

The Neuroanatomy and
Physiology of Pain
Perception in the
Developing Human

--Sheila Page, DO



DEFINITION OF PAIN

Pain is a subjective sensory and emotional experience that requires the presence of consciousness to permit recognition of a stimulus as unpleasant. (Bioethics)

VS

Pain is a protective mechanism for the body. It occurs whenever any tissues are being damaged, and it causes the individual to react to remove the pain stimulus. (Guyton)

RETICULAR ACTIVATING SYSTEM

About 90% of all pain fibers terminate here.

Burning and aching pain fibers excite this system, activating the entire nervous system.

It will arouse from sleep, create sense of urgency and promote defense and aversion reactions.

Summation property causes intense human suffering.

To: Somatosensory areas

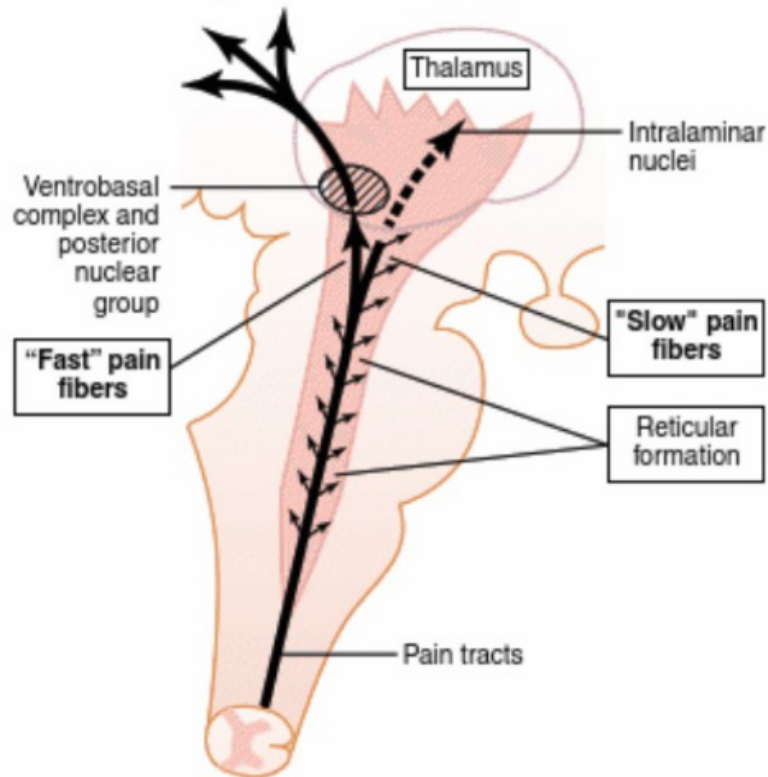
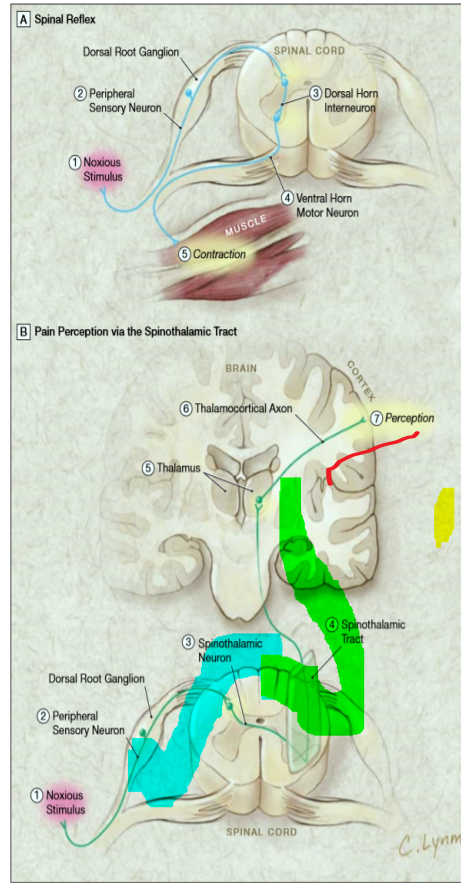


Figure 48-3 Transmission of pain signals into the brain stem, thalamus, and cerebral cortex by way of the *fast pricking pain pathway* and the *slow burning pain pathway*.

Figure. Spinal Reflex and Pain Perception Pathways



A, Reflex responses to noxious stimuli occur early in development, before thalamocortical circuits are functional; noxious stimuli trigger reflex movement without cortical involvement. Activated by a noxious stimulus

analgesics/administration and dosage and fetus (44 articles); (4) MeSH *anesthesia administration and dosage* and fetus (0 articles); (5) *neurodevelopment or development or anatomy* and (fetus or fetal) and (pain or nociception or noxious) (306 articles); (6) *(thalamocortical or thalamus or cortex)* and (fetus or fetal) and (pain or nociception or noxious) (13 articles); (7) *(electroencephalog* or EEG or evoked potential)* and (fetus or fetal or premature neonate or premature infant or preterm neonate or preterm infant) and (pain or nociception or noxious or conscious*) (7 articles); (8) *fetal and pain* and (response or assessment or facial expression) (112 articles); and (9) *facial expression* and (fetus or fetal) or (*neonate or neonatal or infant*) and (*preneonate or preterm*) and (pain or nociception or noxious) (360 articles). The search was performed without date limitations and was current as of June 6, 2005. From these search results, we excluded articles that did not study fetuses of less than 30 weeks' gestational age or that did not specifically address fetal pain perception or nociception. With a focus on topics addressed by earlier review articles on fetal pain, anesthesia, and analgesia, articles were reviewed for additional references.

EVIDENCE SYNTHESIS

What Is Pain?

Pain is a subjective sensory and emotional experience that requires the presence of consciousness to permit recognition of a stimulus as unpleasant.^{5,7} Although pain is commonly associated with physical noxious stimuli, such as when one suffers a wound, pain is fundamentally a psychological construct that may exist even in the absence of physical stimuli, as seen in phantom limb pain.^{5,7} The psychological nature of pain also distinguishes it from nociception, which involves physical activation of nociceptive pathways without the subjective emotional experience of pain.^{5,8} For







7.5 Weeks



10 Weeks

WILL IT HURT?

14 weeks

