Brain Development and Sexual Decision-Making: Does Gender Matter?

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-OR-

Adolescent Boys Are from Pluto

“God created man with a penis and a brain and gave him only enough blood to run one at a time.”

Historian Stephen Ambrose
(Comments on the Clinton-Lewinsky scandal)

Sexual Decision-Making: Does Gender Matter? : Goals

We will discuss:
- Adolescent male/female differences in behavior and academic performance.
- Differences in brain anatomy, maturation and function.
- Are males “fragile?”
- Gender appropriate counseling interventions.

Mortality in Youth (Ages 10-24)

- MVA 31%
- Unintentional injuries 11%
- Homicide 18%
- Suicide 12%
- All other causes 28%

YRBSS
Youth Risk Behavior Surveillance Survey (YRBSS)

Nationwide Survey of Students Grades 9-12
Assesses risky behaviors including:
- Intentional and unintentional injuries.
- Tobacco use.
- Alcohol and other drug use.
- Dietary behaviors.
- Physical inactivity.

Risky Behaviors and Unintentional Injuries

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seatbelt Non-use (overall)</td>
<td>20.8%</td>
<td>11.9%</td>
<td>16.4%</td>
</tr>
<tr>
<td>Motorcycle Helmet Non-use (overall)</td>
<td>44.5%</td>
<td>26.6%</td>
<td>38.0%</td>
</tr>
</tbody>
</table>

Risky Behaviors and MVAs

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Drinking and Driving (30 days)</td>
<td>17.4%</td>
<td>8.7%</td>
<td>13.1%</td>
</tr>
<tr>
<td>Riding with a Drinking Driver (30 days)</td>
<td>34.4%</td>
<td>31.7%</td>
<td>33.1%</td>
</tr>
<tr>
<td>Carried a weapon (30 days)</td>
<td>28.6%</td>
<td>6.0%</td>
<td>17.3%</td>
</tr>
<tr>
<td>Physical fight (12 months)</td>
<td>44.0%</td>
<td>27.3%</td>
<td>35.7%</td>
</tr>
</tbody>
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Physiological Effects of Testosterone

- Growth spurt
- Increased muscle mass
- Change in body composition
- Increased cardiopulmonary capacity
- Increased RBC mass
Testosterone and Emotional Development

↑ Physical aggressiveness
   Elementary school fights
   boys 20x > girls!
   Boys: enhances relationship
   Girls: relationship cut-off

↑ Push for activity
?
↓ Emotional context, awareness

Depressive Symptoms and Suicide Risk
Male/Female Differences

<table>
<thead>
<tr>
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<th>Female</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sad or Hopeless for ≥ 2 weeks (12 months)</td>
<td>21%</td>
<td>35.7%</td>
<td>28.3%</td>
</tr>
<tr>
<td>Considered Suicide (12 months)</td>
<td>13.7%</td>
<td>24.9%</td>
<td>19.3%</td>
</tr>
</tbody>
</table>

Psychosocial Development of Adolescents

<table>
<thead>
<tr>
<th>Area of Growth</th>
<th>Early Adolescence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpersonal Relationships</td>
<td>Intense relationships with same sex</td>
</tr>
<tr>
<td>Self-perception</td>
<td>Increase cognition (“personal fantasy”). Idealistic vocational goals. Increased need for privacy. Lack of impulse control.</td>
</tr>
</tbody>
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Psychosocial Development of Adolescents

<table>
<thead>
<tr>
<th>Area of Growth</th>
<th>Early Adolescence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family Independence</td>
<td>Less interest in parental activities.</td>
</tr>
<tr>
<td>Body Image</td>
<td>Preoccupation with self and pubertal changes. Uncertainty about appearance.</td>
</tr>
</tbody>
</table>

Reported in the Philadelphia Inquirer:

A survey of high school athletes (in Philadelphia) found that nearly 75% of male varsity football and basketball athletes expected to make it to the professional level.
Education: Teen Boys vs. Girls

- Held back: Boys > Girls
- "Learning disabled": 2 : 1
- Suspensions/expulsions: 9 : 1
- Drop-out: 4 : 1

Mental Health: Teen Boys vs. Girls

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autism</td>
<td>4 : 1</td>
<td></td>
</tr>
<tr>
<td>ADHD</td>
<td>5 : 1</td>
<td></td>
</tr>
<tr>
<td>&quot;Emotionally disturbed&quot;</td>
<td>4 : 1</td>
<td></td>
</tr>
<tr>
<td>Schizophrenia</td>
<td>6 : 1</td>
<td></td>
</tr>
</tbody>
</table>

Educational Attainment

- College students: 57% female
- Graduate students: 61% female

Development of the Human Brain

Cortex (→ Prefrontal Cortex)
↑ Limbic
↑ Midbrain
↑ Brainstem

Modulated by:
- hormones
- stress
- EtOH/drugs

MEN WOMEN

![Brain Images]
Anatomic Differences in CNS: Male vs. Female

1. Males: larger brains.
2. Females: more gray/white matter.
3. Males: more CSF.

PET CBF: Word Memory

Healthy People

Acquisition

Recognition

Neuropsychological Function

Sex Differences in Healthy Men and Women
Gender Differences and Memory

**Females** retain more detailed memories with stronger emotional context.

**Males** retain more global memory of events with less emotional context.

Emotional memory modulated by oxytocin which regulates bonding motivation (opposite of “fight or flight”)

Hormonal Effects on Brain Development

- Second “wave” of ↑ gray matter just prior to puberty followed by “pruning”
- Earlier in females (average age 11) than in males (average age 12)
- Girls in puberty: 10 fold ↑ in estrogen → delay in dendritic pruning
- Boys in puberty: 26 fold ↑ testosterone → accelerated dendritic pruning

Hormonal Effects on Brain Structures

**Estrogen** → ↑ growth of hippocampus
- Transfers information to long-term memory
- ↑ recognition of social situations, coordinating complex relationships

**Testosterone** → effects on amygdala, hypothalamus
- Response to fear and danger
- ↑ enjoyment of contact sports, need for motion

Stress and Oxytocin

**Stress → ↑ oxytocin in females**
- ↑ connection seeking, bonding behavior
- Ex: Oxytocin spikes during and after childbirth

**Stress → ↓ oxytocin in males**
- Isolating, emotional cut-off, anger
- Ex: “male fragility”, nurturing and intelligence
**Effect of Substances on Male Brain**

- EtOH, drugs stunt development of hippocampus → impaired long-term memory
- Already delayed in development of prefrontal cortex and “executive function”
- Consequences: Poor impulse control, ↑ risk-taking

**What does it all mean?**

1. Adolescent boys really are from Pluto.
2. Boys’ and girls’ brains develop differently.
3. Executive function in boys may lag behind that of girls
4. Boys are more likely to accept (enjoy) risks.
5. Stress and substance use have negative effects (? more so on boys).

**Counseling Young Men Re: Sexual Decision Making**

1. Assess developmental stage
2. Allow emotional processing time
3. Allow/encourage action when discussing emotional topics
4. Be concrete
5. Use “role playing” scenarios

**“Task” of Male Adolescence**

“(is) to activate in the male the ideals of manhood, ideals to which he will commit by the end of adolescence, to follow the rest of his life.”

Gurian (1998)

**References**