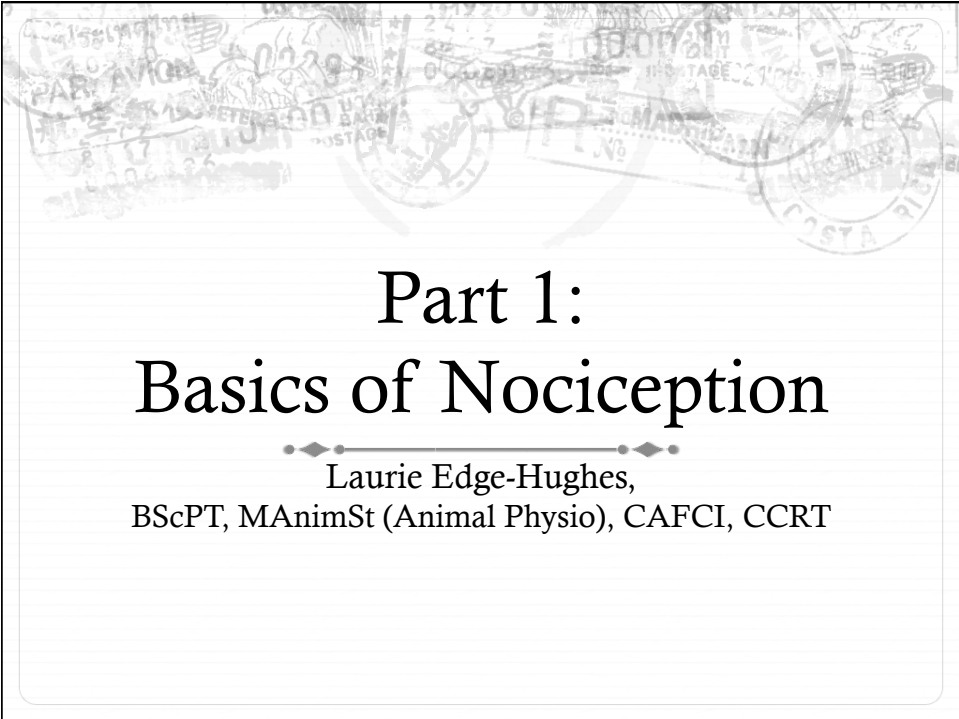




PAIN MANAGEMENT
in the
CANINE PATIENT

◆◆◆
Laurie Edge-Hughes,
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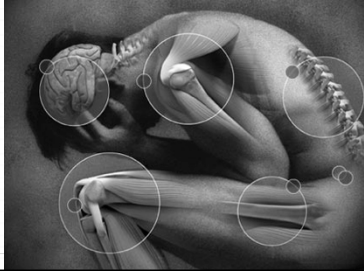


Part 1:
Basics of Nociception

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Basics of Nociception

- ✦ Pain is the most common reason a PERSON seeks medical attention.
- ✦ IASP Definition of Pain:
 - ✦ 'Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage'



Basics of Nociception

- ✦ Categories of Pain
 - ✦ ACUTE PAIN
 - ✦ Protective
 - ✦ Warning System of ACTUAL or POTENTIAL tissue damage
 - ✦ Symptom of tissue damage
 - ✦ CHRONIC PAIN
 - ✦ When the pain outlasts normal healing times
 - ✦ If pain is greater than expected in regards to the extend of damage
 - ✦ Occurs in the absence of identifiable tissue damage or objective findings
 - ✦ Can be considered a 'disease' in and of itself

More about this later

Basics of Nociception

- ✦ When is Pain good?
 - ✦ Protection from danger
 - ✦ Protects the body until healing has occurred
 - ✦ Muscle spasms
 - ✦ Muscle tension
 - ✦ Muscle weakness
 - ✦ Message to the brain to “do something”



Basics of Nociception

- ✦ The SENSORS...
 - ✦ Millions throughout the body surveying their area for activity
 - ✦ MECHANICAL FORCES
 - ✦ TEMPERATURE CHANGES
 - ✦ CHEMICAL CHANGES
 - ✦ ‘Bonus’ sensors
 - ✦ EYES – responding to light
 - ✦ EARS – responding to sound
 - ✦ NOSE – responding to chemicals
 - ✦ Signals (electrical impulses) are sent to the spinal cord & then to the brain

Basics of Nociception

- ✦ A Note about SENSORS
 - ✦ Sensors have a short ‘shelf-life’
 - ✦ i.e. there is a continual turn over
 - ✦ Therefore your sensitivity is continually changing
 - ✦ = Good News for chronic pain sufferers... your sensitivity level is NOT fixed!



Basics of Nociception

- ✦ Sensors send a ‘DANGER’ message up the nerves
 - ✦ Via C-fibers & A-delta nerves
- ✦ It’s up to the SPINAL CORD & BRAIN to interpret the danger message(s)
- ✦ The ‘danger’ messages are ‘sorted’ at the spinal cord and sent up to the brain via the spinothalamic tract.
- ✦ The brain ‘processes’ & interprets the messages

Basics of Nociception

✦ Cheat sheet for Nerve fibre types

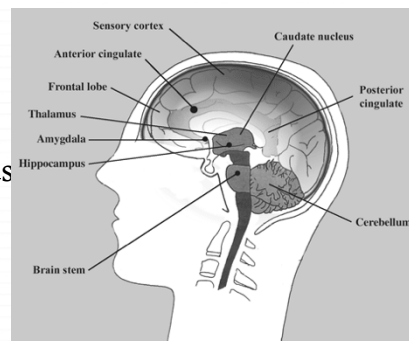
Table 2.1 Afferents of the Peripheral Nervous System (adapted from Hoeger Bement & Sluka 2007)

Afferent Nerves	Skin	Muscle	Joint
Thickly Myelinated	A β = touch	Ia = muscle spindles Ib = GTO II = muscle spindles All = proprioceptive	III = proprioception
Thinly myelinated	A δ = nociceptors	III = nociceptor	III = nociceptor
Unmyelinated	C = nociceptor	IV = nociceptor	IV = nociceptor

Basics of Nociception

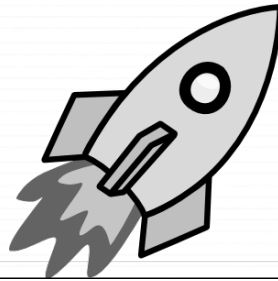
✦ Brain involvement in danger signal / pain processing:

- ✦ Premotor / Motor Cortex
- ✦ Cingulate Cortex
- ✦ Prefrontal Cortex
- ✦ Amygdala
- ✦ Sensory Cortex
- ✦ Hypothalamus / Thalamus
- ✦ Cerebellum
- ✦ Hippocampus
- ✦ Spinal Cord



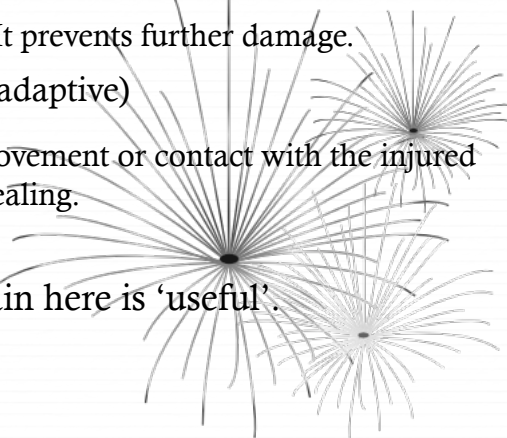
Basics of Nociception

- ✦ If the brain decides that the ‘danger messages’ are real or they reach a critical number...
- ✦ = PAIN!
- ✦ Activate all systems activated!!!!!!! Go! Get you out of danger!



Basics of Nociception

- ✦ Nociceptive Pain (early warning signal)
 - ✦ It keeps you safe. It prevents further damage.
- ✦ Inflammatory Pain (adaptive)
 - ✦ Prevents further movement or contact with the injured area to allow for healing.
- ✦ Good job body! Pain here is ‘useful’.



Basics of Nociception

- ✦ BUT WAIT!!!!!!!!!!
- ✦ You can also get:
 - ✦ MALADAPTIVE Inflammatory Pain
 - ✦ Reverse signaling
 - ✦ NEUROPATHIC pain
 - ✦ PNS or CNS pain
 - ✦ CHRONIC – MALADAPIVE pain
 - ✦ Abnormal responsiveness / Abnormal function

Basics of Nociception

The role of the DORSAL ROOT GANGLION (DRG)

- ✦ Inflammation can activate / irritate nerves
- ✦ Nerve injury / irritation can cause neurones to sprout in the DRGs & can lead to 'short circuiting'
- ✦ The DRG is also vulnerable to adrenaline & other chemicals in your blood stream = INCREASED sensitivity
- ✦ When 'set off' sometimes they don't stop signaling!



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Basics of Nociception

- ✦ Injured neurones will often backfire
- ✦ This causes 'wrong way' transmission of the impulse
- ✦ Backwards travel down a neurone = release of chemicals at the end
- ✦ So.... Injured neurones can cause inflammation in the peripheral tissues.
 - ✦ (i.e. A back injury can cause foot swelling)
 - ✦ = boggy, soggy tissues!

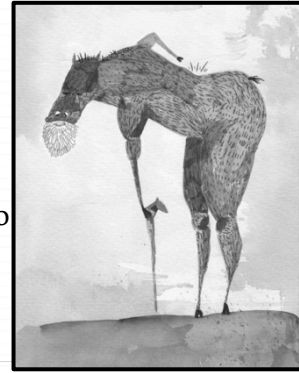
Basics of Nociception

- ✦ Persistence of pain...
 - ✦ Neurone sensitization
 - ✦ Neurones become more excitable, more prolific, + there is a release of excitatory chemical at dorsal horn of the SpC
 - ✦ = Increased response system
- ✦ Windup Pain / Central Sensitization
 - ✦ (The peripheral 'danger sensors' are no longer the issue/ problem!)

Basics of Nociception

- ✦ Peripheral Sensitization:
 - ✦ Increased responsiveness and reduced threshold of nociceptors to stimulation of their receptive fields

- ✦ Central Sensitization:
 - ✦ Increased responsiveness to nociceptive neurons in the central nervous system to their normal or sub-threshold afferent input

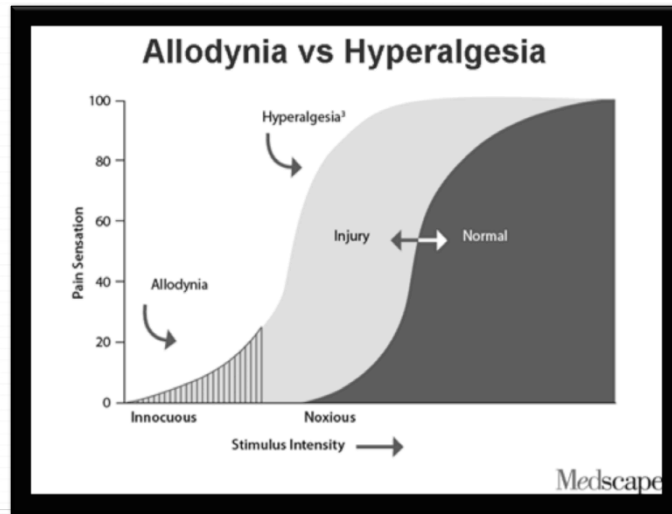


Basics of Nociception

CHRONIC PAIN

- ✦ Once pain is experienced, relatively innocuous stimulation activates the system and triggers pain perception:
 - ✦ Hyperalgesia = an exaggerated or increased response to noxious stimuli
 - ✦ Allodynia = pain is produced by a stimulus not normally painful

Basics of Nociception



Basics of Nociception

- ✦ Goal of ACUTE pain management
 - ✦ PREVENT Chronic Pain
 - ✦ Easier to prevent sensitization than to treat it!



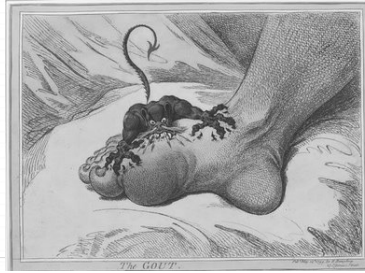
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Basics of Nociception

✦ Complexities of Chronic Pain Management

1. Increased reactivity = Decreased margin of error for kinematics & movement
2. Non-nociceptive receptors can signal for pain even in the presence of normal (non-painful) stimuli.

- ✦ Fine line between being active / promoting control, strength, endurance & FLARING the system

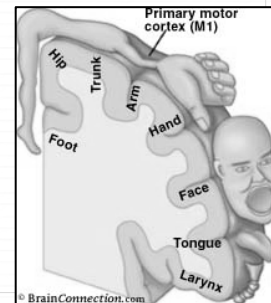


Basics of Nociception

✦ Complexities of Chronic Pain Management

3. The Spinal Cord & Brain begin to over-interpret PERCEIVED threats & vulnerabilities
4. CNS reorganization = inaccurate transmission of proprioceptive inputs

- ✦ THIS disrupts the brain's spatial representation of the body
- ✦ WHICH compromises motor control and movement strategies



Basics of Nociception

✦ So Now What???

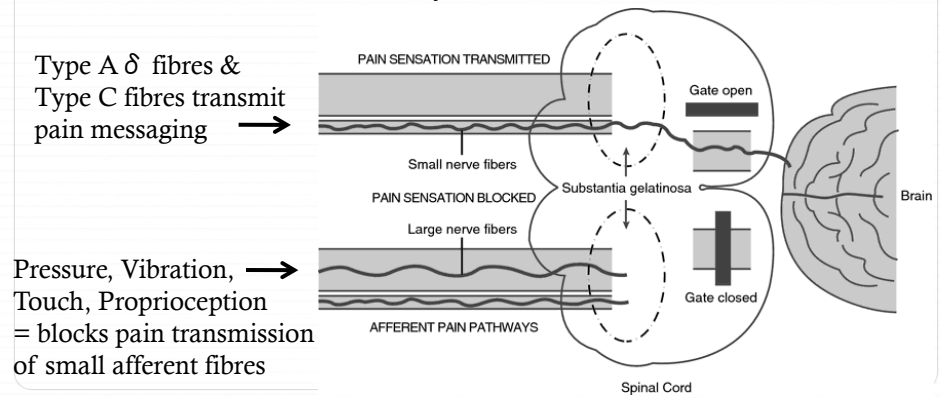
✦ CONTROL:

- ✦ Pain Perception (the brain)
- ✦ Pain Projection (the spinal cord messaging)
- ✦ Pain modulation (spinal cord processing)
- ✦ Pain transmission (peripheral nerves)
- ✦ Pain transduction (pain receptor activation)

Basics of Nociception

✦ So Now What???

✦ Gate Control Theory of Pain (Melzack & Wall 1965)



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Basics of Nociception

- ✦ So Now What???
- ✦ Many more options

