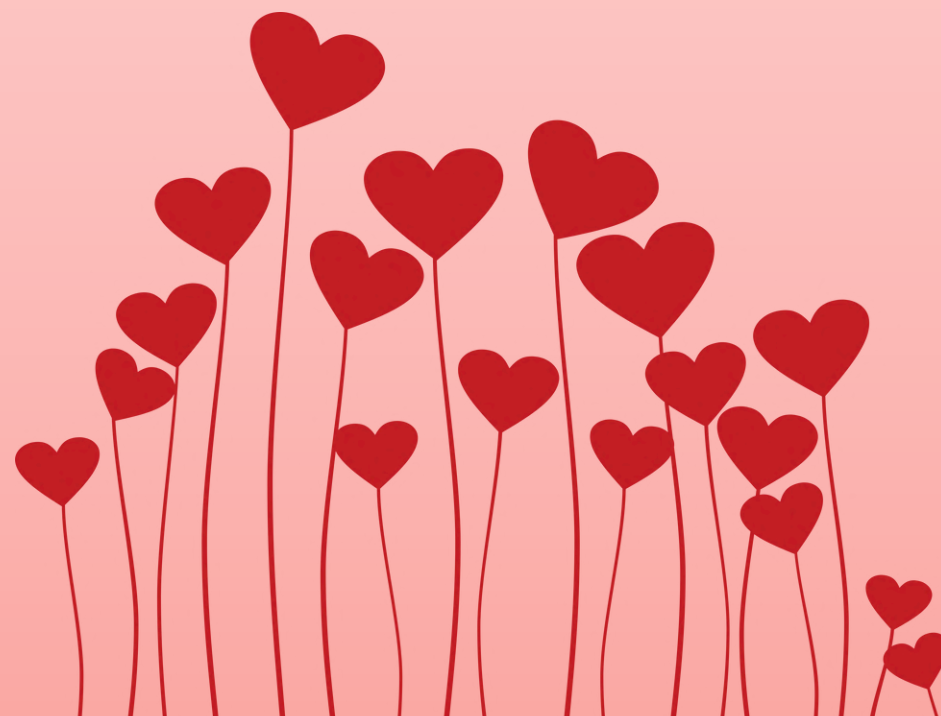


What's love got to do with it?

Love at the intersection of chemistry and sociology

Dr. Lisa Sullivan

Department of Chemistry



Dr. Jonniann Butterfield

Department of Sociology

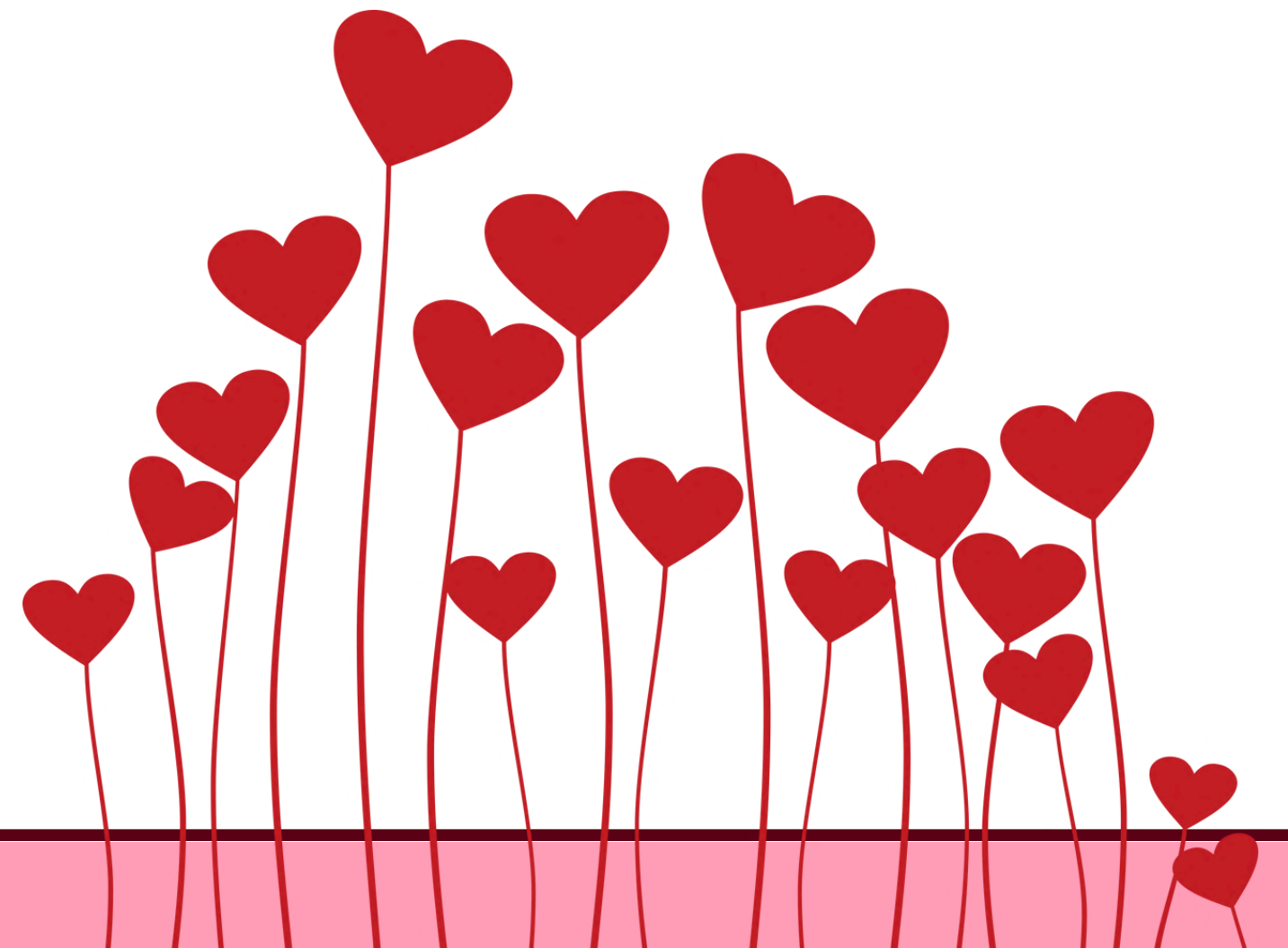
From birth to death, love is not just the focus on human experience but also the life force of of the mind, determining our moods, stabilizing our bodily rhythms, and changing the structure of our brains. The body's physiology ensures that relationships determine and fix our identifies. Love makes us who we are and who we can become.

Lewis et al. 2000 p. viii



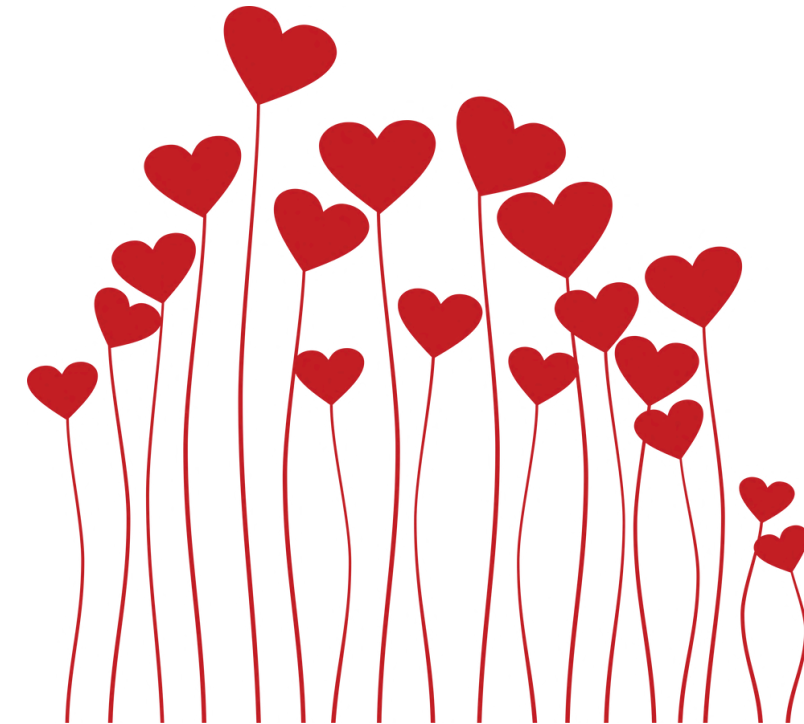
What is love?

- Complex chemical, biological, psychological and social emotion and experience
- Universal
- What is love not?



Love as a social construct

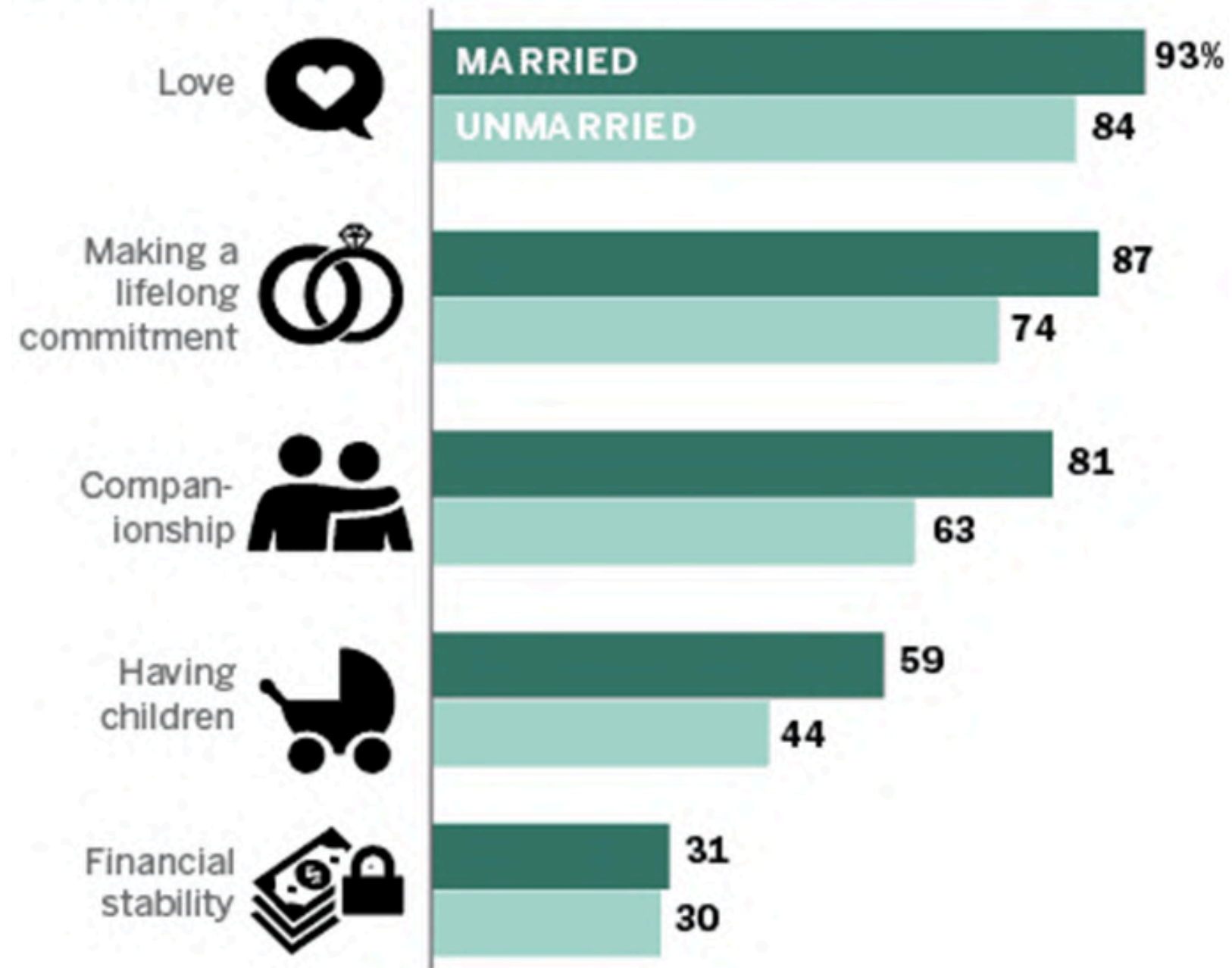
- Social construct / Social scripts
- Varies by historical epoch
- Pathways into relationship
- Individualism vs. collectivism, monogamy vs. non-monogamy, arranged marriage, love as basis for marriage





Why Get Married?

Percent saying each is a very important reason to marry, by marital status

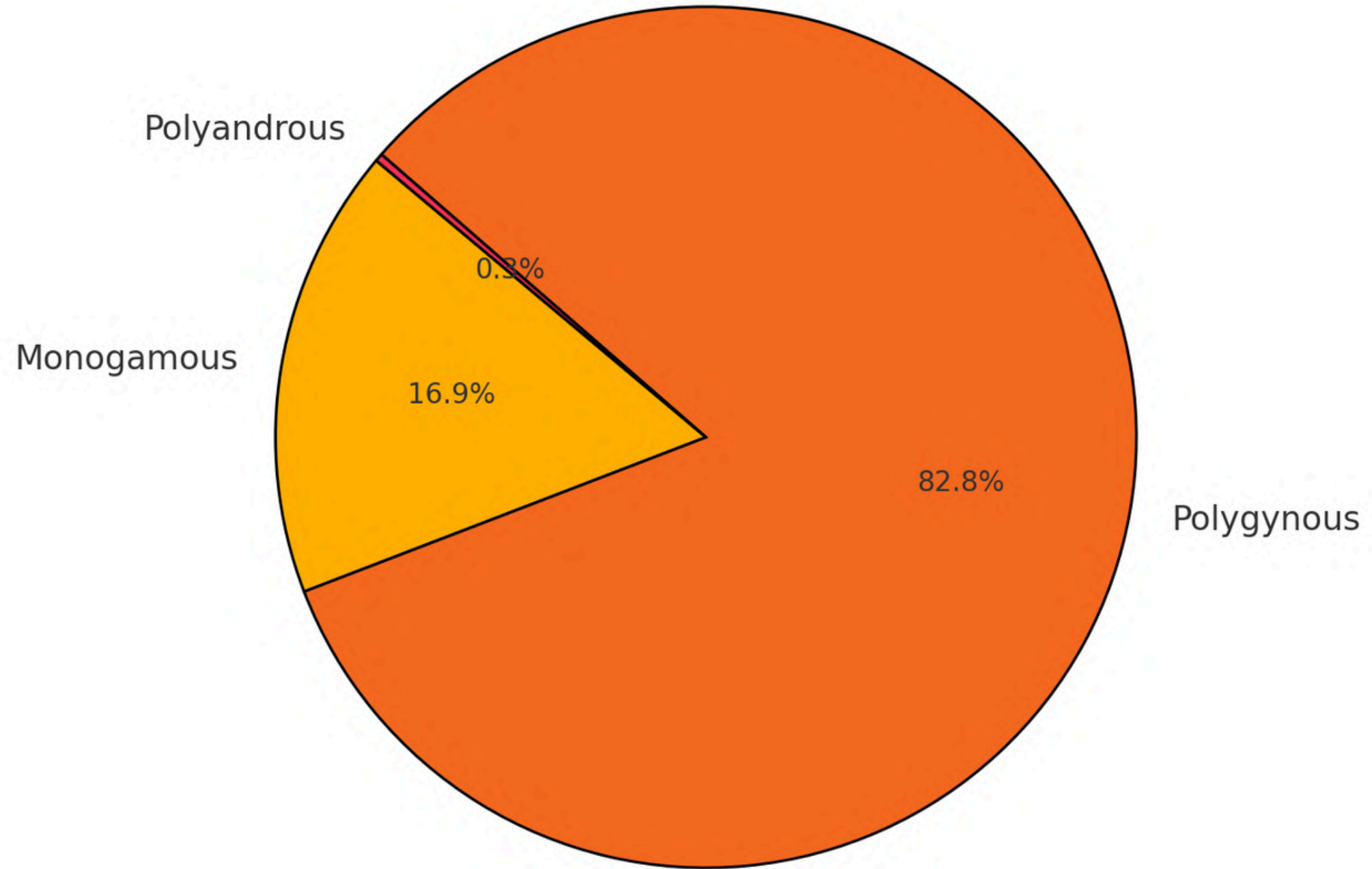


Asked of married and unmarried separately, n=1,306 for married and 1,385 for unmarried.

Pew Research Center



Marriage Systems Across Societies

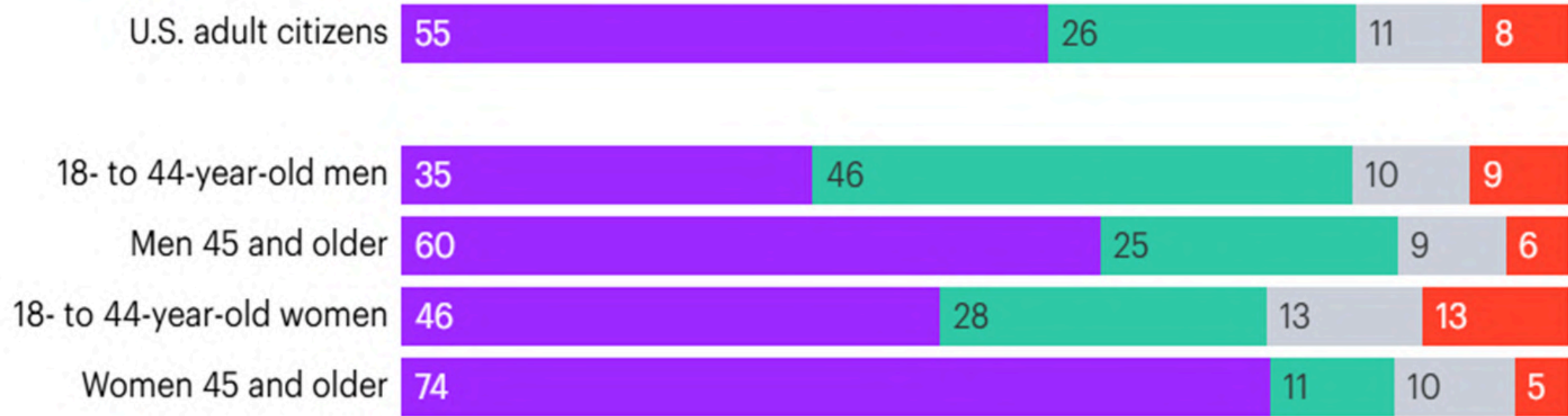




Most men under 45 years old say their ideal relationship is not completely monogamous

On a scale where 0 is completely monogamous and 6 is completely non-monogamous, what would your ideal relationship be? (%)

0 - Completely monogamous 1 - 5 Not sure 6 - Completely non-monogamous



YouGov

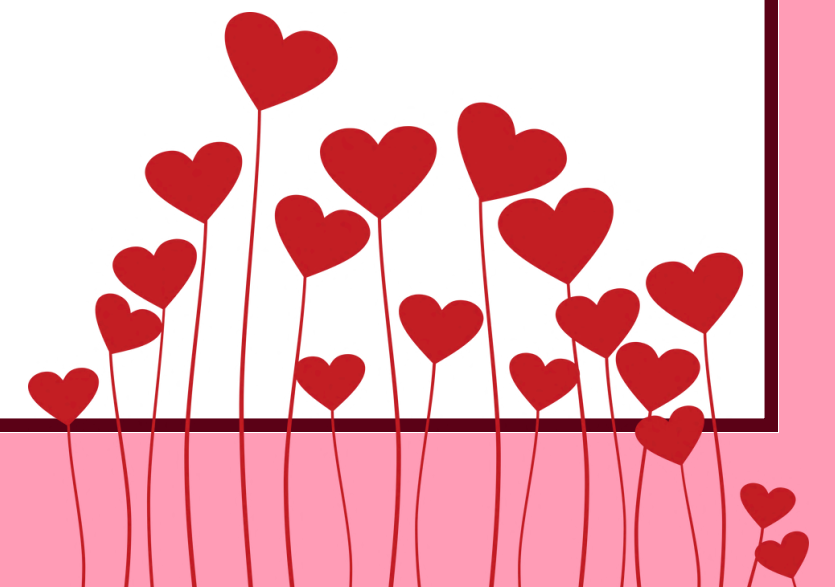
February 1 - 6, 2023



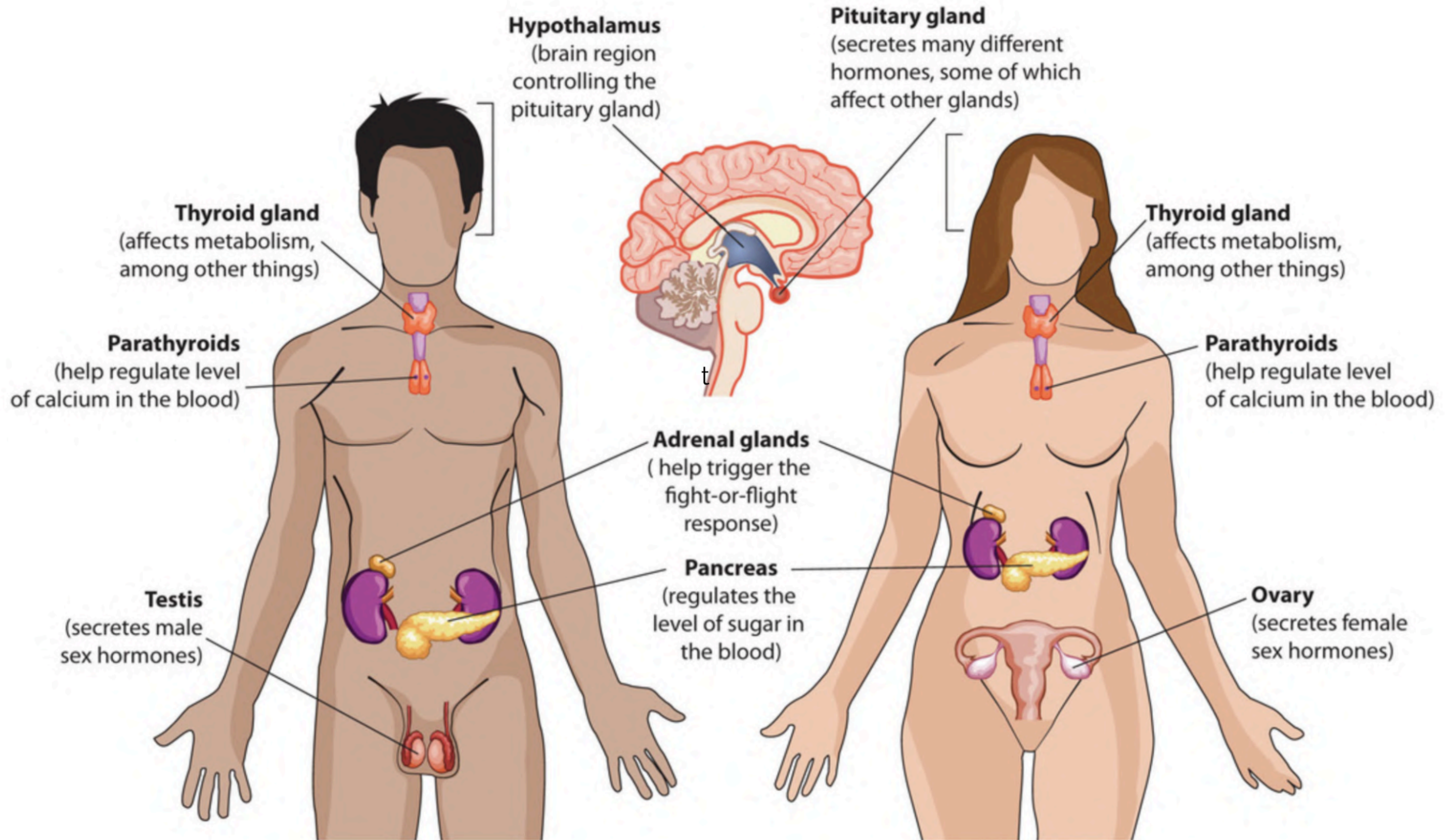
Hormones & Neurotransmitters in LOVE

- **Hormones** = chemicals produced in the endocrine system that travel throughout the bloodstream to signal a cell or organ
- **Neurotransmitters** = chemicals released by the central nervous system into the synapse between two nerves

Some chemicals can act as both a neurotransmitter in the brain and as a hormone in other parts of the body.

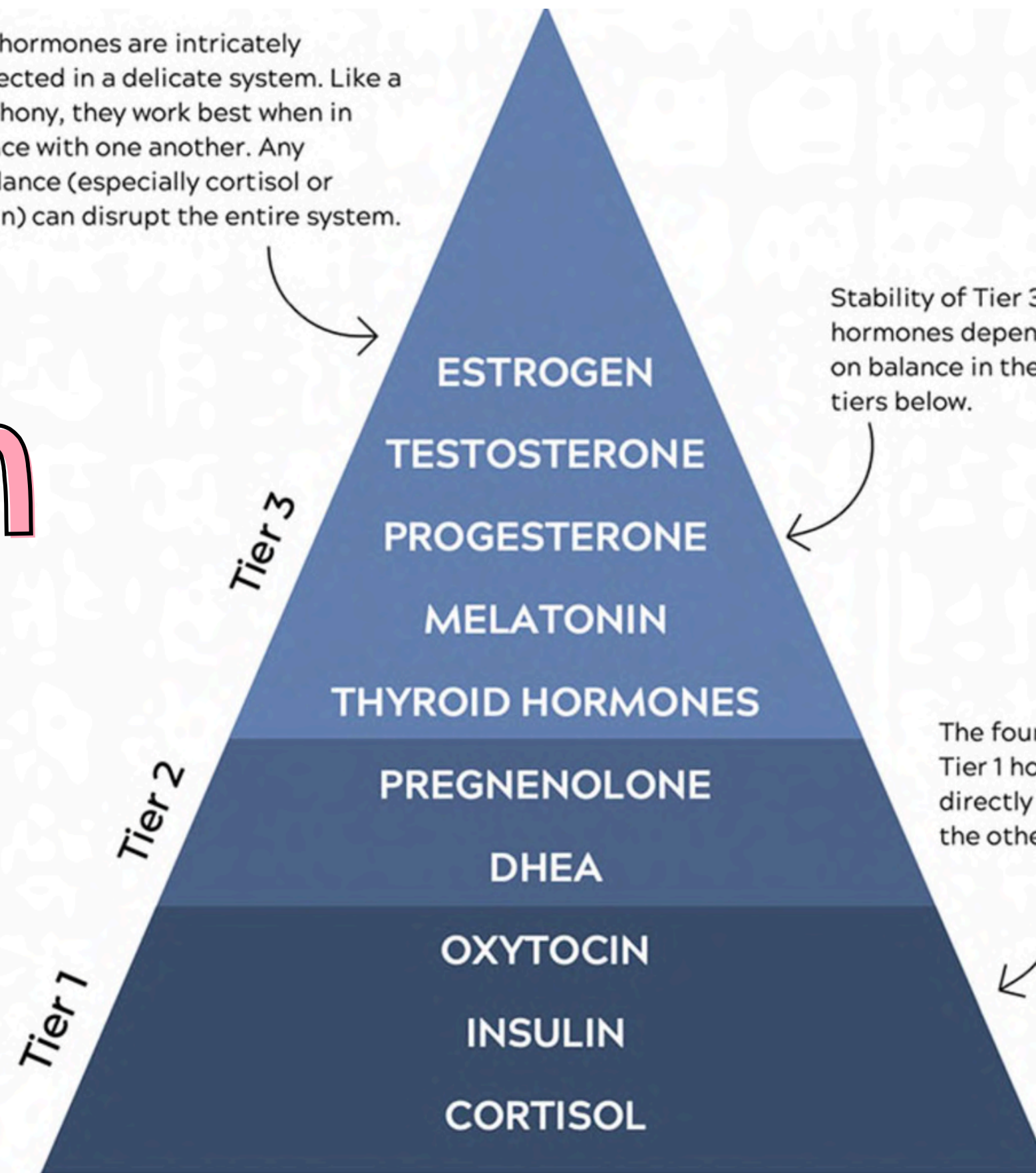


Endocrine System



Hormone Regulation

Your hormones are intricately connected in a delicate system. Like a symphony, they work best when in balance with one another. Any imbalance (especially cortisol or insulin) can disrupt the entire system.

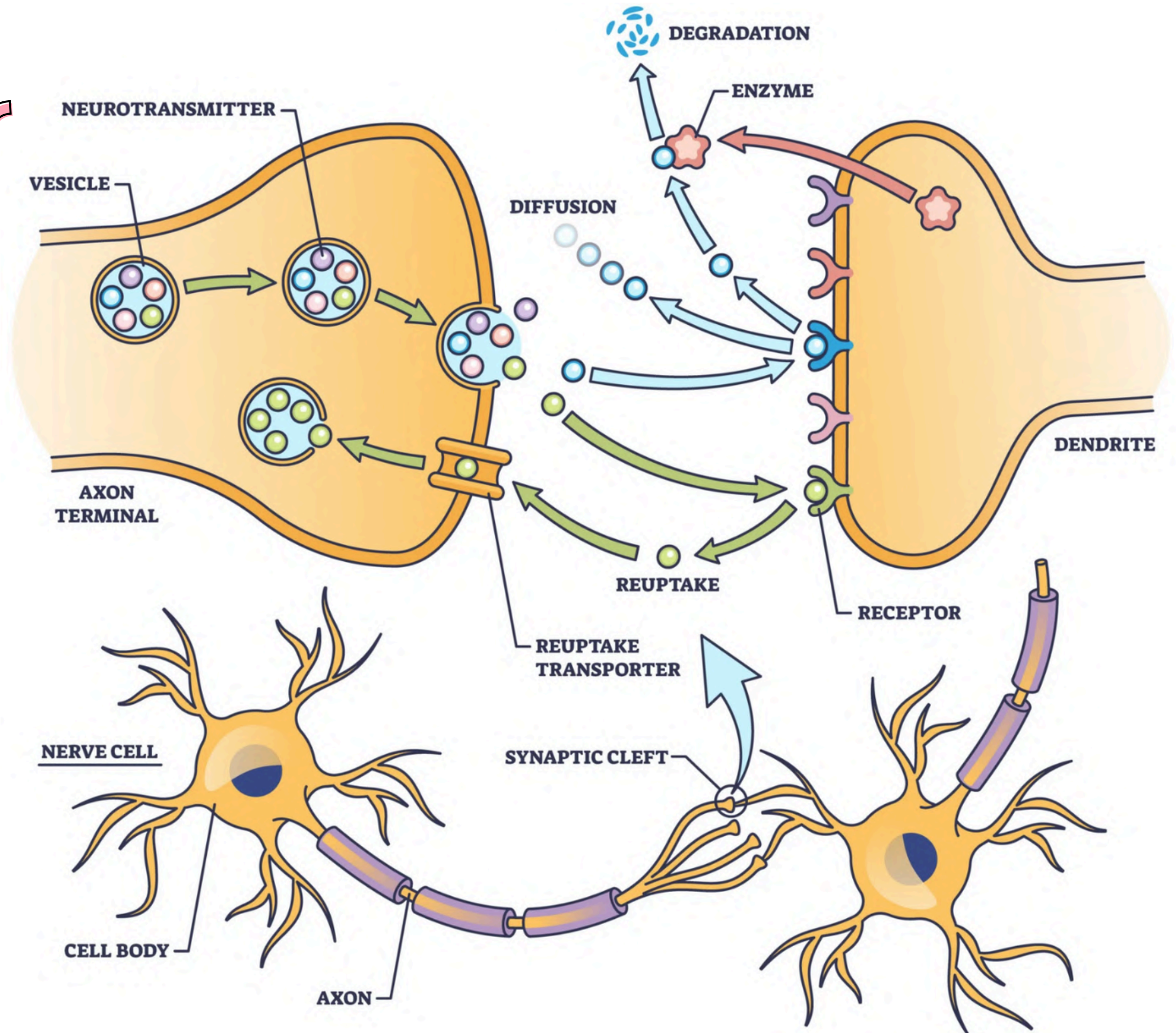


Stability of Tier 3 hormones depends on balance in the tiers below.

The foundational Tier 1 hormones directly impact all the others.



Neurotransmitter Function



NEUROTRANSMITTERS

ADRENALINE fight or flight

produced in stressful situations. Increases heart rate and blood flow, leading to physical boost and heightened awareness.

GABA calming

Calms firing nerves in the central nervous system. High levels improve focus, low levels cause anxiety. Also contributes to motor control and vision.

NORADRENALINE concentration

affects attention and responding actions in the brain. Contracts blood vessels, increasing blood flow.

ACETYLCHOLINE learning

Involved in thought, learning and memory. Activates muscle action in the body. Also associated with attention and awakening.

DOPAMINE pleasure

feelings of pleasure, also addiction, movement and motivation. People repeat behaviors that lead to dopamine release.

GLUTAMATE memory

Most common neurotransmitter. Involved in learning and memory, regulates development and creation of nerve contacts.

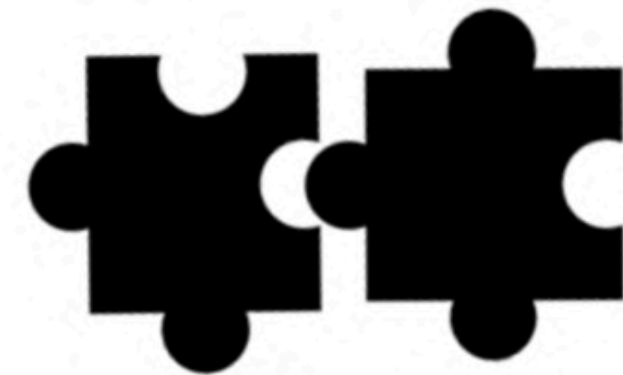
SEROTONIN mood

contributes to well-being and happiness. Helps sleep cycle and digestive system regulation. Affected by exercise and light exposure.

ENDORPHINS euphoria

Released during exercise, excitement and sex, producing well-being and euphoria, reducing pain

Scientific of Stages of Love



Lust

Testosterone
Estrogen

Attraction

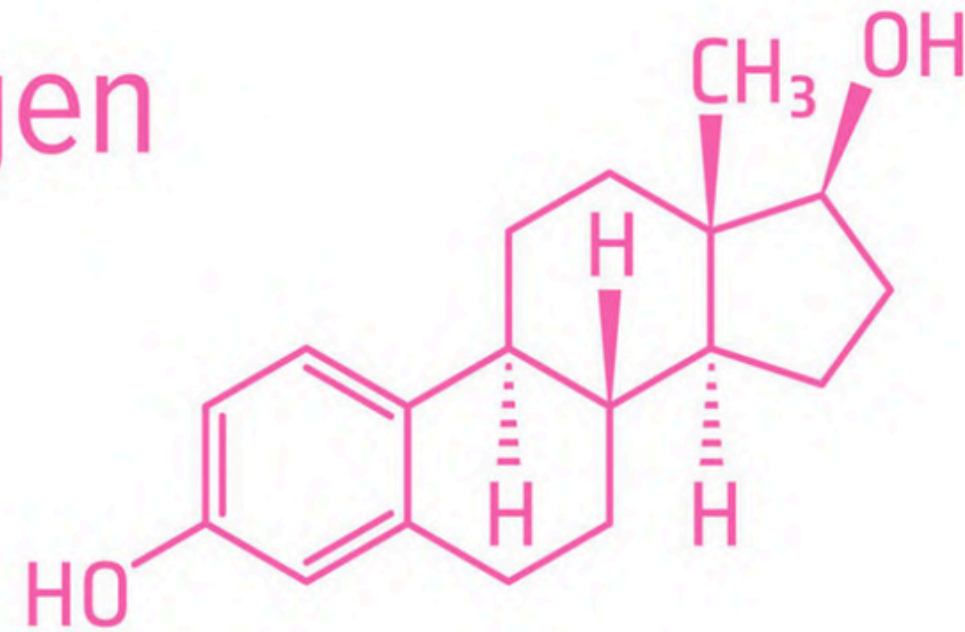
Dopamine
Norepinephrine
Serotonin

Attachment

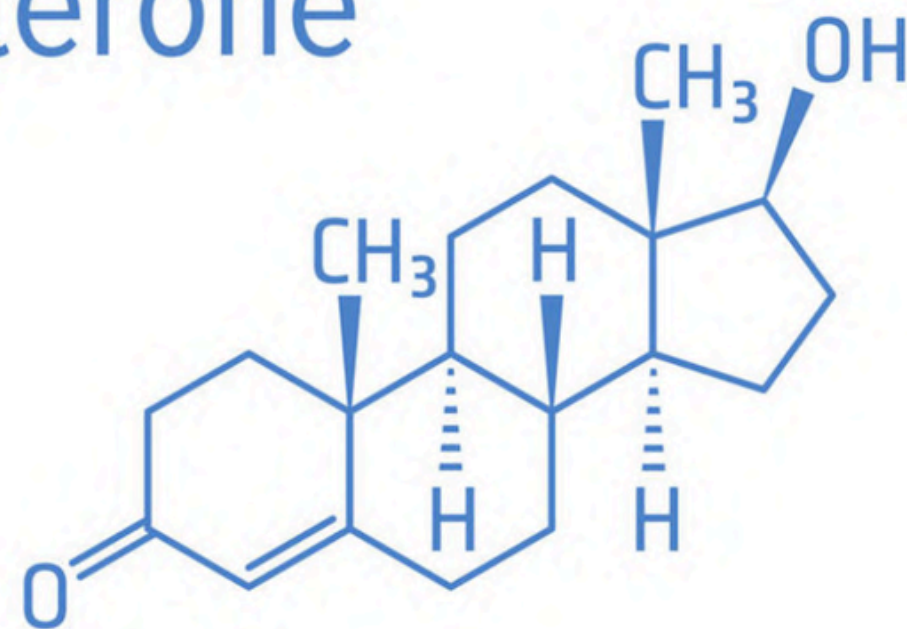
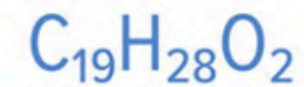
Oxytocin
Vasopressin

LUST: Sex Hormones

Estrogen



Testosterone



Attraction

DOPAMINE

Pleasure neurotransmitter



Feelings of pleasure, and also addiction, movement, and motivation. People repeat behaviours that lead to dopamine release.

NORADRENALINE

Concentration neurotransmitter



Affects attention & responding actions in the brain, & involved in fight or flight response. Contracts blood vessels, increasing blood flow.

SEROTONIN

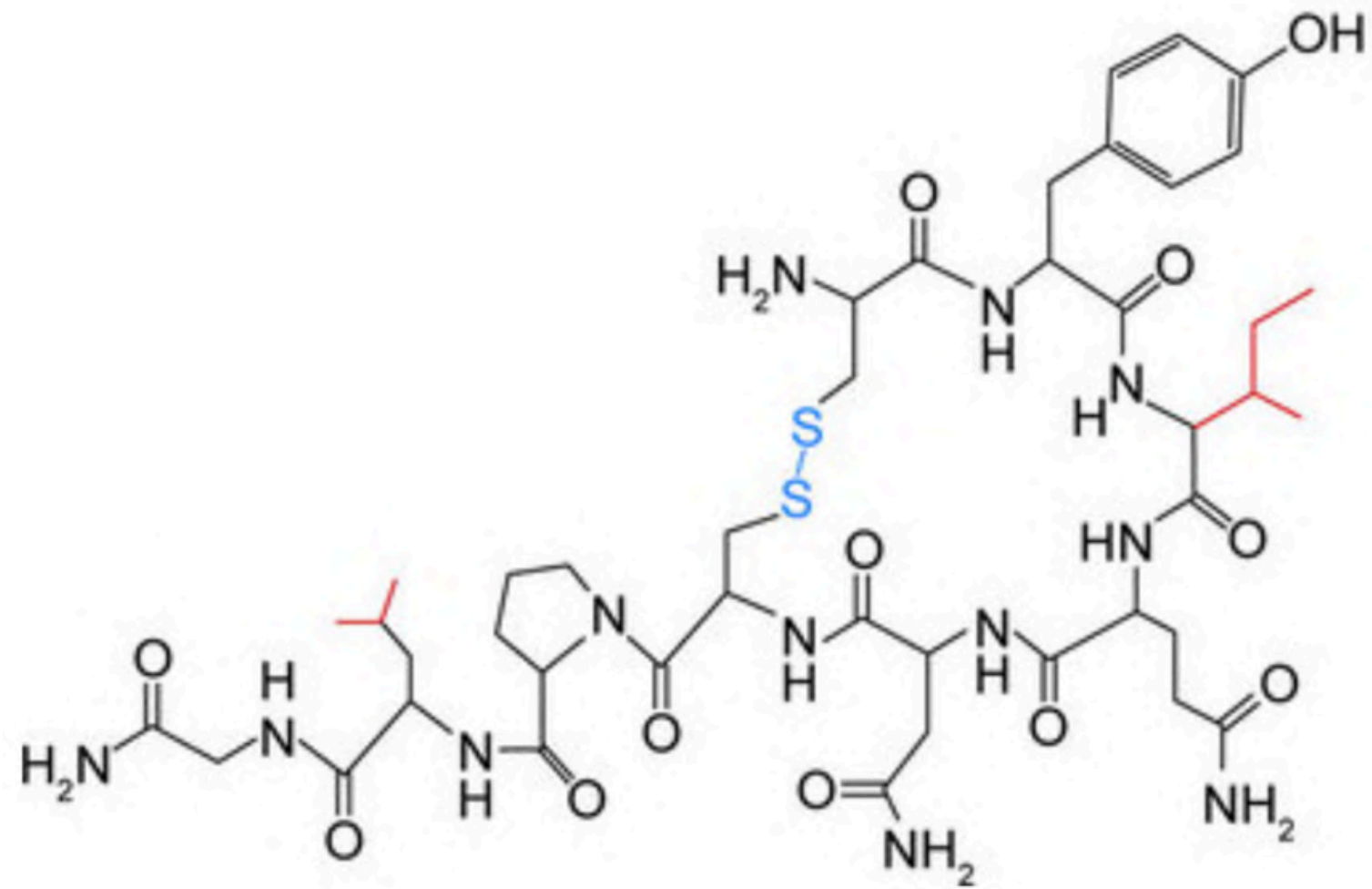
Mood neurotransmitter



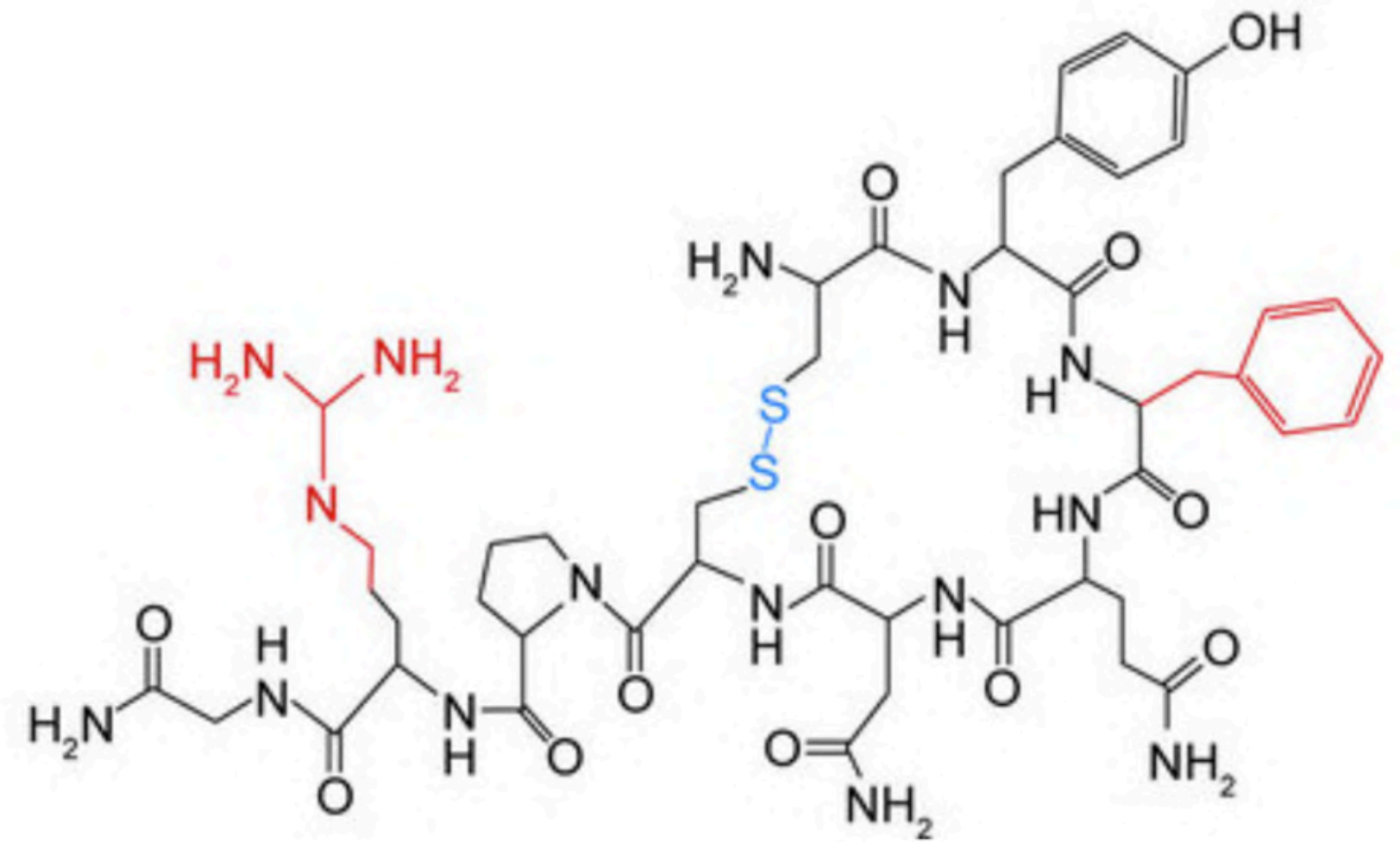
Contributes to well-being & happiness; helps sleep cycle & digestive system regulation. Affected by exercise & light exposure.

Attachment

Oxytocin



Vasopressin



EMOTIONS & CHEMISTRY OF HORMONES

LOVE



DOPAMINE SEROTONIN OXYTOCIN

HAPPINESS



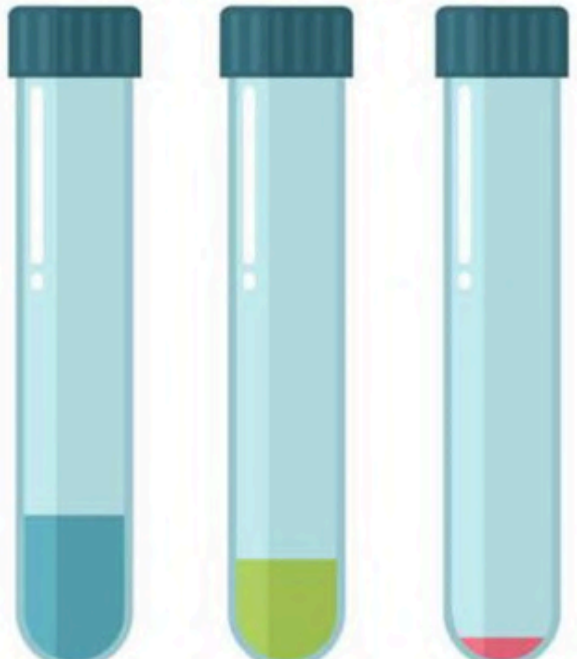
DOPAMINE SEROTONIN OXYTOCIN

ANGER



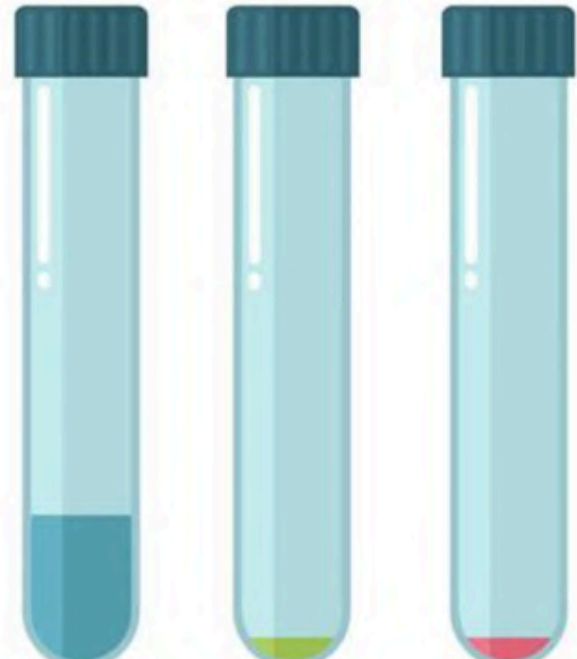
NORADRENALINE

DEPRESSION



DOPAMINE SEROTONIN OXYTOCIN

ANXIETY



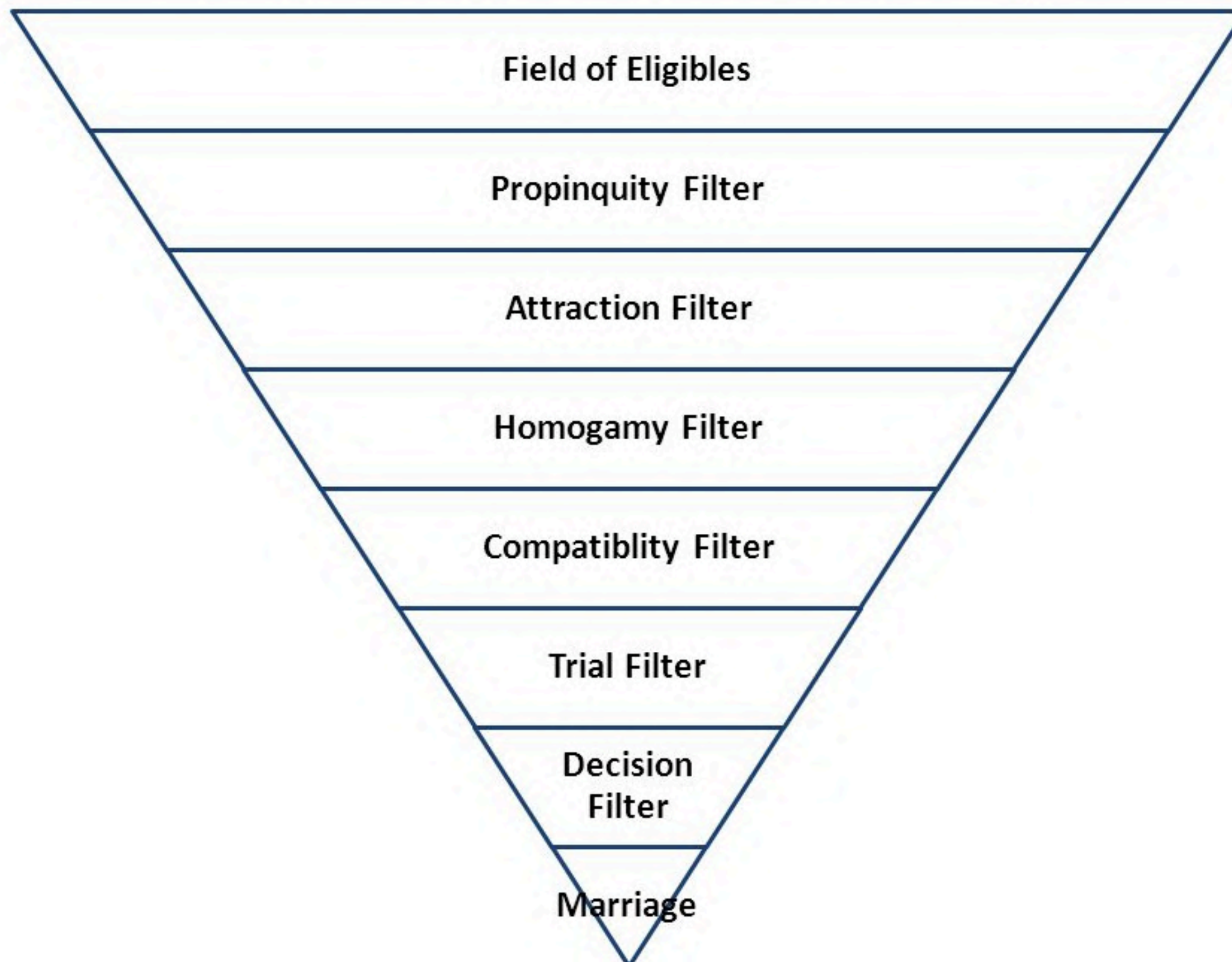
DOPAMINE SEROTONIN OXYTOCIN

MANIA



DOPAMINE

Murstein's Filter Theory



Sociology of Lust & Attraction

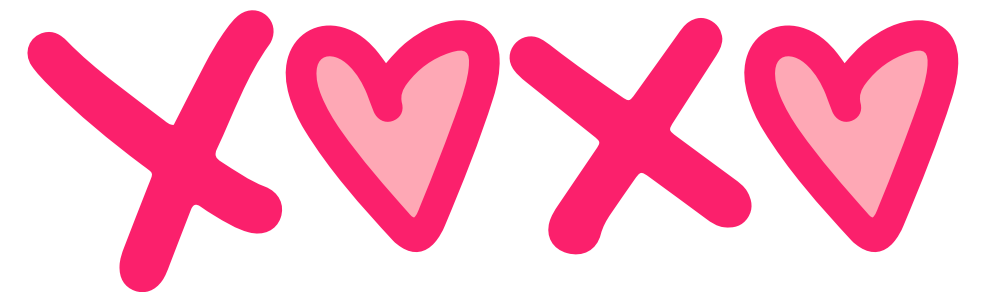
ATTRACTION FILTER - Style, content

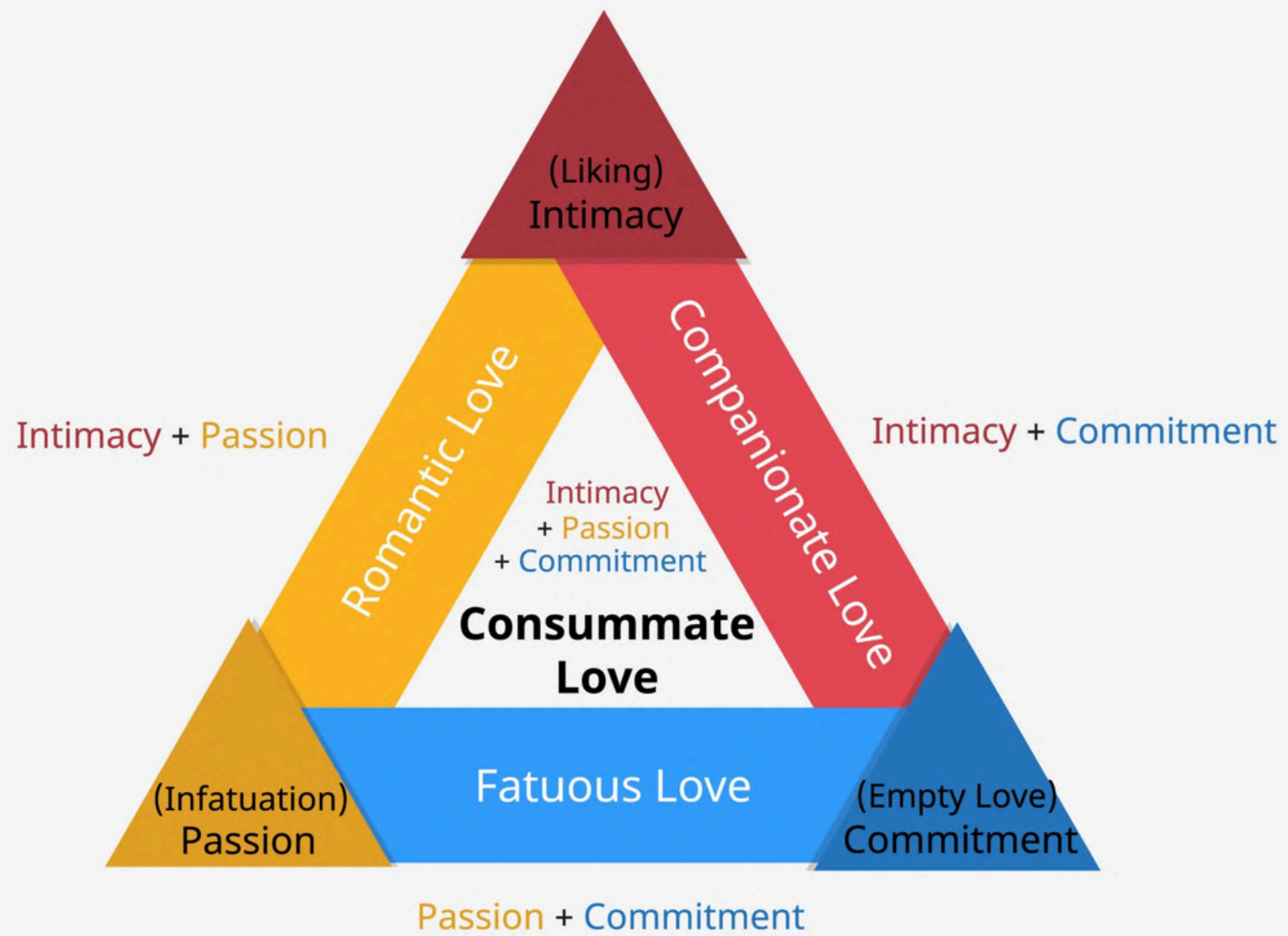
- Market value / pricing – hard to get but not impossible
- Conditioning index – social efficacy
- Market maximization strategy
- Matching market strategy
- Principle of least interest
- Disillusionment model



Cross-cultural similarities

- Physical similarities and differences by sex
- Intelligence differences by sex
- Men rate physical attractiveness as more important
- Stronger predictor of marital satisfaction in men
- Men tend to date "down" in intelligence and income, while women date "up" in SES





Triangle of love-Eight types of love

Type of Love	Intimacy	Passion	Commitment
Non love			
Liking/friendship	█		
Infatuated love		█	
Empty love			█
Romantic love	█	█	
Companionate love	█		█
Fatuous love		█	█
Consummate love	█	█	█

- **Art:** Partner is loved for physical appeal; one person is admirer and the other is admired
- **Business:** Relationship is business deal
- **Dem. Govn't:** power is equally shared; partners keep score
- **Fantasy:** To live happily ever after
- **Game:** Love is a sport
- **Gardening:** Relationships take time and nurturing
- **Police:** One partner is in control of keeping other in line
- **Travel:** Partners travel together on a long journey and grow along the same path

Lee's Love Styles



Lee's Style of Love	Similar Concepts	Chemical response
Eros	SB Romantic / passionate Love	dopamine, noradrenaline
Ludus	SB Infatuation	dopamine
Storge	SB Companionate love	oxytocin
Pragma	Filter Theory of mate selection	
Mania	Enmeshed attachment	dopamine, cortisol
Agape	SB Consummate Love	testosterone, estrogen, dopamine, oxytocin

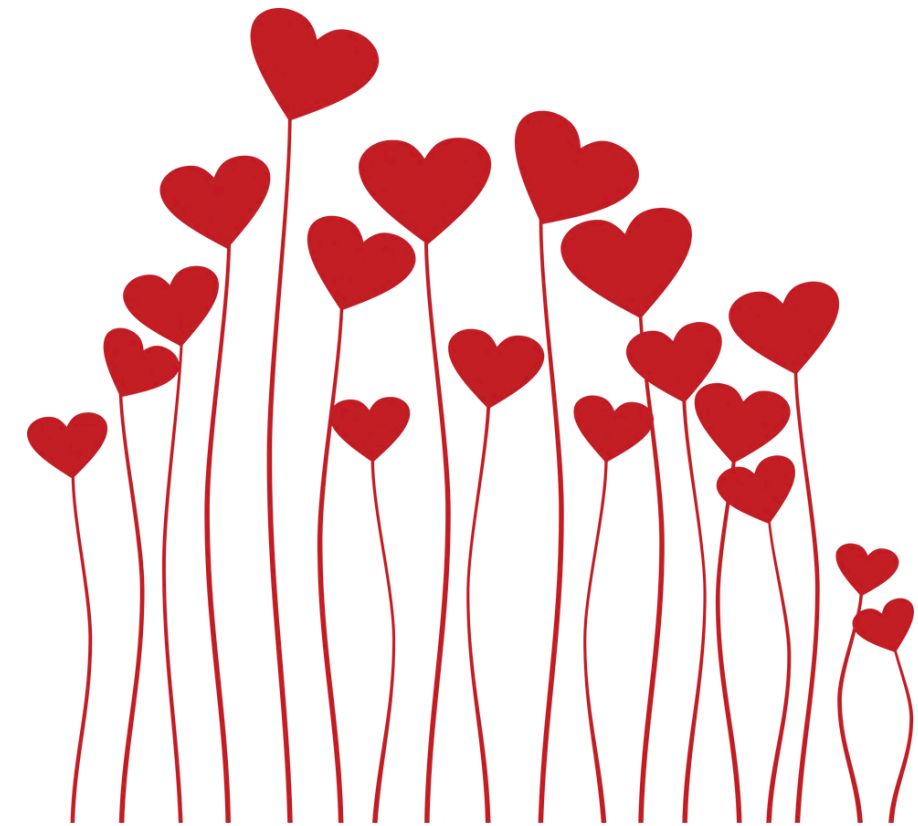
SWIDLER'S 2 TYPES OF LOVE

ROMANTIC LOVE

- Love is unambiguous and clear
- Love is unique
- Must prove or demonstrate love
- Love is permanent and eternal

UTILITARIAN LOVE

- Practical, rational, and logical
- Making it work



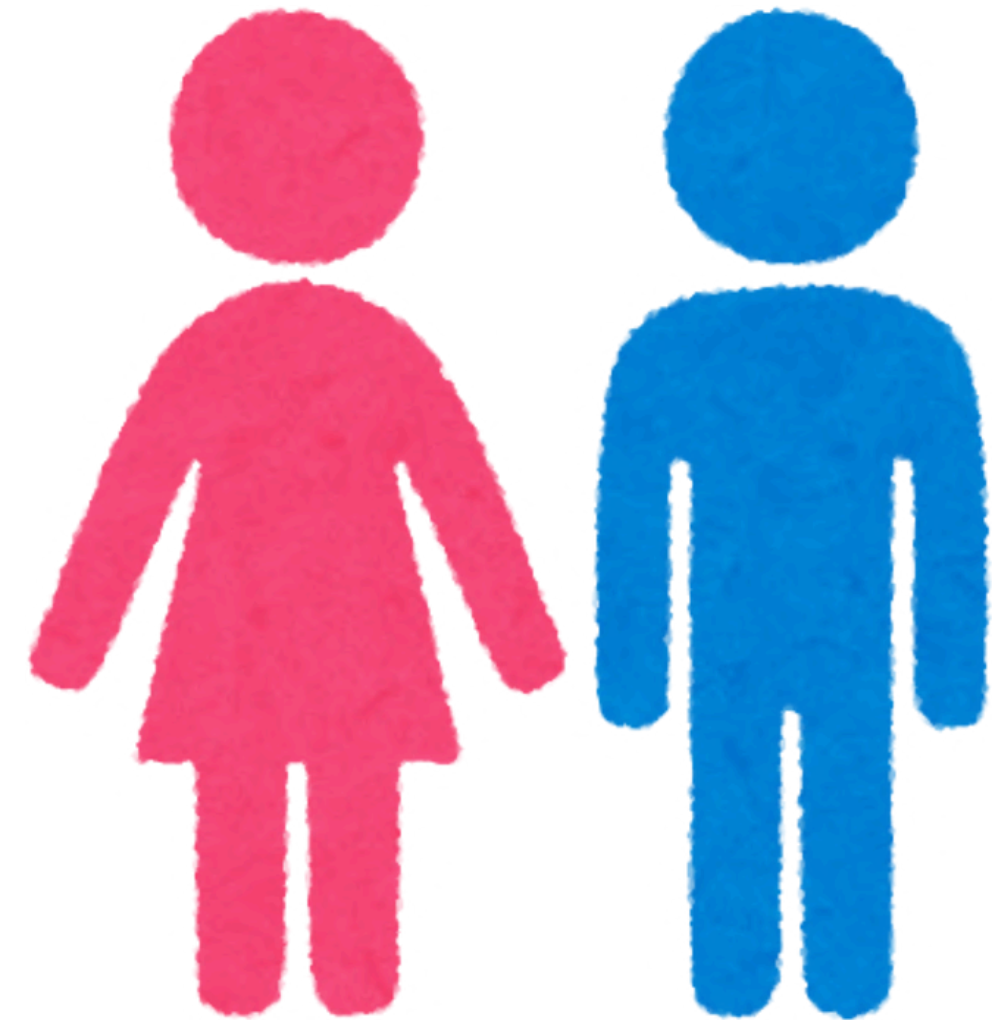
Love, American style

- Americans beliefs about romantic love
- The Disney myth of love
- Consequences



Gender differences in love

- Expression of love
- Who falls in love faster? But, why?
- Toll of breakups





Happy
Valentine's
Day

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Slide 6 Flinn, M. V. 2011. Evolutionary anthropology of the human family. In C. Salmon & T. K. Shackelford (Eds.), *The Oxford handbook of evolutionary family psychology* (pp. 12–32). Oxford University Press.

Slide 7 <https://today.yougov.com/society/articles/45271-how-many-americans-prefer-nonmonogamy-relationship>; Image: Adobe Stock (igor_kell)

Slide 9 https://asapeducate.com/science_notes/endocrine-system/

Slide 10 <https://mitchellholistichealth.com/hormone-health-hack-understanding-how-hormones-play-together/>

Slide 11 & 12 <https://www.simplypsychology.org/neurotransmitter.html>

Slide 13 <https://io.wp.com/sitn.hms.harvard.edu/wp-content/uploads/2017/02/Table-1.png>

Slide 14 <https://create.vista.com/vectors/testosterone/>

Slide 15 <https://www.compoundchem.com/2015/07/30/neurotransmitters/>

Slide 16 Bordt, Evan & Smith, Caroline & Demarest, Tyler & Bilbo, Staci & Kingsbury, Marcy. 2019. "Mitochondria, Oxytocin, and Vasopressin: Unfolding the Inflammatory Protein Response." *Neurotoxicity Research*.

Slide 17 <https://create.vista.com/unlimited/stock-vectors/382475262/stock-vector-vector-science-icon-emotion-chemistry-hormones-image-emotion-hormones-illustration/>

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Sternberg, R.J. 2007, Spring. *Stories we love by*. Tufts Magazine.

Slide 23 Lee, J.A. 1973. *The Colors of Love: An exploration of the ways of loving*. New Press.

Slide 26 Swidler, Ann. 2001. *Talk of Love: How Culture Matters*. Chicago: University of Chicago Press.

Slide 27 Ubando, Melissa (2016) "Gender Differences in Intimacy, Emotional Expressivity, and Relationship Satisfaction," *Pepperdine Journal of Communication Research*: Vol. 4, Article 13.

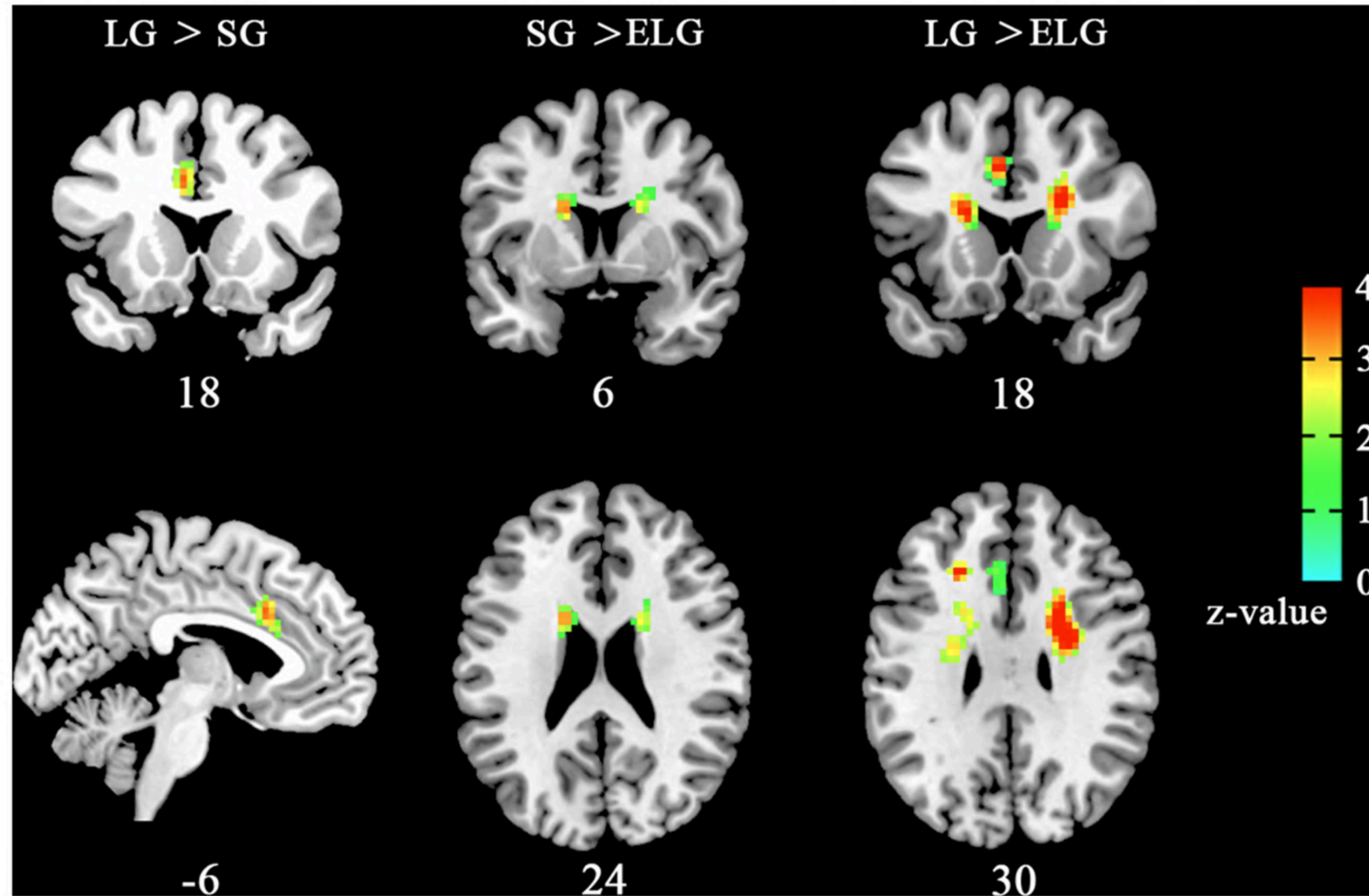


FIGURE 1 | Brain areas with altered ReHo in the in-love group (LG) and ended-love group (ELG). Significantly increased regional homogeneity (ReHo) was found in the left dorsal anterior cingulate cortex (dACC; $-6, 18, 33$) in the LG (LG > SG), but reduced ReHo was found in the left

caudate nucleus [ELG < SG, $(-15, 9, 21)$; ELG < LG, $(-18, 9, 24)$] and the right caudate nucleus [ELG < SG, $(18, 9, 2)$; ELG < LG, $(18, 12, 18)$] in the ELG. All results were corrected by FDR correction ($P < 0.05$).

*Coordinates in MNI space.

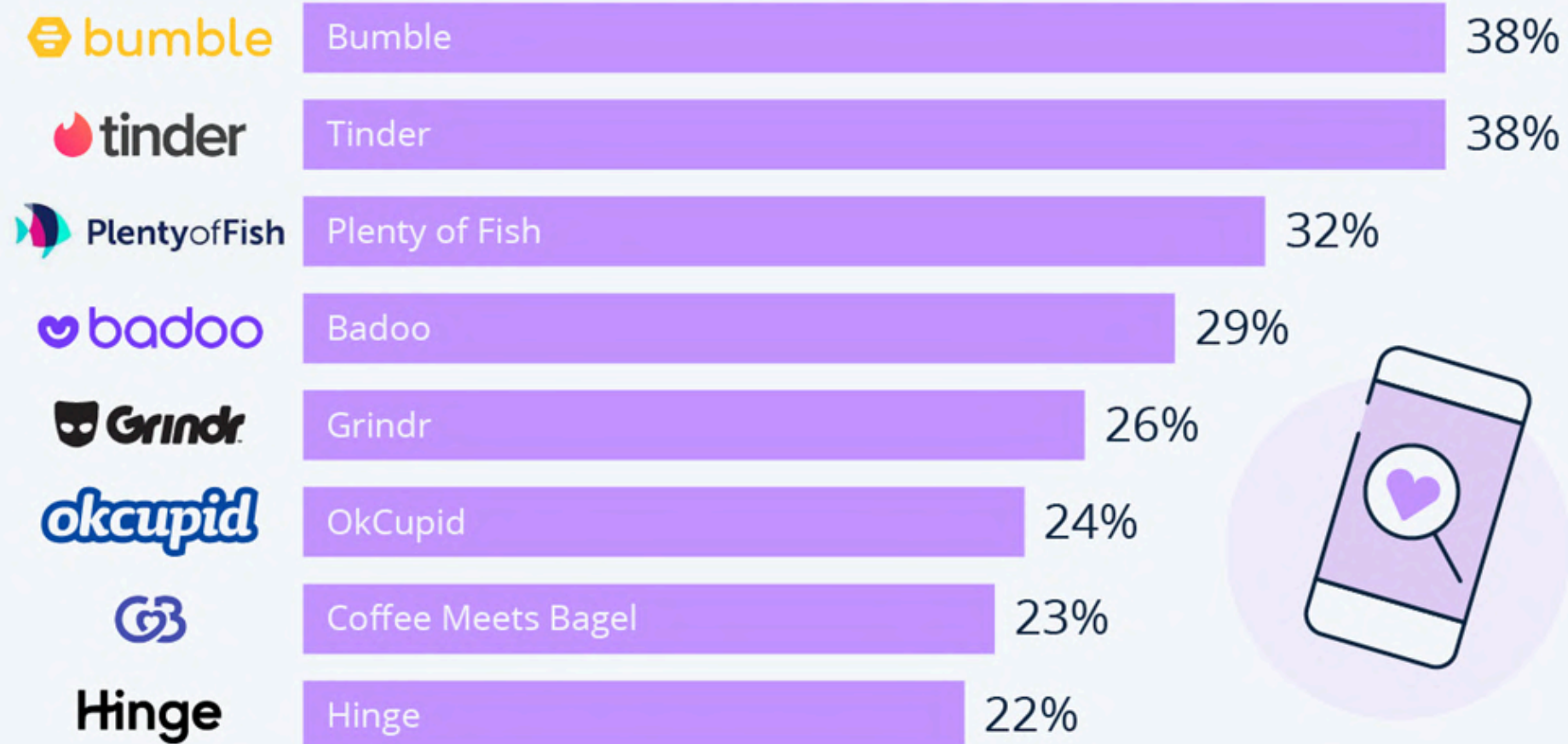
Rise of internet dating

Over 300 millions worldwide use dating apps

- Online dating has become primary way for people to meet partners
- 39% of U.S. couples who married in 2022 met online (Pew 2023)
- Sliding and Deciding (Stanely et al 2021)
- Situationships
- Consequences?

The Most Popular Dating Apps in the U.S.

Share of U.S. online dating users who used the following dating services in the past 12 months (2023)



882 U.S. respondents (18-64 y/o) surveyed Jul. 2022-Jun. 2023.
App and website/paid and unpaid use
Source: Statista Consumer Insights

