

Hormones & Sex/ Emotion & Stress

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7.27.17

Outline

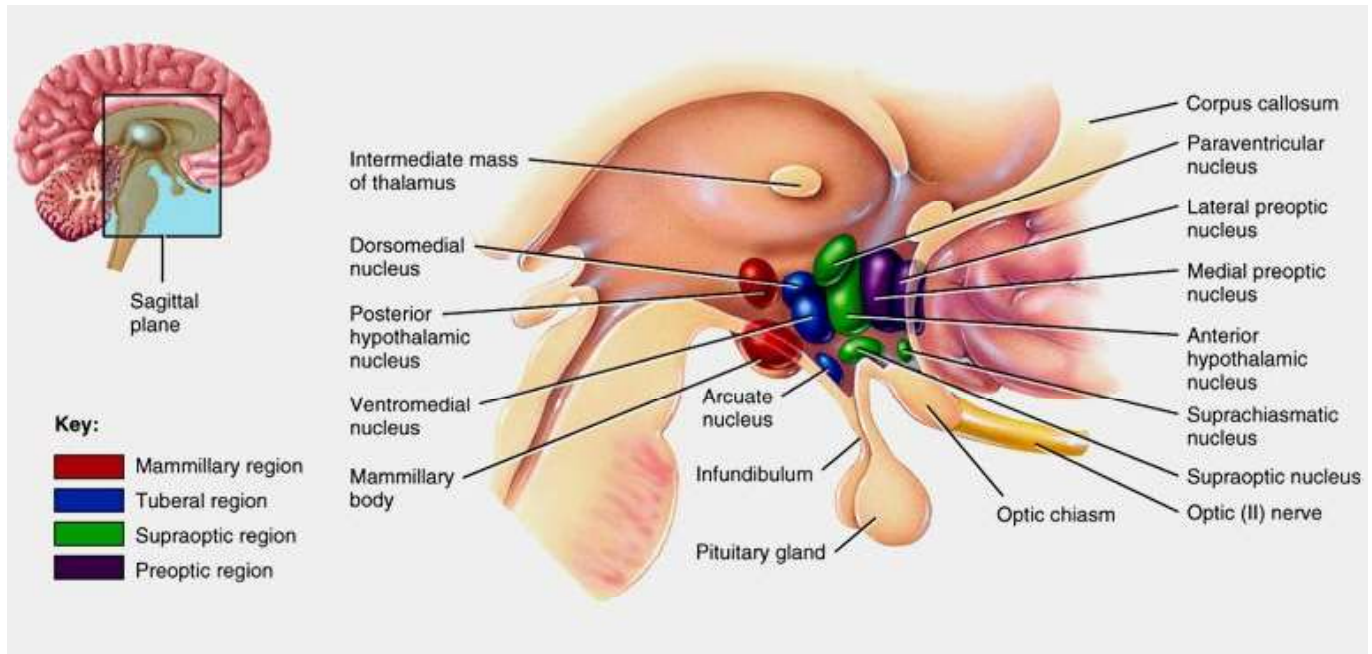
- Organizing Effects -development of sex
- Activating Effects -sexual behavior
- Theories of emotion
- Neural Basis of emotion



Organizing Effects

Fetal Development of Sex

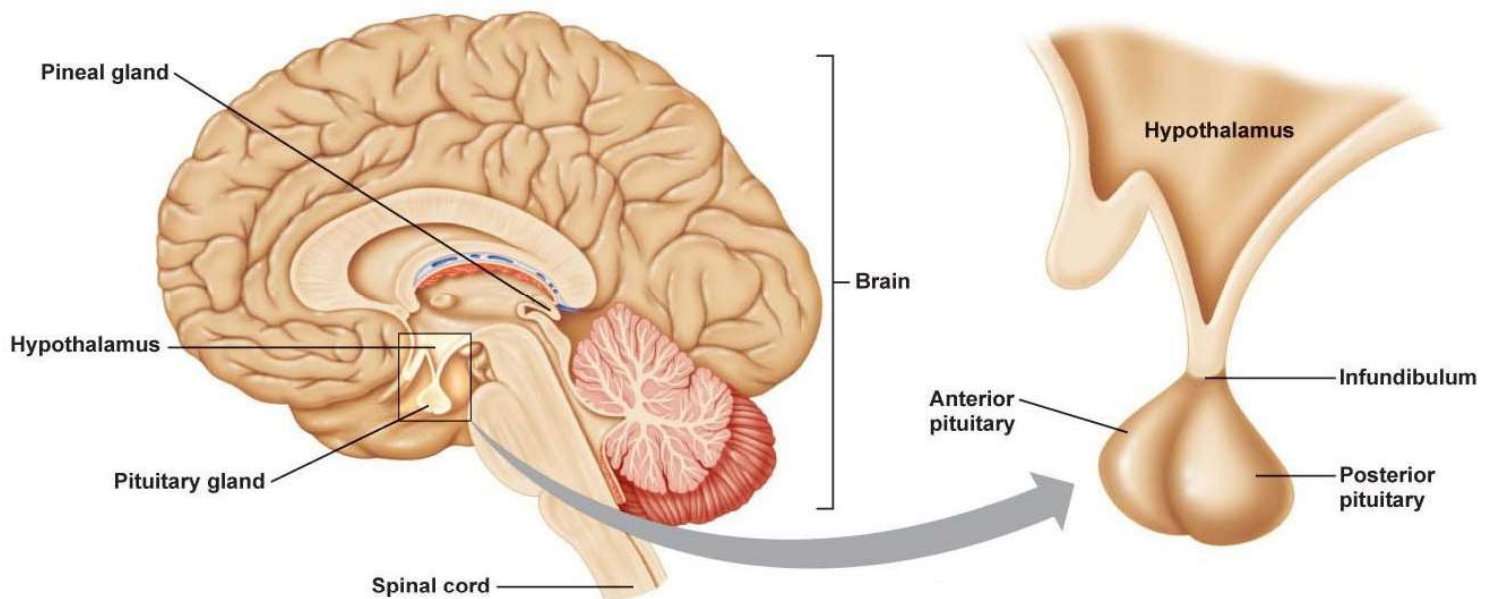
Hail the Hypothalamus!



Sex \neq Gender



The pituitary gland: The “master gland”



How do we become male or female?

- This sex is the “default sex”.
- In females, this duct is developed while the other degenerates.
- In males, this duct is developed while the other degenerates
- The Y chromosome is the “switch” for males, but this enzyme needs to be present.
- This enzyme appears during what period in development?

How do we become male or female?

- This sex is the “default sex”. **Female (XX)**
- In females, this duct is developed while the other degenerates. **Muellerian**
- In males, this duct is developed while the other degenerates. **Wolffian**
- The Y chromosome is the “switch” for males, but this enzyme needs to be present. **Testis-Determining Factor (TDF)**
- This enzyme appears during what period in development? **6-8 weeks (Critical Period)**

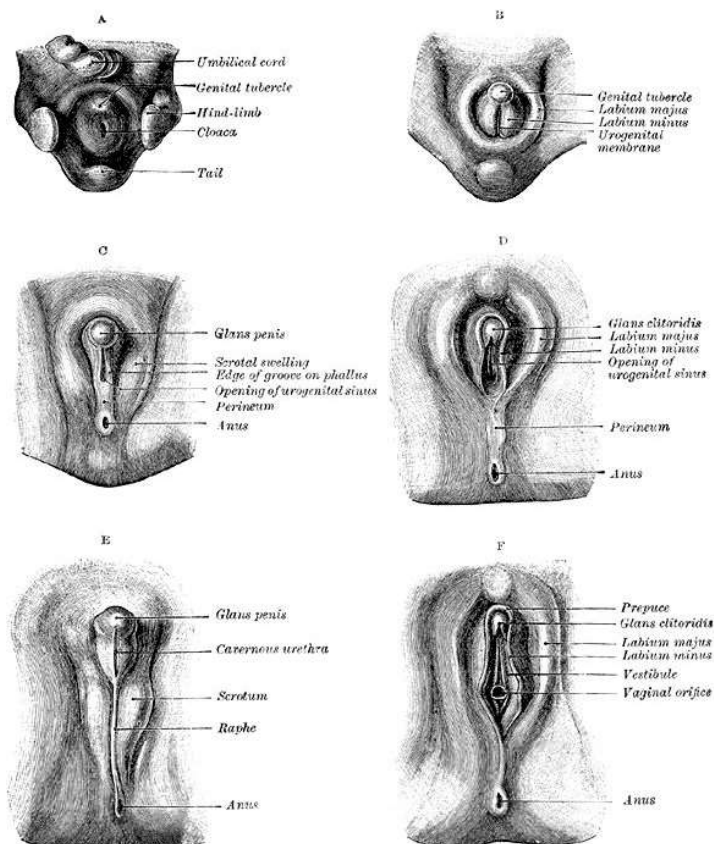
Testosterone and estrogen

- When testosterone enters fetal cells, it is converted to e_____, which masculinizes the fetus.
- But if this is an estrogen, why doesn't the maternal estrogens masculinize all fetuses?
- What does this protein do?

Testosterone and estrogen

- When testosterone enters fetal cells, it is converted to **estradiol**, which masculinizes the fetus.
- But if this is an estrogen, why doesn't the maternal estrogens masculinize all fetuses? **Apha-Fetoprotein**
- What does this protein do? **Binds with estrogen and prevents it from entering female cells**

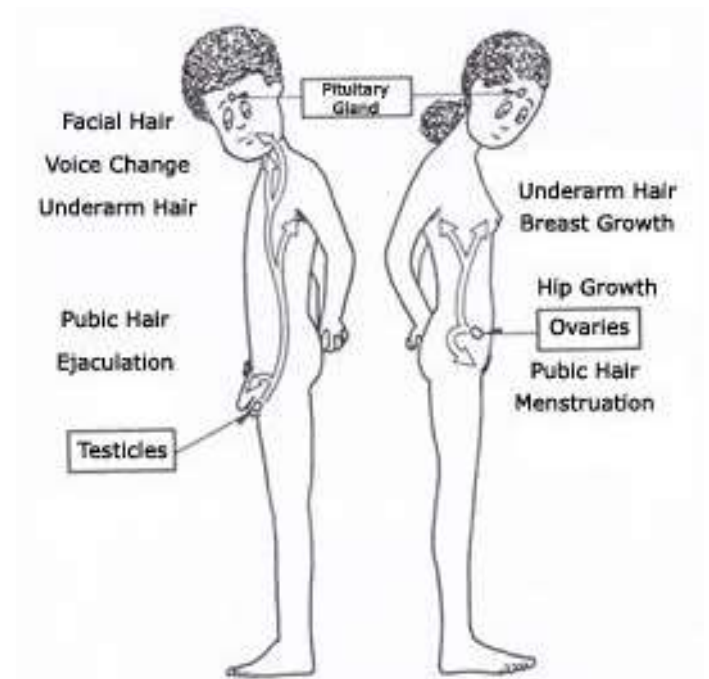
Development of external genitalia



Secondary Sex Characteristics

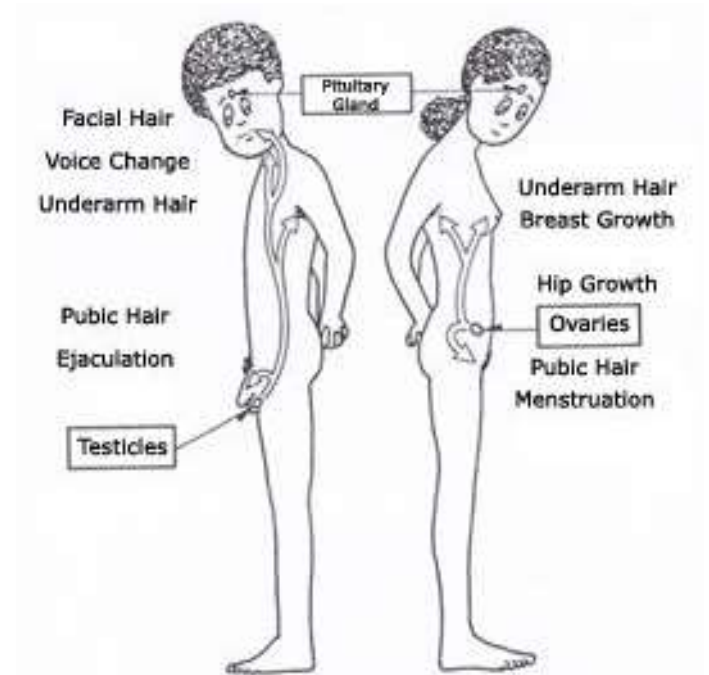
Pesky puberty

- The hypothalamus releases what hormone to stimulate the anterior pituitary?
- The anterior pituitary releases what 2 gonadotropic hormones?
 - L_____ hormone
 - F_____ - _____ hormone

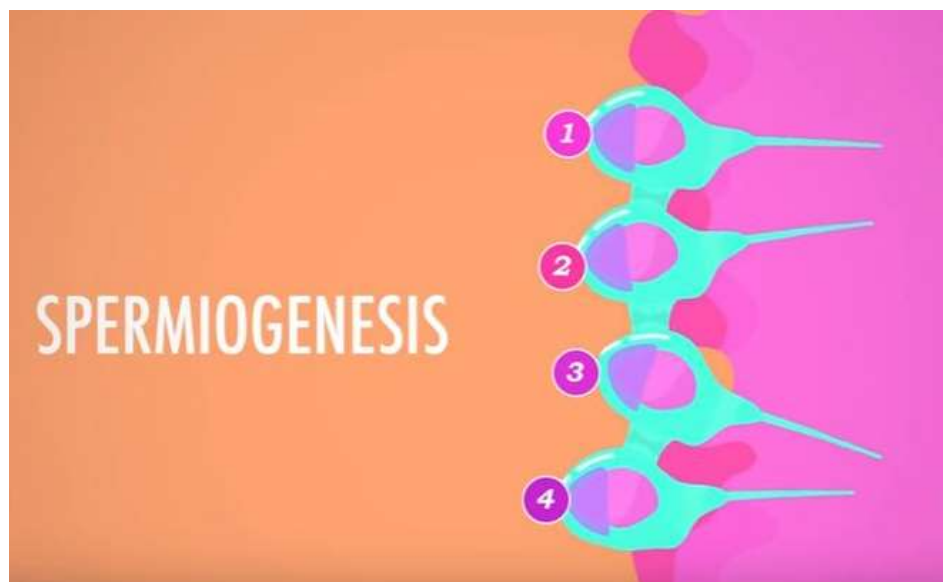


Pesky puberty

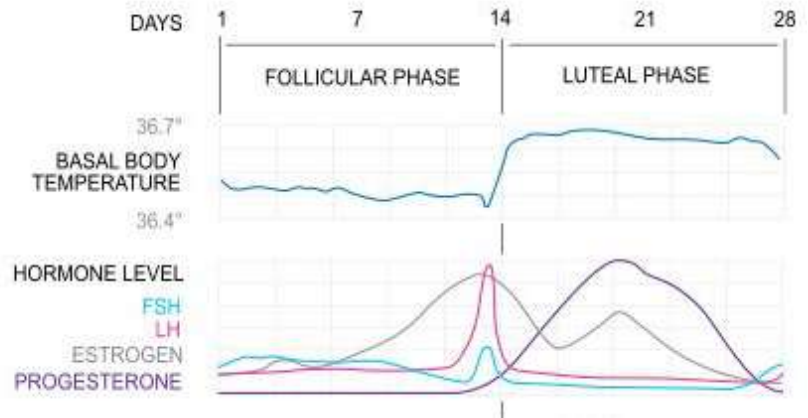
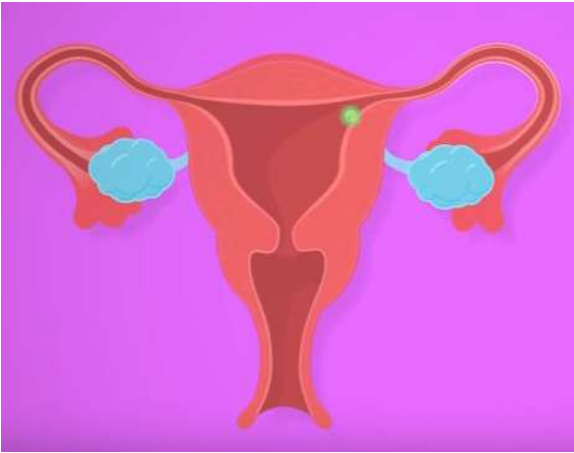
- The hypothalamus releases what hormone to stimulate the anterior pituitary? **Gonadotropin releasing hormone (GnRH)**
- The anterior pituitary releases what 2 gonadotropic hormones?
 - **Lutenizing** hormone (LH)
 - **Follicle-stimulating** hormone (FSH)



Puberty in males



Puberty in females

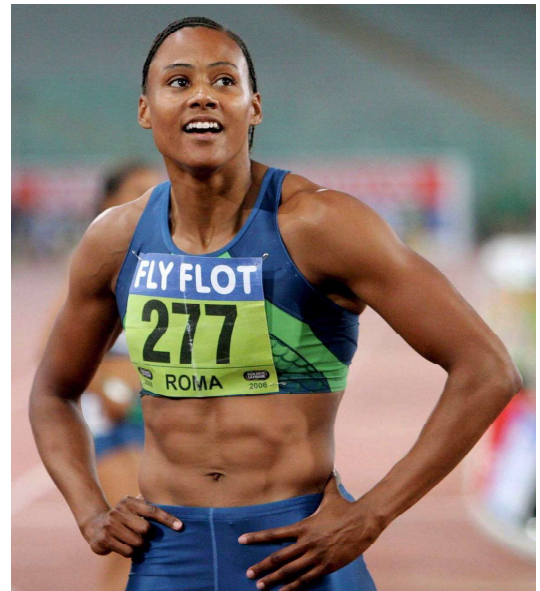


How do birth control pills work?



- Synthetic estrogen that regulates hormone levels
- Prevents pituitary gland from producing LH/FSH to prevent ovulation

How does steroid use affect males and females?



How does steroid use affect males and females?

- Excess testosterone leads to the inhibition of LH/FSH in both males and females
- Why does this...
 - Feminize males?
 - Masculinize females?

How does steroid use affect males and females?

- Excess testosterone leads to the inhibition of LH/FSH in both males and females
- Why does this...
 - Feminize males? **Decrease in sperm production. Excess testosterone converted to estrogen.**
 - Masculinize females? **Decreases levels of estradiol. Decreases ovulation, irregular menstrual cycles**

Activating Effects

Sex Differences in the Brain

- This region of the hypothalamus has androgen receptors
 - This region of the hypothalamus has estrogen receptors
 - This region is larger in males than females
- A. Sexually dimorphic nucleus (SDN)
 - B. Medial preoptic area (MPOA)
 - C. Posterior hypothalamic nucleus (PHN)
 - D. Ventro-medial hypothalamus (VMH)

Sex Differences in the Brain

- This region of the hypothalamus has androgen receptors **B**
 - This region of the hypothalamus has estrogen receptors **D**
 - This region is larger in males than females **A**
- A. ~~Sexually dimorphic nucleus (SDN)~~
 - B. ~~Medial preoptic area (MPOA)~~
 - C. Posterior hypothalamic nucleus (PHN)
 - D. ~~Ventro-medial hypothalamus (VMH)~~

Your Brain During Sex

What goes on in a male's brain during sex?

- This hormone produces a feedback circuit with the MPOA.
- This circuit involves the reward system, including the V_____ and the N_____.
- This NT is released in response to sexual stimulation.

What goes on in a male's brain during sex?

- This hormone produces a feedback circuit with the MPOA. **Testosterone**
- This circuit involves the reward system, including the **Ventral Tegmental Area (VTA)** and the **Nucleus Accumbens**.
- This NT is released in response to sexual stimulation. **Dopamine**

Why do males get sleepy after sex?



- The pituitary gland releases 2 hormones at orgasm.
 - P_____
 - O_____
- These hormones are associated with sleep.

Why do males get sleepy after sex?



- The pituitary gland releases 2 hormones at orgasm.
 - **Prolactin**
 - **Oxytocin**
- These hormones are associated with sleep.

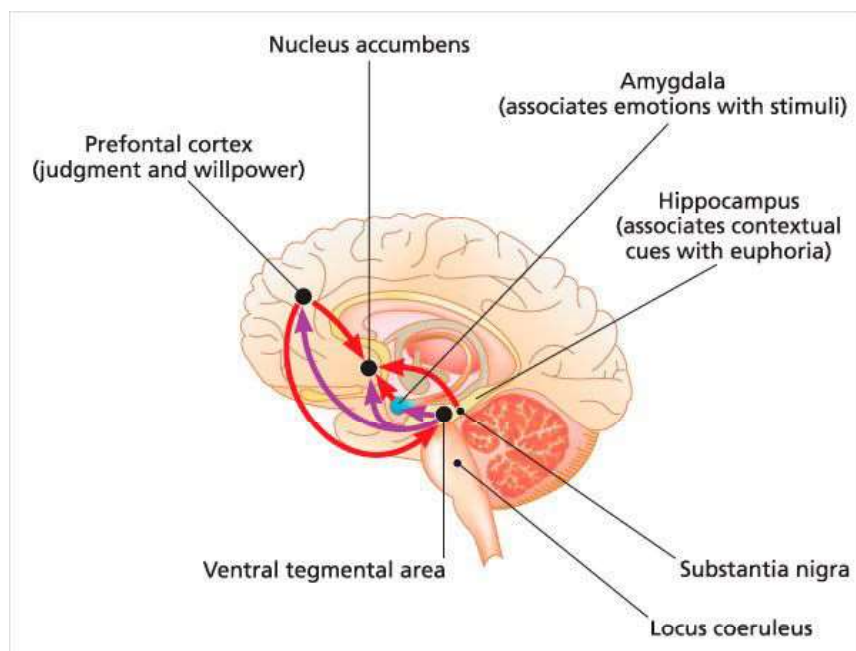
What goes on in a female's brain during sex?

- Female sexual response is similar except the arousal feedback circuit involves which region?
- This region then stimulates the PAG area to cause the release of what feel-good hormone?
- At orgasm, oxytocin is released by posterior pituitary
- Do females have a sexual refractory period?

What goes on in a female's brain during sex?

- Female sexual response is similar except the arousal feedback circuit involves which region. **VMH**
- This region then stimulates the PAG area to cause the release of what feel-good hormone? **Endorphins**
- At orgasm, oxytocin is released by posterior pituitary
- Do females have a sexual refractory period? **No, because less prolactin released after female orgasm.**

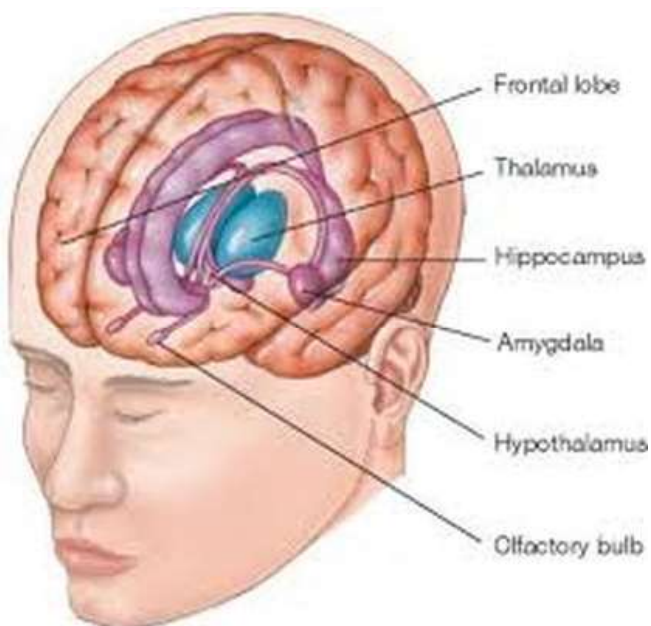
Sex and Reward



Scents and Sensibility

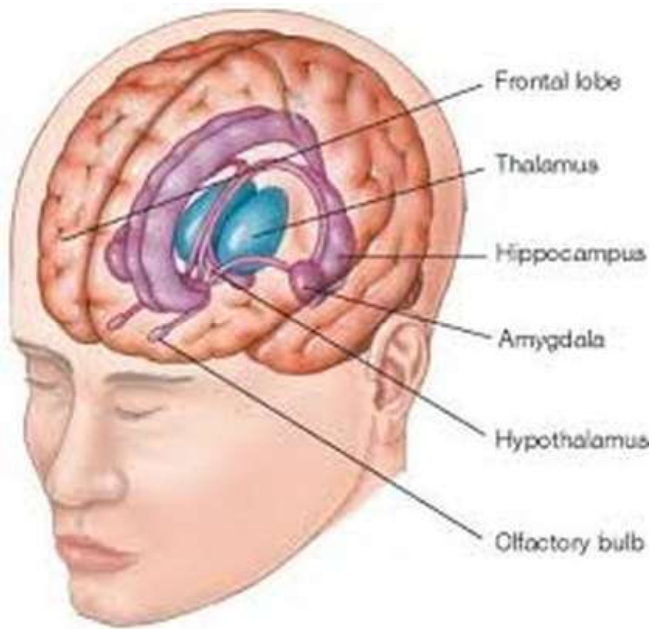


Limbic System



- Smell info comes from this part of the limbic system.
- Smell info then goes to this region responsible for regulating emotion.

Limbic System



- Smell info comes from this part of the limbic system. **Olfactory bulb**
- Smell info then goes to this region responsible for regulating emotion. **Amygdala**

Emotion & Stress

Theories of emotion

- Emotions are our interpretation of our physical reaction
 - Cognitive appraisal and autonomic system interact
- A. Cannon-Bard Theory
 - B. James-Lange Theory
 - C. Schacter-Singer Theory

Theories of emotion

- Emotions are our interpretation of our physical reaction **B**
 - Cognitive appraisal and autonomic system interact **B**
- A. Cannon-Bard Theory
 - B. ~~James-Lange Theory~~
 - C. ~~Schacter-Singer Theory~~

****What is the Cannon-Bard Theory of emotion? Physical and subjective experience is simultaneous**

Want to be happier?

Smile more!

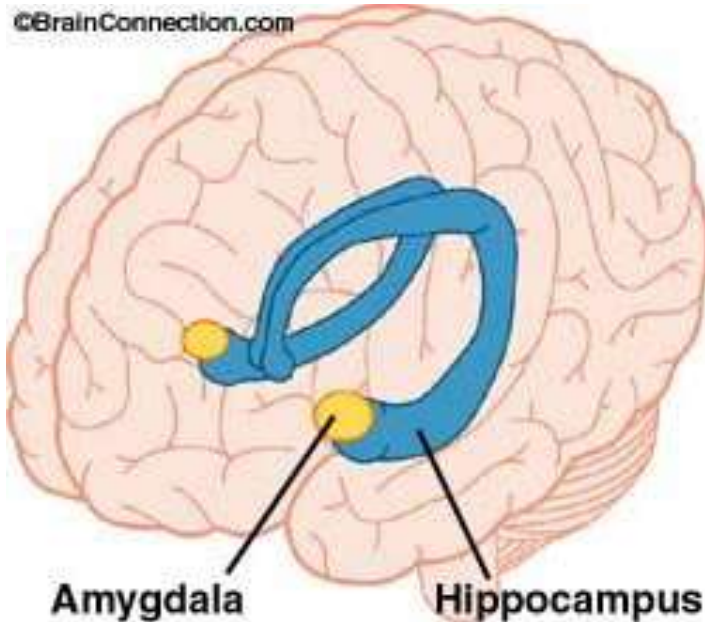


Paul Ekman: Universal emotions



Amygdala and Emotions

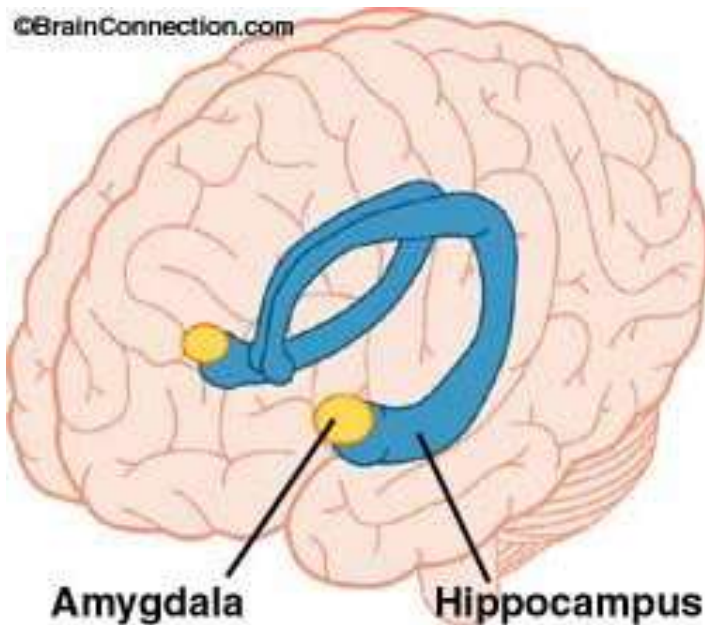
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- Stimulation of the cortico-medial amygdala leads to what emotion?
- Lateral amygdala involved in what reflex?
- Central and basolateral nuclei are involved in what?

Amygdala and Emotions

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- Stimulation of the cortico-medial amygdala leads to what emotion? **Rage**
- Lateral amygdala involved in what reflex? **Startle reflex**
- Central and basolateral nuclei are involved in what?
Conditioned fear

The sad case of Little Albert



- Baby conditioned to be afraid of a rat
- Eventually generalized to anything furry

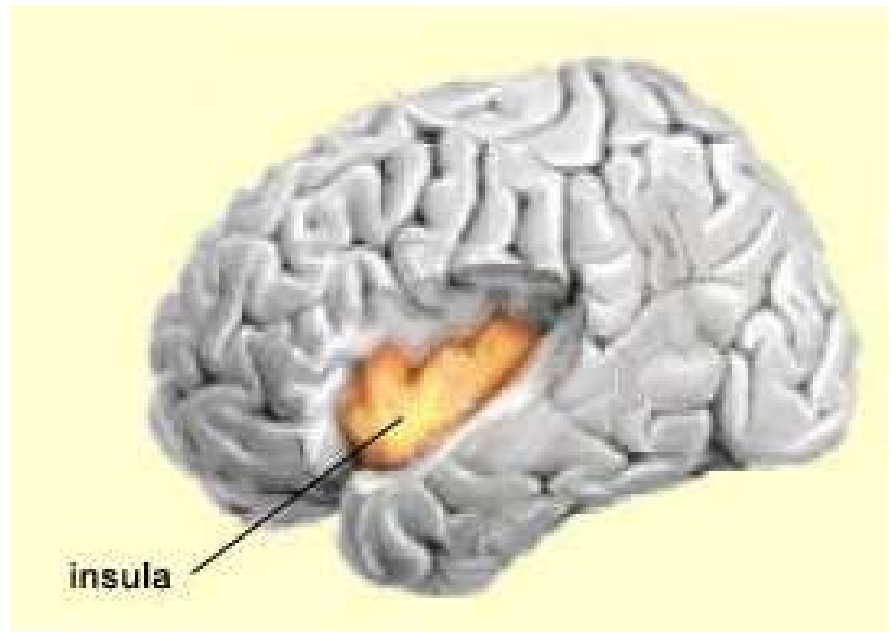
Emotions closely related to social interactions

- Which region regulates emotional expression in social situations?



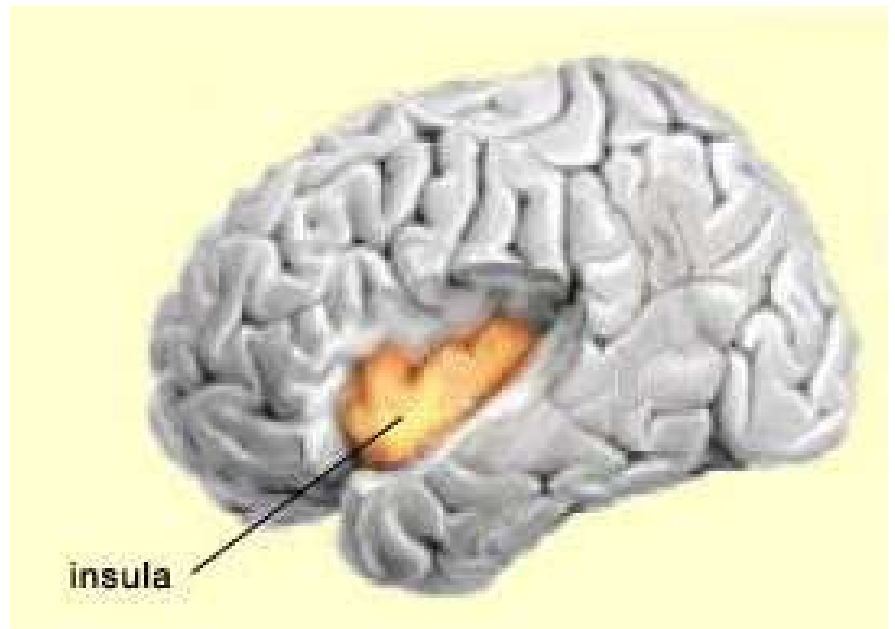
Emotions closely related to social interactions

- Which region regulates emotional expression in social situations? **Anterior insula**



Damage to anterior insula

- Damage to the left anterior insula causes emotional facial paresis, which is the inability to produce a smile when?



Facial paresis

- Damage to anterior insula → inability to produce spontaneous smile.
- Damage to motor cortex → inability to produce smile on command

Volitional facial Paresis



(a)



(b)

Emotional facial paresis



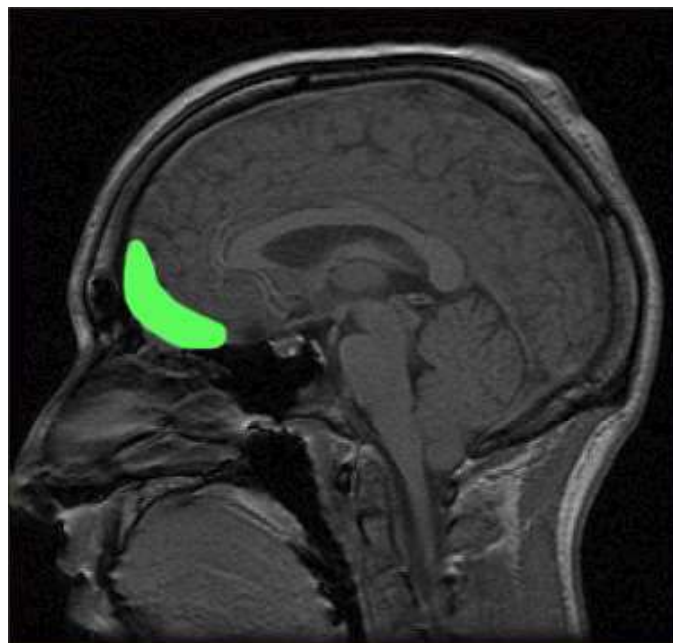
(c)



(d)

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What part of the PFC relevant to social emotional behavior?

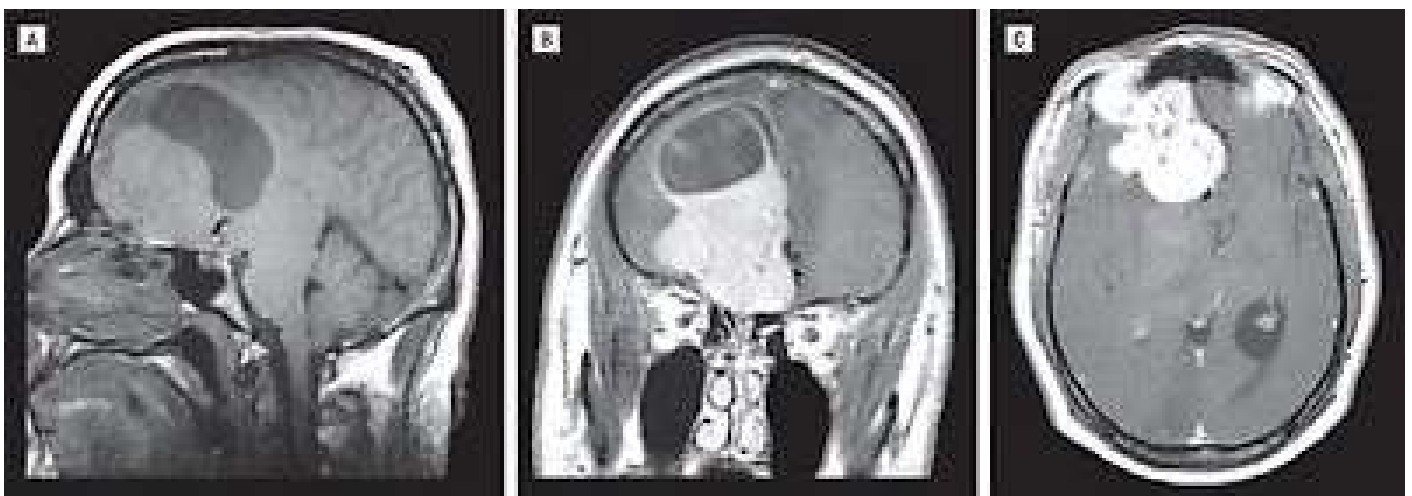


What part of the PFC relevant to social emotional behavior?

- Orbitofrontal cortex



Are you responsible for your actions?



Burns & Swerdlow, 2003