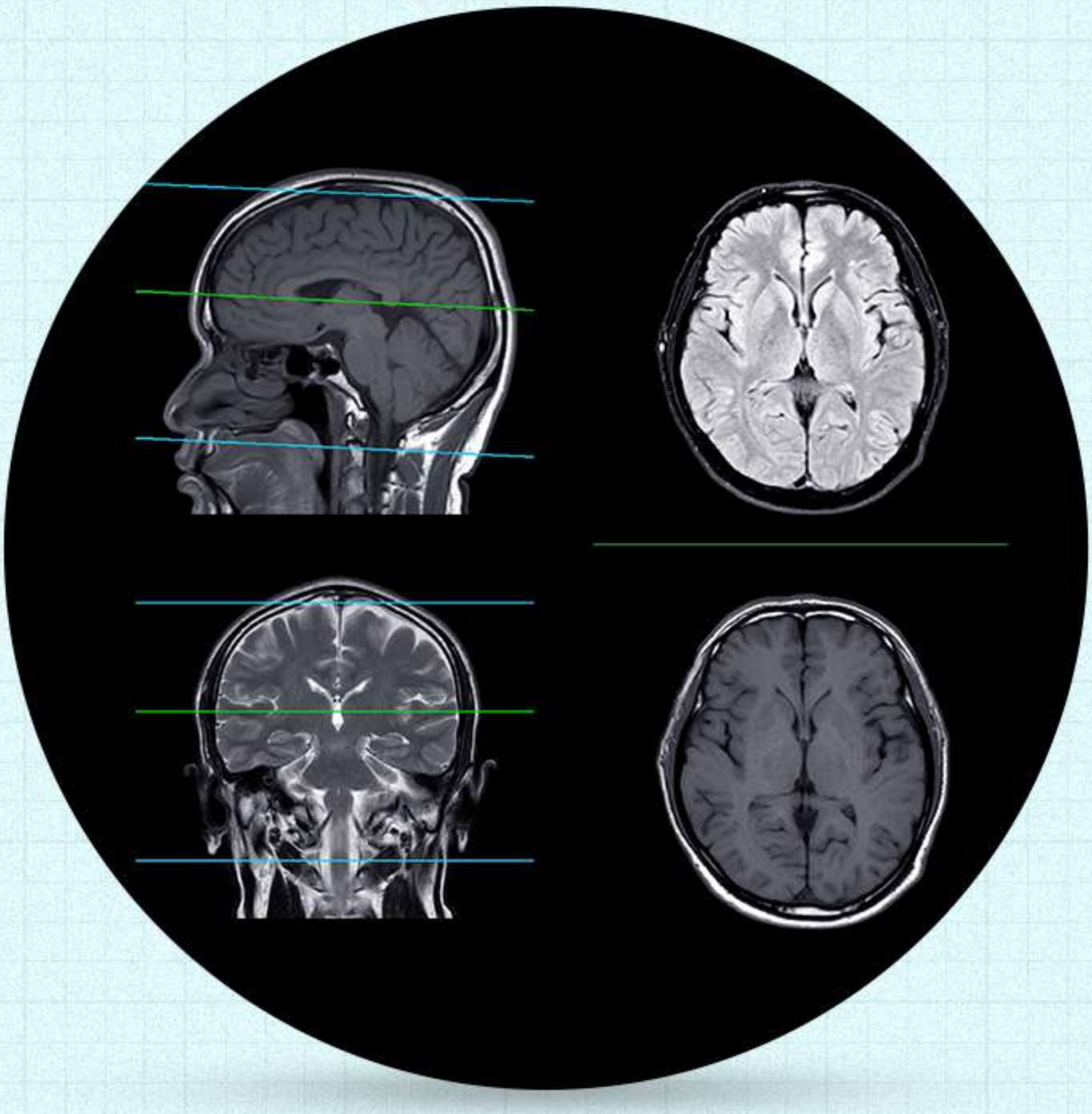
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MAPPING

BRAIN FUNCTION

(Neuroimaging Techniques)



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Why do we map the brain?

To understand thoughts, emotions, and behavior, we need to see which parts of the brain do what.

That's where techniques like EEG, MEG, PET, and fMRI come in.

They help scientists study how the brain responds to different tasks or stimuli.

Let's break down these major techniques!



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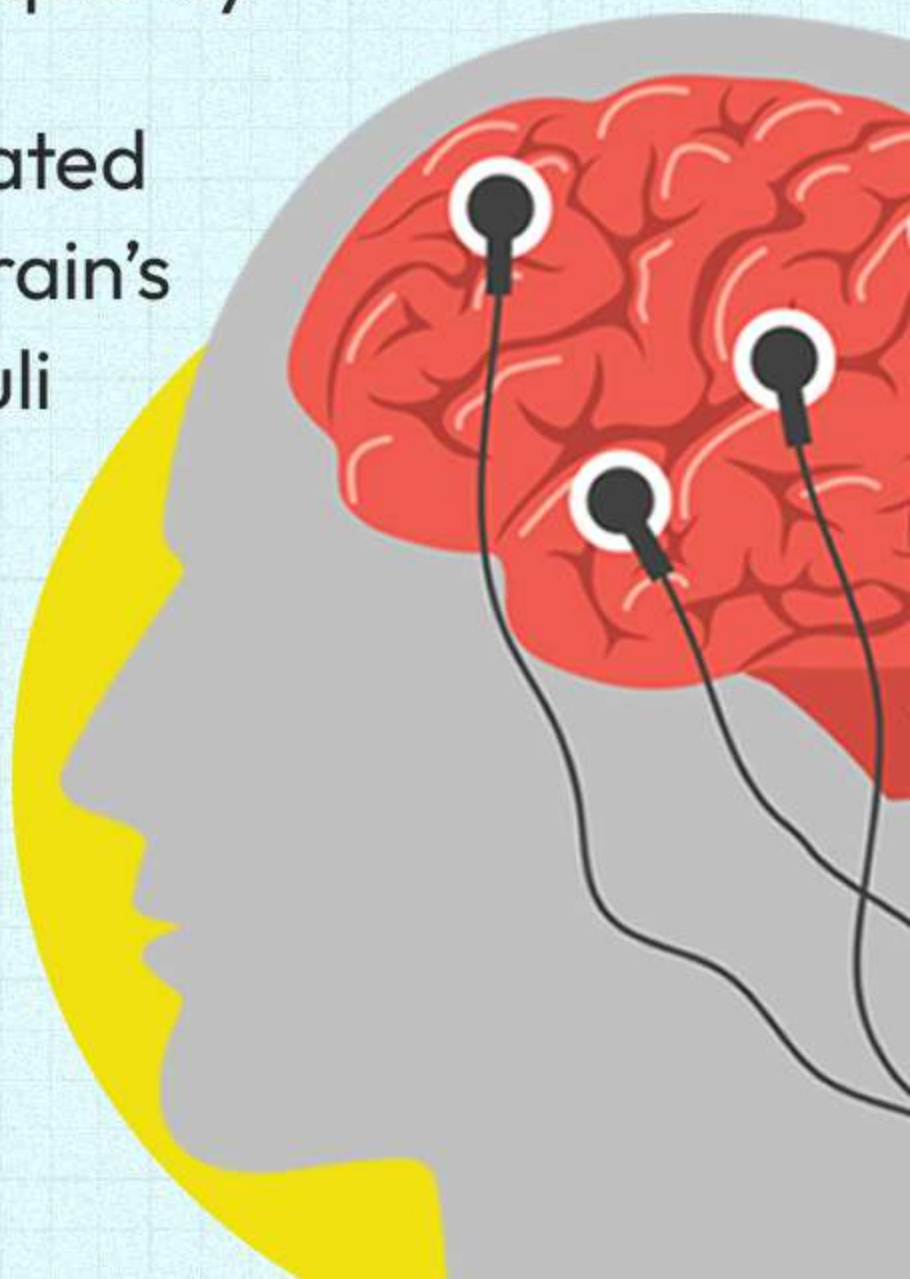
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EEG (Electroencephalography)

- Detects electrical activity via electrodes on the scalp
- Used for studying sleep cycles, seizures, and brain states
- Shows brainwaves (like alpha, beta waves) based on frequency
- Can also track Event-Related Potentials (ERPs) — the brain's response to specific stimuli

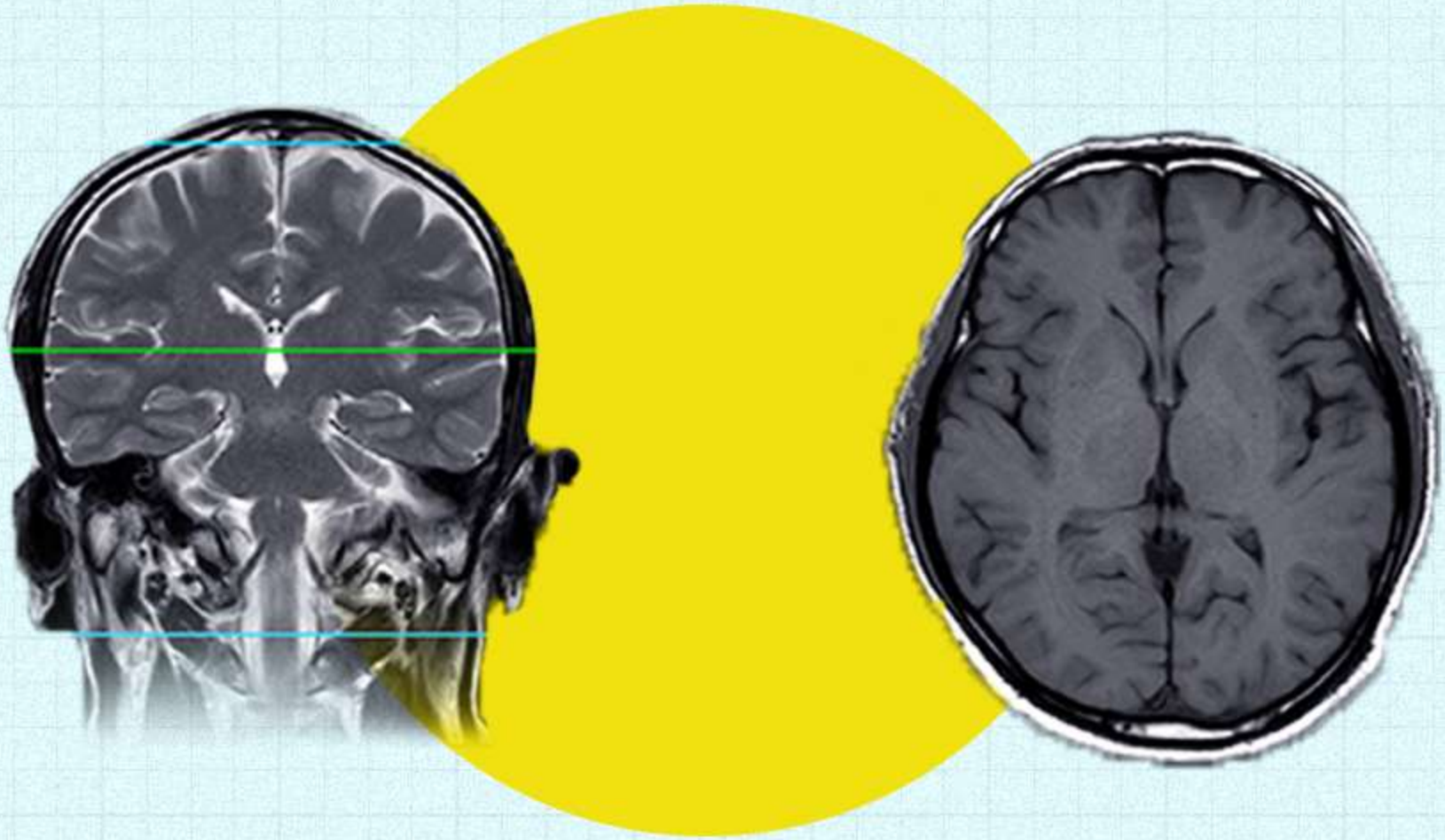
Example:

ERPs help study attention and decision-making during a task.



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MEG (Magnetoencephalography)

- Measures magnetic fields from brain activity
- Offers better spatial precision than EEG
- Requires a helmet-like scanner with superconducting sensors

Used in:

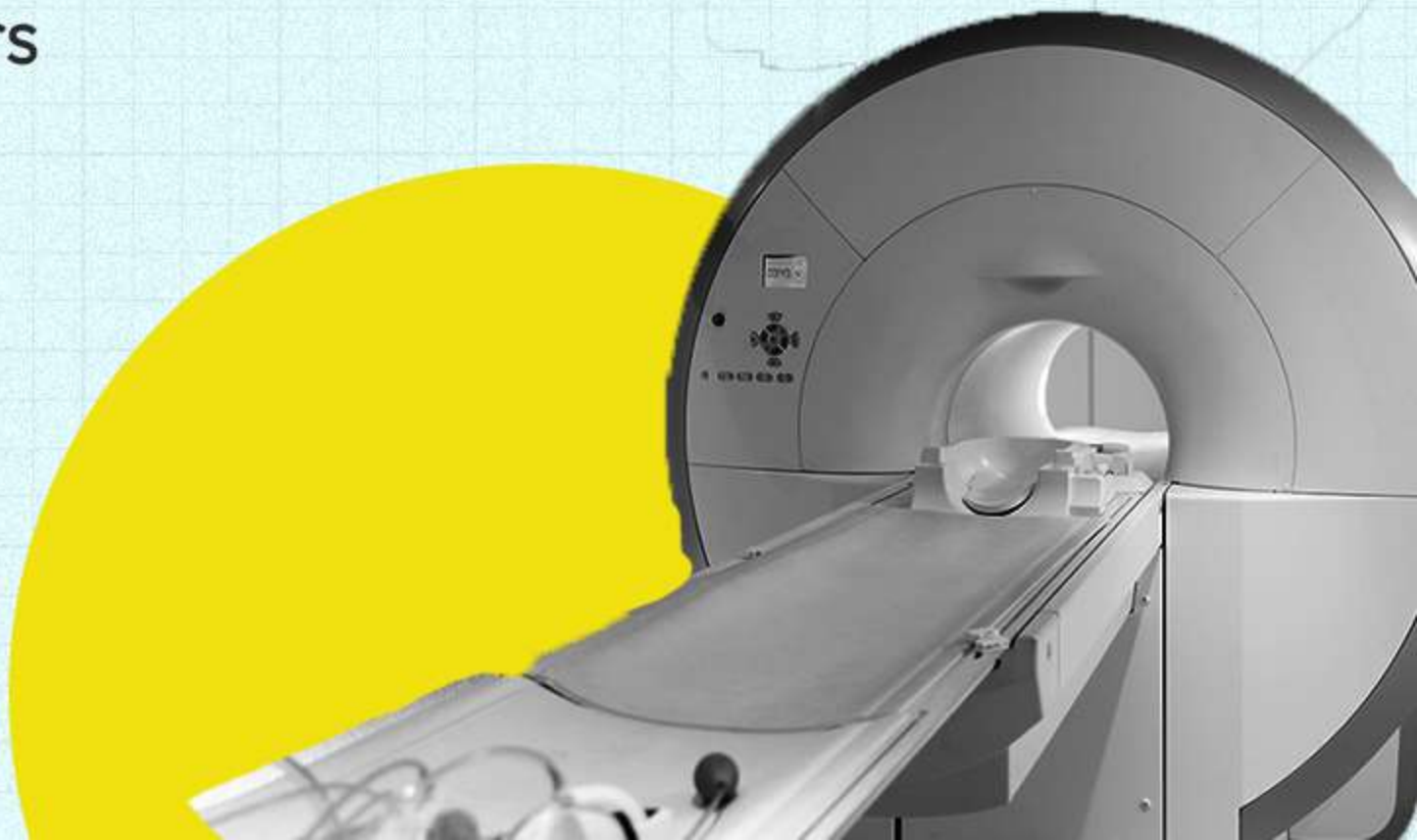
- Early detection of dementia
- Brain mapping in autism research

PET (Positron Emission Tomography)

- Injects radioactive glucose into the bloodstream
- Active brain cells absorb more glucose → more activity
- Scanner detects emitted gamma rays
- Brain activity shows up in color-coded images

Helpful in detecting tumors, studying metabolism, or conditions like Alzheimer's

Similar tool: SPECT — measures blood flow using different tracers



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fMRI (Functional MRI)

- Measures blood oxygen levels — more oxygen = more brain activity
- Combines structure + function in one scan
- High spatial resolution without needing injections

Used to study:

- Which brain areas activate during speech, movement, or thinking

Non-invasive & widely used in cognitive neuroscience



Quick Comparison

Technique	Measures	Strength
EEG	Electrical activity	Great for timing (temporalresolution)
MEG	Magnetic fields	Better spatial resolu-tion than EEG
PET	Glucose use	Good for metabo-lism studies
fMRI	Blood oxygen	High spatial & functio-nal accuracy

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