See also PDF online from Purves et al.

Method	Pros	Cons
Computational Modeling	• Forces researcher to be explicit about mechanism • Allows for direct, testable predictions • Simple but powerful (small changes, big effects; validity of a hypothesis)	• Simplification of Nervous System • Sometimes at odds with biology (e.g., "all knowing") • Catastrophic interference • Relatively narrow (re:, generalization) • Research sometimes in isolation
Behavior (RT/accuracy/self report/etc.)	• Most simple method & underlies all other methods • Flexible	• Gives incomplete picture of mechanism • Only as good as your design
Single Cell Recording (not discussing in class, except Perception paper)	• Records at the level of individual neurons (usually) • Direct measure of neuronal activity to expt manipulation	• May record extracellularly; unclear then if activity is of single neuron • Aggregate behavior might be more complicated (e.g., multiunit)
Lesions	• Convergence across humans & animals for particular brain region fxn • How necessary is a brain region for a particular function	• Don't know if effect isolated to region or its connection to other regions • Compensatory strategy to minimize effects of lesion • Difficulty in precision of area affected; hard to generalize • In animals, training is much more difficult than in humans • In humans, not under control of expter • Ethical concerns for animal treatment
Genetic manipulations (optogenetics, epigenetics)	• Identify risk factors for diseases • Which cognitive fxns are heritable (knockout) • GxE interactions	• Genes can have many downstream effects, so hard to isolate specific mechanism of action • Often need a lot of people to make anything of GxE, and knockouts tend to be really specific (less generalizable)
Structural imaging (MRI, CT scans)	• Identify brain regions impacted in disorder, how disorder & healthy individuals vary as a fxn of damage	• Has little to do with a particular experimental manipulation (usually, re: temporal scale), only general abilities
DTI	• Discover the flow of information within the brain for white matter tracks	• Same as structural imaging above
TMS (newer things like tDCS, tACS)	• Can either impair or improve task performance • Researchers are now looking at how stimulation can improve brain fxn • Noninvasive virtual lesion	• Effects of TMS usually brief • Only works for superficial cortical regions • Affects large area, limiting anatomical resolution • Sometimes adverse effects
fMRI	• High spatial resolution underlying	• Indirect measure of neuronal activity

	the regions impacted by task manipulations • Noninvasive	• OK/poor temporal resolution • Not cheap
EEG (ERPs)	• High temporal resolution underlying cognitive processes • Direct measure of neuronal activity on scalp • Cheap, noninvasive	• Poor spatial resolution • Needs a lot of trials to average over •
MEG	• Similar to EEG, but affects sulci, not gyri • Less affected by distortions in skull than EEG • Has simpler source estimation	• Same problems & benefits as EEG
PET	• Figuring out the concentration of particular neuromodulators in the brain (e.g., dopamine)	• Short half life of reagents • Radioactive materials • Expensive • Poor temporal resolution (block designs)
Pharmacological perturbations (not in textbook)	• Drug use on cognitive processes • Experimental control setting, effects monitored	• Lack of specificity in the effects (don't know the actual mechanism)

Also not covered in textbook: eye-tracking (see: https://en.wikipedia.org/wiki/Eye_tracking for brief summary), EcoG (see: https://en.wikipedia.org/wiki/Electrocorticography for brief summary of what the method is)