Neuropsychological Experiments:

• Pluses:
  » Allows you to dissociate between different mental processes
  » Can tell you something about the brain structures necessary for a task

• Minuses:
  » Great variability among patients, can be difficult to relate structure-to-function with precision.
  » Can only observe the processes that interest you in absence, not in action.
  » Practically, studies can be difficult (need to have infrastructure & collaborators)
Lesions in animals can be made very precisely

Amygdala

Hippocampus

Normal Monkey  Lesioned Monkey
Induced Lesion Experiments:

- **Pluses:**
  - Same pluses as naturally-occurring lesion experiments
  - And with *greater spatial precision*
  - Can also do reversible inactivations

- **Minuses:**
  - Same minuses as naturally-occurring lesion experiments
  - Can *only* do in animal models
Transcranial Magnetic Stimulation (TMS)

- Based on Faraday Principle
- Rapidly fluxing magnetic field
- Induces current in underlying cortex
- Noninvasive
- Permits focal manipulation of cortical activity
Administration of TMS
TMS:

- **Pluses:**
  - Causal: can tell you something about the brain structures *necessary* for a task
  - Allows you to do *reversible* inactivation in humans
  - Allows you to test *timecourse* of necessity
  - Good spatial specificity

- **Minuses:**
  - Can only reach the dorsal cortical surface
  - Spatial specificity might allow neural compensation
  - Need to be cognizant of safety concerns
Transcranial direct current stimulation (tDCS)

tDCS:

**Pluses:**
- Causal: can tell you something about the brain structures *necessary* for a task
- Allows you to do both *activation* and *inactivation* reversibly in humans
- Greater perceived safety than TMS
- Less expensive, more portable set-up than TMS

**Minuses:**
- Can only reach the dorsal cortical surface
- Less spatially specific than TMS
- Less temporal control compared to TMS
Agonist
Antagonist

Depletion

Loading

The Neuropeptide oxytocin

Tyrosine
Tyrosine hydroxylase (TH)
L-Dihydroxy-phenylalanine (dopa)
Dopa decarboxylase
Dopamine (DA)
Dopamine β-hydroxylase (DBH)
Norepinephrine (NE)
Phentolamine N-methyltransferase (PNMT)
Epinephrine
Pharmacology:

- **Pluses:**
  - Causal: can tell you something about the brain systems *necessary* for a task
  - Can both *upregulate* and *downregulate* systems
  - Relevance to health care applications
  - Complementary to other techniques

- **Minuses:**
  - Drugs act at *many* locations simultaneously
  - Drugs can also have *multiple* actions
  - Practically, studies can be difficult (usually need a collaborating physician)
Questions?