Human Nervous System

CNS
central nervous system
brain and spinal cord

PNS
peripheral nervous system
somatic nervous system = muscle, enteric, and sensory systems
autonomic nervous system

CNS somatic autonomic

neuronal synapse in action
• Neurotransmitter / ligand-gated ion channel receptor
  • Ionotropic receptor

• G-protein coupled receptor (GPCR)
  • Metabotropic receptor
Glutamate and GABA are abundant throughout the brain.

Monoaminergic (norepinephrine, dopamine, serotonin, etc) nerve fibers emerge from relatively small clusters of cells in the brainstem and innervate the entire brain.

Cannabinoid receptors and endocannabinoid transmitters are abundant throughout the brain.
Abuse / Addiction Potential
- pharmacology
- dose
- route of administration
- psychological state
- social / environmental context

James Olds - learning in rats - 1954
Rats will choose brain stimulation over food.

Rats will cross a painful electrified grid to receive brain stimulation.
Rat pushes lever to receive electrical brain stimulation.

Rat Seeks Stimulus as it places its paw on the treadmill. Some of the animals have been seen to stimulate themselves for 24 hours without rest and as often as 1,900 times an hour.

Rat Feels Stimulus as it presses on treadmill. Pulse lasts between several; the current is less than .005 ampere. The animal must release lever and press again to renew the stimulus.
animals will self-administer cocaine, amphetamine, morphine, heroin, nicotine, and other euphorogenic chemicals.
Animals will self-administer cocaine, amphetamine, morphine, heroin, nicotine, and other euphorogenic chemicals into blood system and into specific brain regions.

Reward-reinforcement pathway:
- Dopamine
- Ventral Tegmentum (VTA)
- Frontal cortex
- Nucleus accumbens
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hypothesized intracellular changes resulting from alcohol abuse

Koob & Le Moal Neurobiology of Addiction Figure 5.40

neurobiological differences in limbic regions between high and low ethanol-preferring rats

Koob & Le Moal Neurobiology of Addiction Table 5.14

hypothesized intracellular changes in gene expression resulting from drug abuse

Koob & Le Moal Neurobiology of Addiction Figure 9.19
- G-protein coupled receptor (GPCR)
  - metabotropic receptor

Addiction Treatment / Recovery

- Restoration of brain's reward system to normal function
- Unlearn / rewire behavioral programs
- Practice new behaviors
- Facilitate rewiring