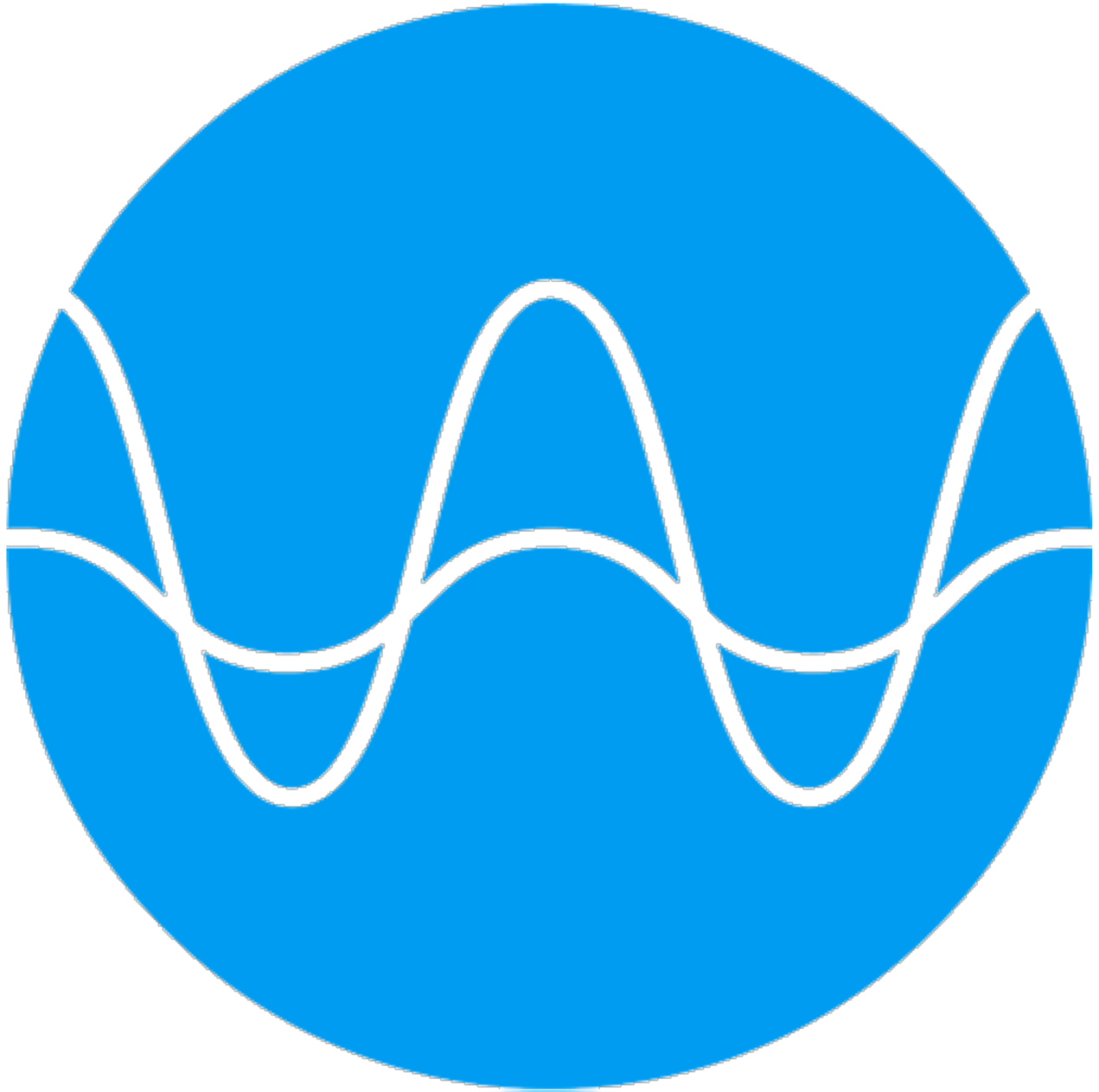


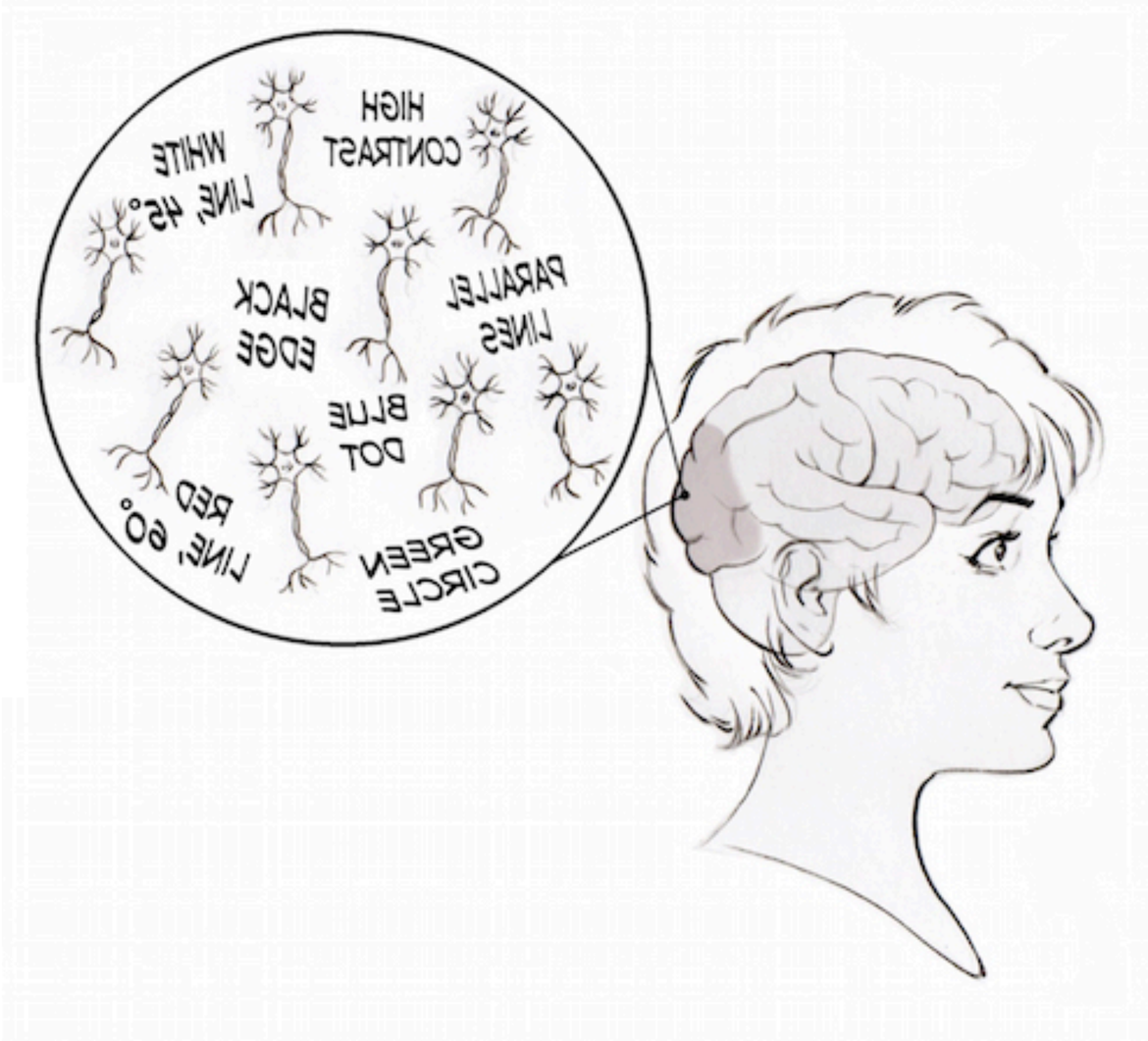
How do BCI actually* work ? 🤔

* Naive explanation

BCI: Brain

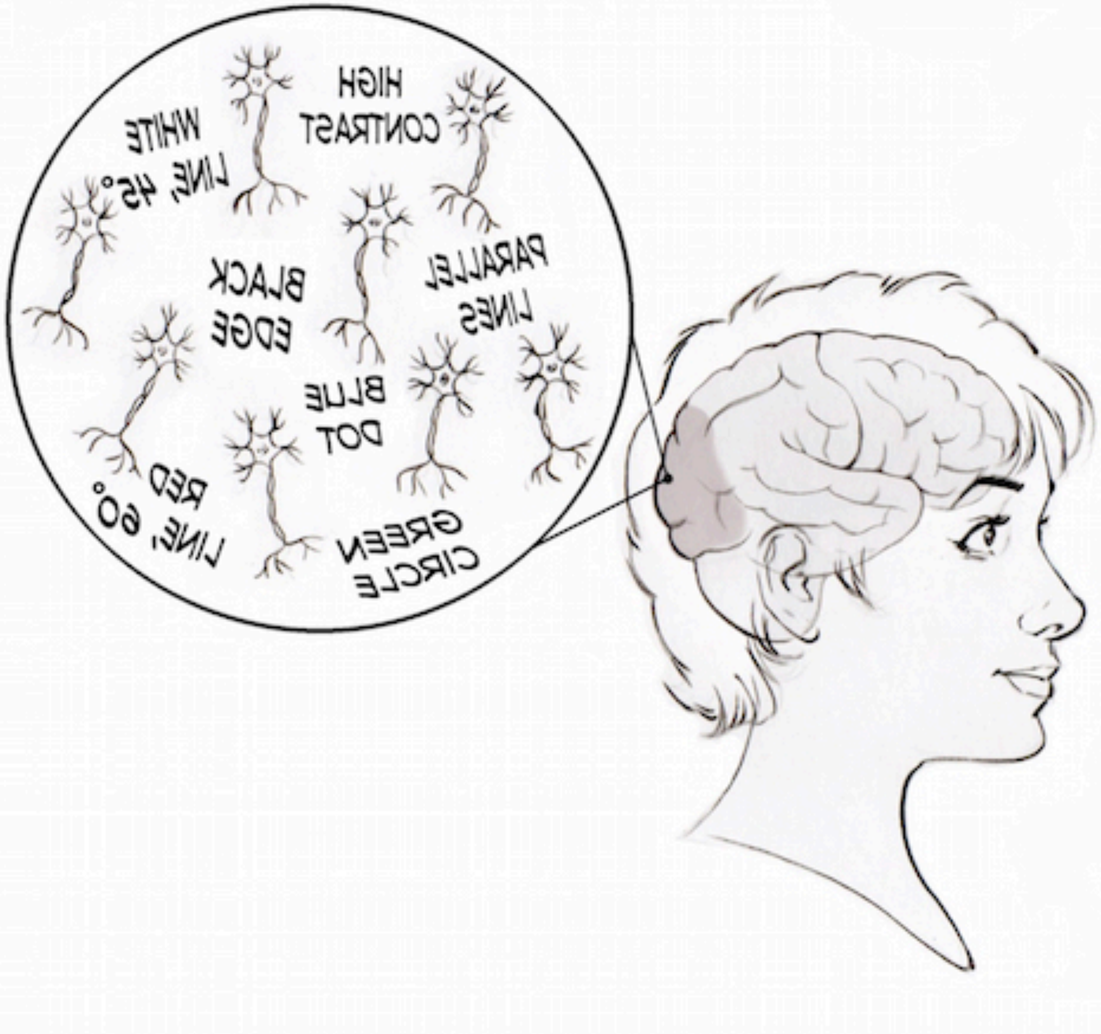
- Electroencephalography (EEG)
- Brainwaves
- Evoked potentials

Electroencephalography (EEG)



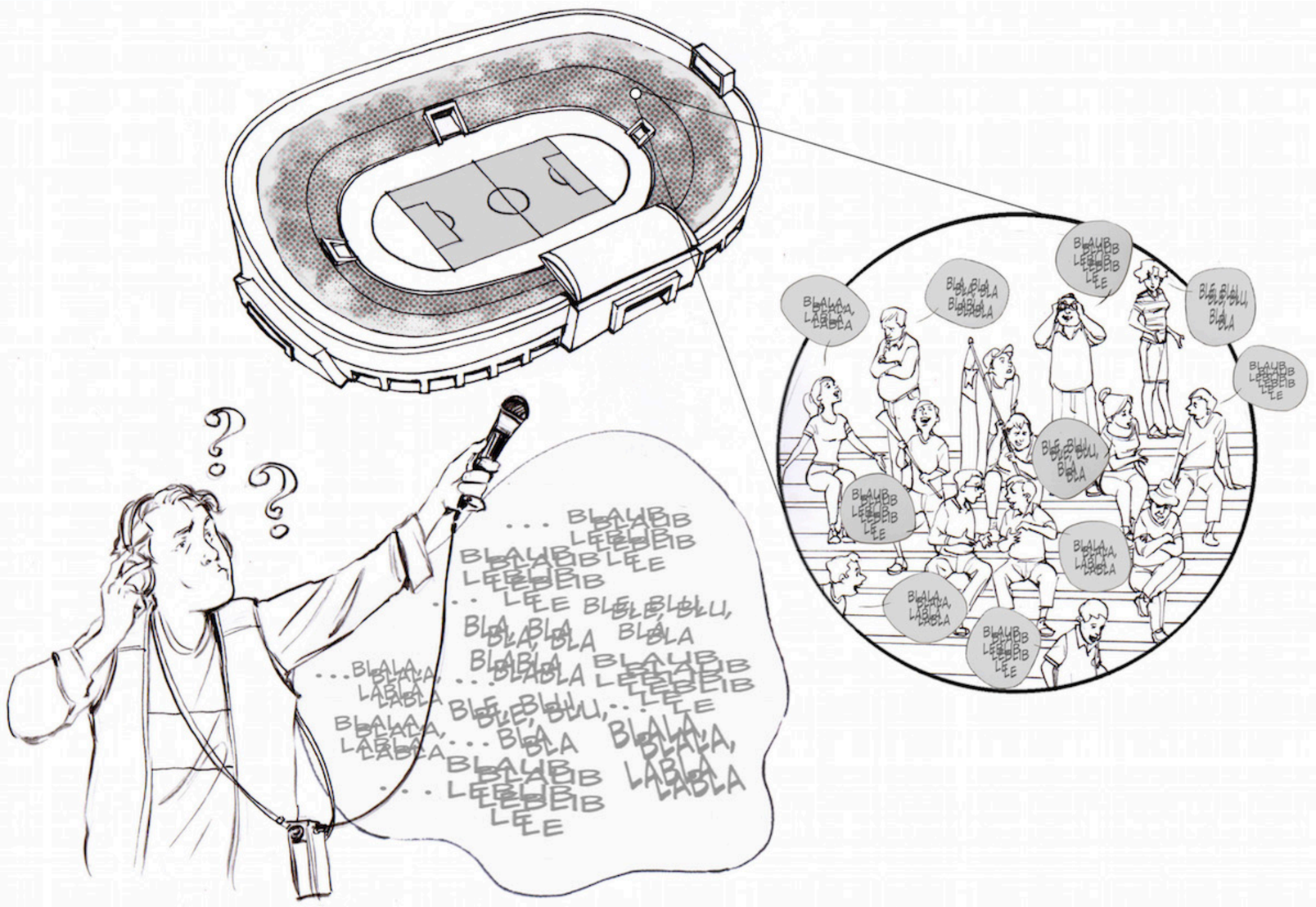
https://backyardbrains.com/experiments/EEG

Electroencephalography (EEG)



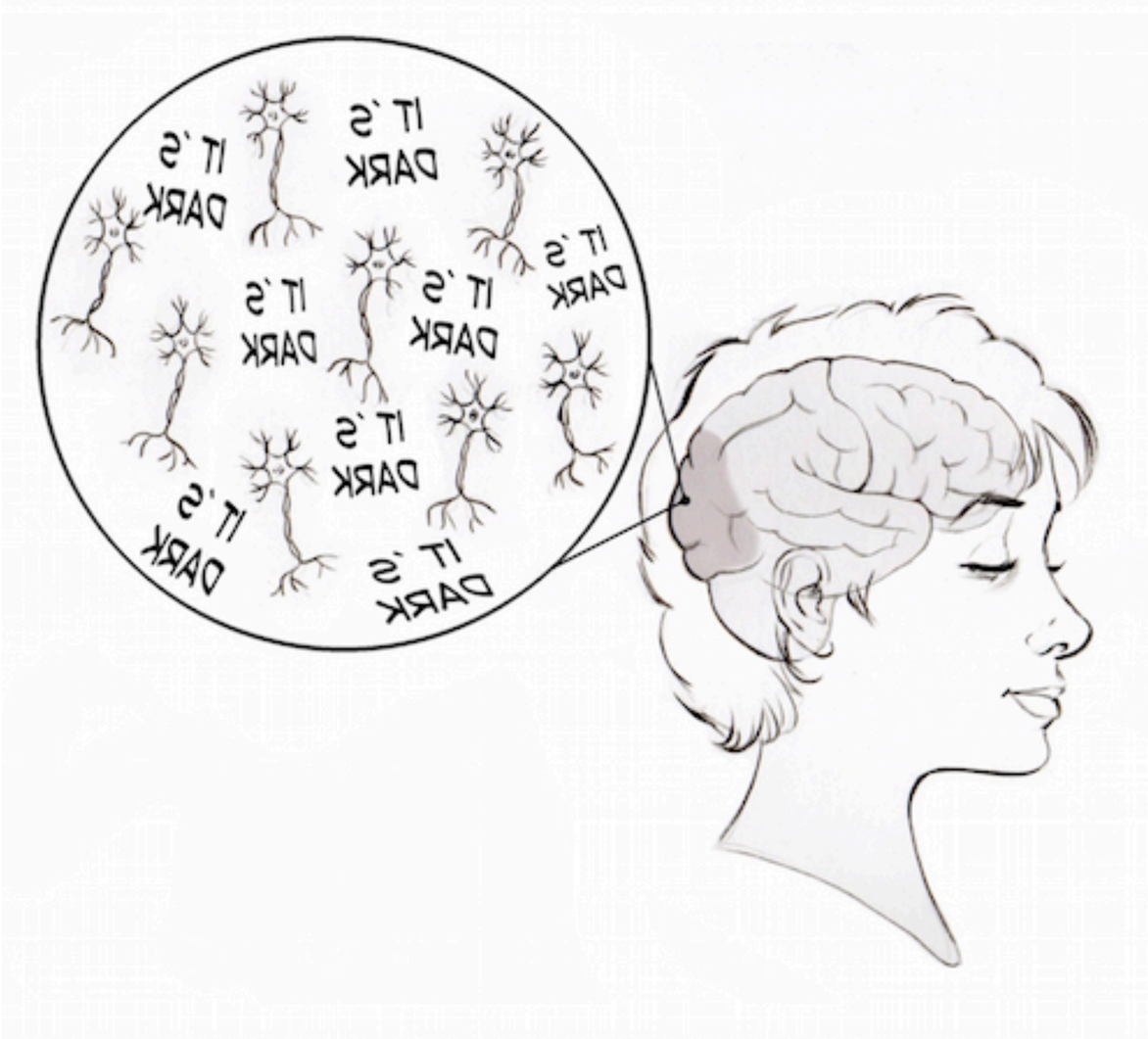
https://backyardbrains.com/experiments/EEG

Electroencephalography (EEG)



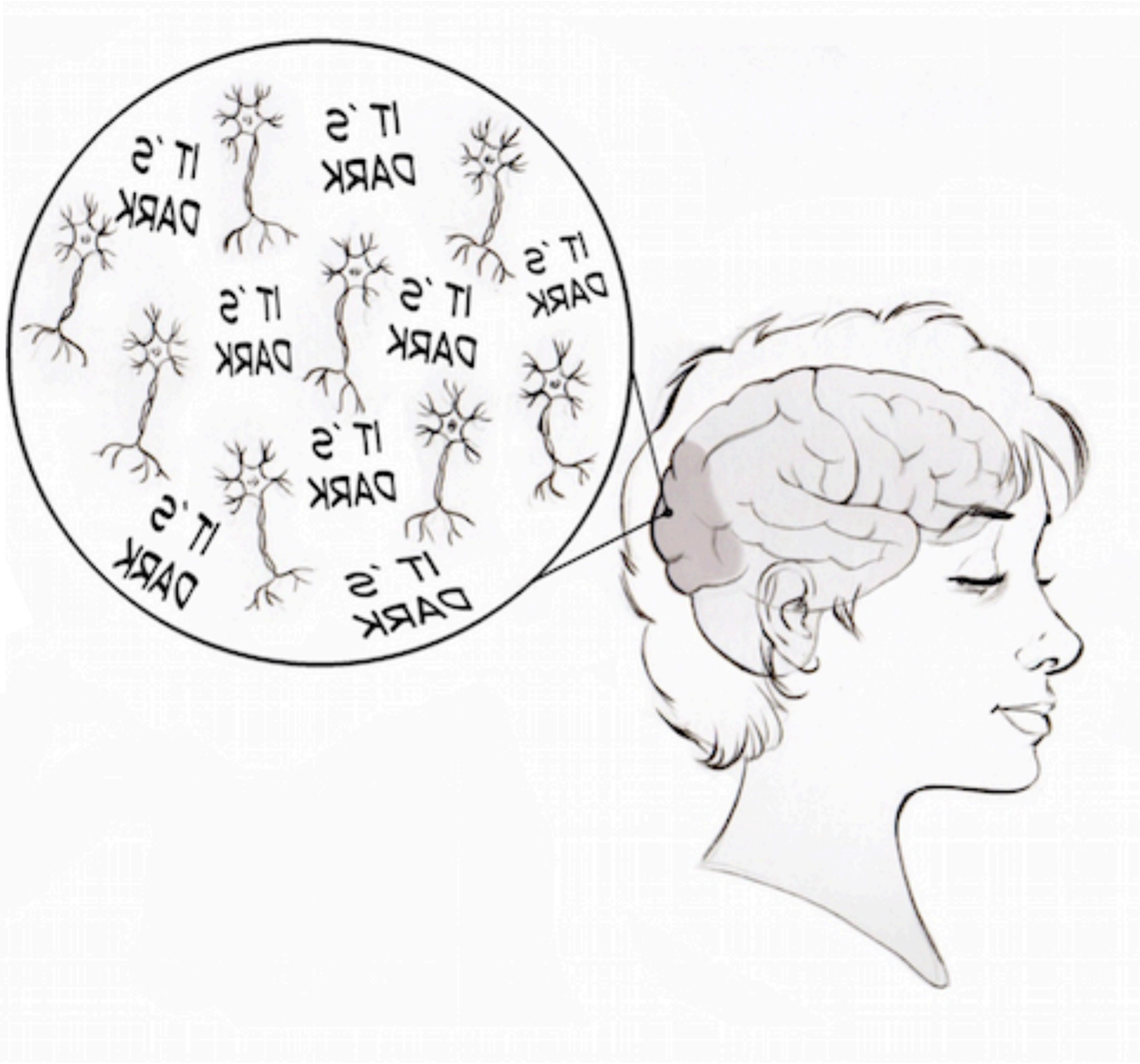
https://backyardbrains.com/experiments/EEG

Electroencephalography (EEG)



https://backyardbrains.com/experiments/EEG

Electroencephalography (EEG)

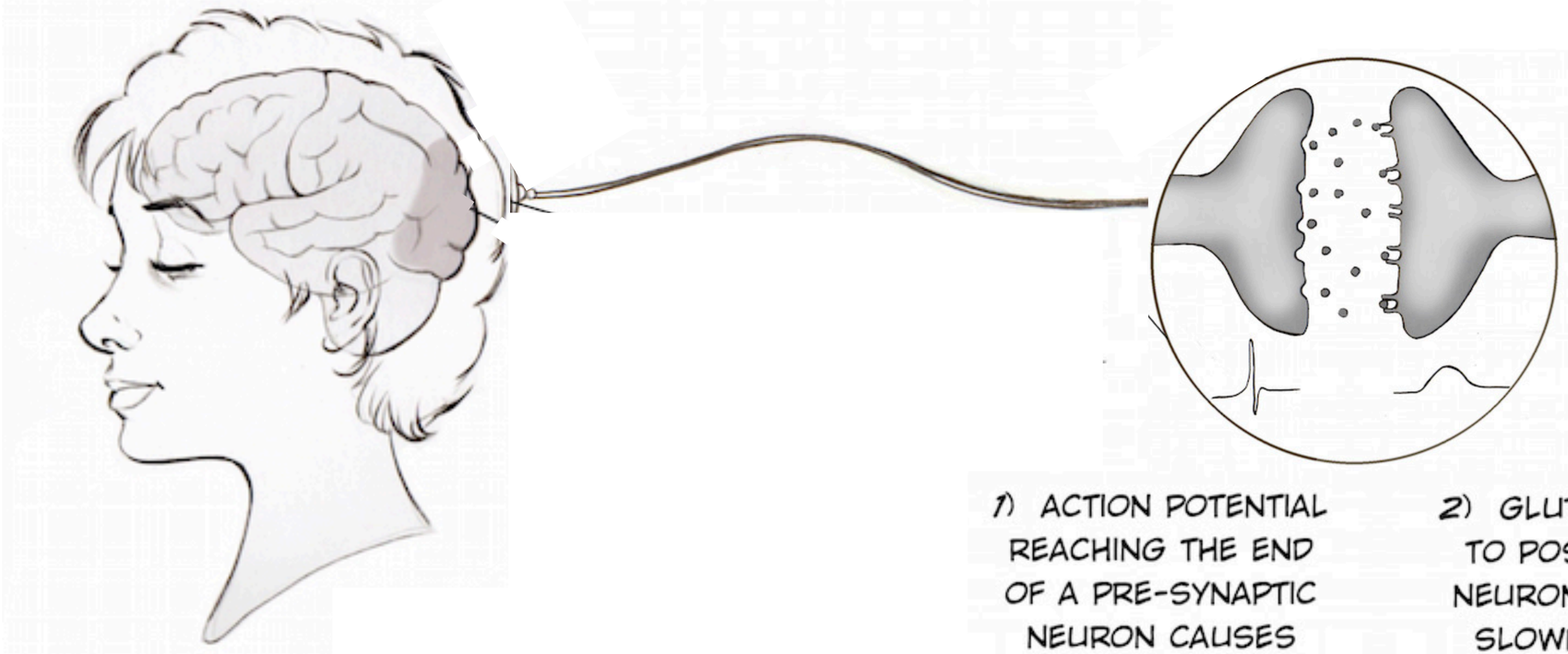


https://backyardbrains.com/experiments/EEG

Electroencephalography (EEG)

https://backyardbrains.com/experiments/EEG

Electroencephalography (EEG)



1) ACTION POTENTIAL REACHING THE END OF A PRE-SYNAPTIC NEURON CAUSES RELEASE OF GLUTAMATE.

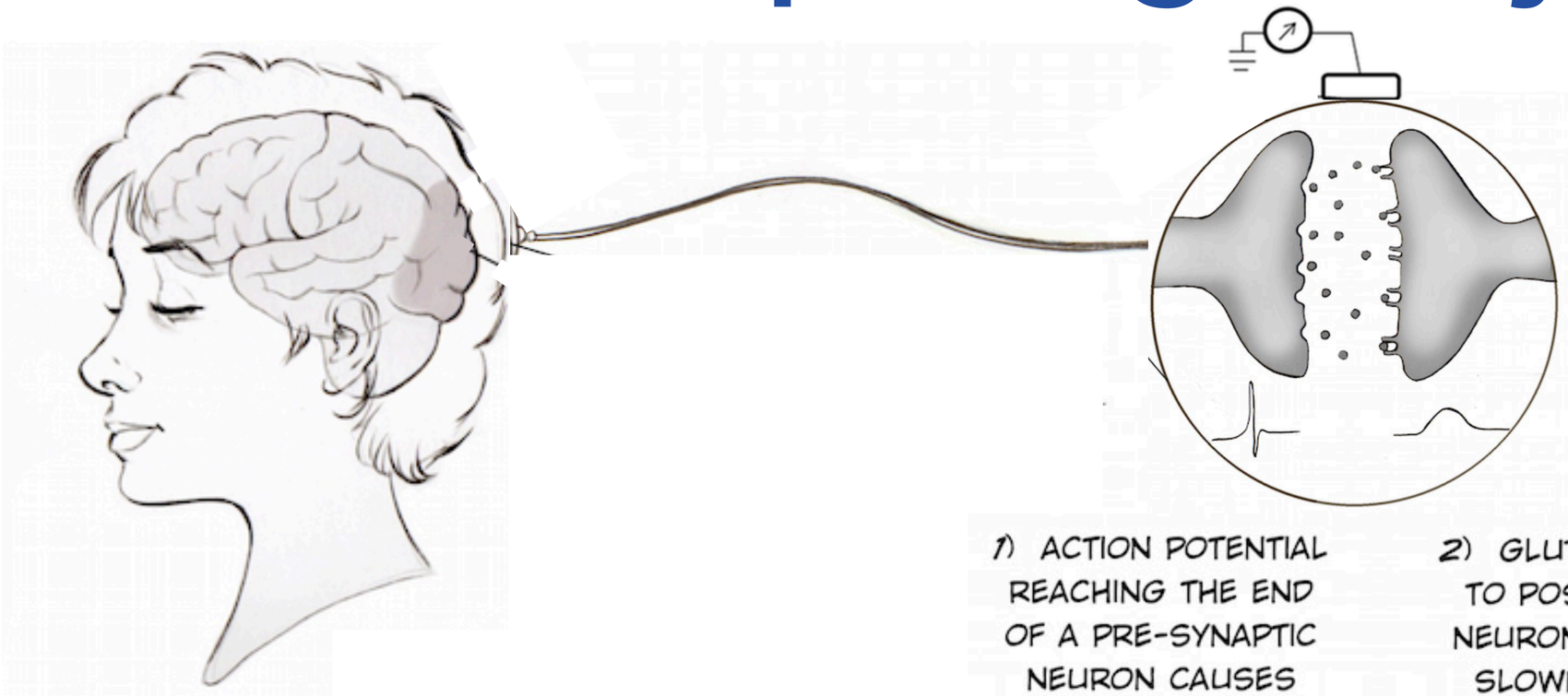
1 MS

2) GLUTAMATE BINDS TO POST-SYNAPTIC NEURON, CAUSING A SLOWER, LONGER CHANGE IN VOLTAGE CALLED AN *EPSP*.

5 MS

https://backyardbrains.com/experiments/EEG

Electroencephalography (EEG)



1) ACTION POTENTIAL REACHING THE END OF A PRE-SYNAPTIC NEURON CAUSES RELEASE OF GLUTAMATE.

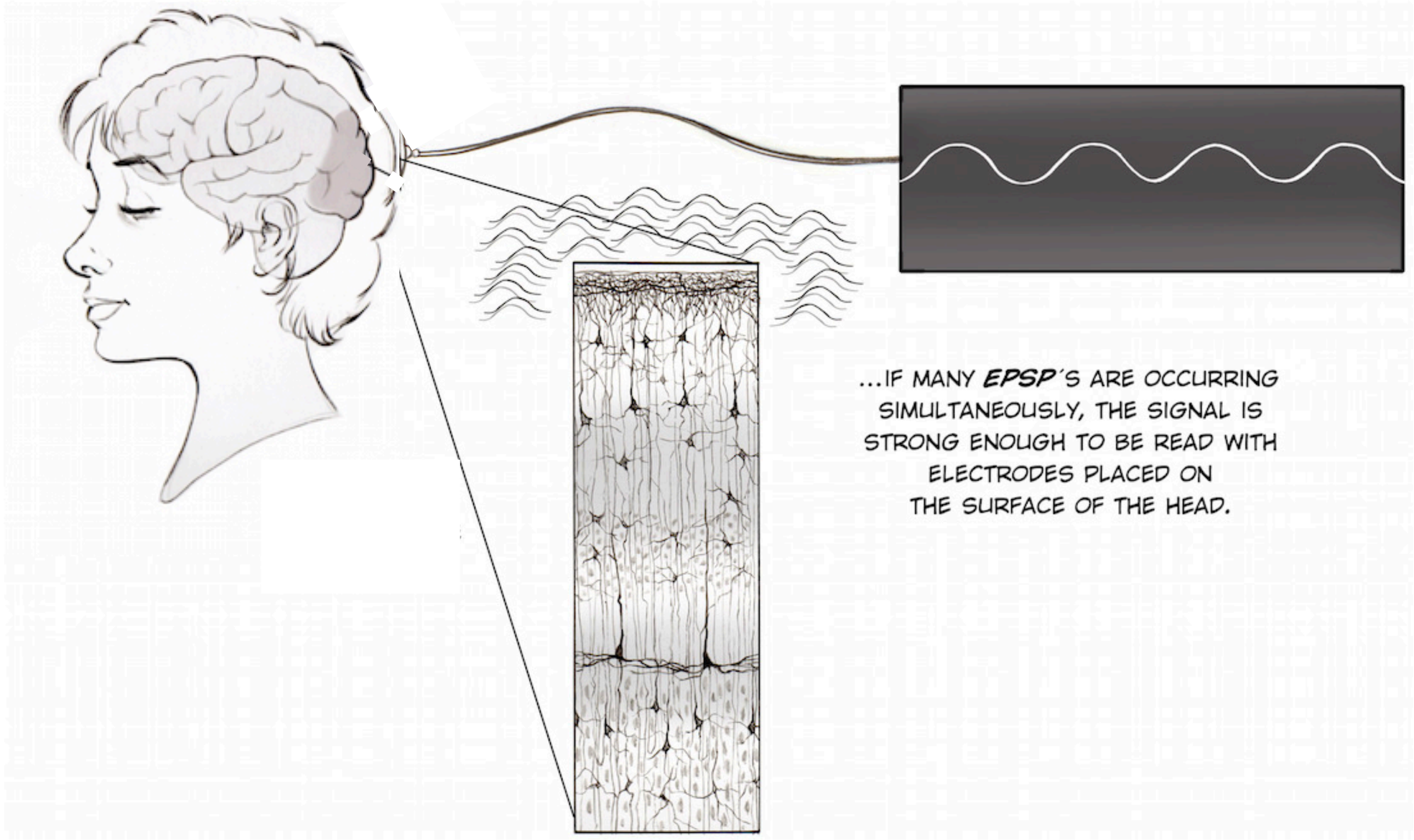
1 MS

2) GLUTAMATE BINDS TO POST-SYNAPTIC NEURON, CAUSING A SLOWER, LONGER CHANGE IN VOLTAGE CALLED AN *EPSP*.

5 MS

https://backyardbrains.com/experiments/EEG

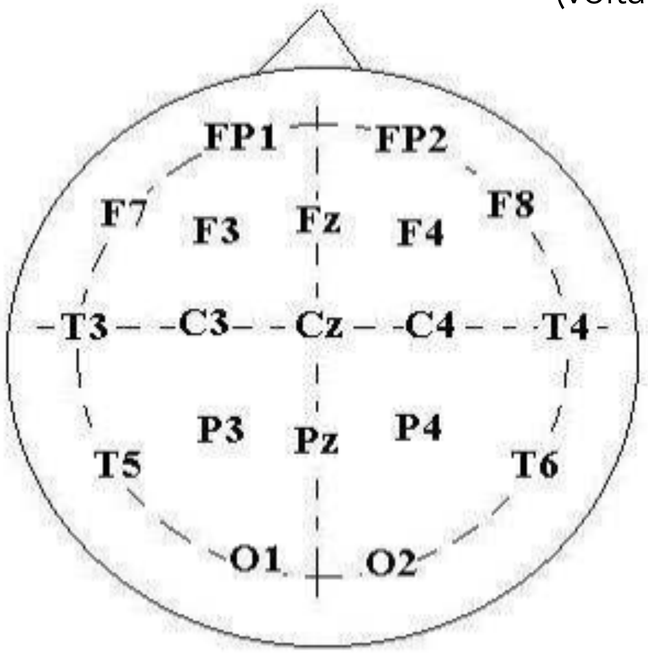
Electroencephalography (EEG)

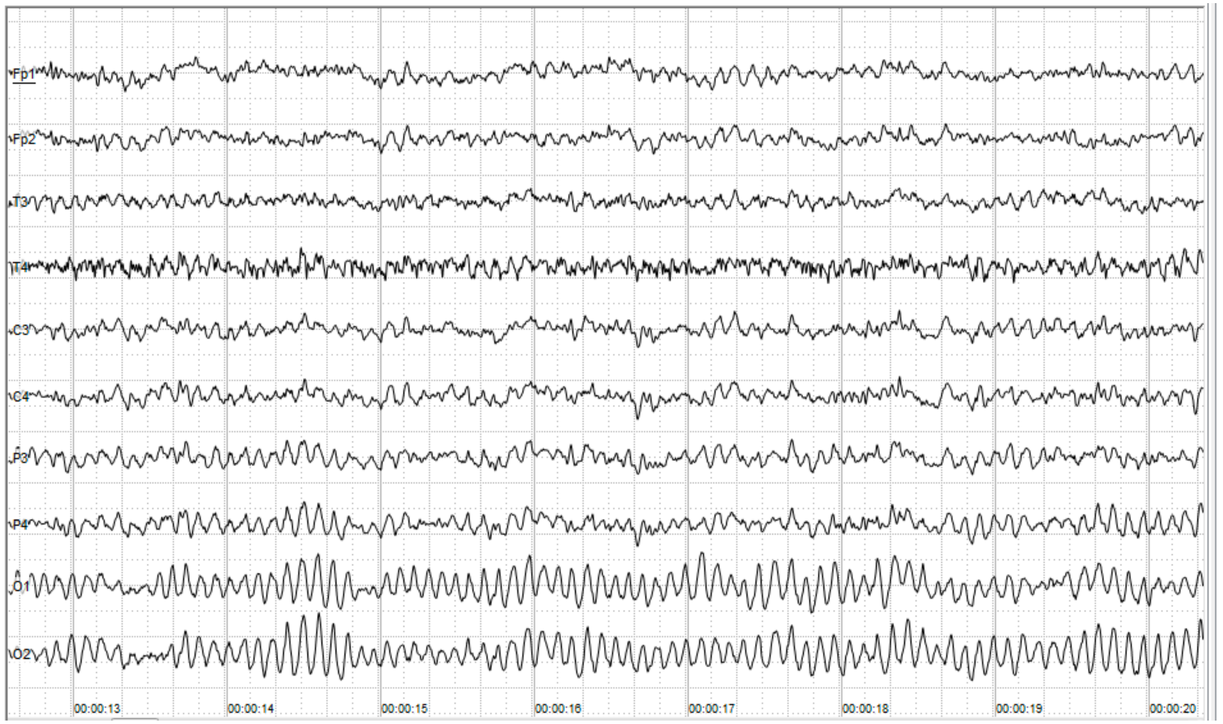


Electroencephalography (EEG)

Electrodes

(voltage)





Time

(seconds)

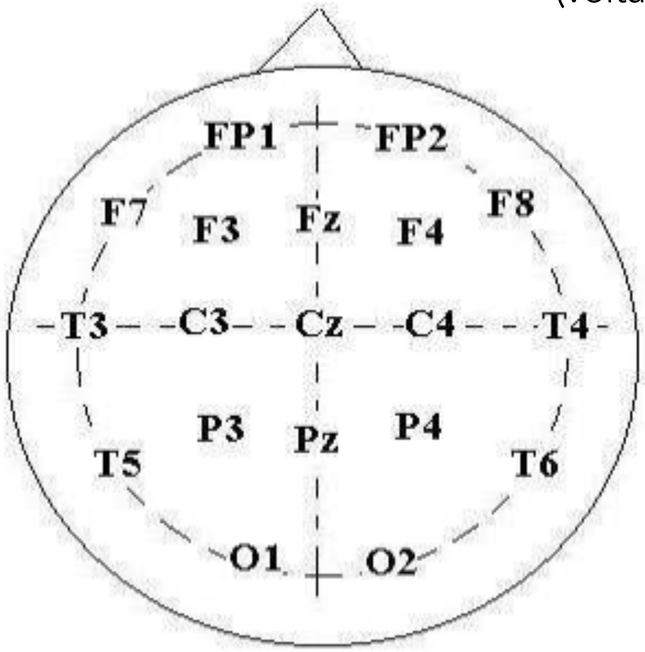
BCI: Brain

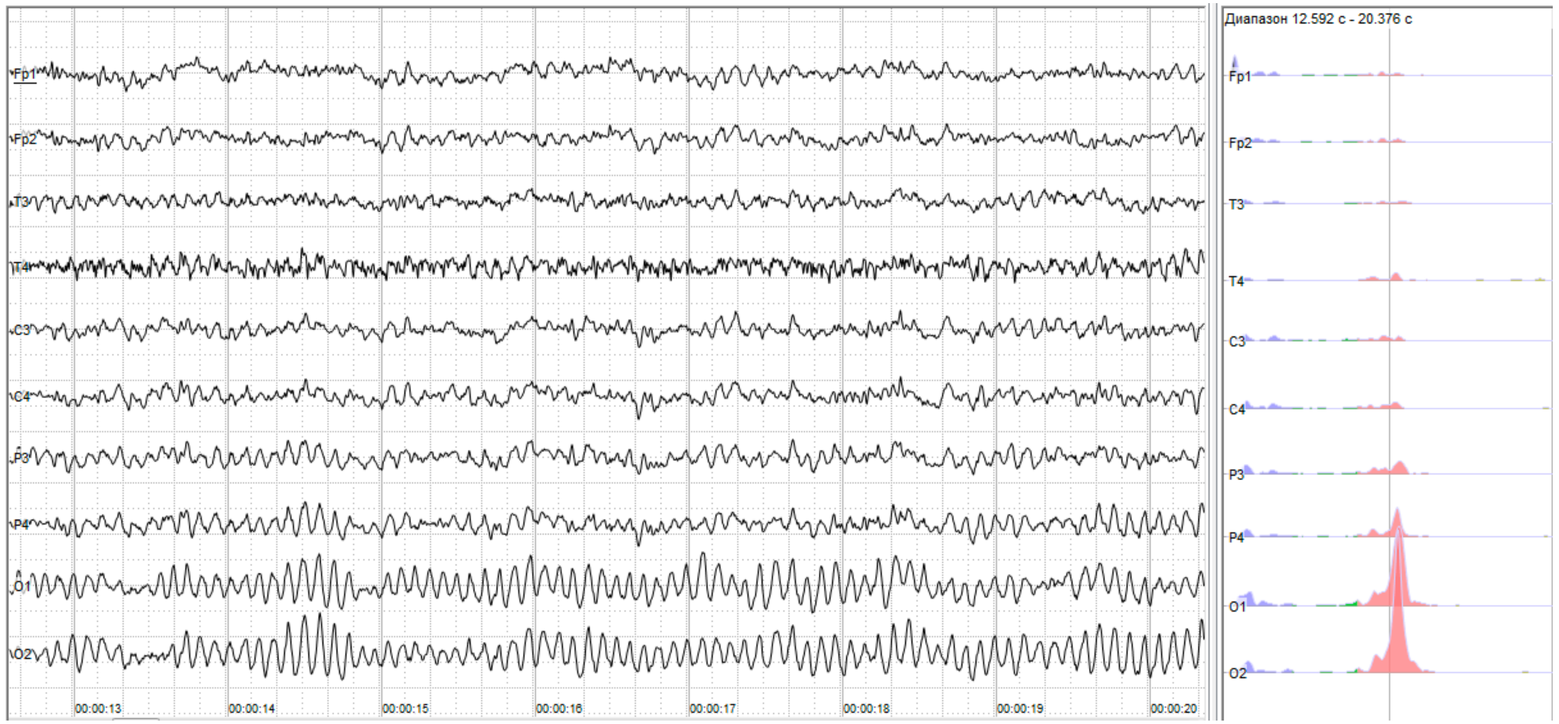
- Electroencephalography (EEG)
- Brainwaves
- Evoked potentials

Brainwaves

Electrodes

(voltage)





Power

(W/Hz)

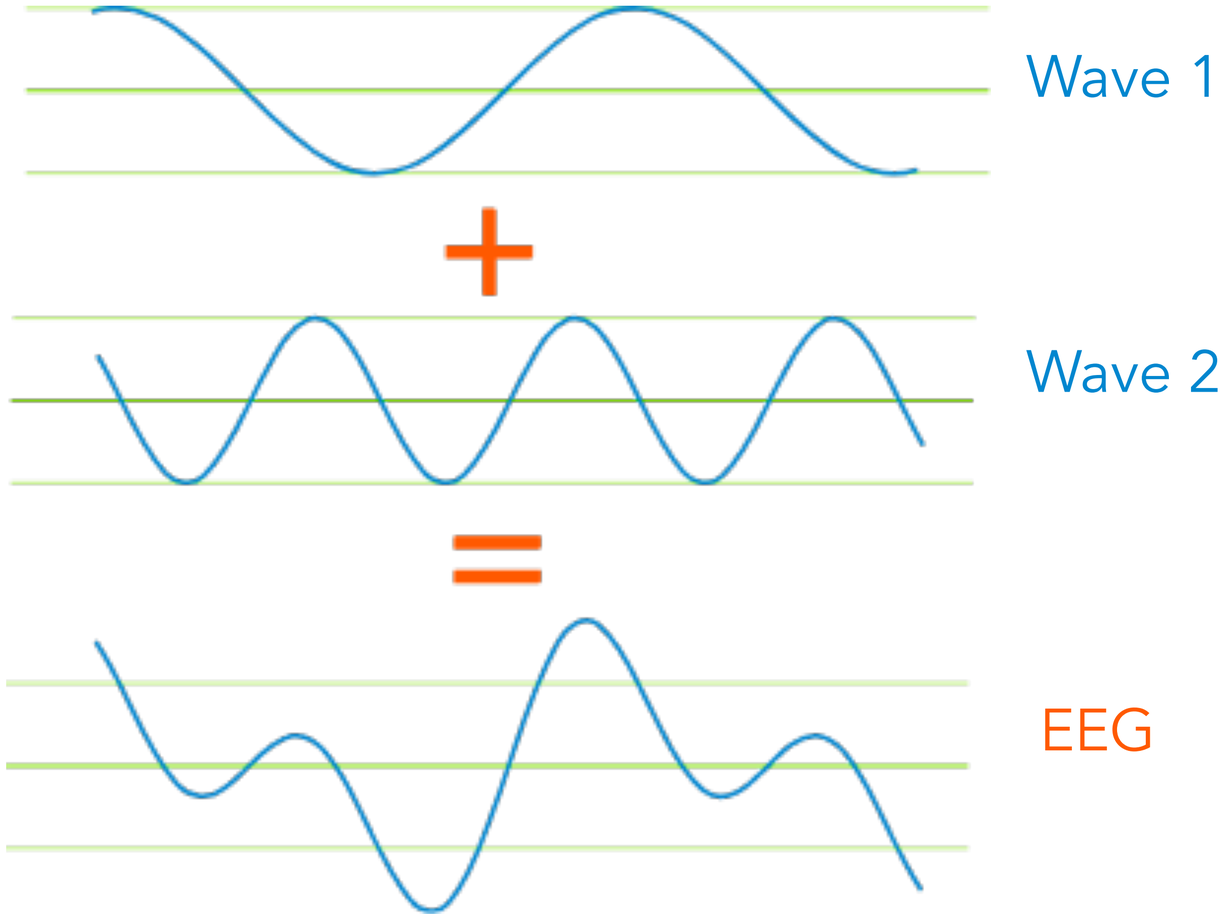
Time

(seconds)

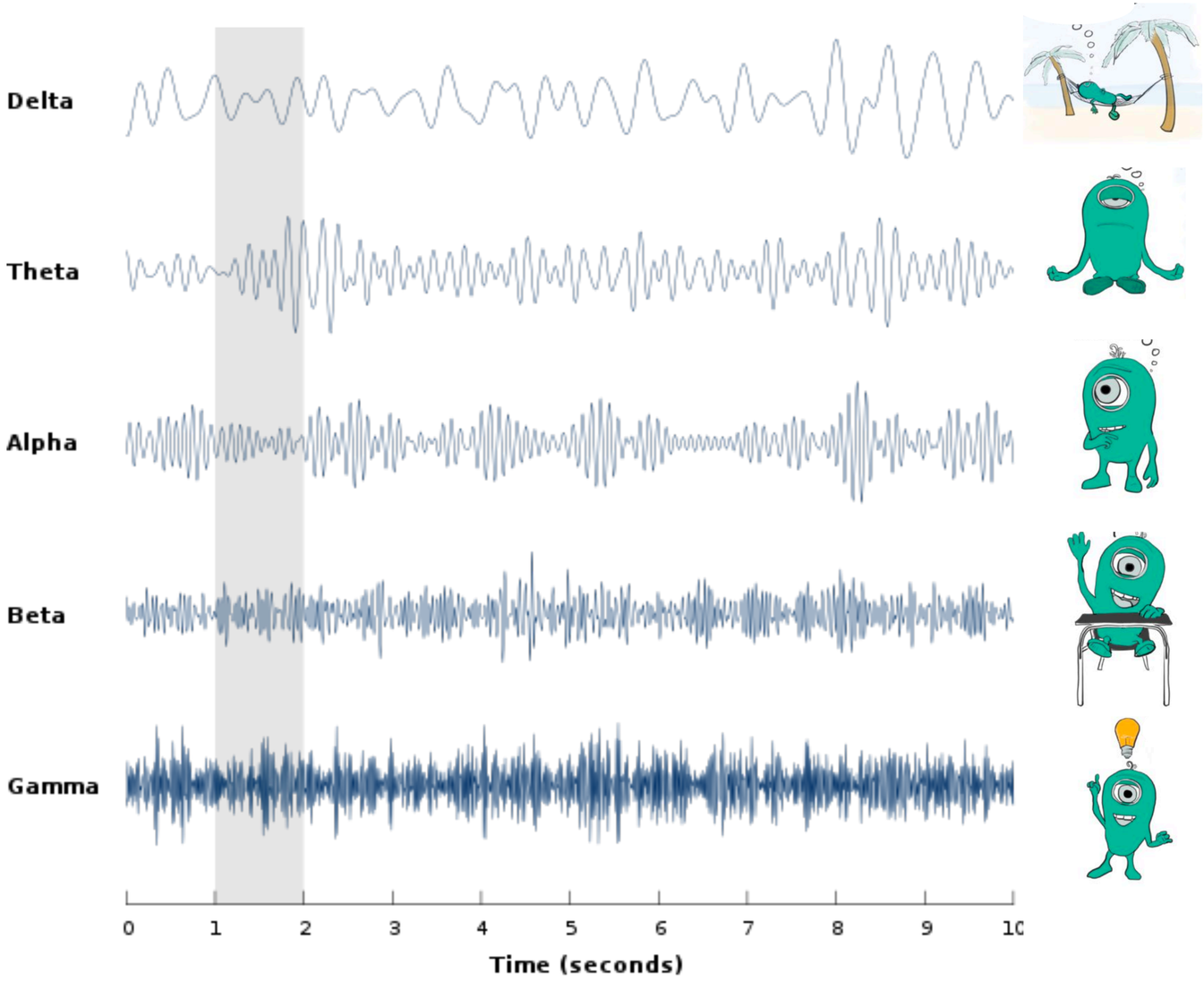
Frequency

(Hz)

Brainwaves



Brainwaves



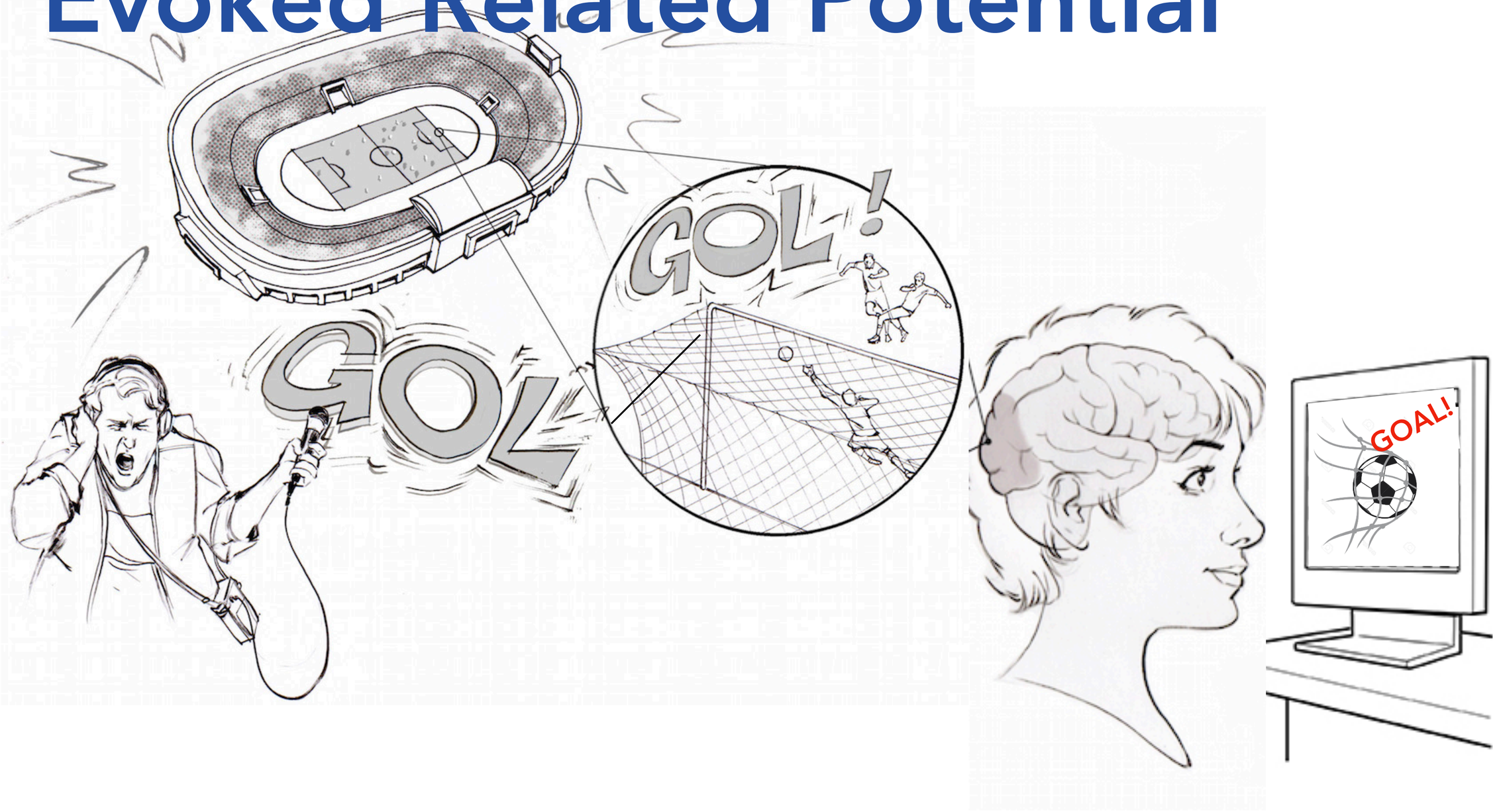
BCI: Brain

- Electroencephalography (EEG)
- Brainwaves
- Evoked Related Potential (ERP)

Evoked Related Potential

https://backyardbrains.com/experiments/EEG

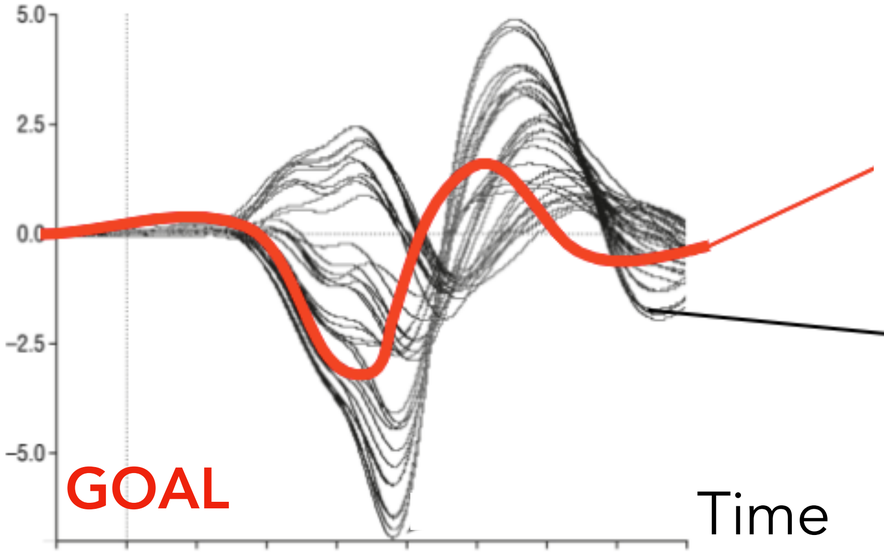
Evoked Related Potential



https://backyardbrains.com/experiments/EEG

Evoked Related Potential

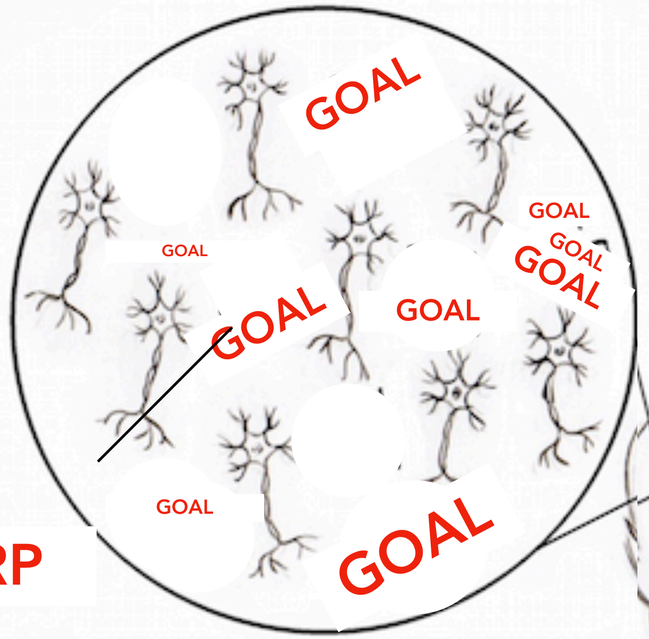
Electrodes
(voltage)

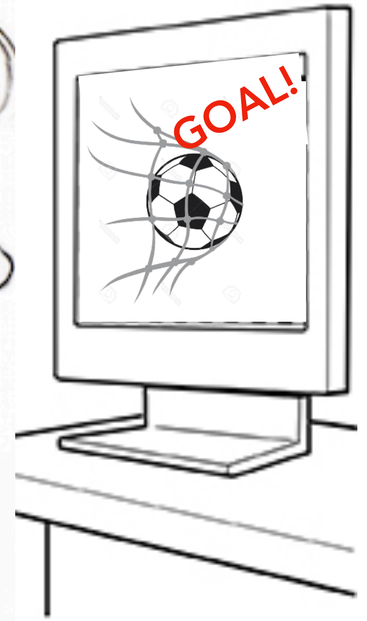


Time
(seconds)

ERP

signals



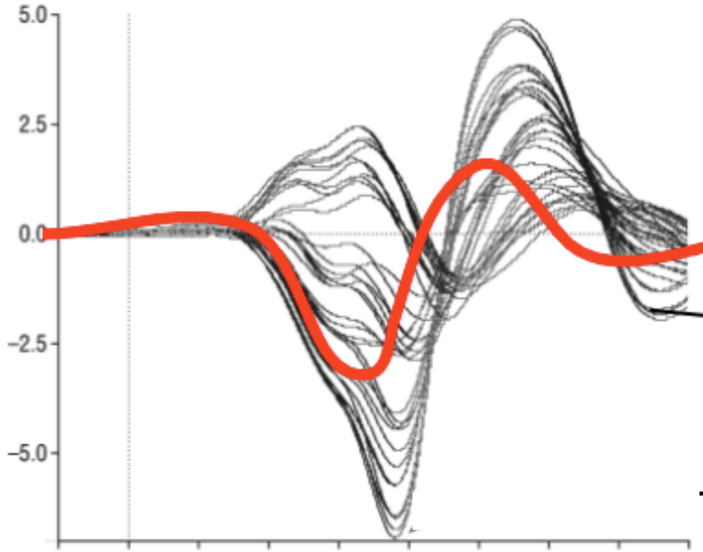


https://backyardbrains.com/experiments/EEG

Evoked Related Potential

Electrodes

(voltage)

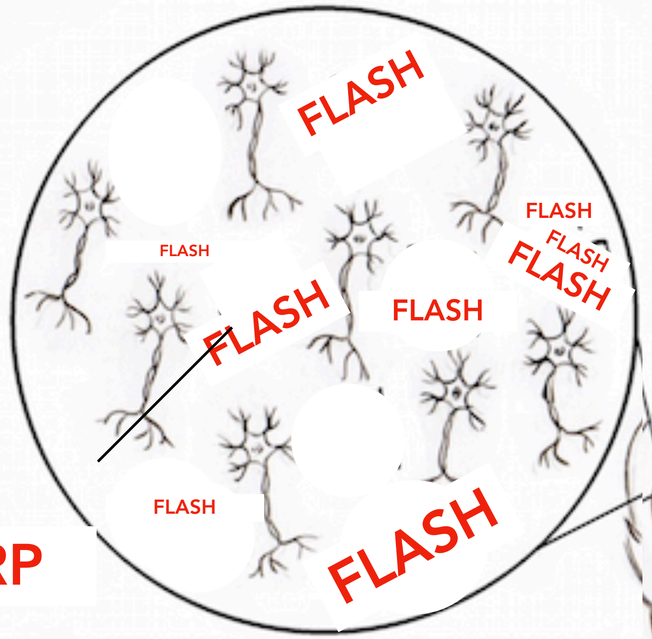


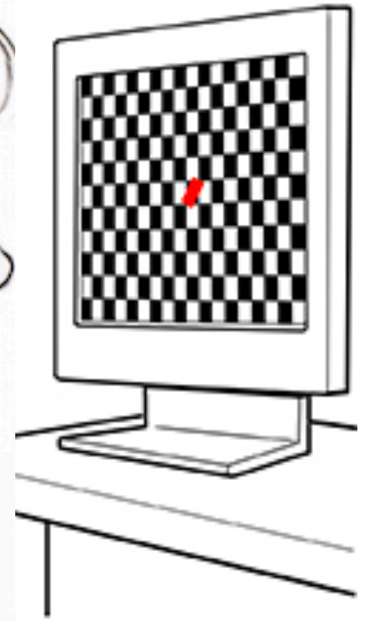
ERP

signals

Time

(seconds)





https://backyardbrains.com/experiments/EEG

BCI: Brain Computer

1. Stimuli

2. Record
brain response

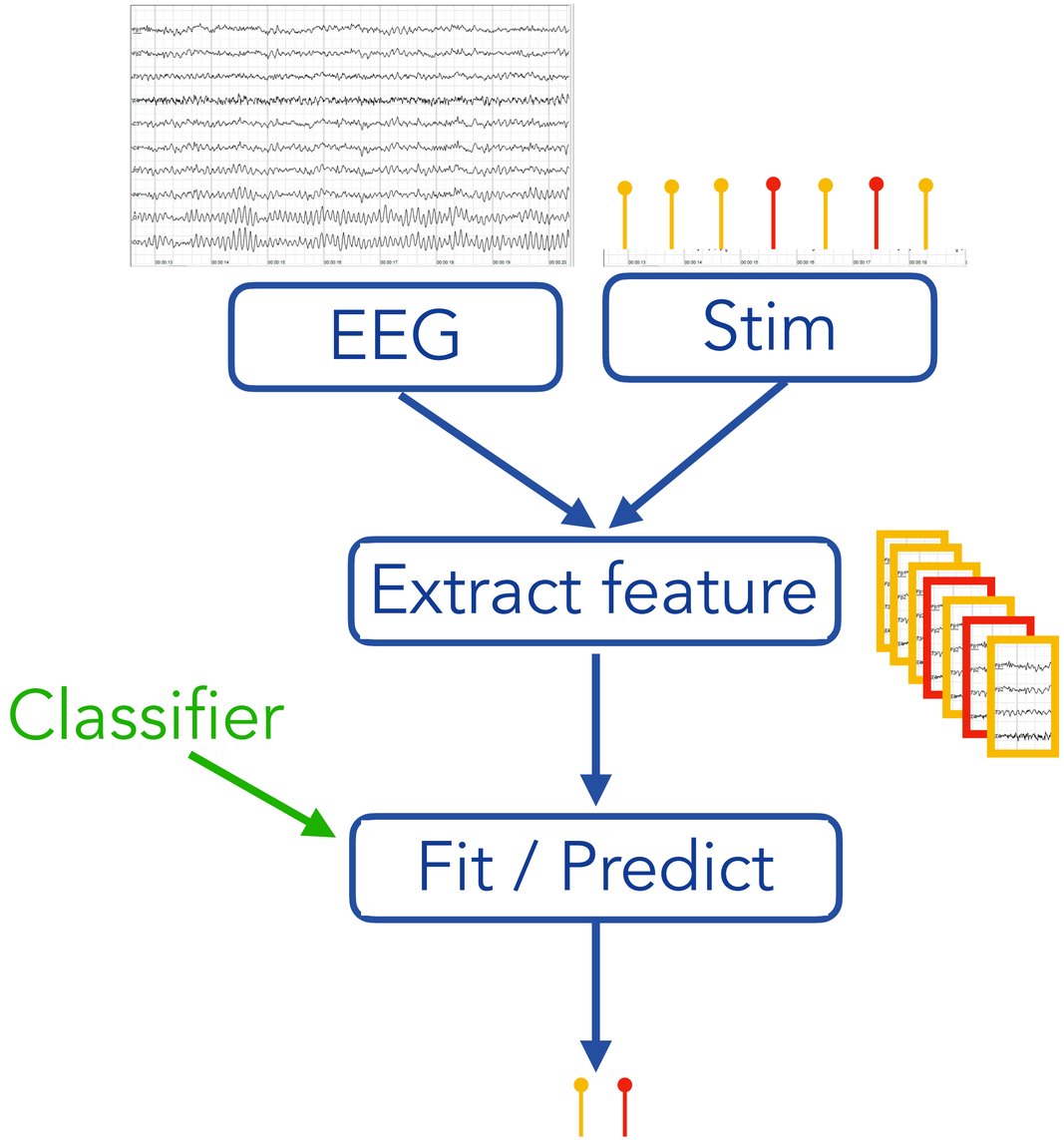
BCI: Brain Computer Interface

1. Stimuli

2. Record
brain response

3. Feedback

BCI pipeline



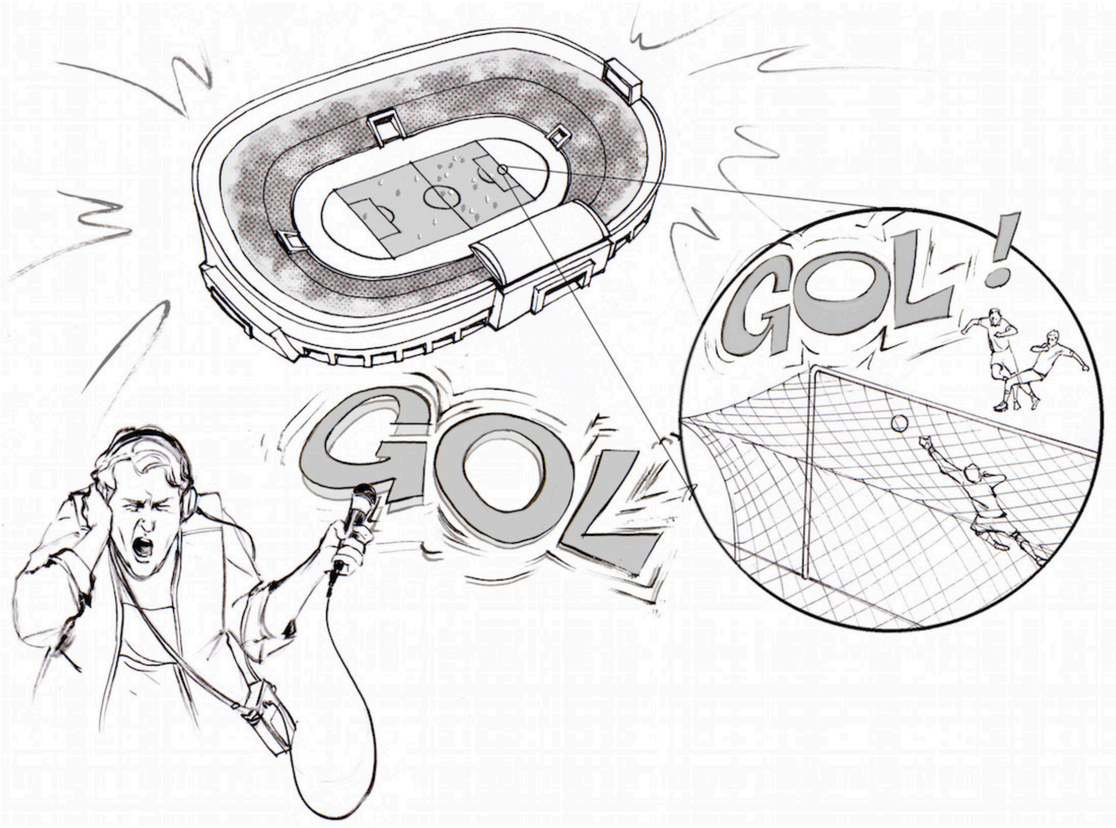
BCI Paradigms

Induced

BCI Paradigms

Induced

Evoked



BCI Paradigms

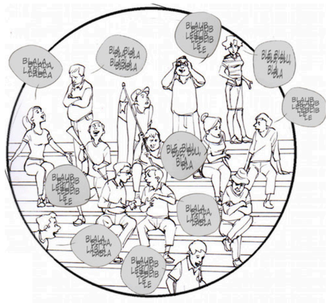
Passive

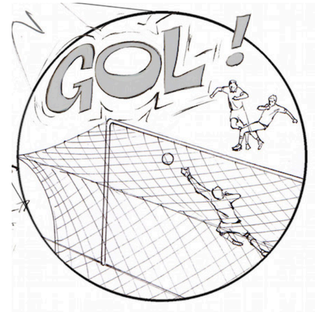
Active

BCI Paradigms

Active

Induced





Evoked

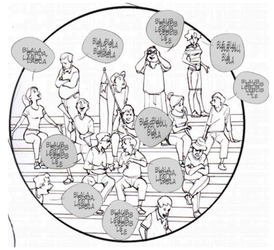
Neurofeedback

Passive

BCI Paradigms

Passive

Induced

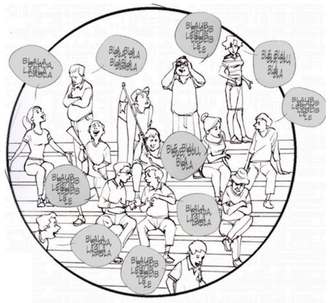


Neurofeedback

BCI Paradigms

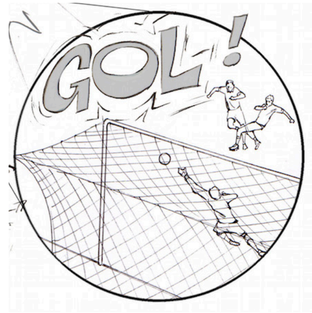
Active

Induced



SSVEP

Evoked



Neurofeedback

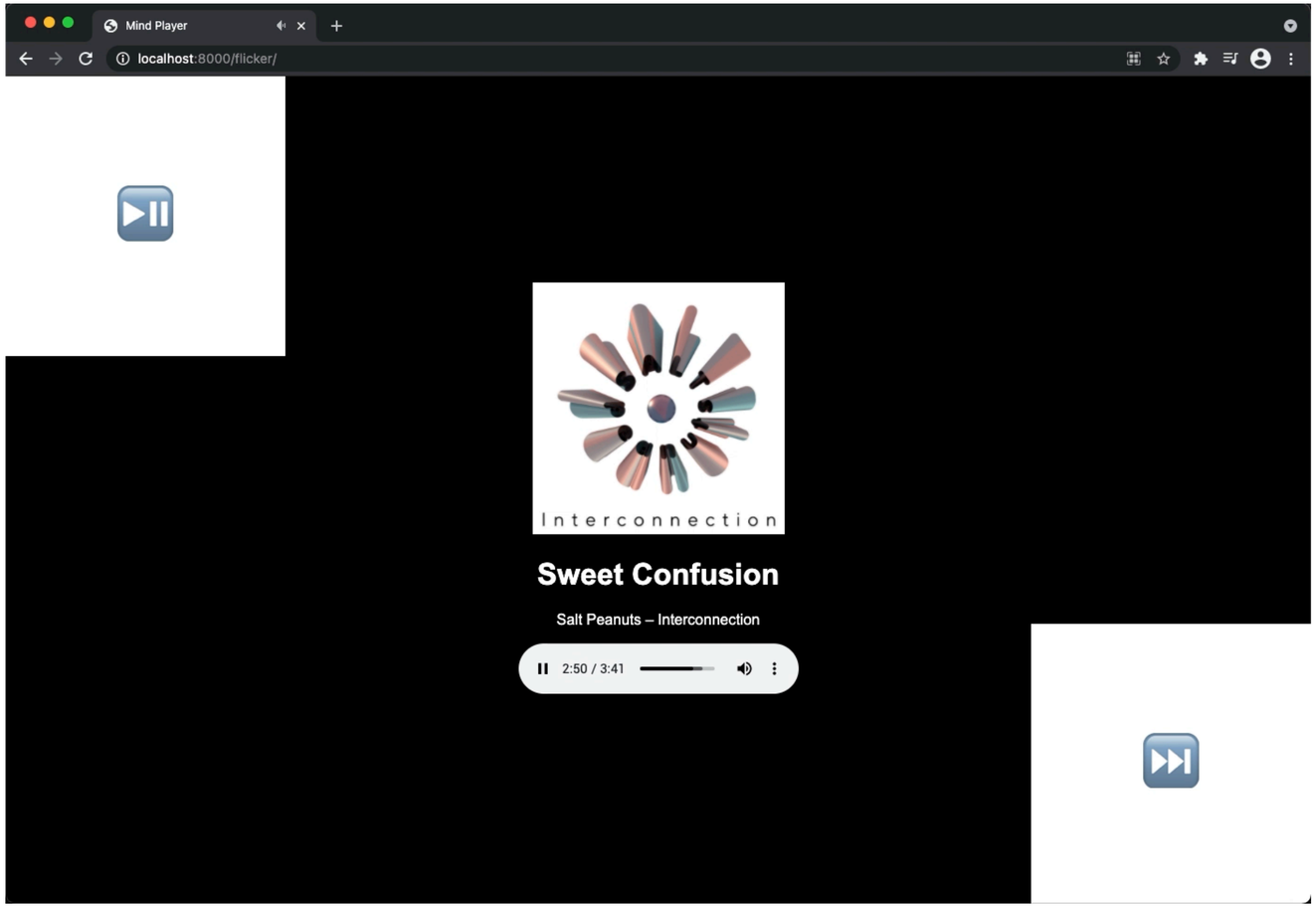
Passive

BCI Paradigms

Active

Evoked

SSVEP

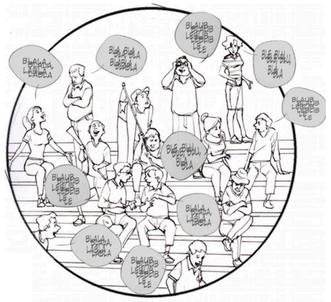


BCI Paradigms

Active

P300

Induced



SSVEP

Evoked

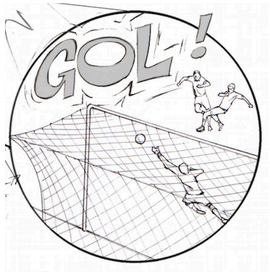
Neurofeedback

Passive

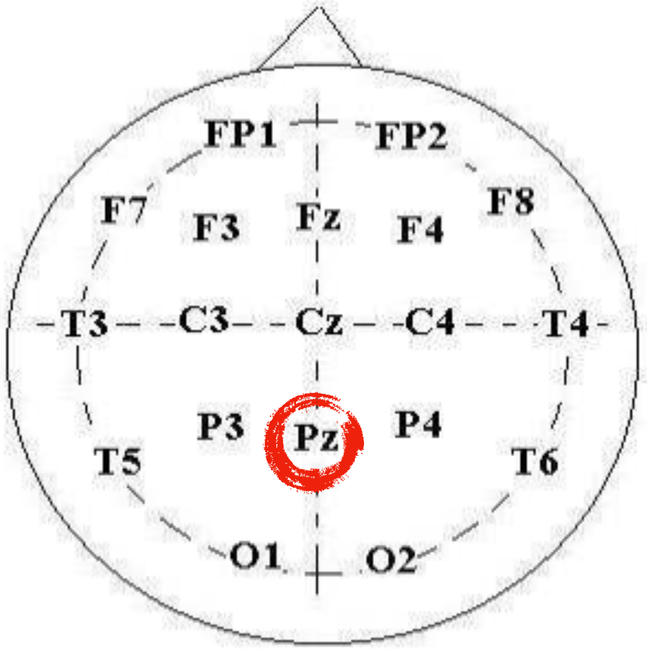
BCI Paradigms

Active

Evoked



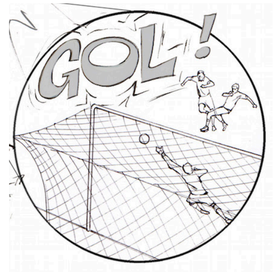
P300 Speller



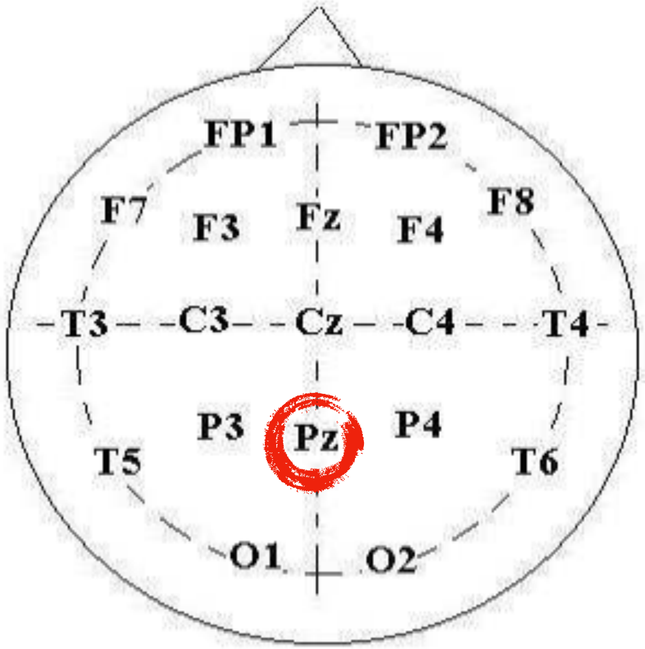
BCI Paradigms

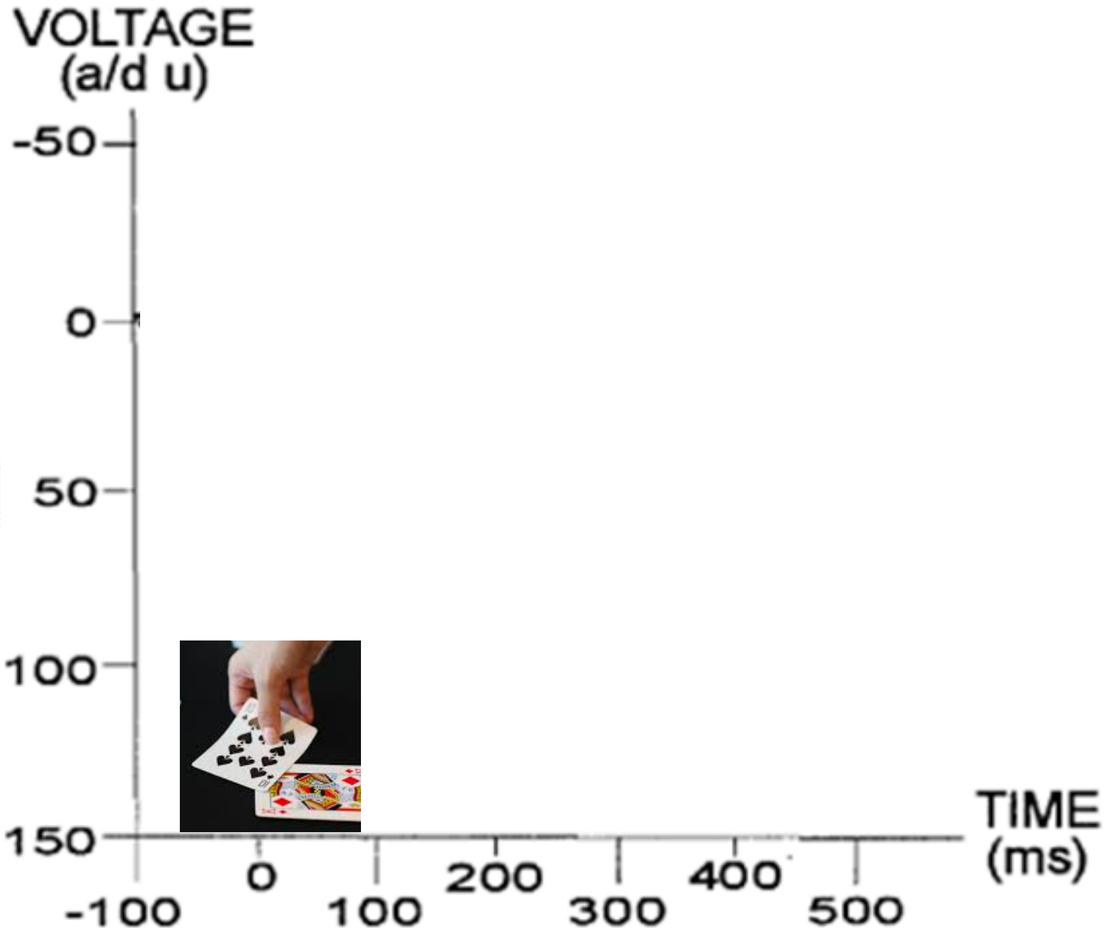
Active

Evoked



P300 Speller

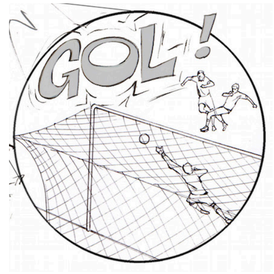




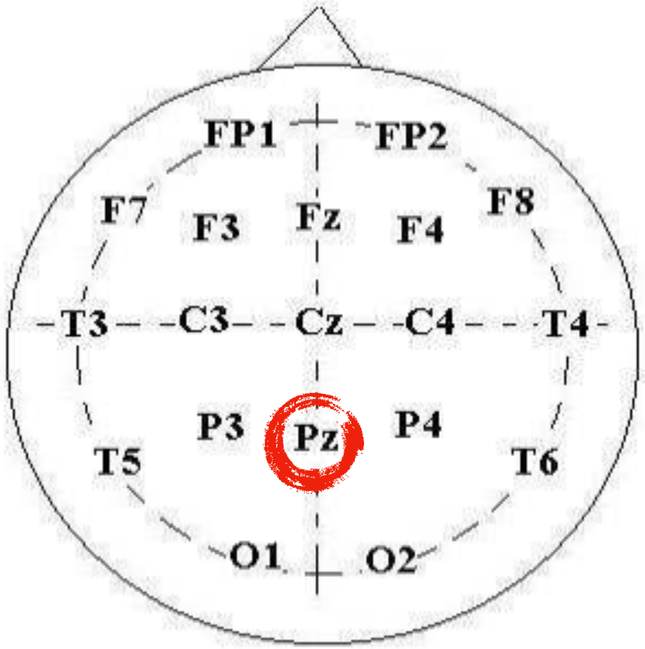
BCI Paradigms

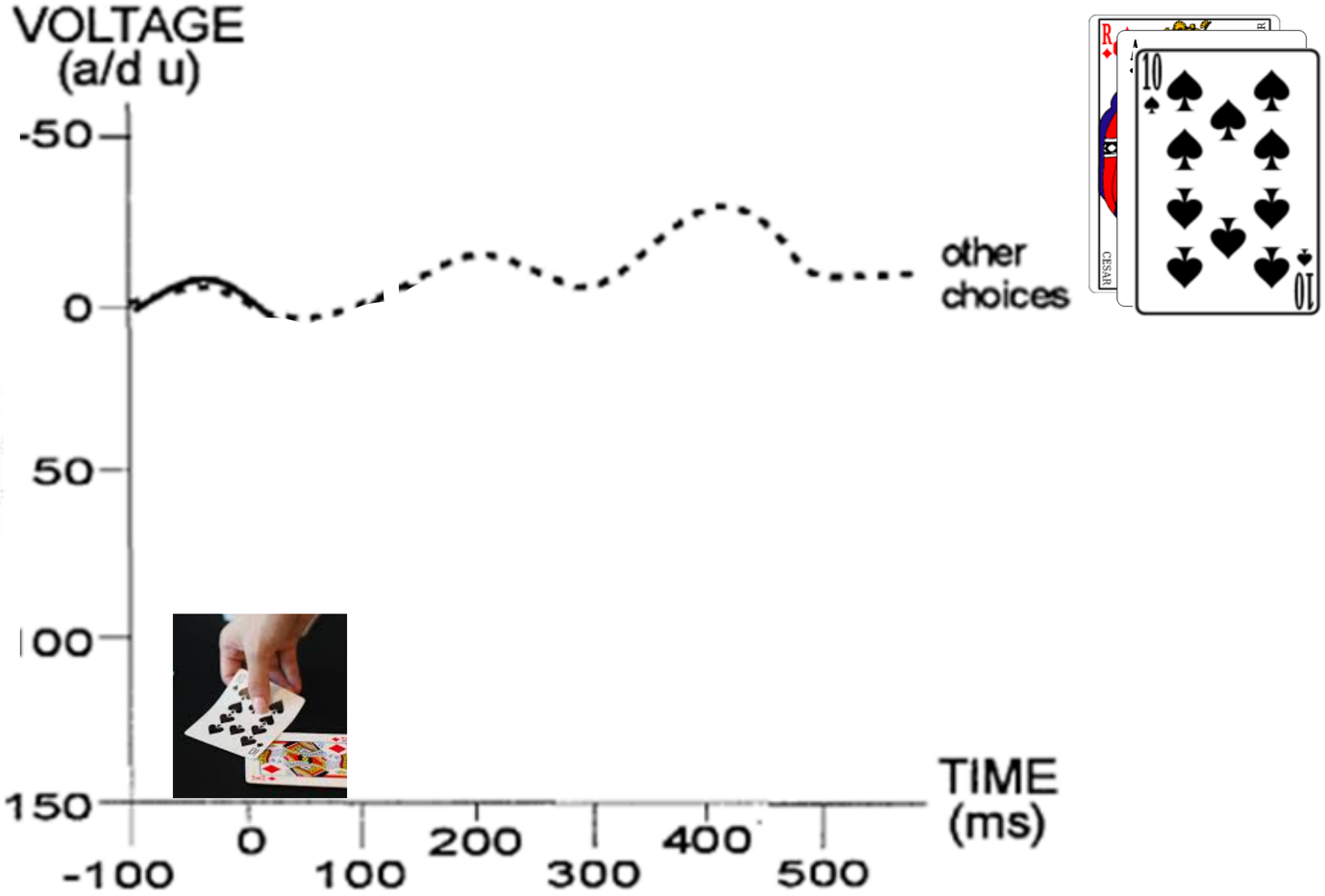
Active

Evoked



P300 Speller

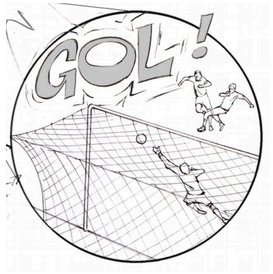




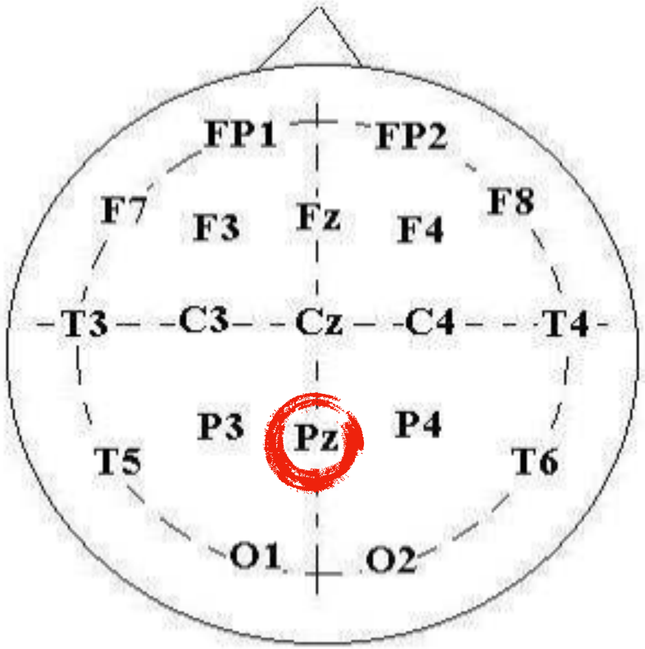
BCI Paradigms

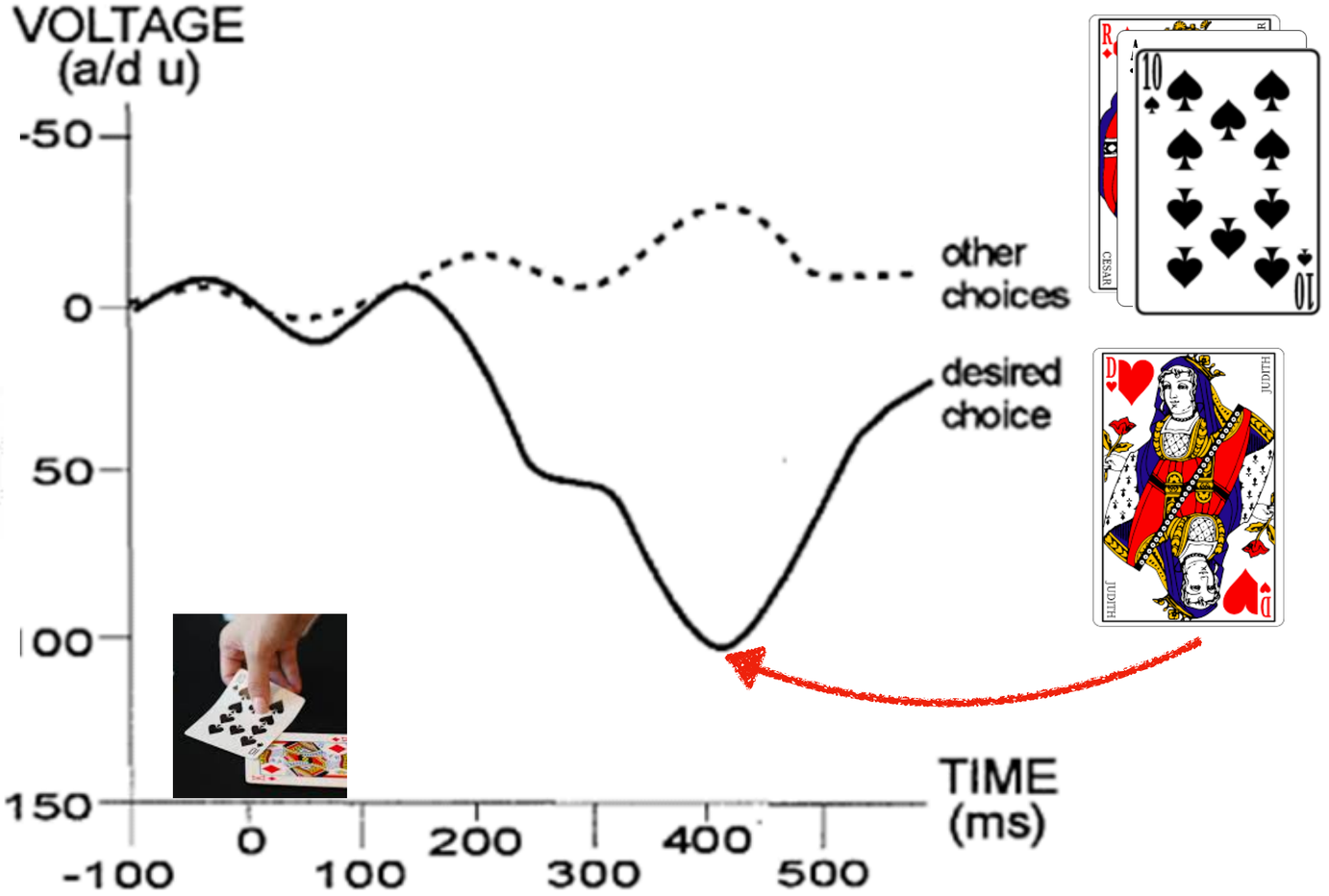
Active

Evoked



P300 Speller





BCI Paradigms

Active

Evoked

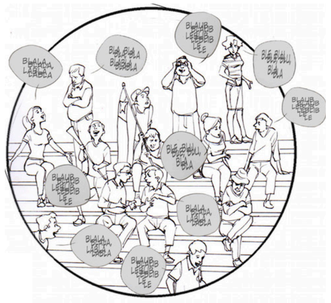
P300 Speller

BCI Paradigms

Active

P300

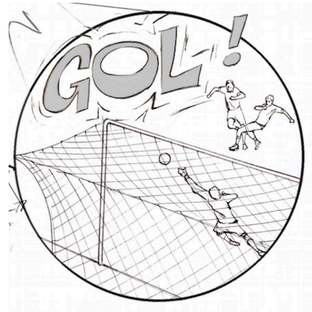
Induced



Motor imaginary

SSVEP

Evoked



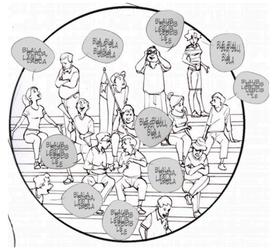
Neurofeedback

Passive

BCI Paradigms

Active

Induced



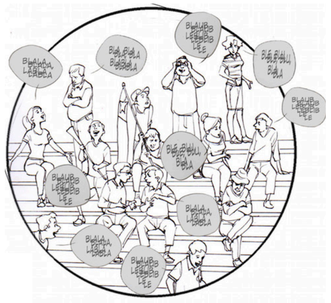
Motor imaginary

BCI Paradigms

Active

P300

Induced



Motor imaginary

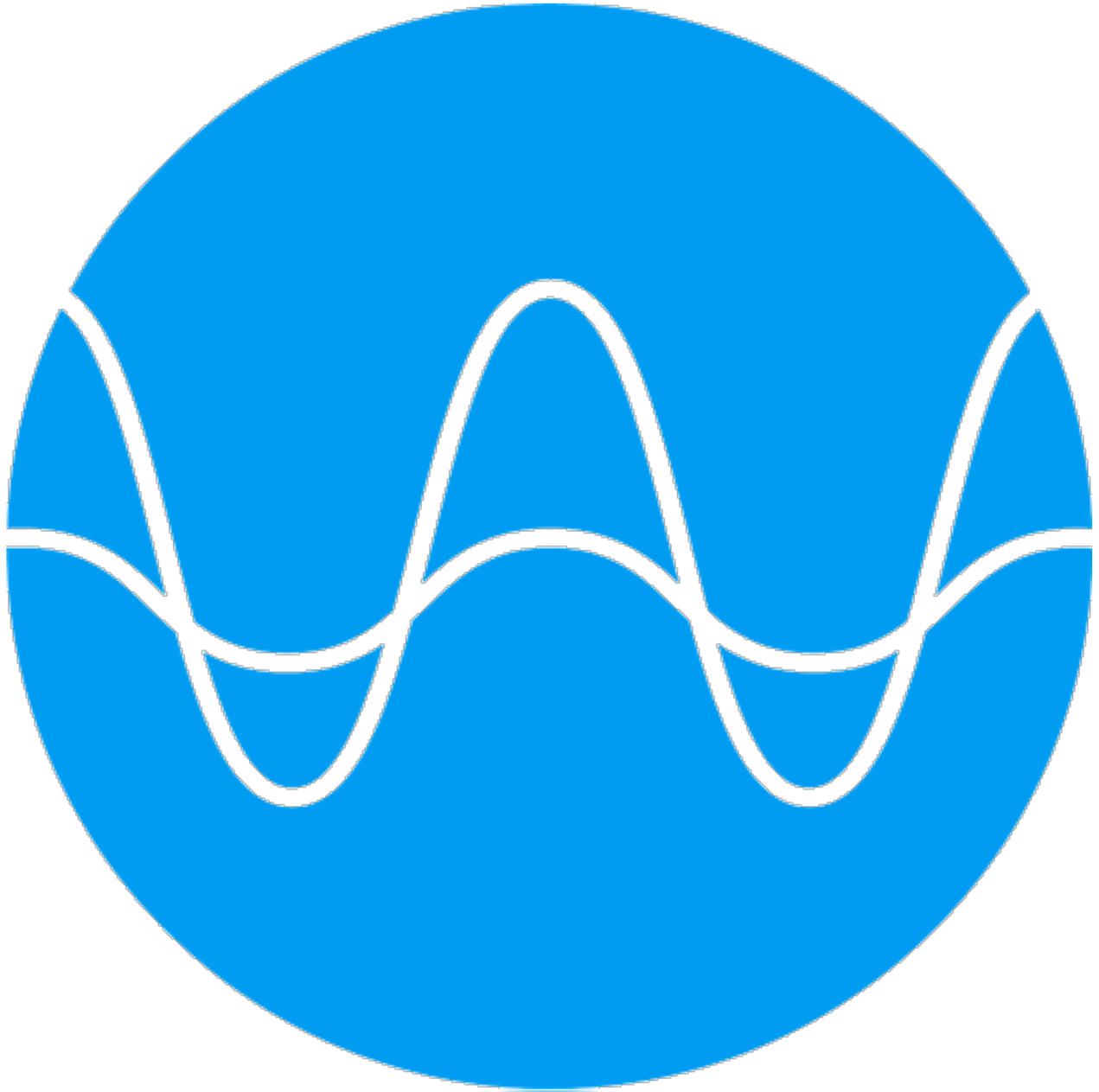
SSVEP

Evoked

Lie detector

Neurofeedback

Passive



Thank you