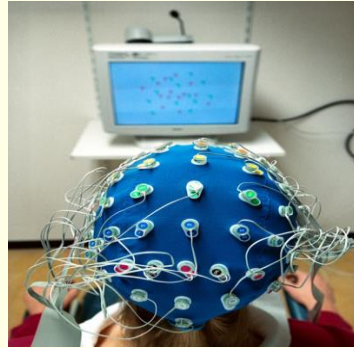
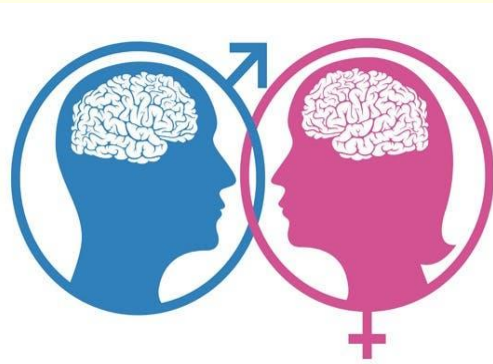


## Sex and the Brain, part 2

### Objectives:

1. Differences between brains of men and women
2. Similarities between brains of men and women



1

## Sex and the Brain, part 2

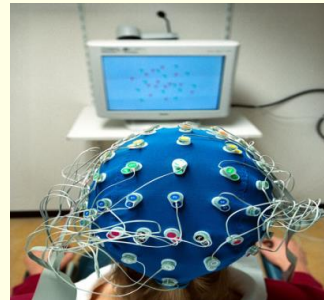
### Readings:

#### Showing Differences:

1. [Sex and the Brain \(Scientific American\)](#)
2. [The amygdala and female orgasm](#)
3. [Brain Scans Find the Penis At Last](#)

#### Showing these differences are quite minimal, and controversial:

- [Study finds some significant differences in brains of men and women \(Science\)](#)
3. [The hardwired difference between male and female brains. \(The Independent\)](#)
  3. [New insights into gendered brain wiring, or a perfect case study in neurosexism?](#)



2

## 1. Differences in the brain between the sexes.

### Some Differences:

- 1) Hypothalamus, hormones, & organizational changes
- 2) Sexually dimorphic nucleus of hypothalamus (SDNH)
- 3) Brain size
- 4) Brain Pleasure Center Differences (Amygdala & Homunculus)
- 5) Corpus callosum
- 6) Hippocampus
- 7) Early performance differences in children (shortly after birth)
- 8) Problem solving differences

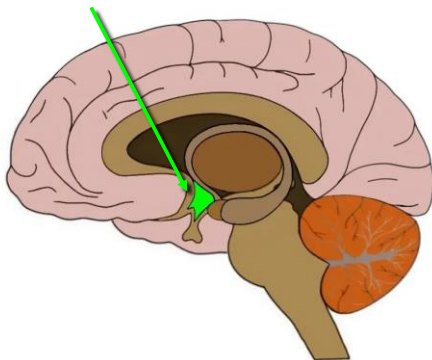
3

### 1) Hormones & Organizational Changes in Male & Female Behavior:

[Sex and the Brain](#) reading (pgs 1 – 2 in the PDF, pgs 39 - 40 in article)

> The **hypothalamus** (controls all things reproductive, including hormone production) is larger in men than in women.

> \*\*\*But larger body size is likely for this difference.



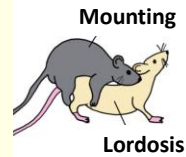
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## 1) Hormones & Organizational Changes in Male & Female Behavior:

[Sex and the Brain](#) reading (pgs 1 – 2 in the PDF, pgs 39 - 40 in article)

> During early embryonic development, and even just after birth, testosterone or estrogen have organizational (permanent) effects on development of body, and brain.

> BUT, we lack research distinguishing between **nature** (born with it) versus **nurture** (how we are raised, and our experiences) on these changes between human males & females.



> Male rats who are castrated, or treated with testosterone blocker drugs, show less male-like behavior (mating-like mounting, aggression) and more female-like behavior (lordosis or arching of the back).

> Female rats who treated with testosterone after birth show more male-like behavior (mating-like mounting, aggression) and less female-like behavior (lordosis or arching of the back).

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## 2) Sexually dimorphic nucleus of the hypothalamus (SDNH).

By sex Two morphologies

- Important in libido (sex drive).

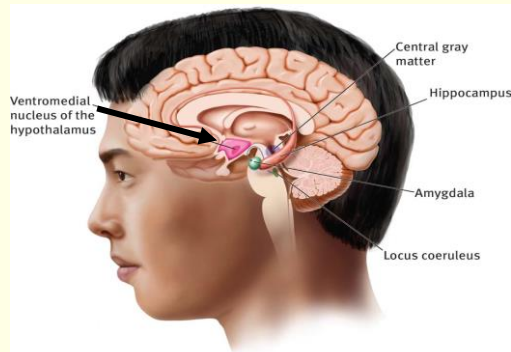


Figure 4.5  
Comer, *Fundamentals of Abnormal Psychology*, 8e, © 2016 Worth Publishers

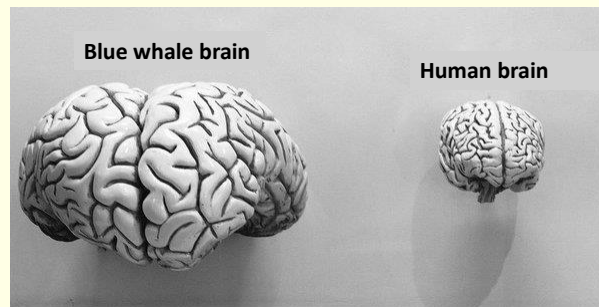
- Is larger in men than in women.
  - activity of this area in men is always "active"
  - Activity of this area in women is "cyclical" – sometimes off, sometimes on.
- Is larger in straight men than in gay men (more similar to women)
  - Possible differences in brain between gay & straight.
  - Controversial between researchers:
    - Swaab – saw no diff. in SDNH between straight & gay men.
    - LeVay – says there is a diff. in SDNH between straight & gay men.

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### 3) Brain Size Differences Between Men & Women:

> **Men's brains are ~10 % larger than women's**, but most of that difference is because of overall body size (men tend to be larger than women).

- *There is no indication that larger brains = smarter brains. A blue whale's brain is MUCH bigger than a human brain, but that doesn't mean humans are less intelligent than whales.*

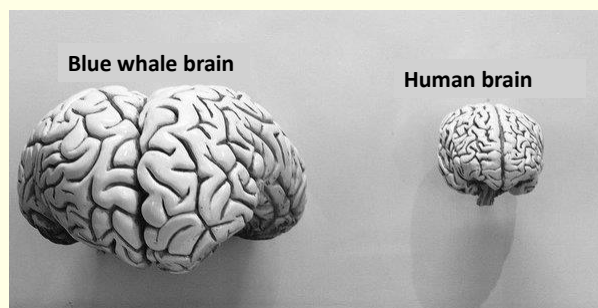


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### 3) Brain Size Differences Between Men & Women:

“Larger brains create different sorts of engineering problems and so – to minimize energy demands, wiring costs, and communication times – there may be physical reasons for different arrangements in differently sized brains. The results may reflect the different wiring solutions of larger versus smaller brains, rather than sex differences per se.”

[New insights into gendered brain wiring, or a perfect case study in neurosexism?](#) Pg 2



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#### 4) Brain Pleasure Centers Differences:

A. The **Amygdala**, located in the **limbic system** of the brain, is involved in fear & anxiety.

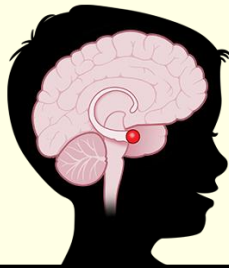
##### Amygdala and orgasm:

- In women, during **real** orgasm, the amygdala **shuts off**.
- In women, during **fake** orgasm, the amygdala **remains active**.

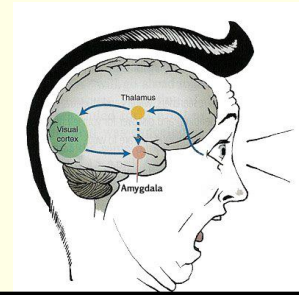
##### Amygdala and fear:

- Women were asked to recall a scary movie – their **left** amygdala activates.
- But in men recalling scary movie, **right** amygdala activates.

#### AMYGDALA



Source: [Fake Orgasms Don't Fool Brain Scans](#)



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#### 4) Brain Pleasure Centers Differences:

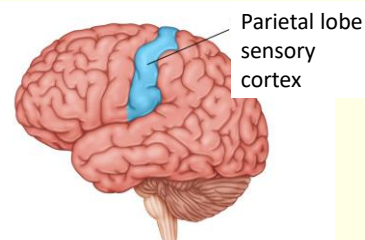
- Location of sensations of male penis = **parietal lobe of cerebrum (sensory cortex)** called the **homunculus**.

J. of neuroscience (Christian Kell) used functional MRI scans when different parts of body were “stimulated” in men.

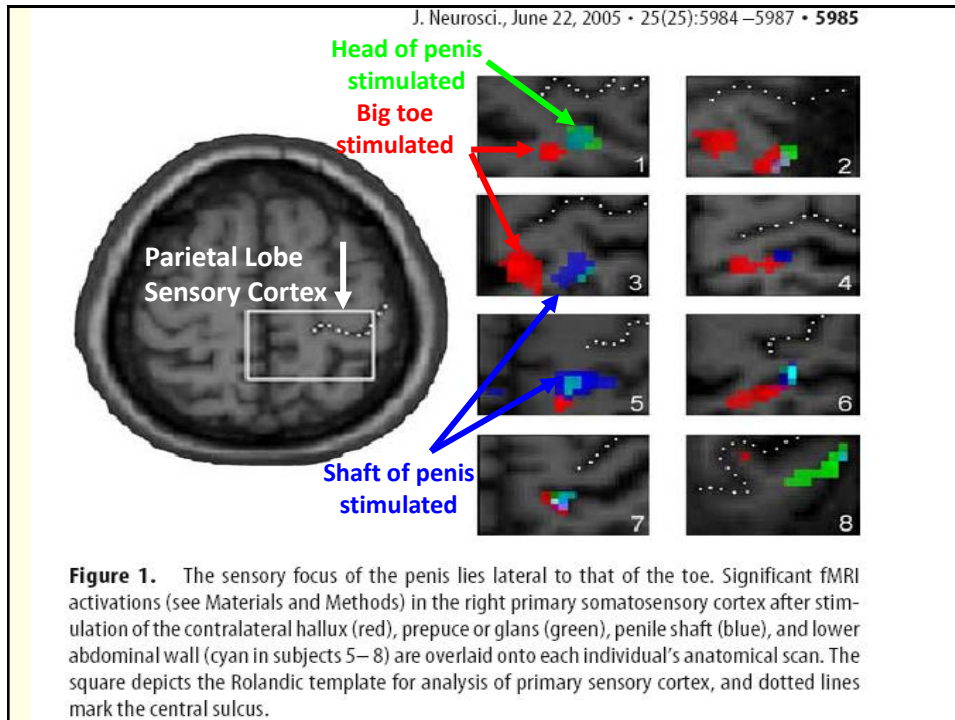
> When head of penis (**green**), and shaft of penis (**blue**), were stimulated it showed up in **parietal lobe of cerebrum** (sensory cortex).

> strangely enough, if big toe stimulated it also shows here (**red**)! 😊

Source: [Brain scans find the penis at last.](#)



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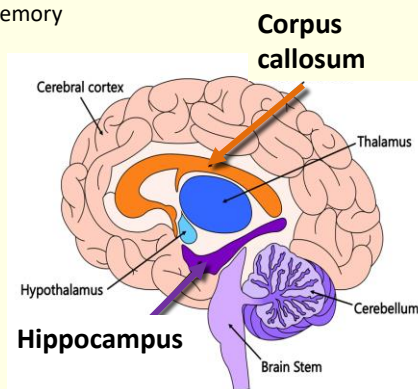
### Other Brain Structure Differences:

#### 5) Corpus callosum

- Communicates between left and right brain cerebral hemispheres.
- Is larger in women than in men.
- Thought responsible for greater multi-tasking abilities.

#### 6) Hippocampus

- Brain area that plays role in spatial learning & memory
  - Ex. > Ability to navigate mazes & maps,
  - > Ability to rotate 3-dimensional objects.
- Is larger in men than in women.



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## 7) Early performance differences in children

### > Differences in Visual Focus

Can see differences soon after birth:



#### At 24 hrs old:

- Girls stare longer at faces.
- Boys stare longer at mechanical objects (like nursery mobiles)

#### At 10 months: (pregnant women's amniotic sacs tested for testosterone, then after birth babies were tested)

- Children exposed to higher testosterone in womb – make less eye contact.
- Children exposed to less – make more eye contact

### > Differences in Verbal Skills

#### At 24 months: (same study as above)

- Children exposed to higher testosterone in womb – start talking later.
- Children exposed to ~~higher~~ **lower** testosterone in womb – start talking sooner.

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## 8) Problem solving differences:

### Cognitive Skills:

(See reading assign: "[Sex and the Brain \(Scientific American\)](#)")

#### Males tend to:

- Better at spatial tasks
- Navigate mazes faster w/fewer errors
- Better at mathematical reasoning
- Less so
- More accuracy w/throwing skills (probably due to childhood activity)
- Less so
- Less so

#### Females tend to:

- Less so
- Navigate mazes slower w/more errors
- Less so
- Better at mathematical calculations
- Less so (probably due to childhood activity)
- Better at precision manual tasks
- Better at verbal memory & vocabulary

- > These are generalities and DO NOT always represent all people!
- > These differences do not imply genetic superiority/inferiority.
- > These likely reflect differences in "nature" and culture.
- > These don't account for training /practice (which can improve initial abilities).  
[Males and females get the job done - in slightly diff. ways.]

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## Other, Behavioral Differences before 18 months of age.



### **Males tend to:**

- Like a lot of action (motion)
- Start walking earlier
- Start talking later
- Prefer looking at groups of faces rather than individual ones
- Express fear later than girls
- Gain precision manual skills later than girls
- “Feel” emotional without showing it outwardly

### **Females tend to:**

- Be less active than boys
- Start walking later
- Start talking sooner
- Prefer looking at individual faces than groups of faces
- Express fear sooner than boys
- Gain precision manual skills earlier than boys
- Show emotions more clearly (outwardly) than boys

*But, there is considerable overlap in behaviors between boys & girls, and no research can completely rule out the influence of nurture (culture, gender norms, and reinforcement of behavior according to stereotypes) on these things.*

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## Review

- 1) Hypothalamus, hormones, & organizational changes
- 2) Sexually dimorphic nucleus of hypothalamus (SDNH)
- 3) Brain size
- 4) Brain Pleasure Center Differences (Amygdala & Homunculus)
- 5) Corpus callosum
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- 8) Problem solving differences

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## 2. Similarities in the brain between the sexes.

- > When it comes to neuroscience research, more men have been studied than women.
- > More recent research on the brain, between men and women, have shown more similarities than differences.
- > A lot of research has shown more variation in brain structures and connectivity within each sex, rather than between them.
- > Research also shows that for most of the differences found, there is A LOT of overlap between the sexes.

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## 2. Similarities in the brain between the sexes.

Recently (2021), a neuroscientist analyzed 30 years of research on human sex differences in the brain, and found ...

“Except for the simple difference in size, there are no meaningful differences between men’s and women’s brain structure or activity that hold up across diverse populations. Nor do any of the alleged brain differences actually explain the familiar but modest differences in personality and abilities between men and women.”

Yes, men’s overall brain size is about 11% bigger than women’s, but ....., no specific brain areas are disproportionately larger in men or women. Brain size is proportional to body size, and the brain difference between sexes is actually smaller than other internal organs, such as the heart, lungs and kidneys, which range from 17% to 25% larger in men.” - Lisa Eliot

[Dump the “dimorphism”: Comprehensive synthesis of human brain studies reveals few male-female differences beyond size.](#)

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## 2. Similarities in the brain between the sexes.

Recently (2021), a neuroscientist analyzed 30 years of research on human sex differences in the brain, and found ...

“When overall size is properly controlled, no individual brain region varies by more than **about 1%** between men and women, and even these tiny differences are not found consistently across geographically or ethnically diverse populations.

**Other highly touted brain sex differences are also a product of size, not sex.** These include the ratio of gray matter to white matter and the ratio of connections between, versus within, the two hemispheres of the brain. Both of these ratios are larger in people with smaller brains, whether male or female.

What’s more, recent research has utterly rejected the idea that the tiny difference in connectivity between left and right hemispheres actually explains any behavioral difference between men and women.” - Lisa Eliot

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## 2. Similarities in the brain between the sexes.

In an larger earlier study (from which the participants of the PNAS study were a subset), the same research team compellingly demonstrated that the sex differences in the psychological skills they measured – executive control, memory, reasoning, spatial processing, sensorimotor skills, and social cognition – are almost all trivially small.



Biological sex is a dismal guide to psychological ability.

To give a sense of the huge overlap in behaviour between males and females, of the twenty-six possible comparisons, eleven sex differences were either non-existent, or so small that if you were to select a boy and girl at random and compare their scores on a task, the “right” sex would be superior less than 53% of the time.

Even the much-vaunted female advantage in social cognition, and male advantage in spatial processing, was so modest that a randomly chosen boy would outscore a randomly chosen girl on social cognition – and the girl would outscore the boy on spatial processing – over 40% of the time.

As for map-reading and remembering conversations, these weren’t measured at all.

*New insights into gendered brain wiring, or a perfect case study in neurosexism?* Pg 2

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## 2. Similarities in the brain between the sexes.

Click [HERE](#) for YouTube video (6.5 min)



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