Interoception

Perception of one’s own internal physical state

- "Sense of the physiological condition of the entire body" (Craig 2002)
- Monitoring integrity of internal body state:
  - temperature
  - pain
  - itch
  - tickle
  - sensual touch
  - muscular and visceral sensations
  - vasomotor flush
  - hunger
  - thirst
  - air hunger and others

Interoception includes proprioception and visceroreception

- Proprioception – signals from
  - skin
  - musculoskeletal - joints, tendons, muscles

- Visceroreception
  - the inner organs - mechano, chemo, thermo, and osmoreceptors
Key Features of Interoception

- Two important aspects of interoceptive processing
  - Strong incentive motivational component (urges, e.g., blinking, thirst, sneezing)
  - Relative preference assessment – what feels good depends on how you feel inside (e.g., a well heated room in the winter vs. summer)

Neural systems underlying interoception
Critchley et al., 2004, Nat Neurosci

Interoceptive ability: accuracy differences
Critchley et al., 2004, Nat Neurosci
Neural systems underlying interoception

- The thalamus sends projections to the
  - insula (posterior part)
  - anterior Cingulate Cortex (ACC)
  - somatosensory cortex

Anatomy of the Insula

- Major macroscopic divisions:
  - Posterior – SII, topographic organization of interoceptive afferents
  - Anterior – re-representation and multi-modal integration of interoceptive afferents

- Microscopic divisions:
  - Granular
  - Dysgranular
  - Agranular

The Insula and Addiction

Smokers who acquire insula damage are very likely to
- quit smoking and remain abstinent
- no longer to experience conscious urges to smoke after quitting

Naqvi et al., 2007, Science
Greater cortical thickness in meditators compared to non-meditators

Lazar et al., 2005, Neuroreport