



# The Influence of Reproductive Hormones on the Female Brain

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OHSU Center for Women's Health

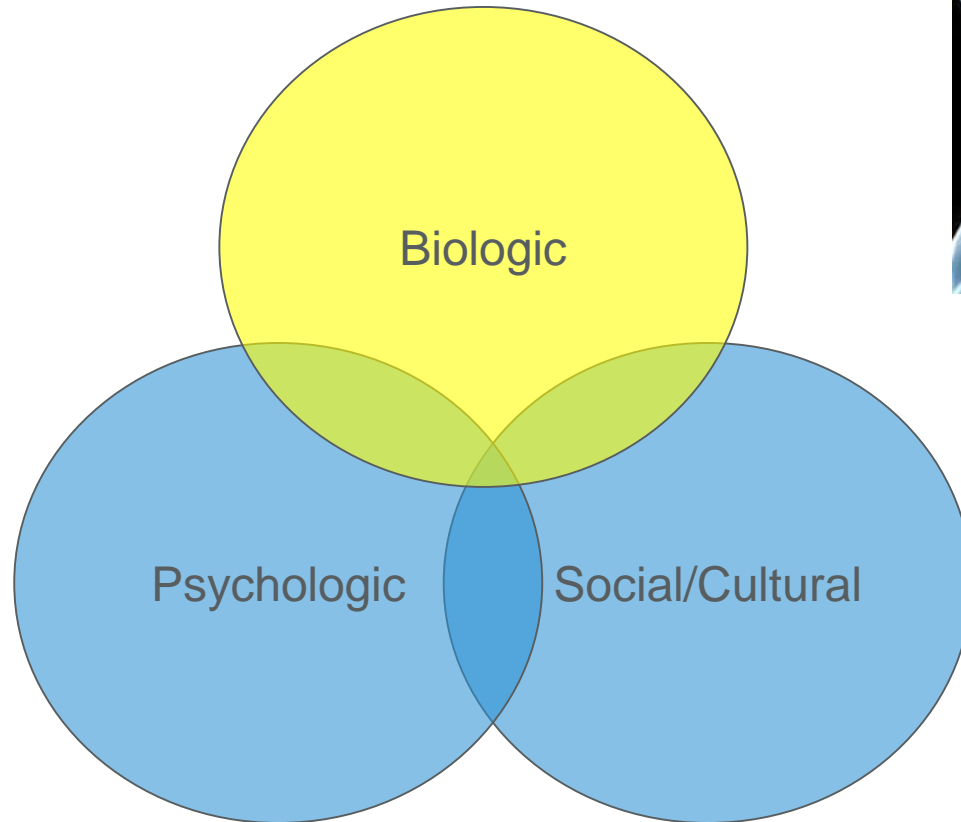
Oregon Health Science University

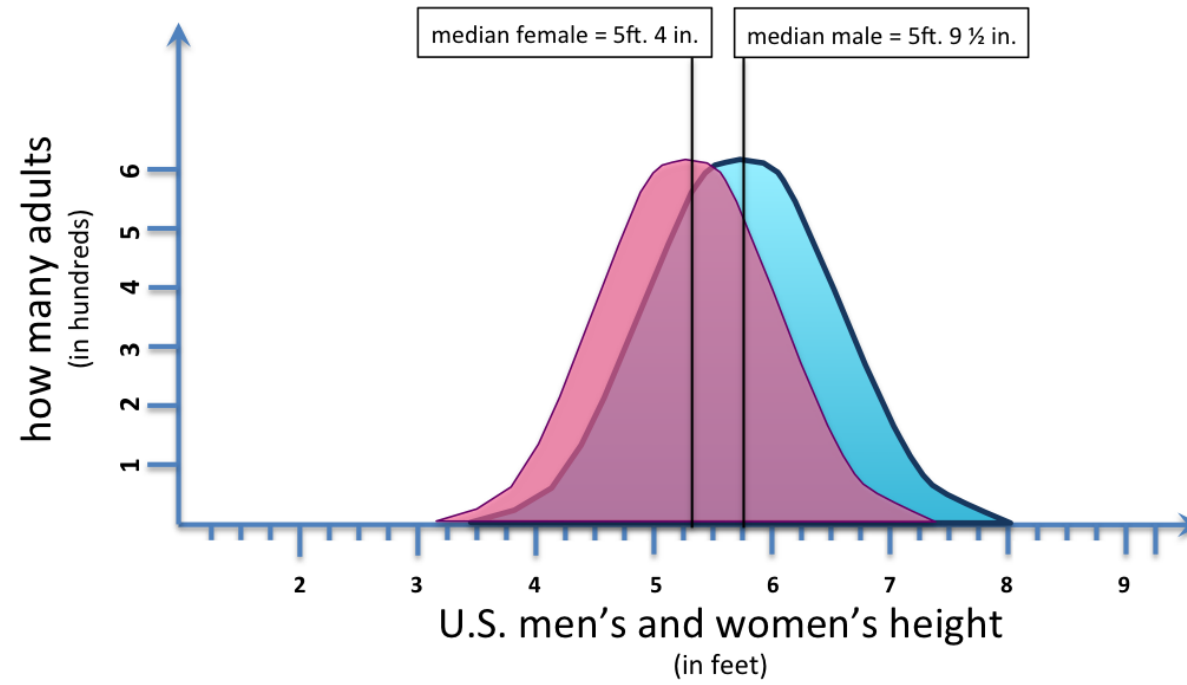


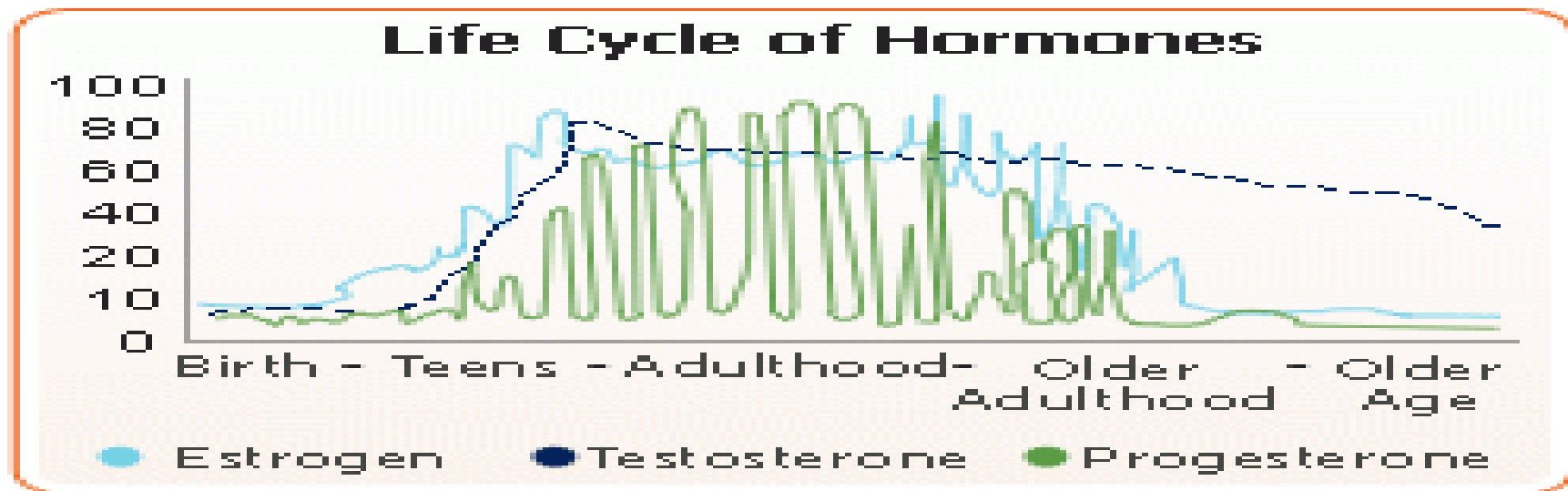
## Key Objectives and Goals

1. Discuss how reproductive hormones (estrogen, progesterone, and oxytocin) fluctuate across a women's reproductive cycle.
2. Describe how reproductive hormones influence the major neurotransmitters in the female brain.
3. Introduce how these factors can influence women's moods, cognitions, and behaviors including childbirth, parenting and sexual behavior.
4. Discuss treatment options for women, based on our knowledge of these factors that are unique in women.

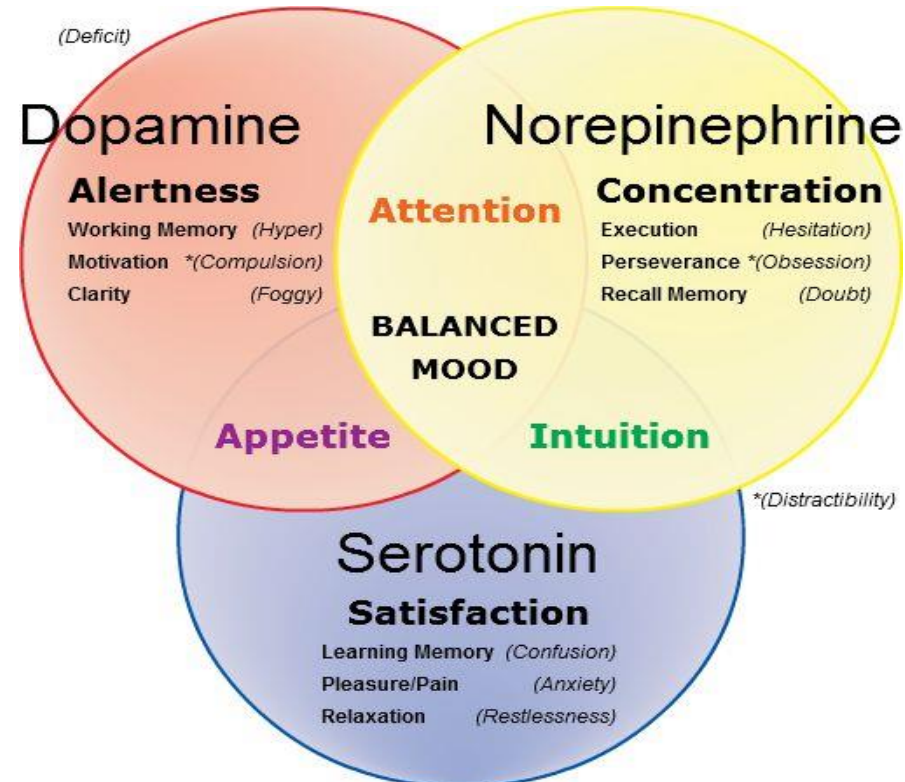
# Male/Female Brain Differences







# Brain Neurotransmitters

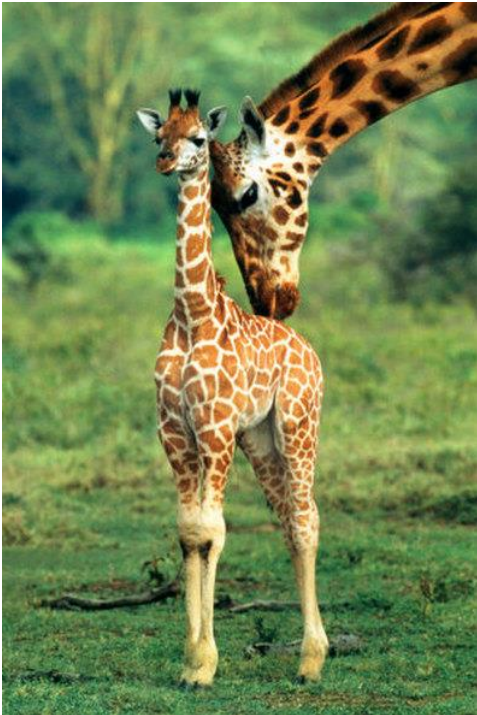






A mother's unique special connection to the child is vital for infants care and survival.

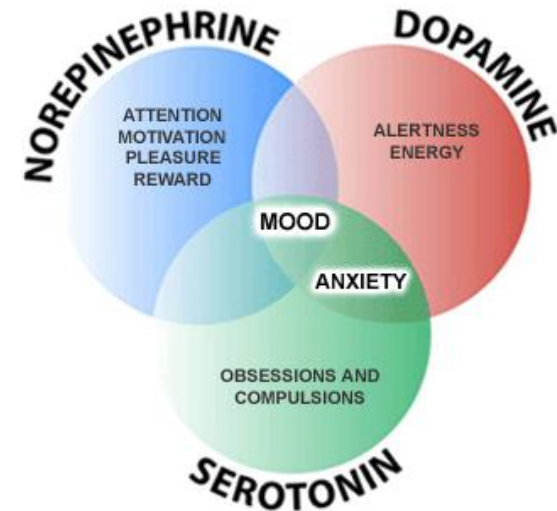
The ability to attach and remain the parent caregiver is the remarkable step that has marked our evolution from reptiles to mammals."



Women's Moods – Deborah Sichel MD

# Estrogen – Mood Enhancing Effects

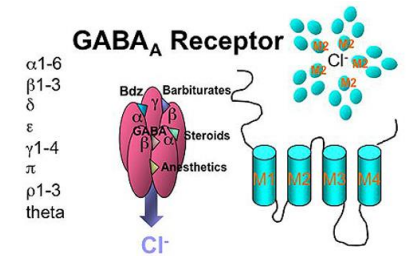
- Estrogen supports Serotonin
- Estrogen supports Norepinephrine
- Estrogen decreases the stress response
- Antidopaminergic effects
- Promotes Oxytocin





# Progesterone – Anti anxiety effects?

- Elevated in pregnancy with rapid drop postpartum
- Fluctuates monthly –withdrawal premenstrually
- Significant decline in menopause
- Progesterone targets areas of the brain **similar to anti-anxiety, pain and sleep medications**
- Clinical studies show it has **hypnotic and anxiolytic** as well as **dysphoric** effects in postmenopausal women



# Oxytocin (OT) and Attachment

- Fosters attachment b/w all mammalian mothers and infants
- Improves ability to interpret social situations and facilitates attending to others
- OT activates limbic structures assoc. with emotion and *attention*
- Postpartum women: Lactation suppresses physiologic response to stress.
- Promotes amnesia during labor



# Oxytocin in men

- Improves social reciprocity in men
- Improves the ability to identify competitive relationships
- Fosters striving to improve social status
- Improves males perception of desirability in their mate



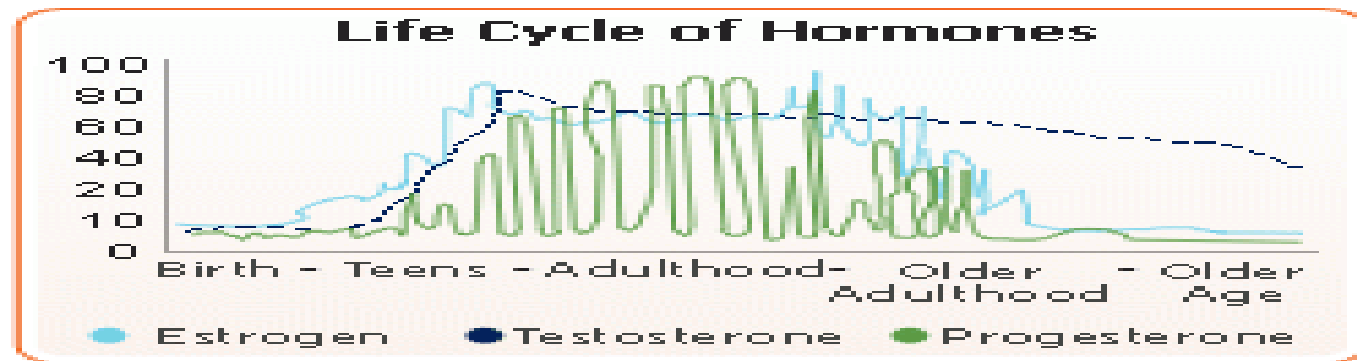


"The female brain has tremendous unique aptitudes: verbal agility, the ability to connect deeply in friendships, a nearly psychic capacity to read faces and tone of voice for emotions and states of mind, and the ability to diffuse conflict.

**"These are talents that women are born with that men frankly, are not."**

Women's Moods – Deborah Sichel  
MD

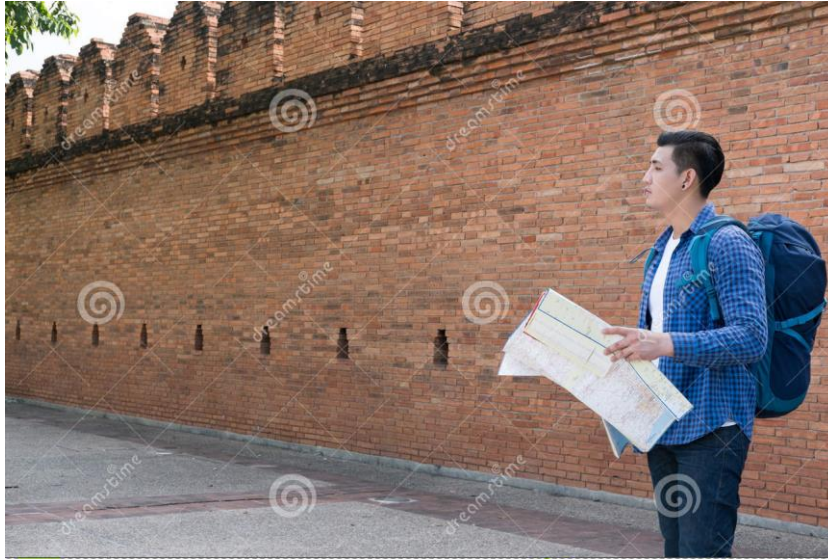




# Brain changes -School Age girls



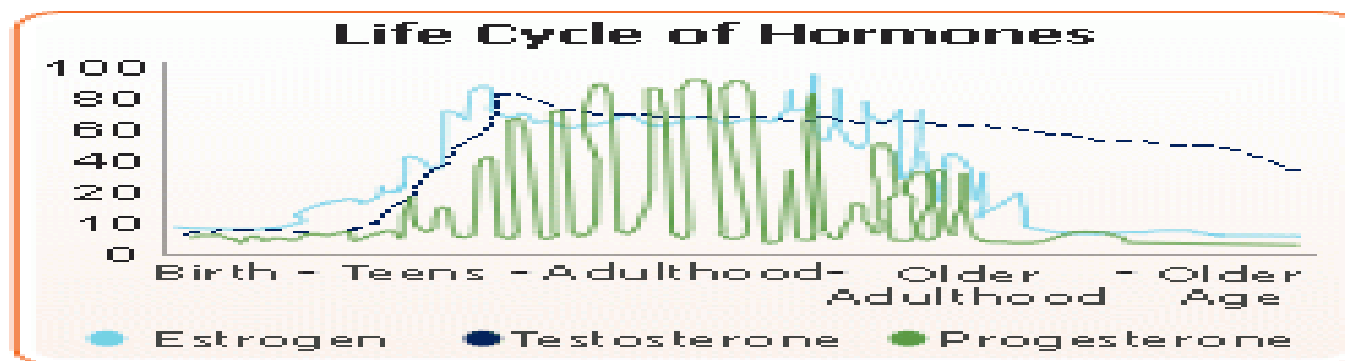




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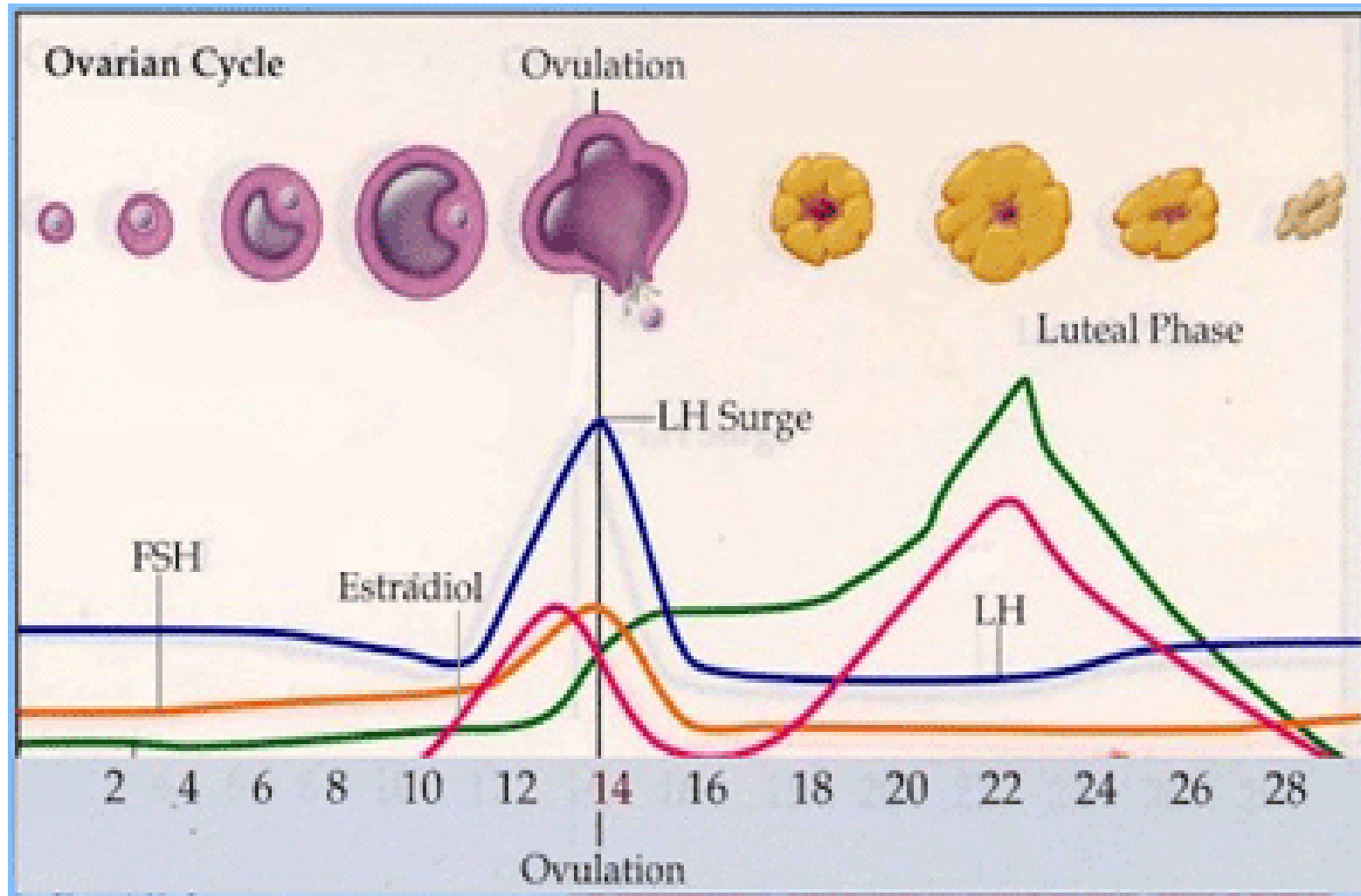
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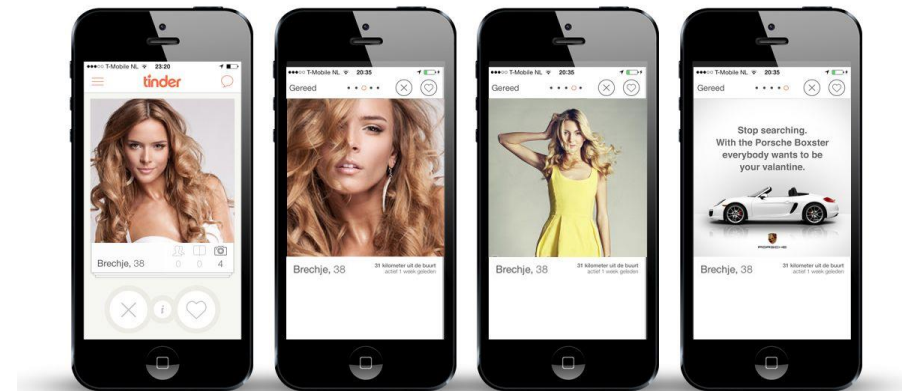
## Brain Changes – Puberty (Menses begins)



# "Finding a mate"

- Social status
- Age
- Emotional intimacy
- Physical Appearance

The screenshot shows the eHarmony website interface. At the top, there's a navigation bar with the eHarmony logo and a 'LOG IN' button for existing members. The main heading is 'From single to soul mate' with the tagline 'Get deeply matched with singles based on 29 Dimensions®'. A prominent green banner says 'CHECK YOUR MATCHES FREE'. Below this is a registration form with fields for 'What is your first name?', 'Your zip code?' (with a dropdown for 'United States'), 'What is your email?', 'Setup your password', and 'How did you hear about us?'. A 'Find my matches' button is at the bottom of the form. To the left of the form is a promotional box for a 'Free Communication Weekend' from January 3rd to 8th, stating 'communicate with your matches for FREE' and 'Absolutely no cost or obligation - No credit card needed.' To the right of the form are two user profile cards: one for 'Stephan' (a man) and one for 'Jamilie' (a woman). Below the form is a profile card for 'Lindsey' (a woman).

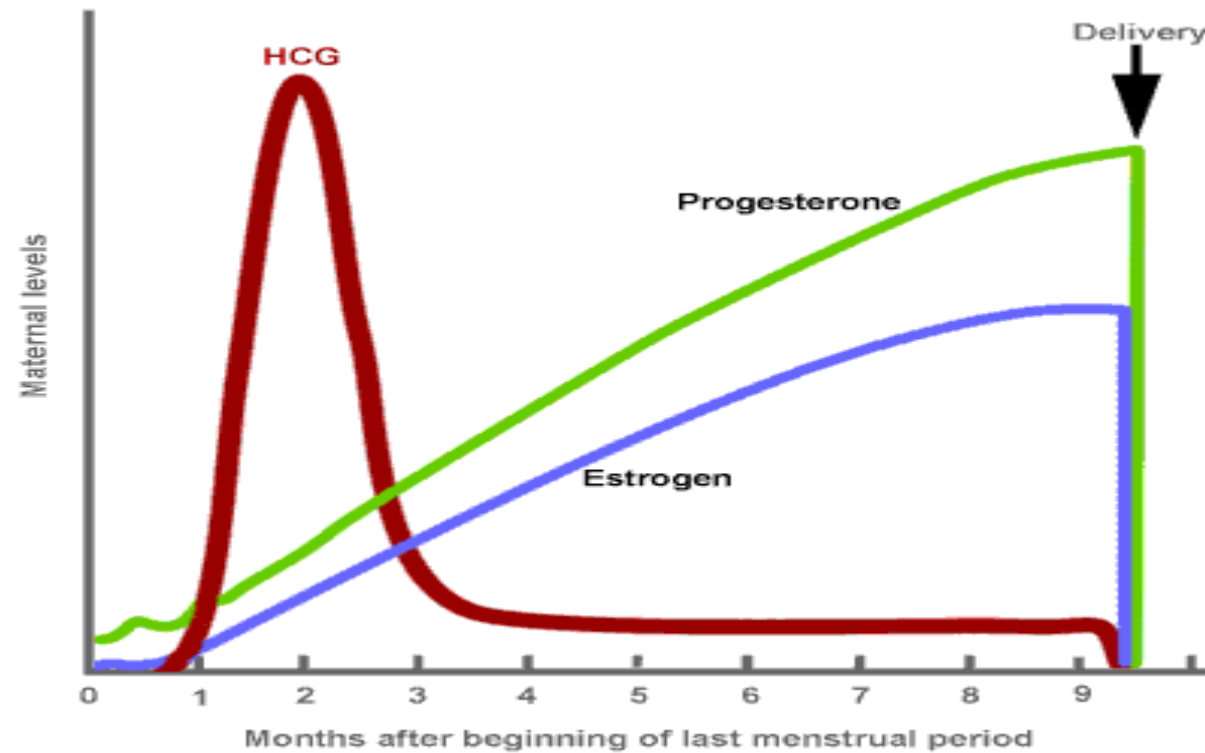




“Entering motherhood is the most significant biological event that happens in your life causing profound and permanent brain changes.”

Jodi Pawluski PHD

# Hormones across pregnancy

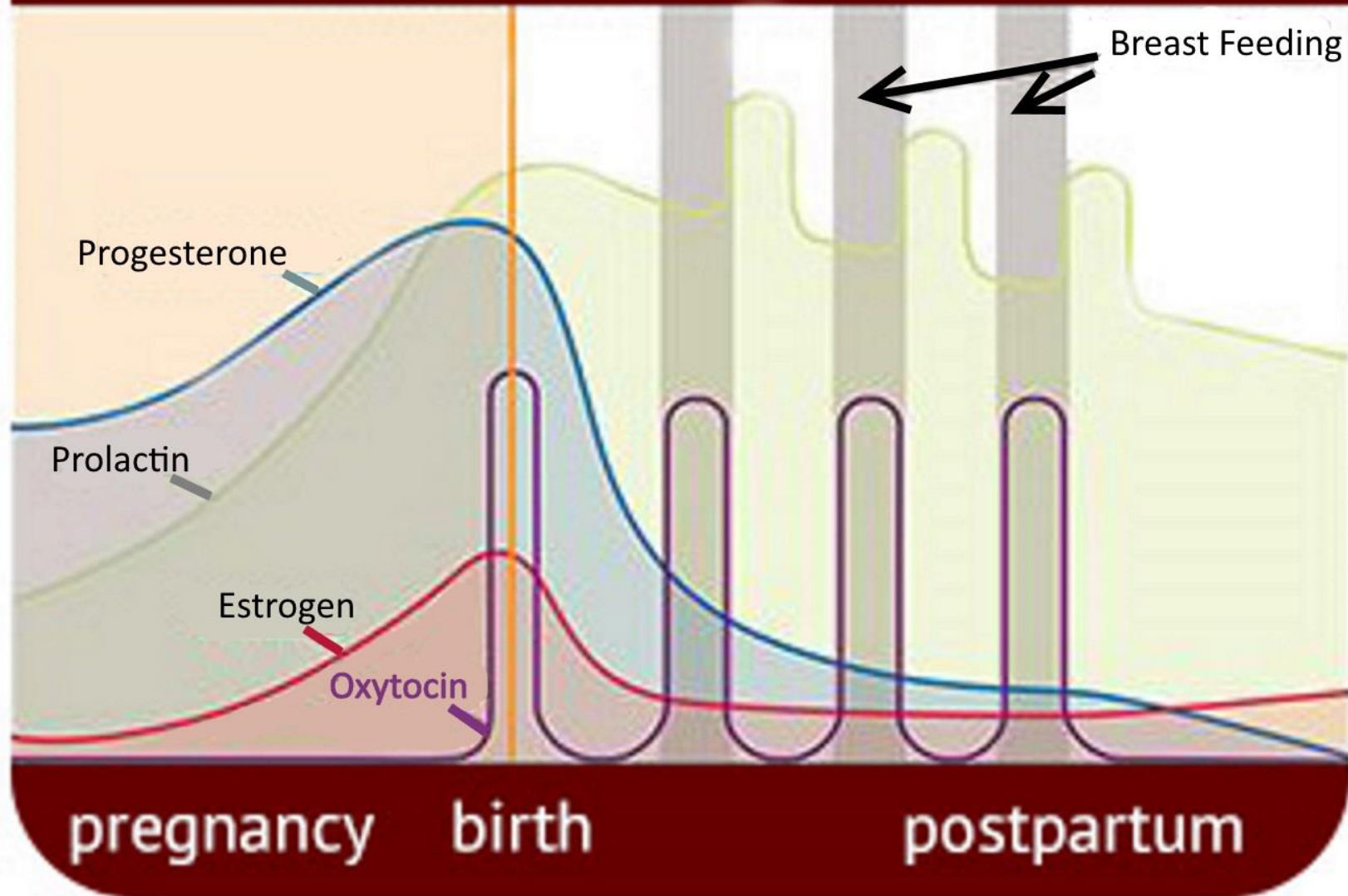




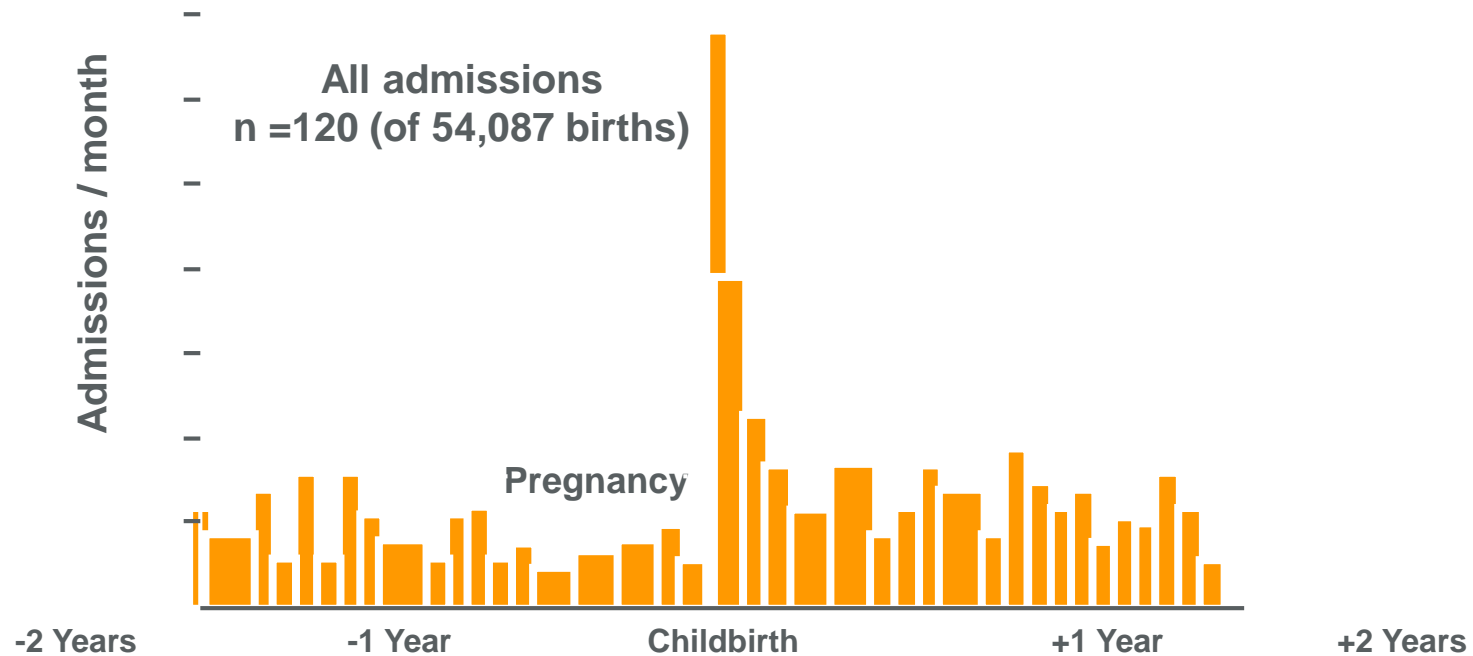
# Brain changes in motherhood

- Enable her to multitask to meet her babies needs
- Emphasize with the infants emotion and pain
- Regulate how she responds to stimuli or threats
- Sync her brain with her babies for life
  - Synchronized brain responses
  - Matching responses in gaze, touch and vocalization

# hormone levels of lactation



## Impact of Reproductive Cycle: Psychiatric Admissions in the 2 Years Preceding & Following Childbirth



Kendall RE et al. Br J Psychiatry 1987;150:662-673.  
Grof P et al. J of Affect Disorders 2000;61:31-39.  
Viguera AC, et al. Can J Psych 2002;47:426-436.

# Perinatal Mood and Anxiety Disorders (PMADs)





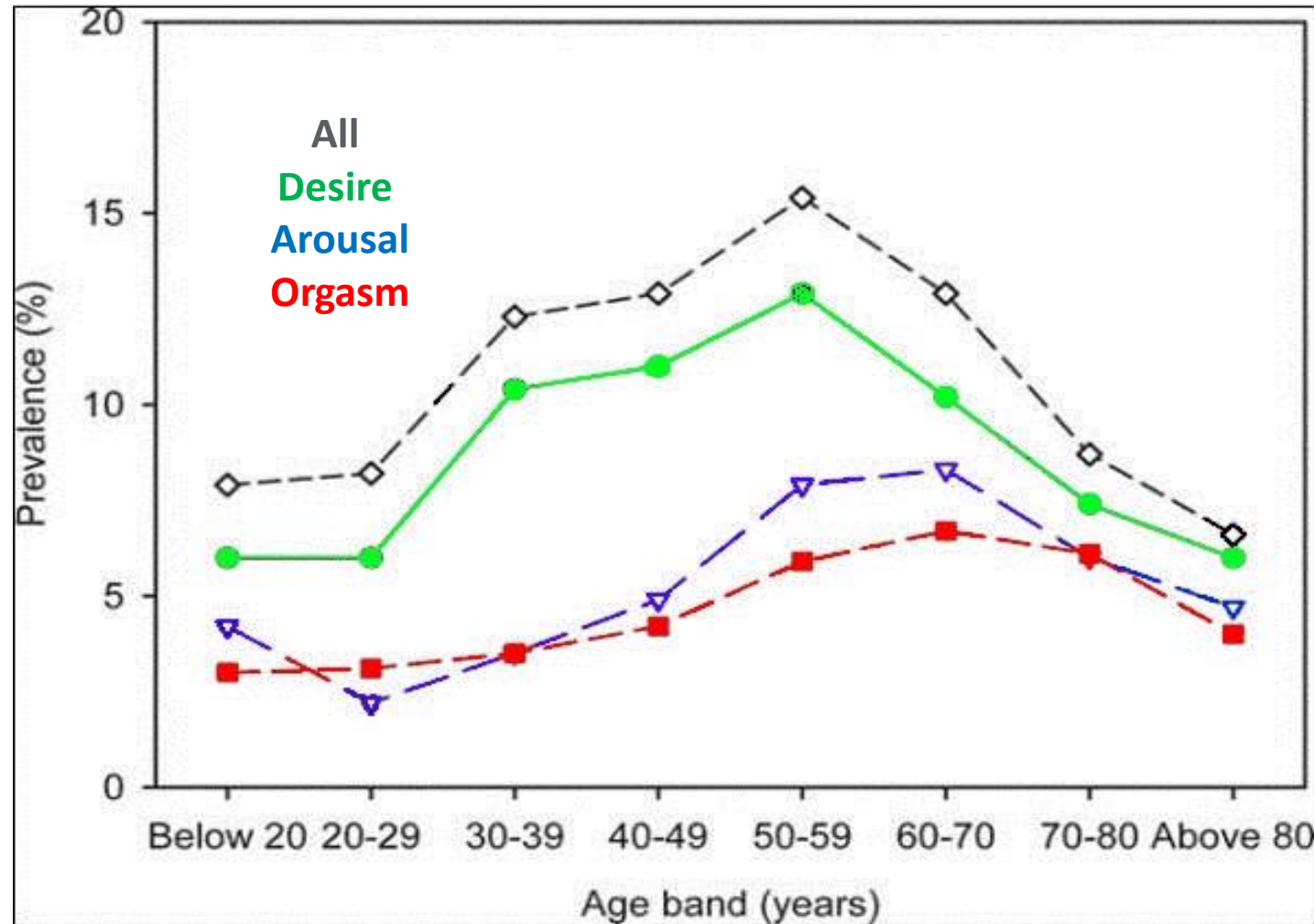


# Menopause



- In 1900, average age of menopause=45
  - Life span = 49 years old
- Today, women experience menopause between 45-55
  - Average life span = 75 years
  - 20-30 years or more are post menopause

# Sexual Problems/Distress in US Women: Prevalence and Correlates\*



Shifren, Jan; Monz, Brigitta; Russo, Patricia; Segreti, Anthony; Johannes, Catherine: Obstetrics & Gynecology. 112(5):970-978, November 2008

\*Recent data suggest prevalence same in women who identify as lesbian or bisexual

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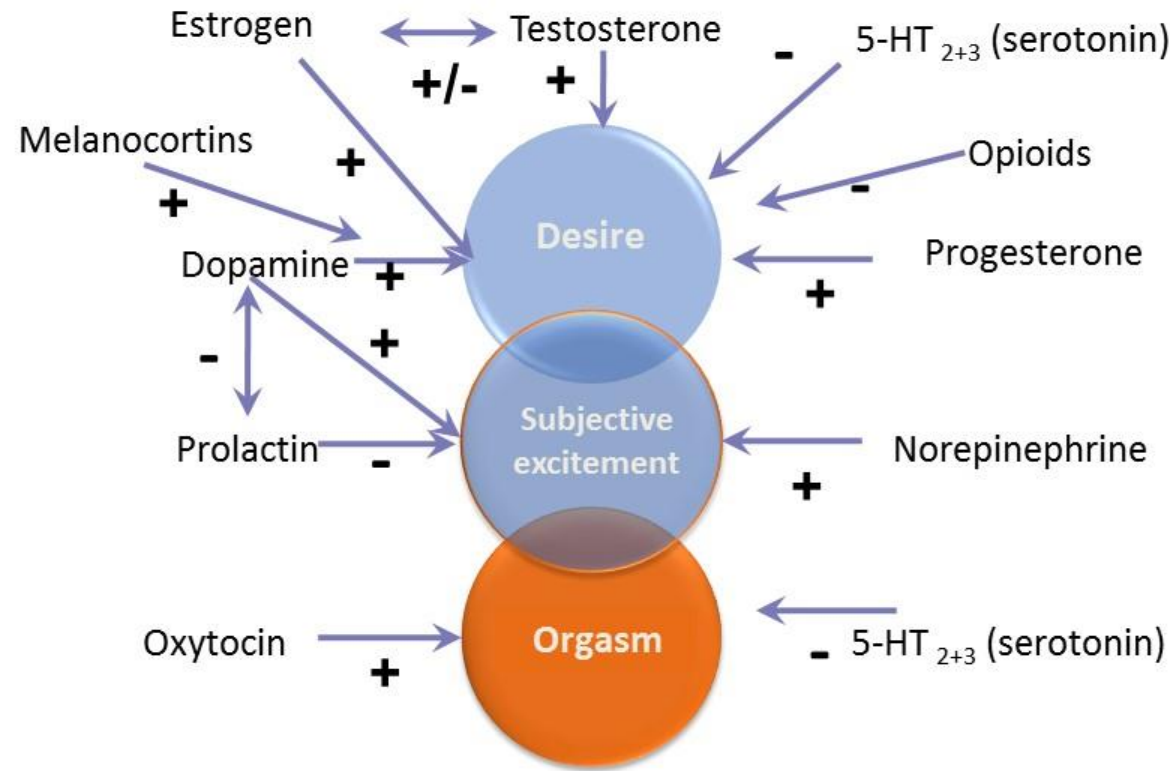
# Women and Sexuality

- Context
- Emotional reciprocity
- Rise and decline of libido
- Sensitivity to stress





# Central Effects of Neurotransmitters and Hormones on Sexual Functioning

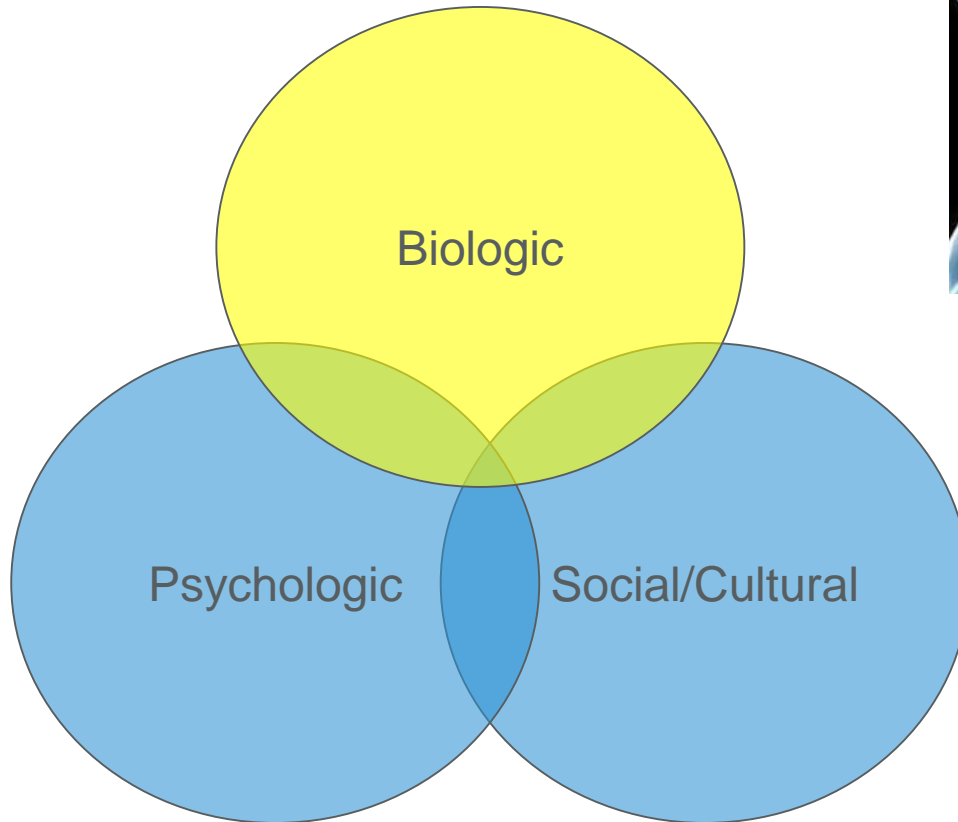


This image was published in the Journal of Sexual Medicine, Vol 4. Clayton AH, Epidemiology and neurobiology of female sexual dysfunction. Copyright Elsevier 2007.

# Expression of Psychiatric Illness by Gender

More common in Males	More common in Females
Antisocial Personality Disorder/ Behavior	Depressive Disorders
Autism	Anxiety Disorders
Schizophrenia	Bipolar II disorder
Addiction	

# Male/Female Brain Differences: Treatment



# Available Antidepressants

SSRIs serotonin	SNRIs/Others serotonin and norepinephrine	Others dopamine,etc.
<b>Brintellix</b> (vortioxetine) <b>B</b> <b>Celexa</b> (citalopram) <b>G</b> <b>Lexapro</b> (escitalopram) <b>G</b> <b>Luvox</b> (fluvoxamine) <b>G</b> <b>Paxil</b> (paroxetine) <b>G</b> <b>Prozac</b> (fluoxetine) <b>G</b> <b>Viibryd</b> (vilazodone) <b>B</b> <b>Zoloft</b> (sertraline) <b>G</b>	<b>Cymbalta</b> (duloxetine) <b>G</b> <b>Effexor</b> (venlafaxine) <b>G</b> <b>Fetzima</b> (levomilnacipran) <b>B</b> <b>Pristiq</b> (desvenlafaxine) <b>B,G</b>	<b>Wellbutrin</b> (Bupropion) <b>Remeron</b> (Mirtazapine)
Inhibit the reuptake of serotonin (5HT)	Inhibit serotonin and norepinephrine reuptake	

**G**=Generic; **B**=Brand



# Medication treatment for Depression and Anxiety in Women across her life span

## Antidepressants

- Moderate to severe depression or anxiety across the course of her lifespan
- Most effective if in combination with psychotherapy

- Effect in 2-6 weeks

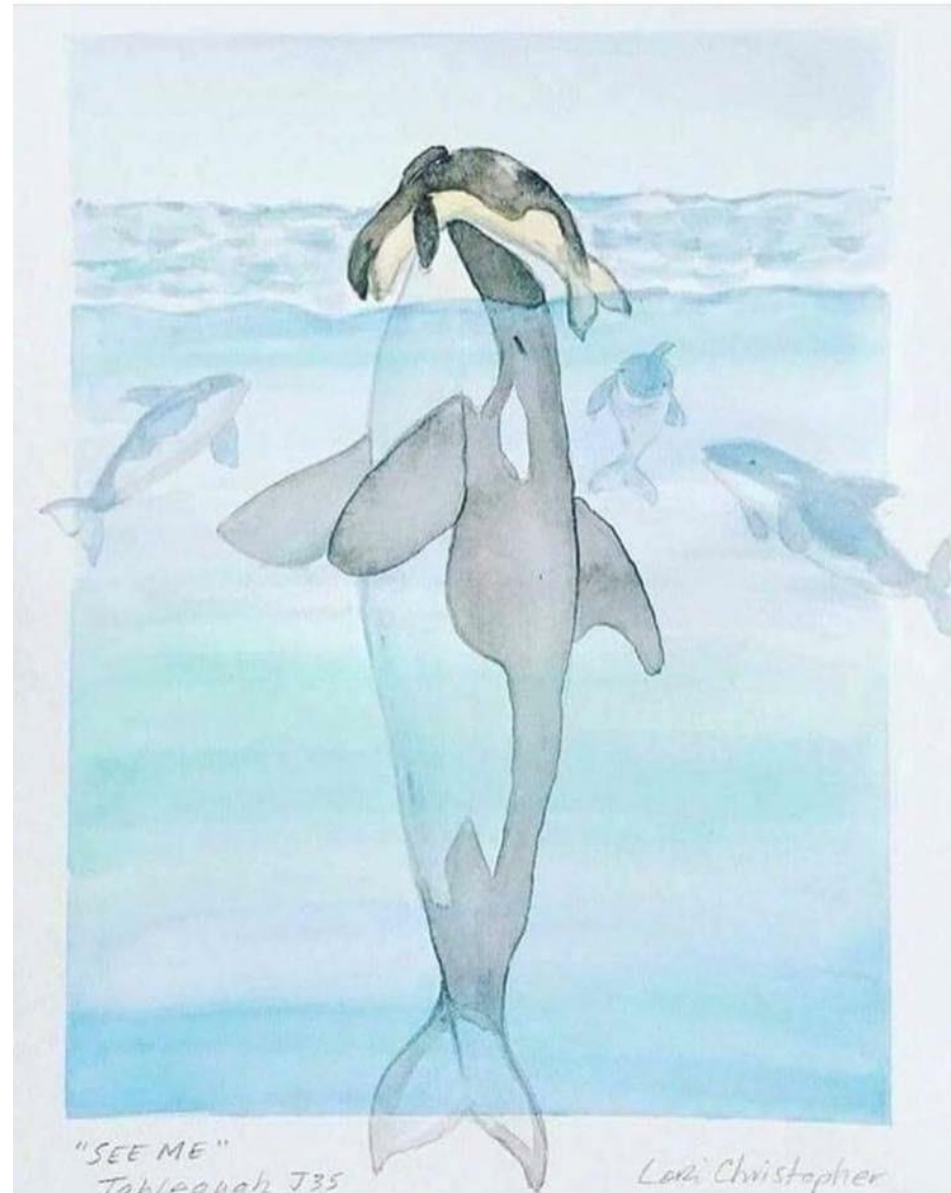
## vs. Hormone therapy

- Studies underway for PP Depression
- Use in PMDD
- Mild depression or anxiety if other symptoms are present in perimenopause
- In combination with SSRIs for severe depression in menopause
- Surgically induced menopause
- Low Libido (testosterone)

(Oxytocin in boys)

- Effect in 1-4 weeks

# Women's Hormones: *Grit and Grace*





# Further Reading

## Books

Women's Moods: Deborah Sichel MD

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The Female Brain: Louann Brizendine MD