

Slide 1

The  
Brain:  
A Work  
in  
Progress



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Slide 2

The Adolescent – Myth or Fact?

- ✦ Adolescence is a time when they are in rebellion against parents and their parents' values
- ✦ Adolescence is a time of storm and stress and is the hardest stage of development.
- ✦ Adolescents tend to be responsible and hardworking
- ✦ Adolescents should be encouraged to work at least 20 hours a week

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Slide 3

The Brain – Myth or Fact?

- ✦ We use only 10% of our brain
- ✦ Children learn better in a pastel environment
- ✦ New neurons growth ceases during childhood
- ✦ If the first three years are not enriched, then no chance for future brain growth

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Slide 4

 **The Mozart Effect**

- Physicist Gordon Shaw and Cellist/Psychologist Frances Rauscher
- 36 college students; 10 minutes of Mozart's *Sonata for Two Pianos*
- Scored higher on paper folding and cutting task; other non-spatial tasks unaffected
- Effect lasted 10 minutes

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Slide 5

 **The Mozart Effect**

- Books, CDs, programs
- National Academy of Recording Arts and Sciences foundation gave free CDs to hospitals for newborns
- Tennessee and Georgia started programs giving Mozart CDs to every newborn
- Florida – Daycares receiving state aide must include ½ hour of Mozart daily
- Not replicated
- No experimental support in children

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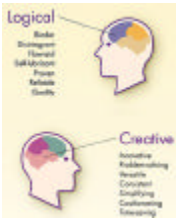
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Slide 6

**Left Brain/Right Brain**

- What are you?
- Based on research on split and intact brains
- Popular culture
- Left – logical, verbal, sequencing
- Right – emotionally intuitive, expressive, spatial relations, able to deal with things all at once



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Slide 7

**Left Brain/Right Brain**

- ⚡ Caution!!
- ⚡ Complex activities (science or art) require the integration of both hemispheres
- ⚡ Doreen Kimura

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Slide 8



**Being Wise Consumers of Information**

From J. W. Santrock, 1995

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Slide 9



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Slide 10

**Be cautious about what is reported in the media.**

- Television, radio, newspapers, magazines
- Information is reported by journalists and reports
- Not all information comes from professionals with good credentials
- A lot of information is sensationalized
- Public often not given the whole picture
- Be careful about overgeneralizations or single studies

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Slide 11

**Know Difference Between Nomothetic Research and Idiographic Needs**

Nomothetic Research – conducted at the group level  
Idiographic Needs – what is important for the individual, not the group

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Slide 12

**Don't Overgeneralize from a Small Sample**

- Small samples require care when making generalizations
- Sample may be biased

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Slide 13

**Single Studies are Usually Not the Final Word**

- Rare for one study to come up with conclusive answers
- Usually studies are conflicting
- Most “answers” emerge gradually over time

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Slide 14

**Remember that Correlational Studies Do NOT Show Causation**

- Correlation – “co” “relate” – two variables measured to see how they relate
- Does NOT mean that one variable CAUSES the other

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Slide 15

**Consider the Source of the Information**

- All studies are not automatically accepted
- Media has different levels of credibility

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Slide 16



Educators and  
The Brain

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Slide 17

I think it has the potential to go either way. Which way depends on how we educators interpret and use the research. Unfortunately, some consultants and educators are proposing "brain-based" programs and strategies that have not been tested in classrooms.

Running ahead of the research before sound clinical trials and testing of new hypotheses have been completed makes us vulnerable to the criticism of jumping on yet another bandwagon

Pat Wolfe, EdD

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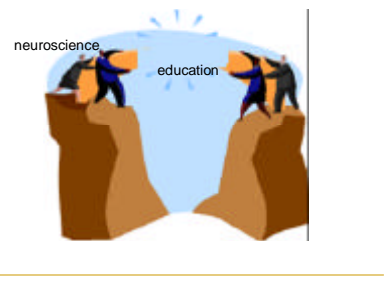
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Slide 18



neuroscience

education

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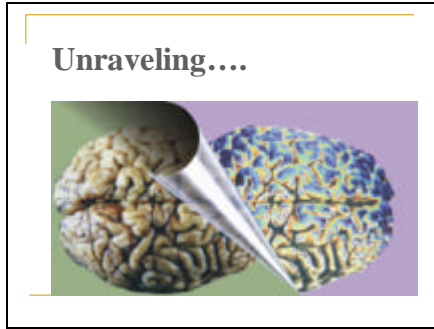
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Slide 19



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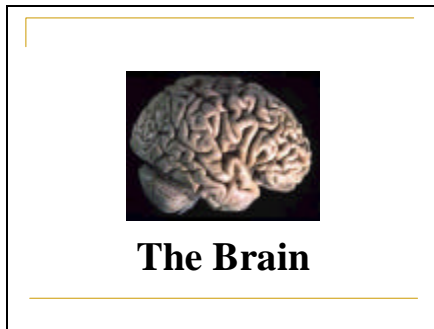
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Slide 20



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Slide 21



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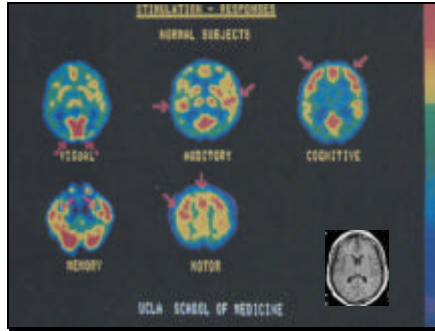
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Slide 22



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Slide 23

- Brain reaches 90% of adult weight by age 4
- Past scholars and researchers believed "hardware" in place by early childhood and "software" resulted in maturity

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Slide 24

- "Hardware" changes occur past early childhood, through adolescence and into young adulthood
- These changes may influence adolescent behavior and thinking

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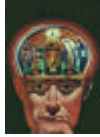
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Slide 25

**What happens to the brain in childhood and adolescence?**



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Slide 26



- Structural changes occur
- Gray matter waxes and wanes in different parts of the brain at different times in development

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Slide 27



- “Use it or lose it” theory (Giedd, 2000)
- Neuronal connections will be maintained if used or disappear if unused

“Teens thus have the power to determine their own brain development.”

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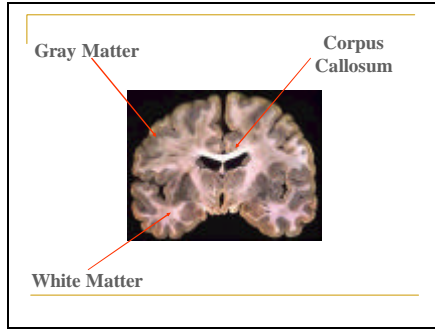
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Slide 28



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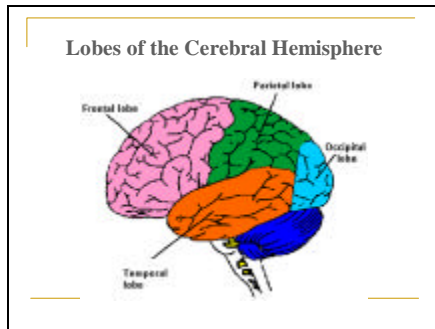
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Slide 29



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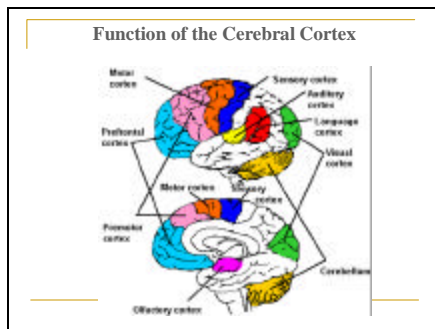
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Slide 30



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Slide 34



### Limbic System

- Generates emotions, motivated behavior
- Increases in testosterone result in growing amygdala (almond shaped structure in temporal lobe that generates fear and anger; guides gut reaction)
- Especially pronounced in boys
- Estrogen increases enlarge the hippocampus (processes memory)

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Slide 35



### Limbic System

- Neurotransmitters in this area change levels (dopamine, serotonin)
- More emotional, more responsive to stress, less responsive to rewards
- Decline in reward sensitivity may increase vulnerability to depression, substance abuse, and mental illness

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Slide 36



### Limbic System

- Adults brains use frontal lobes to control emotional responses; activity in frontal lobes higher than in amygdala relative to adolescents
- Adolescent brains still in process of developing this ability; activity in amygdala is higher than in frontal lobes relative to adults

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
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Slide 37



### Limbic System

- Discrimination of facial expressions is poor in adolescence
- Adult brains light up in limbic system and prefrontal cortex; teens light up in limbic system
- Teens not as adept at reading social signals or discriminating between emotions in others

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Slide 38



### Temporal Lobes

- Processes language and emotional control
- Reach gray matter maximum at 16 years before pruning

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Slide 39



### Parietal Lobes

- Integrate information (auditory, tactile, visual)
- Continue to mature through the midteens
- Gray matter peaks between 10 and 12 in these lobes

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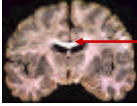
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Slide 40



**Corpus Callosum**

- Cable of nerves connecting right and left hemispheres
- Appears to be related to intelligence, consciousness, and self-awareness
- Continues growing into the 20s

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Slide 41



1. Frontal forceps 2. Corpus callosum commissural fibers 3. Short arcuate fibers 4. Occipital forceps 5. Indusium griseum 6. Medial longitudinal stria 7. Lateral longitudinal stria

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Slide 42



**Frontal Lobes**

- Responsible for “executive” functions; i.e., self-control, judgment, emotional regulation, organization, and planning
- Frontal lobes undergo the greatest change during adolescence
- Grow between 10 and 12, then shrink into the 20s

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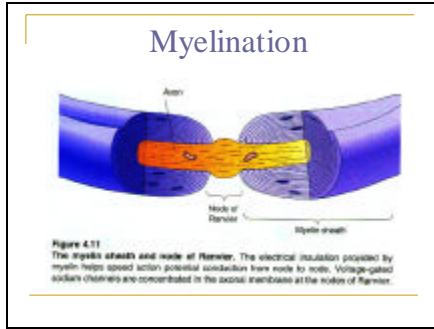
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Slide 43



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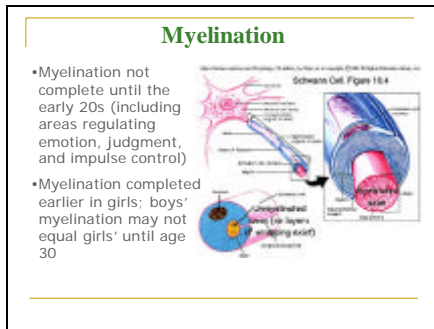
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Slide 44



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Slide 45

## So what does this mean?

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Slide 46

**Teenage Drinking**



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Slide 47



- Adolescent's brain different; responds differently
- One drink; impairs learning more in 21-24 y/os than in 25 to 29 y/os

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Slide 48

**Binge Pattern Ethanol Exposure in adolescent and Adult Rats: Differential Impact on Subsequent Responsiveness to Ethanol**

Aaron M. White, Amol J. Ghia, Edward D. Levin, and H. Scott Swartzwelder  
August 2000

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Slide 49

**Does alcohol exposure during adolescence produce changes in thinking that go beyond adolescence?**



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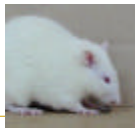
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Slide 50

**Method**

- 28 male Sprague Dawley rats
- 14 were 30 days old (adolescents)
- 14 were 70 days old (adult)



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Slide 51



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Slide 52

**Results and Conclusions**

- The groups of rats did not differ in learning the maze without alcohol
- The rats that had been treated with ethanol in adolescence had a very difficult time with the maze when they had been given moderate amount of alcohol; the rats that hadn't been treated in adolescence did not have this problem.

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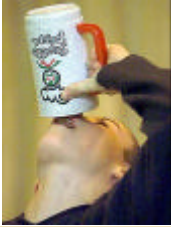
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Slide 53

**Other effects??**



- Interferes with memory formation in youth
- Alcohol less sedative in adolescents

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Slide 54



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Slide 55

### Drugs and Alcohol

- Ideas surrounding depression and other mental problems continues to change
- Use of medication for teens and younger increasingly popular
- Most such medication untested on children and teens...today's teens are guinea pigs



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Slide 56

### Drugs and Alcohol

- Some meds have been found to affect size of brain
- Effective non-drug treatments available for many mental disorders, including depression, anxiety, obsessive-compulsive disorder
- Economics may be determining treatment



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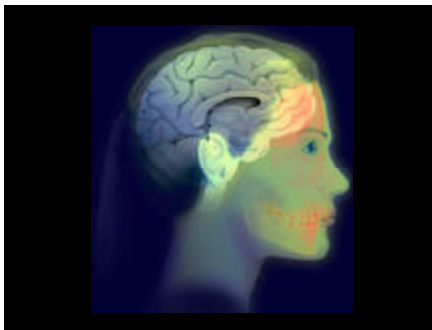
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Slide 57



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Slide 58

So what DO we know?

- Experience shapes the brain – Brains are "sculpted"
- Different parts of the brain are developing on different timetables
- The teen brain is affected differently by substances such as alcohol and drugs



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Slide 59

Suggestions for Educators...

- Become literate about the brain
- Learn how to determine the validity of a study
- Be cautious about applying research to the classroom
- Consider findings in all fields, not just brain research

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Slide 60

Suggestions for Educators...

- Encourage young people to be involved in many things
- Consider the teen's sleep needs
- Help youth find healthy sources of stimulation
- Take a strong stand on drinking and drug use in adolescence
- Mentor youth – provide example and guidance through choices

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Slide 61

**Suggestions for Educators...**

- Provide leadership opportunities
- Encourage education
- Help youth to develop a positive self-concept
- Encourage healthy and positive parenting of youth

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Slide 62

**What Works and What Doesn't for Addressing School Violence**

**Effective Strategies**

*Primary Prevention: Universal*

- Skills training
- Behavior monitoring and reinforcement
- Behavioral techniques for classroom management

*Building school capacity*

- Continuous progress programs
- Cooperative learning
- Positive youth development programs

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Slide 63

**What Works and What Doesn't for Addressing School Violence**

**Effective Strategies**

*Secondary Prevention: Selected*

- Parent training
- Home visitation
- Compensatory education
- Moral reasoning
- Social problem solving
- Thinking skills

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Slide 64

**What Works and What Doesn't for Addressing School Violence**

**Effective Strategies**

*Tertiary Prevention: Indicated*

- Social perspective taking, role taking
- Multimodal interventions
- Behavioral interventions
- Skills training
- Marital and family therapy by clinical staff
- Wraparound services

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Slide 65

**What Works and What Doesn't for Addressing School Violence**

**Ineffective Strategies**

*Primary Prevention: Universal*

- Peer counseling, peer mediation, peer leaders
- Nonpromotion to succeeding grades

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Slide 66

**What Works and What Doesn't for Addressing School Violence**

**Ineffective Strategies**

*Secondary Prevention: Selected*

- Gun buyback programs
- Firearm training \* Social casework
- Mandatory gun ownership \* Redirecting youth behavior
- Shifting peer group norms

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Slide 67

What Works and What Doesn't for  
Addressing School Violence

**Ineffective Strategies**

*Tertiary Prevention: Indicated*

- Boot camps
- Residential programs
- Milieu treatment
- Behavioral token programs
- Waivers to adult court

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