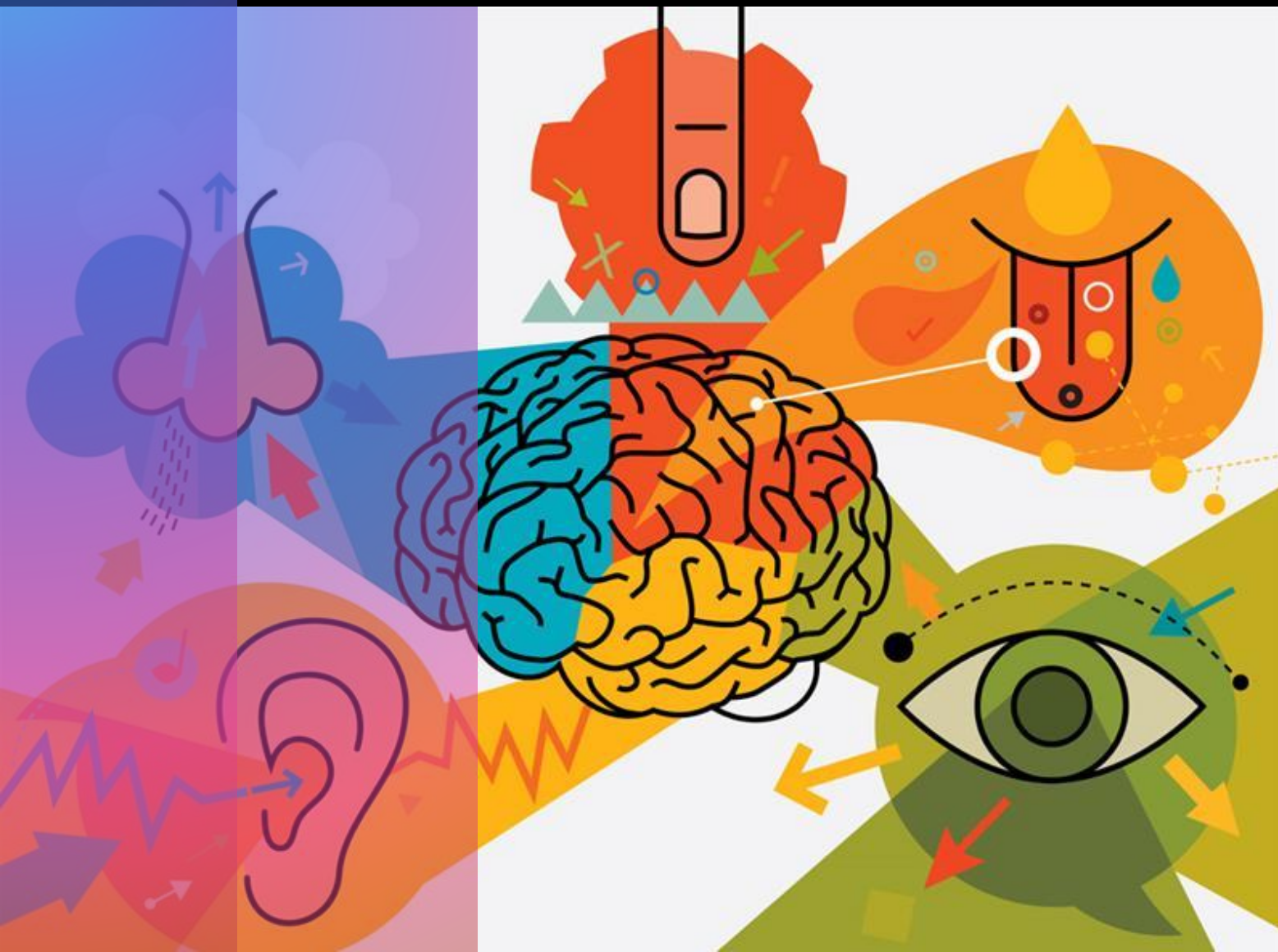




Knowledge Category 3 Sensation & Perception

Difference between Sensation and Perception

Sensation

The process of receiving information through your senses, which can be interpreted by your brain

The source is the stimuli received by your senses

Sensation results in raw information from your senses

Sensation is a general biological process

Perception

The process of interpreting the information received by the sensation process

The source is the information sent to the brain through sensation

Perception results in meaning of that information

Perception is a more psychological process because information that is already stored within your brain affects the outcome

Is color a sensation or a perception?

Is pain a sensation or a perception?

Vision

Theories of Color Vision

Trichromatic theory (Young-Helmholtz)

three types of color receptors (cones) each responds to a different primary color
red, blue, and green : all other colors are a mix of activity in these three

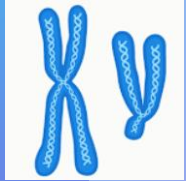
Opponent-process theory (Hering)

three types of bi-polar receptors: red-green, yellow-blue, white-black
each cell is responsive to only one member of the pair
color results from combined variations of all cells activated
supported by “afterimages” : stare at one member then see the complimentary color on a neutral background

Current theory

trichromatic mechanism explains coding of color by cones
opponent-process mechanism explains what happens in the thalamus (relay station)

Vision Color Blindness



Red-Green Color Blindness: most common (8-10% of males)
cannot distinguish between the two colors

Blue-Yellow: much less common

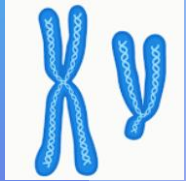
Complete Color Blindness: also rare, can be congenital and inherited (**congenital achromatopsia**)
whereby cones do not function or due to a brain lesion, typically in the occipitotemporal region (**central or cerebral achromatopsia**)

Often a genetic defect in 1 or more types of cones

Can be caused by disease or injury affecting retina, optic nerve, or other part of the visual system

Inherited version is usually sex-linked on the X chromosome so more males affected – why?

Vision Color Blindness



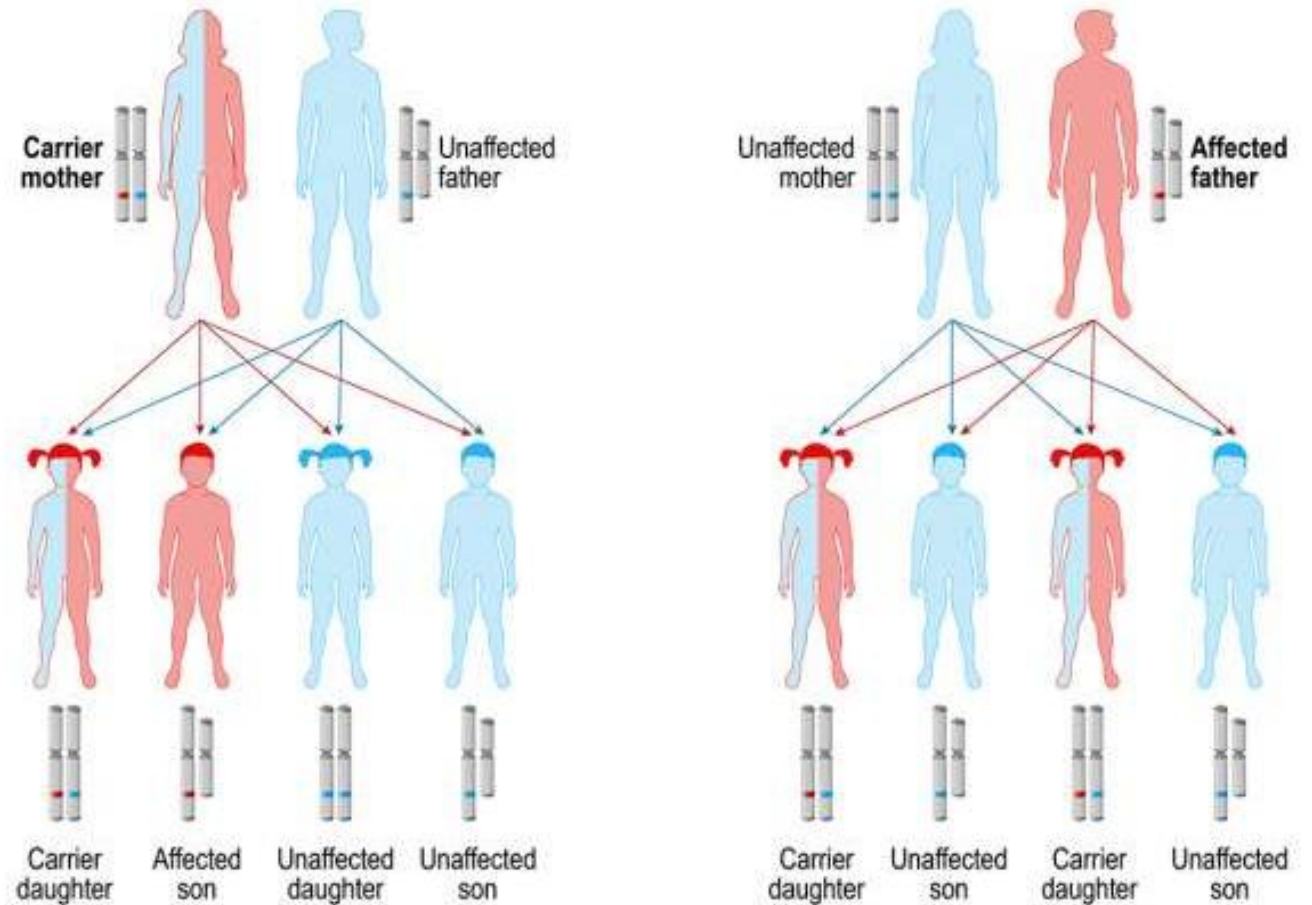
Females can be a carrier OR affected

Males cannot be a carrier - ONLY affected

A female can receive ONE color blind allele and be ok

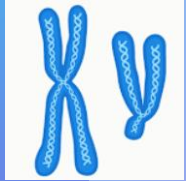
If a male receives ONE color blind allele, they will be color blind

X-linked recessive inheritance



Vision

Color Blindness



Color blind mother

		Normal father	
♀ \ ♂	♀	X_B	Y
	X_b	$X_b X_B$ Carrier daughter	$X_b Y$ Colorblind son
	X_b	$X_b X_B$ Carrier daughter	$X_b Y$ Colorblind son

carrier mother

		Affected father	
♀ \ ♂	♀	X_b	Y
	X_b	$X_b X_b$	$X_b Y$
	X_B	$X_b X_B$	$X_b Y$

Vision

Depth Perception

Depends on a combination of monocular and binocular cues

Binocular Cues: i. eyes converge inward towards nose as object gets closer
ii. retinal disparity between the two eyes
mediates depth perception for objects relatively close

Monocular Cues: mediates depth perception for objects farther away
uses relative size of objects and the interposition (overlap)
of objects, linear and atmospheric perspective, motion parallax



Not again?!

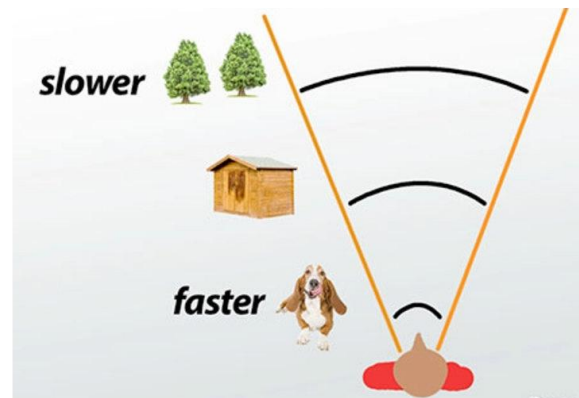
linear perspective



atmospheric perspective



motion parallax



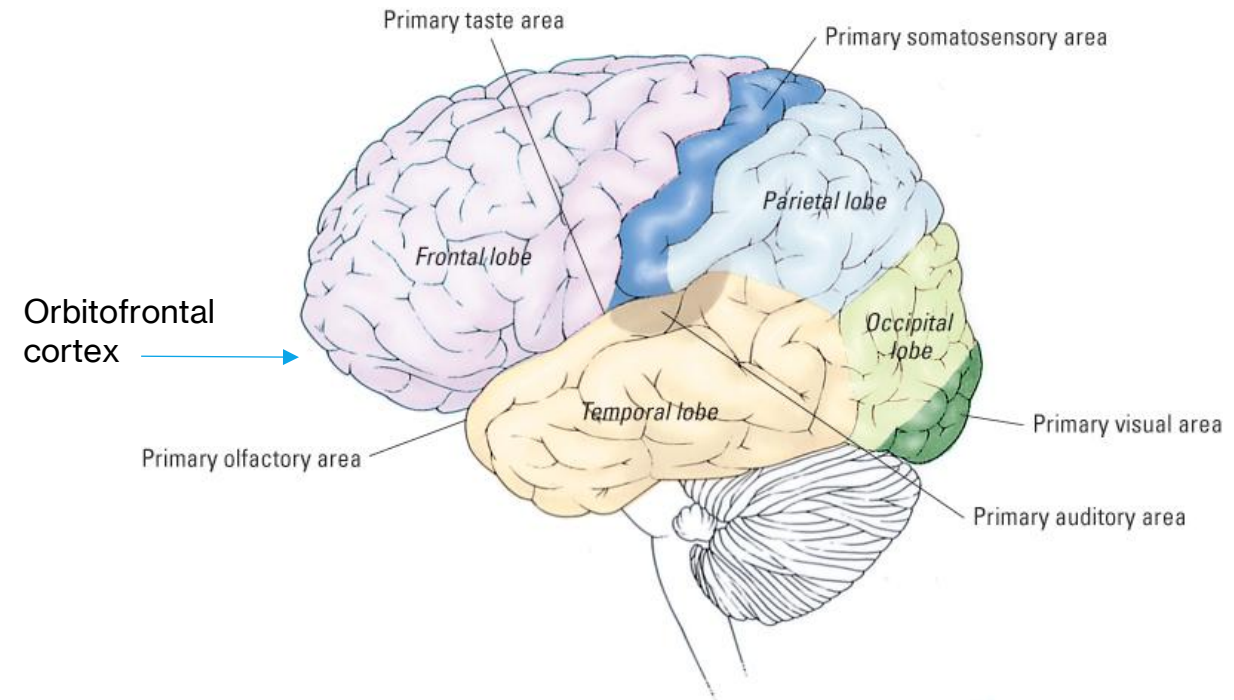
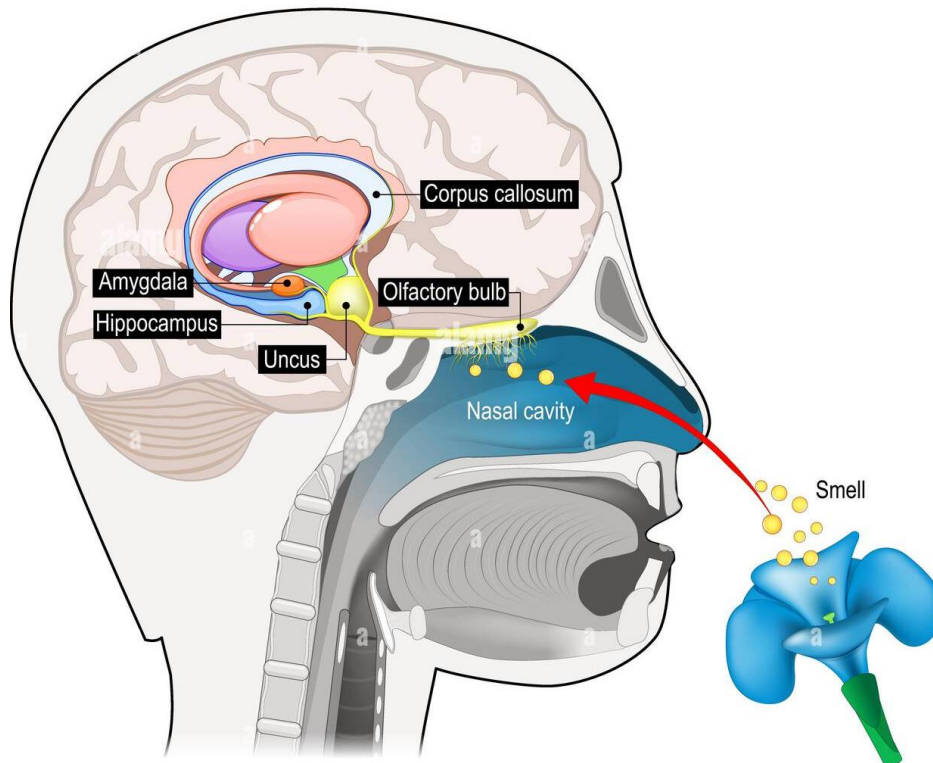
Olfaction

Airborne molecules stimulate receptors in the nasal cavity -> neural signals along olfactory nerve are sent to the olfactory bulb in the brain -> signals are relayed to primary olfactory cortex, orbitofrontal cortex, amygdala

Primary Olfactory Cortex: processes & integrates olfactory signals

Orbitofrontal Cortex: mediates conscious perception of odors

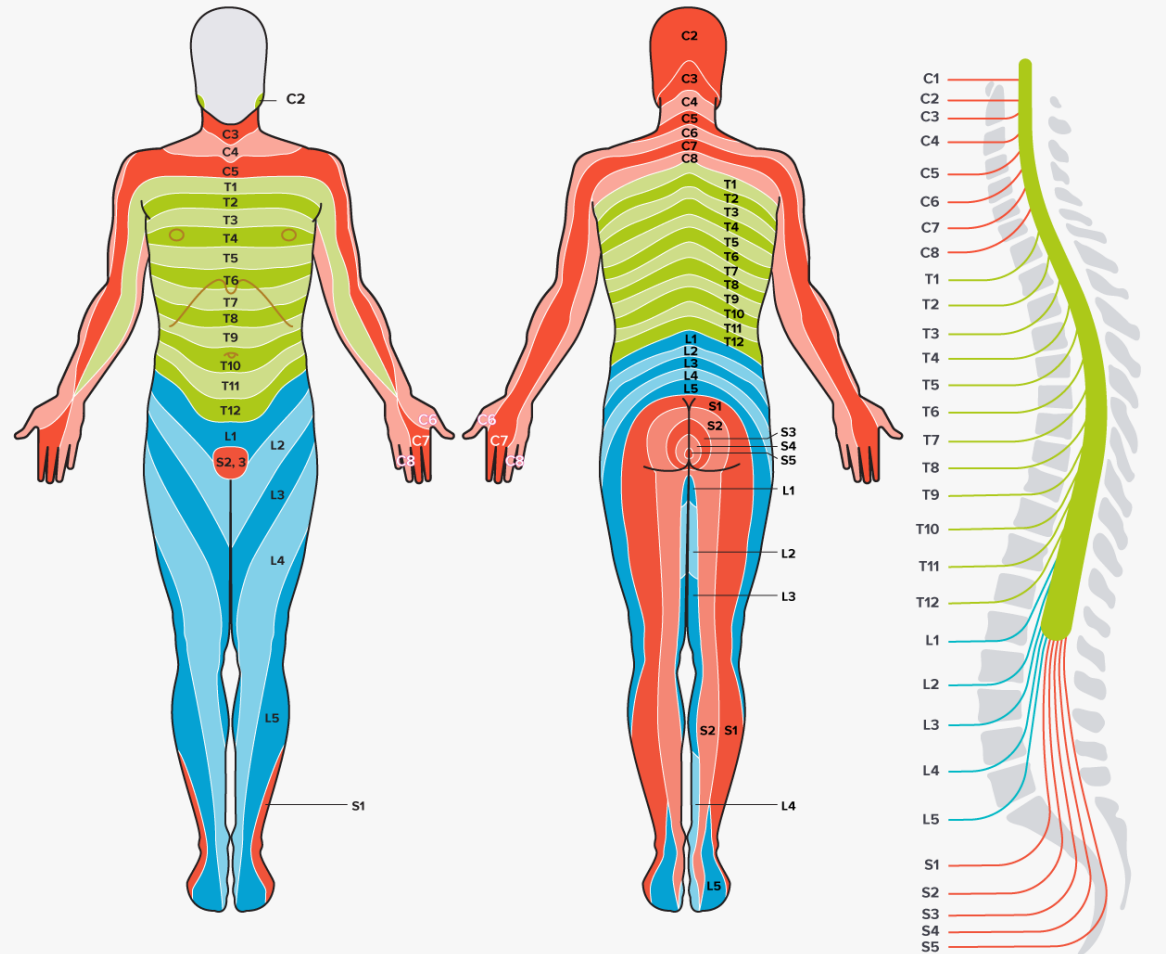
Amygdala: olfactory memory



Cutaneous Senses

Pressure (touch), warmth, cold, noxious stimulation

Dermatomes

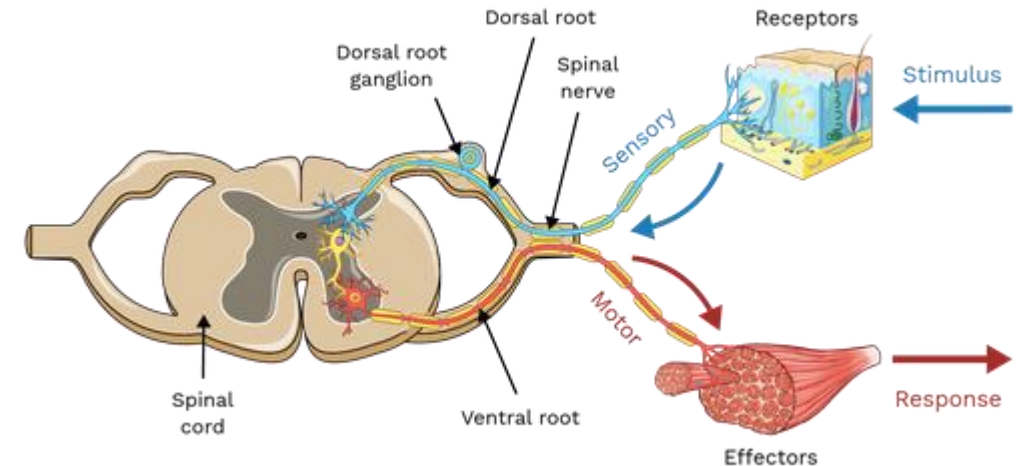


Axons carry sensory info from cutaneous receptors travel in bundles (**nerves**) -> enter the spinal cord dorsal root

Dermatome: the area of the body that is innervated by nerves which connect to a specific location on the spinal cord.

Adjacent dermatomes overlap

Damage to the nerve of one dermatome usually just diminishes sensation in that dermatome – doesn't eliminate it.



Cutaneous Senses

The special case of noxious stimulation and pain



The variable link: pain without injury, injury without pain, pain disproportionate to the injury, pain after all healing

Pain is not always related to stimulus intensity: culture, context, age, mood, sex, physical health status, prior experience, stress coping techniques etc.... matter!

Noxious info modulation: sensory info can be modulated up/down, on/off at the level of the spinal cord & brain

Pain Treatment: analgesic drugs, sensory modulation techniques (e.g. TENS), cognitive/psychological techniques, rest, placebos, traditional psychotherapy has not been effective, surgical techniques – depends

active strategies may be more effective than passive



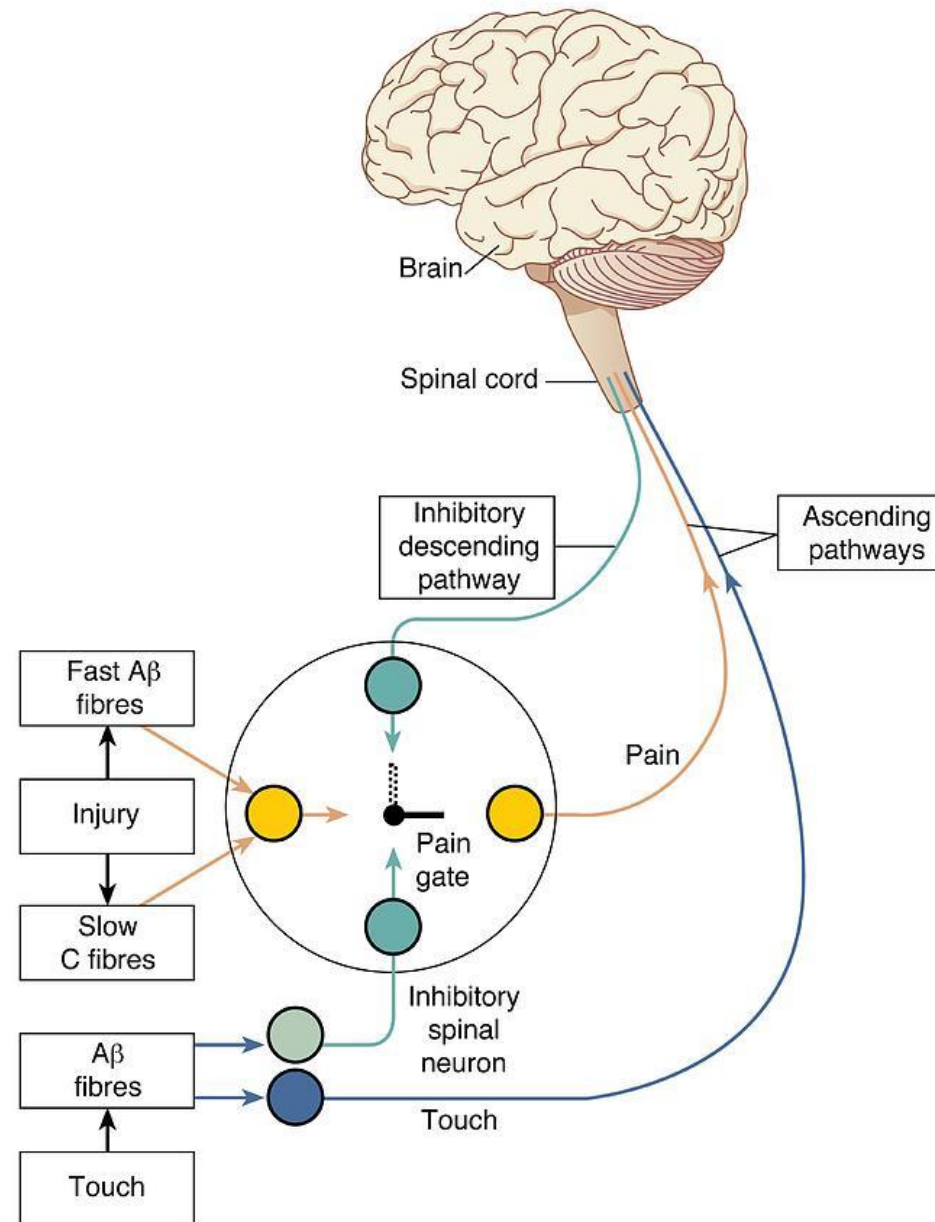
Cutaneous Senses

The special case of noxious stimulation and pain



Ronald Melzack

Patrick Wall



The need to know

There is a neurological “gate” in every spinal cord segment

Sensory information coming into the cord can open the gate (noxious info ascends to brain) or can close the gate (noxious info does not ascend to brain)

The pathways that descend from the brain enter the cord and can also open the gate (e.g. negative thoughts & emotions) or close the gate (positive thoughts & emotions)

Drugs and sensory stim can also open and close the gate

The study of the relationship between physical stimulus magnitudes and their corresponding psychological sensations



Psychophysics



Absolute threshold: minimum stimulus to produce a sensation

Difference threshold: the smallest change in stimulus needed to recognize a difference between the two – also called just noticeable difference (JND)

Psychophysical Laws

Weber's Law	The more intense the stimulus, the greater the increase in stim. intensity required for the increase to produce a JND. JNDs represent psychologically equal intervals but their corresponding physical differences do not.
Fechner's Law	Physical stimulus changes are logarithmically related to their stimulus sensations
Steven's Power Law	Sensation is an exponential function of stimulus intensity

Weber's and Fechner's Law work well for midrange stimulus intensities but not extremes. Steven's Power Law was developed to overcome this shortcoming.

DON'T WORRY



I'VE GOT THIS!