instant access to data and information, age-proofing with brain-aerobic exercises and internet searches, etc.

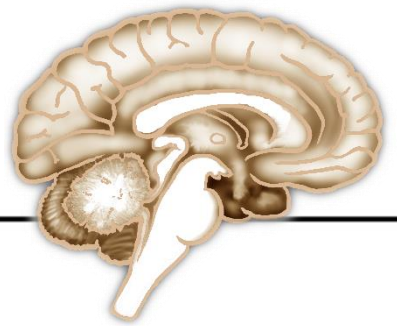
- **iPhone, iPad, Facebook, Linked-In, talking, texting, tweeting, email, TV, YouTube, "Surfing the net," on-line games, shopping, pornography, "Hooking up," Et cetera …**

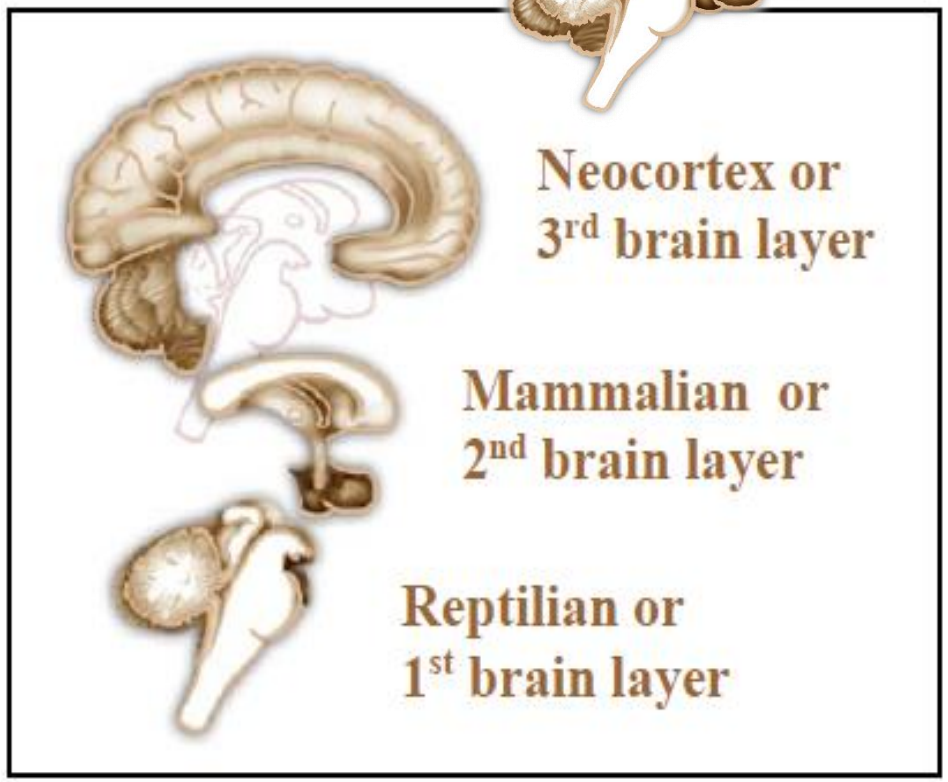
Half of teens send 50 or more text messages a day or 1,500 texts a month; 1 in 3 teens sends more than 100 texts a day or more than 3,000 texts a month **—Pew Research Center**

Technology creates problems for the brain—especially in the developing immature brain (clock already 2 hours behind)

- Inconsistent myelination
- Over-development of reptilian areas
- Stunted personal and mental growth
- Increased risk for addictive behaviors
- “Blue light” stimulation to the brain
- Lack of interpersonal skills, anger if interrupted
- Suppressed immune system due to lifestyle imbalances

Dr. Paul MacLean's Triune Brain Model can help explain both the brain's fascination with technology and its inherent dangers or down side—you always give up something to get something in this life …





Each brain layer contains distinct functions—although all systems tend to continually interact at some level

Brain Stem and Cerebellum -

Reptilian or
1st brain layer

- Subconscious
- Processes present tense only
- Contains stress responses
- Houses dopamine neurons (feel better chemical)
- Egocentric - directs attention to the self
- Motor neurons load rapid automatic responses (games)

Also called Limbic Structures

Mammalian or 2nd brain layer

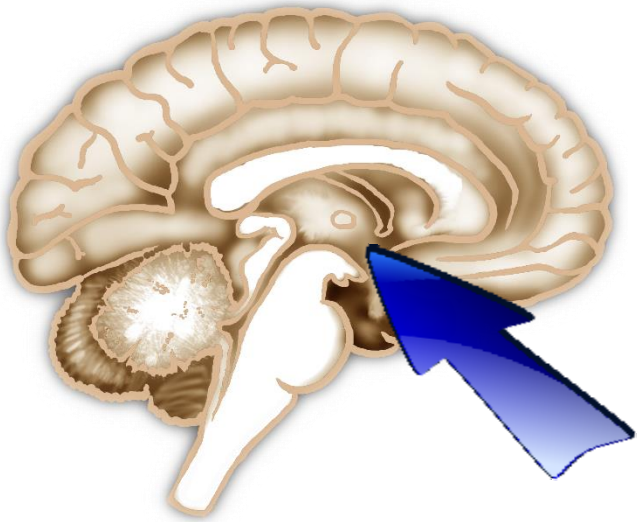
- **Subconscious**
- **Processes present and past**
- **Generates emotional impulses**
- **Hippocampus—search engine**
- **Triggers release of oxytocin when you connect with others by text, phone, email**
- **Processes information 80,000 times faster than the conscious 3rd brain layer**

Gray Matter or Cerebrum

Neocortex or
3rd brain layer

- Consciousness
- Registers awareness of present, past, and future
- Contributes executive functions that help to manage technology such as: goal-setting, willpower, planning, creating feelings, conscience, paying attention, time, problem-solving, creativity, making decisions, moral compass, communication with self and with others

Technology provides chemical brain rewards (e.g., adrenalin-dopamine rush), which helps to keep people using it



1. **Adrenalin is released when playing games, which provides a hit of energy—plus dopamine rises as adrenalin rises**

2. **Dopamine is released when anticipating or doing an enjoyable activity (tweet, text, talk by phone; surf the net; play computer games) and your brain *feels better***

3. Testosterone levels ↑ when males compete, especially when playing actual or virtual games—increase is much rarer in females

4. Oxytocin (bonding chemical) is released when the brain connects with friends through technology

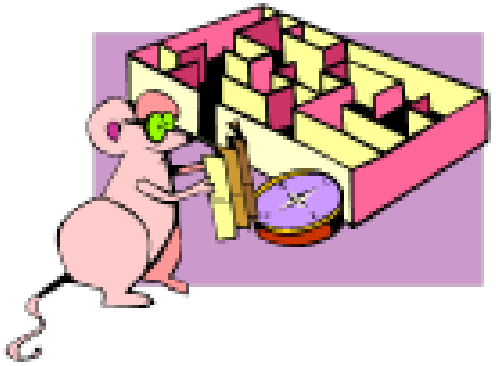
5. Adrenalin and *cortisol* are released when the brain experiences frustration / stress with technology (dopamine also rises with adrenalin levels

The brain can become addicted to the rush of hormones and chemicals that technology provides to the Brain Reward System or BRS—you feel as if something is missing unless you are constantly involved with technology

Your risk of addiction rises to the extent that technology is the most exciting thing in your life and your ability to choose—consciously—to disconnect for periods of time every day

Too much technology can interfere with learning

USF study: Rats were given a new learning experience (hard to tell a rat neuron from a human neuron, rat brain uses 30+ similar neuropeptides)



Directly after the new learning experience, some rats went immediately to another activity

Some rats were given a period of down time after the new learning experience before they engaged in another activity

Learning experiences are encoded in the hippocampus (mammalian 2nd layer) in short-term memory and then moved into long-term memory

- **Rats that immediately went from then new learning experience to another activity showed reduced encoding in long-term memory and therefore reduced learning, retrieval, and recall**

- **Rats that received down time after the new learning experience showed enhanced encoding in long-term memory and enhanced learning and recall**

The brain needs daily downtime to consolidate learning (put the pieces together), which has huge implications for learning and school systems

It is critically important to schedule time each day to shut off all electronics and give the brain breaks so it can consolidate learning [Adults role-model this . . . or not]

One of the brain's housekeeping tasks during sleep involves consolidation and movement of information from short-term to long-term memory

The ability to delay gratification—a key component of high levels of Emotional Intelligence or EQ—is critical for almost all types of success

Those with addictive behaviors tend to be unable to delay gratification

Research participants were given a choice to text now and get a small $ reward or unplug for a while and get a substantially larger $$$$ reward the following week

An ability to delay electronic gratification was dependent on the person who was contacting the research participant

The larger the rush from the specific person, the more difficult it was for the research participant to delay gratification - many Participants found it impossible even in the face of the larger reward

Daily *unplugging* can help the brain learn the skills of delaying gratification

Those who spend three hours per day on Facebook tend to occupy self with self

- Use lower brain functions over higher brain functions
- Tend to exhibit decreased empathy and compassion
- Myelination tends to be stronger in the 2nd and 3rd layers

← Superego - self care and care for others

← Ego - mediates 1st & 3rd layers (self-worth, relationships)

← Id - "self-absorbed" (and narcissistic?)

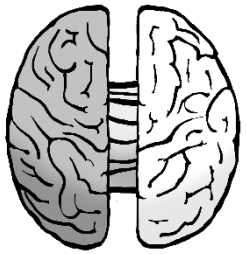
Teenage brain is not *done* yet and is self-absorbed as in "It's all about me" (quite narcissistic); maturing the teenage brain is a learned process designed to move it away from narcissistic behaviors to more balanced, functional adult behaviors - not an automatic genetic process

An <u>unbalanced</u> use of technology during adolescent years can interfere with brain maturation; if the teenage brain fails to mature and move to more balanced behaviors, it tends to continue narcissistic behaviors into adulthood [antisocial narcissistic adult is at ↑ risk for sociopathic behaviors]

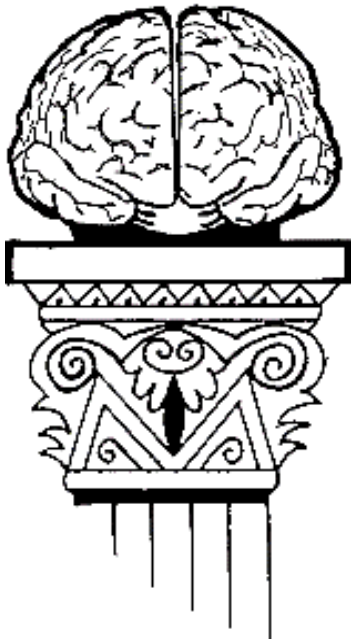
In order to develop effective socialization skills the brain needs real time, real life, face-to-face experiences, practicing striking up a conversation with another individual and setting them at ease through small talk

- **Teens were unable to strike up conversations with strangers and engage in small talk . . .**
- **Executive texting during committees or meetings gave the appearance of being unconnected or somewhat disengaged from the group**

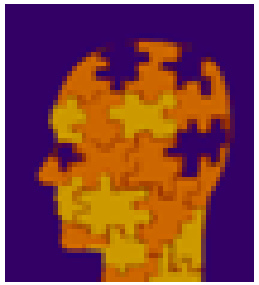
Although there are two hemispheres connected by bridges, both hemispheres are attached to a common brain stem so they sleep and wake at the same time



There appears to be only one integrated attention system—so <u>conscious</u> attention cannot be distributed to or divided between two spatially separate brain locations (vehicle and distracted walking accidents)



The human brain is not designed for multi-tasking—it decreases concentration, interferes with decision-making, and increases your risk of becoming distracted and being involved in an accident



Talking on the phone decreases conscious mindful awareness of traffic conditions - the right cerebral hemisphere cannot watch traffic while the left is texting, tweeting, or decoding speech sounds

In simulations, drivers underestimated the interference of talking on the phone with cognitive processes—cell phone conversation hand-held OR hands-free) while driving increases driver reaction time. The total mean increase in reaction time was 0.25 sec

It can take up to SEVEN seconds to transfer one's attention fully from one activity to another …

Legislation has been introduced to require teenage drivers to have cell phones turned OFF while vehicle is moving

3,477 people were killed and 391,000 were injured in motor vehicle crashes involving distracted drivers

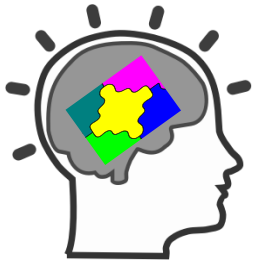
Estimates that 26% of all traffic crashes are associated with drivers using cell phones and text messaging (21% cell phone and 5% text messaging) **—2015 NSC**

Distracted walking pedestrian <u>fatalities</u> have risen 4.2%, while <u>injuries</u> have risen by 400% over the past seven years

—National Highway Traffic Safety Administration


HONK IF YOU LOVE
JESUS TEXT
WHILE DRIVING IF YOU
WANT TO MEET HIM
SUN. SCHOOL
10:00 AM
SUN. WORSHIP
11:00 AM & 6:00 PM
WED.
7:00 PM

Suggestions to consider:

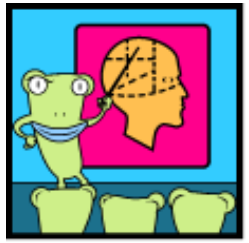


1. **Practice unplugging from technology by choice**
2. **When focusing on one activity, turn off the phone or iPad or computer, etc.**
3. **When learning new things, take regular breaks to give your brain the time to consolidate the information**
4. **Walk or bike in nature, read books / audiobooks, play games, play/listen/compose, music, do puzzles, do sports, write stories/poems/music, or converse face-to-face …**

5. Stop distracted driving/walking—brain you save may be yours
6. Stop texting / tweeting during classes or in meetings

7. Engage in conscious breathing, a major component of martial arts: it helps increase awareness and oxygenate the brain
8. Keep your bedroom free from all technology: No TV, cell phone, iPad, computer, or clock with visible LED lights (LEDs stimulate the brain to wakefulness and interfere with sleep
9. Shut off all electronics 1 hour before bedtime or wear tinted glasses that block electronic light from entering the brain

You always give up something to get something—maturity involves evaluating what you will GET versus what you will GIVE UP, when deciding and choosing



With some knowledge and forethought you can obtain the benefits technology offers while preventing it from creating problems for your brain, your health, and your interpersonal relationships

Adults need to role-model what they recommend to young people because they tend to do what they "observe" (rather than what they are "told") or 180 degrees opposite