THE AMAZING TEEN BRAIN: A WORK IN PROGRESS

* Areas undergoing reconstruction

Tim Burns
EDUCARE
www.TimBurnsEducare.com

Frontal Lobe Functions

- Envision the future
- Dream big dreams
- Set goals
- Carry out plans
- Detect problems
- Solve problems
- Manage emotions
- Control impulses
- Consider consequences
CEREBRAL CORTEX
Six Cell-Layers

Neuron

SENDING NERVE CELL

AXON

RECEIVING NERVE CELL

DENDRITE

SPINES

ELECTRICAL INPUT

BOUTON

SPINE

TRANSMITTER

ELECTRICAL OUTPUT
**Stages of Neural Organization**

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<th>Stages</th>
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<td>Competition</td>
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**HIPPOCAMPUS**

Processes, labels and stores information as memories
Gray Matter Pruning

(White Matter Replacement)

N. Gogtay, J. N. Giedd, et al,
"Dynamic Mapping of Human Cortical Development during Childhood through Early Adulthood;"
Proceedings of the National Academy of Sciences of the United States of America

The Three S’s of Myelination

1. **Speeds** the flow of energy/information

2. **Stabilizes** learning into neural patterns.

3. **Secures** learning by resisting pruning.
THE TEEN BRAIN: A WORK IN PROGRESS

Nucleus accumbens *
Corpus Callosum *
Cerebellum *
Frontal lobes *
Amygdala *

*AREAS UNDERGOING UPGRADE

Corpus Callosum

Left Brain
Logic
Verbal
Detail
Science
Names
Math
Strategy
Order
Thinking
Write

Right Brain
Pictures
Stories
"Big Picture"
Observation
Shapes
Music
Patterns
Imagination
Beauty
Possibilities

Controls Intelligence and Creativity
Cerebellum

Controls Balance, Posture, Coordination

Amygdala

Processes Emotion-Laden Memories
**Nucleus Accumbens**

Controls Motivation, Pleasure and Reward

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**NEUROTRANSMITTERS**

**Excitatory:**
- Nor-epinephrine
- Dopamine
- Acetylcholine

**Inhibitory:**
- Serotonin
- G.A.B.A.
- Endorphin
EFFECTS of ALCOHOL and OTHER DRUGS

RANGE OF EMOTIONS --DRUG INDUCED--

EUPHORIA
NORMAL
DYSPHORIA

STAGE:  
1. Learning the mood swing  
2. Seeking the mood swing  
3. Preoccupation  
4. Using to feel normal

Motivation, Pleasure and Reward

EXERCISE GOALS FOOD REST

DOPAMINE RELEASED INTO BRAIN

BRAIN BATHED IN DOPAMINE

ALCOHOL & OTHER DRUGS

DOPAMINE BRAIN DRAIN
Stages of Sleep and Learning

BRAIN WAVE STATES

**Gamma** - 25-100 Hz (40Hz typical). Binds conscious perception

**Beta** – 13-30 Hz. Active, alert, concentration

**Alpha** – 9-13 Hz. Relaxed focus, light trance, enhanced serotonin production

**Theta** – 4-8 Hz. Trance-like state; enhanced catecholamine aids retention of learning

**Delta** – 1-3 Hz. Dreamless sleep; HGH produced

**REM** – Rapid Eye Movement; dreaming
For information about my work with teachers, students and parents, please visit www.TimBurnsEducare.com
The Amazing Teen Brain: A Work in Progress

Suggested Readings

Donaldson, O. Fred, Playing By Heart. Deerfield Beach, FL: Health Communications.
Robbins, Jim, A Symphony in the Brain: The Evolution of the New Brain Wave Feedback. New