Ouick Review from class





Stress hormones 🗨 Glucocorticiods (GCs) include cortisol and corticosterone.

Sex Hormones

Two main classes of sex steroids are androgens and estrogens, of which suppressing the entire reproductive system. the most important human deriva- Menstrual problems gens and progestogens are consid- resulting in late period, missed period, etc. the testes less responsive to LH. ered "female sex hormones." alll types are present in each sex, albeit at different levels.

Men And Women Under Stress Abstract: Stress can be defined as a

real or interpreted threat to the physiological or psychological integrity of an individual that results in physiological and behavioral responses. While stress response is associated with various psychosomatic and psychiatric disorders, it is important to understand the underlying mechanisms that influence this association. Moreover, as men and women tend to react differently with stress both psychologically and biologically (**sexual dimorphism**), these differences also need to be studied in order to have a better understanding in the gender difference observed for many disorders and responses, which can have profound meaning in related medical treatments and education areas, etc.

Reproductive System

The stress-shift in hormone production helps us to respond to life-threatening situations by focusing hormone production for survival rather than procre ation. However, chronic stress and the shift in hormones can cause menstrual problems, erectile dysfunction, and even infertility.

Mechanism

When there is no stress, the hypothalamus produces GnRH, which stimulates the pituitary gland to produce the peripheral hormones -- luteinizing normone (LH) and follicle-stimulating hormone (FSH), acting on either ovaries or testes to produce estrogen, progesterone and testosterone respectively. While chronic stress takes place, the glucocorticiods produced by the adrenal gland will directly act on the hypothalamus to suppress GnRH production (red X). Researchers have now found that glucocorticiods also boost hypothalamic GnIH production (red star), which acts to reduce GnRH production as well as to directly lower pituitary secretion of sex hormones (red arrow), thereby

Sex-related disorders

tives are testosterone and estradiol, Under the stress response, reproductive 1. During stress, blood vessels don't dilate respectively. Other contexts will system, including the menstrual cycle, which fully and the sphincter fails to constrict. include progestogens as a third class is considered to be less necessary may be both contributing to erectile dysfunction. of sex steroids, distinct from andro- inhibited by the cortisol produced by the 2. Endorphins, which block pain during gens and estrogens. Progesterone is HPA axis. Cortisol signals the brain to stop stress, also block the release of LHRH the most important and only natu- releasing reproductive hormones estrogen (luteinizing hormone releasing hormone). rally occurring human progestogen. and progesterone. Both of these hormones In turn, a decrease in LHRH causes a drop Generally, androgens are considered are necessary to stimulate the menstrual in LH. FSH, which stimulates sperm forma-"male sex hormones", since they cycle. Due to the variance of women's cyclic tion, also declines. To add fuel to the fire, have masculinizing effects; estro- cycle, the stress effects can be inconsistent, cortisol, the main stress hormone, makes

Erectile dysfunction 🧉

Sexual activity is under the control of the autonomic nervous system, that ans WE CANNOT CONTROL ERECTILE DYSFUNCTION!! (nmune System 🛾

Gender may exert differential effects on the immune system by modulating Glucocorticoid (GC) sensitivity of proinflammatory cytokine production.

Mechanism

Cellular immunity is inhibited by estrogen, as it induces a shift in cytokine balance toward a type 2 cytokine response, which means to suppress the cell-mediated immunity. Proinflammatory cytokine production is inhibited by progesterone as well. This action of progesterone is mediated by its competitive binding to the GC receptor. Testosterone inhibits immune functions to some extent.

personal relationship & rumination Experiment thinking

depression independent of the Result & Conclusion

likely to ruminate on sad and anxious stress and alcohol cues. emotions than men whereas men are Limitation: tion has been linked to depressive psychopathology is still unclear. than men.

Cognitive Structure of women: inter- a. Stressed-men risk in alcohol-use disorders; Stressed-women risk in anxiety and depression

Healthy adult social drinkers (27 men, 27 women) were exposed to individually developed and calibrated Interpersonal relationships with a stressful, alcohol-related, and neutral-relaxing imagery, 1 imagery per session, on separate days and in focus on "pleasing others to avoid random order. Subjective emotions, behavioral/bodily responses, cardiovascular arousal [heart rate disapproval" pose significant risk for (HR), blood pressure (BP)], and self-reported alcohol craving were assessed.

effects of stressful life events for No gender differences in alcohol craving, systolic BP or HR were observed.

Men: For men but not women showing a greater inter- Women: Women [subjectively] eported and Women may also focus cognitively on gration of reward motivation and emotional stress displayed greater sadness and anxiety following sadness/anxiety more than system, alcohol craving was associated with greater stress than men. men—-for example, women are more subjective emotion and behavioral arousal following

more likely to distract attention away 1. The logics, such as the cause and effect sequences, of from these emotional states. Rumina- how these gender differences develop and risk for

and anxious symptoms, symptoms 2. The sample for present study is relatively small, with which are more common for women groups of intersection of gender and ethnicity neglected.

Female sex hormones attenuate the sympathoadrenal and HPA responsiveness. This leads to sluggish cortisol feedback on of the stress response. Tendency of women stressed. to develop depression is related to the compromised cortisol feedback effects on HPA arousal.

Reaction to a stressor

Sympathetic branch of tha autonomic nervous system turns on.

Heart: running from a predator, catching a prey, fighting an opponent.....you want to have blood pumped to deliver quick energy to the muscles in your body, so you can run, punch, etc. You want your heart to beat faster. This is, o ourse, a beneficial adaptation in the right situation

 Lungs: make the airways bigger (dilate) as you want to take in as much oxygen as possible, again, to help fuel your body for a run or fight

Sweat glands: active to keep you from overheating during your run; some people also sweat when they are very nervous/embarassed (emotional stress) ("sweaty palms"

 Liver: sympathetic branch stimulates glucose production and release – again fuel for fighting/running

 Digestive system: shuts down – we can get existing, easy to use energy from sources other than the food that is in our stomach, so digestion shuts down to conserve the energy used in that process (takes too long anyways, we want an immediate burst of energy; on the scale of seconds to

 Stimulates secretion of Epinephrine (E) and Norepinephrine (NE) from adrenals – these are stimulatory substances which can go into the circulation to further amplify the sympathetic response

However, the researches on "fight-or-flight" response have been majorly conducted on males, especially on male rats. Even when women are included, the stress studies remains heavily dependent on the specific topics confounded by sex. While the basic neuroendocrine core of stress response doesn't seem to substantially vary between sexes, due to the different challenges faced by women under condition of stress such as those arising from maternal investment in offspring, the mechanisms may evolve to adapt behaviors of "tend and befriend" than "fight or flight".

Model "Tend and Befriend" than "Fight or Flight" for women

buffer the sympathetic and HPA arousal. behavior in response to stress. Limitation

1. Oxytocin and endogenous opioids are neither necessary nor sufficient bases for the behavioral responses identified. 2. Little consideration of the nature of the stressor in moderating stress responses.

3. Females' stress response is greatly affected by cyclical variation by reproductive system, which can lead to confusing, uninterpretable, inconsistent results.

b. Stressed-women reach out. befriend Experiment

The researchers measured levels of the stress hormone cortisol from saliva samples collected from 47 predominately observed in the male brain, suggesting a greater acute HPA volunteers. Next, half of the men and half of the women were asked to immerse their hands in nearly freezand autonomic responses corresponding to the "fight or flight" model. ing water for up to three minutes, while the others dipped their hands in comfortably warm water. Both groups then had their brains scanned using functional magnetic resonance imaging (fMRI), which measures blood flow to different brain areas. The participants completed some tasks unrelated to the study, **Conclusion:** A gender-specific neural activation model underlying the before giving another saliva sample for stress-hormone levels. After that, the researchers continued the central stress response has been observed, including asymmetric prefrontal activity in males and, primarily, limbic activation in females. brain scan while participants watched images of 160 faces, 80 angry and 80 neutral. Limitation: **Reference**: **Results & Conclusion**

The researchers found that the men and women who had been given the ice water were equally stressed by the experience, judging by their cortisol levels. Men: Viewing either neutral or angry faces, men's Women: By contrast, women seemed more attuned brains showed a decrease in activity in the fusiform to recognizing facial expressions facial area, which helps with facial recognition. No comparable fluctuations is found based on estro-What's more, the higher the **testosterone** levels to **gen** levels. the brain and less or delayed containment begin with, the lower the FFA activity when

> When women are stressed, social and emotional areas of the brain go on alert, perhaps reflecting a tendency to **reach out**, while the same areas in men's brains seem to disengage. This pattern is consistent with the "fight or flight" for men while "tend and befriend" model for women.





Oxytocin is associated with parasympathetic nervous system, also released in birth and lactation. It has been found to enhance sedation and relaxation, reduce fearfulness, and decrease sympathetic activity, patterns of responses that are antithetical to the fight-or-flight response.

In females, the stress response specifically builds on attachment care-giving processes, which tends to

Fight-or-flight response may be heavily tied to androgenic pre- or postnatal organization of an aggressive response to threat that is activated, in part, by testosterone. In contrast, women's sympathetic and HPA responses may be downregulated by **oxytocin** under stressful circumstances and that oxytocin, coupled with endogenous opioid mechanisms and other sex-linked hormones, may foster maternal and affiliative



nportant for sex differences under stress response?



The amygdala, crucial for memory of emotional events, reacted Serotonin production was a remarkable 52 percent higher on averdifferently in men and women who viewed emotionally arous- age in men than in women, which might help clarify why women are ing slides, such as of a decaying animal. Men who reported more prone to **depression**—a disorder commonly treated with strong responses showed greatest activity in the right hemi- drugs that boost the concentration of serotonin. sphere amygdala, whereas women showed greater activity in story (by hampering the right-ability to come up with the treat women's depession. precise details (by hampering the left amygdala--details (by hampering the left amygdala).



MALE

the left amygdala. Further studies suggest that the hemispheric Implication: Physicians may need to consider the sex of patients sex differences in amygdala activity cause women to be more when meting out their medications. It's already demonstrated that likely to retain details of an emotional event and men more drugs such as propranolol which used to dampen the activation of likely to remember its gist. If that conception is true, we the amydala diminish memory for traumatic situations work in reasoned, a drug that dampens the activity of the amygdala women but not in men, probably due to the different activation in should impair a man's ability to recall the gist of an emotional amygdala. What's more, serotonin is frequently used as a drug to

FEMALE

Spines are the sites where dendrites receive excitatory signals from other neurons.



tudy3: Hippocampaus under acute stress vs. chronic stres Acute stress: A brief exposure to a series of one-second tail shocks, acting as the short-term stress caused the density of dendritic "spines" in hippocampal neurons to increase in male rats but to decrease in female rats.

Chronic stress: In contrast, long-term stress may leave the male hippocampus more vulnerable to harm. When exposed to chronic stress, the male rodents' hippocampal nueurons than females' suffered more damage to a nerve toxin than same-sex controls did. Implication: The hippocampus is involved in learning and memory. While short-term stress seems to induce anatomical changes facilitating learning in males and reducing in females, females appears to be more tolerative in chronic stress. Due to hippocampus' different reactions for sexes under stress, optimal learning environments different for boys and girls may also be considered in education. Limitation: Experiment done on rodents may not directly apply to situations in human.

c. Stressed-men more aggressive, withdrawl, less fear; stressed-women more emotional "rewinding

Men: It was observed that the Right Parieto-Frontal Cortex (RPFC) is activated Women: The role of ventral striatum along with several and Left Orbitofrontal Cortex (LOrF) is suppressed by stress. RPFC is an limbic regions has been implicated in learning, reward, important part of the negative emotion and vigilance systems, evident in motivation, and emotion. moderating and inhibiting Dorsal Anterior Cingulate Cortex (DACC) and amyg- Under "tend and befriend" model, weaker RPFC regula-

dala hyperactivities, while LOrF is associated with positive emotion and tion resulting in persistent DACC activation in females hedonic goals. Under "fight or flight," RPFC activation and LOrF deactivation with stress is

might predispose women to mood disorders and depres**sion** than immediate stress response in "fight or flight". Persistent cingulate activation, the observed limbic activation to stress in females suggests a greater degree of **emotional "rewinding"** (melancholy thinking) or reflection of own emotional traits, consistent with the model of "tend and befriend."

1. The majority of emotional stimu employed in existing Functional Magnetic Resonance I maging (fMRI) studies (eg, fearful faces) lack critical features of a standard psychosocial stress paradigm. Such a paradigm comprises motivated performance tasks along with social-evaluative threat and/or subjective feelings of uncontrollability. Factors such as type of stressor/challenge, experimental procedure, outcome measured, subject status, and modulation by other stress mediators may all serve to influence the findings.

0. Dr. Porter's PPT, (2017). ccst 9046 The Science of the Mind-Body-Health Relationsihp 1. Verma, R., Balhara, Y. P. S., & Gupta, C. S. (2011). Gender differences in stress response: Role of developmental and biological determinants. Industrial psychiatry journal 20(1), 4–10. 2. Chaplin, T. M., Hong, K., Bergquist, K., & Sinha, R. (2008). Gender Differences in Response to Emotional Stress: An Assessment Across Subjective, Behavioral, and Physiological Domains and Relations to Alcohol Craving. Alcoholism, clinical and experimental research, 32(7), 1242–1250. 3. Cahill, L. (2012). His Brain Her Brain. Sicentific American. Retreived from https://www.scientificamerican.com/article/his-brain-her-brain-2012-10-23/ 4. Goliszek, A. (2014). The Stress-Sex Connection. Psychology Today. Retrieved from https://www.psychol-

ogytoday.com/blog/how-the-mind-heals-the-body/201412/the-stress-sex-connection 5. University of California - Berkeley (2009). Stress Puts Double Whammy On Reproductive System, Fertility. ScienceDaily. Retrieved from www.sciencedaily.com/releases/2009/06/090615171618.htm 6. Pappas, S. (2010). Stress Brings Out the Difference in Male, Female Brains. Live Science. Retreived from https://www.livescience.com/10140-stress-brings-difference-male-female-brains.html 7. Kuoppala, A. (2017). Stress and Testosterone: How Stress Chokeholds the Endocrine System. Anabolic Man. Retreived from https://www.anabolicmen.com/stress-and-testosterone/

Serotonin helps regulate mood, appetite, and sleep. High rate