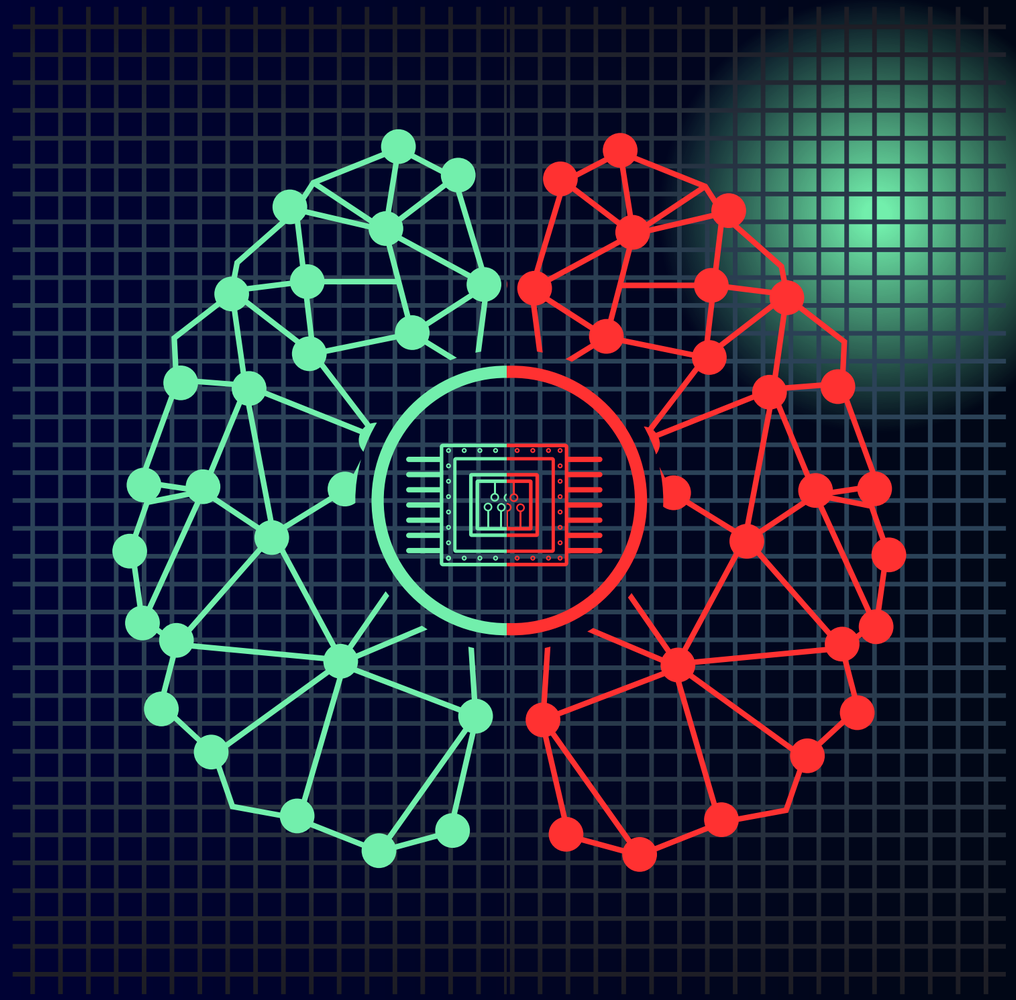
COMPARATIVE EEG RESPONSES TO REWARD AND LOSS IN THREE ARMED BANDIT GAMBLING TASKS



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- Major: Data Science and Innovation
- Junior Year (3rd year)

AGENDA

GAMBLING

Gambling can be an escape for people who’ve experienced a **stressful** change in life. Or who want to forget about **life’s worries**, such as relationship issues or money troubles. Others may start gambling on the pokies because they’re **lonely** and crave company.

Source: Gambler’s Help, Siam Media

77% **Thai people have gambled before**

GOAL

TO INVESTIGATE HOW NEURAL RESPONSES DIFFER BETWEEN REWARD AND LOSS OUTCOMES, FOCUSING ON ERP COMPONENTS SUCH AS FEEDBACK-RELATED NEGATIVITY (FRN) AND REWARD POSITIVITY (REW-P)

THREE ARMED BANDIT GAMBLING TASK

The Three-Armed Bandit gambling task is a popular experimental paradigm used in psychology and neuroscience to study decision-making under uncertainty.

01 **STATE**

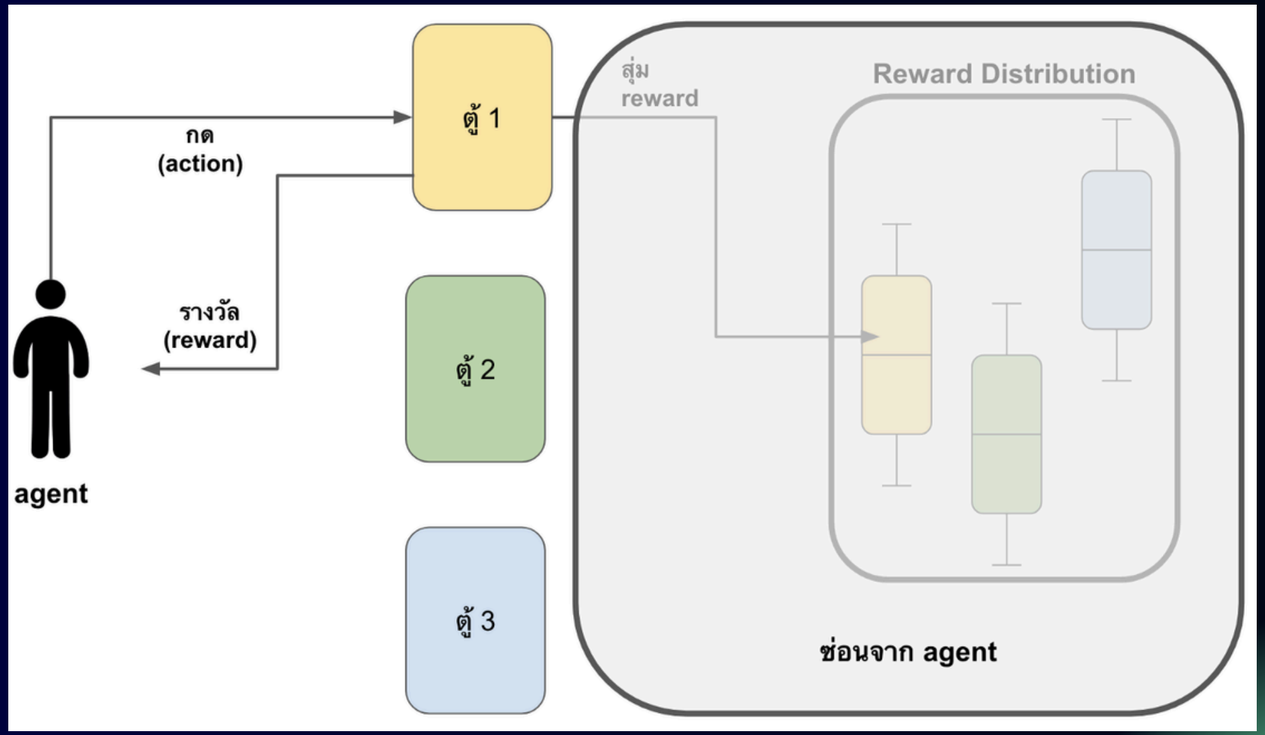
3 Slot machine

02 **ACTION**

Choose any Slot machine

03 **REWARD**

The number of rewards each machine randomly generates when pressed.



DESCRIPTION

Healthy control college students, 23 subjects

SEX

Male: 7

Female: 16

AGE

MIN: 18

MAX: 24

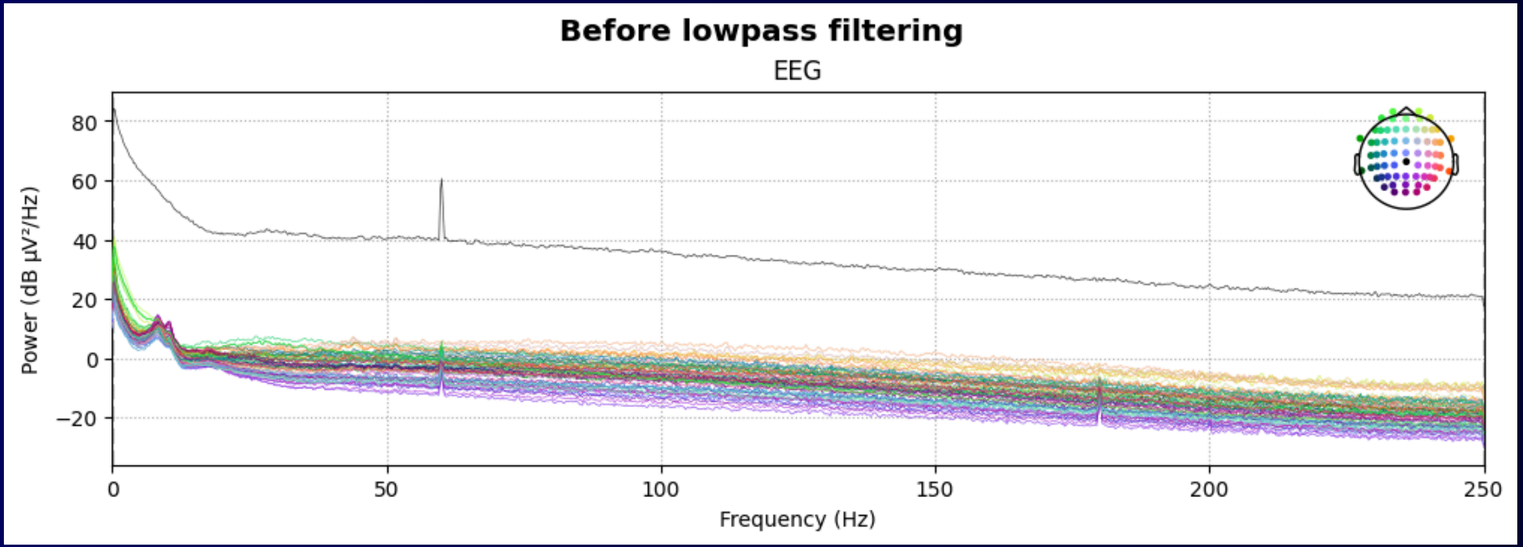
AVG: 20

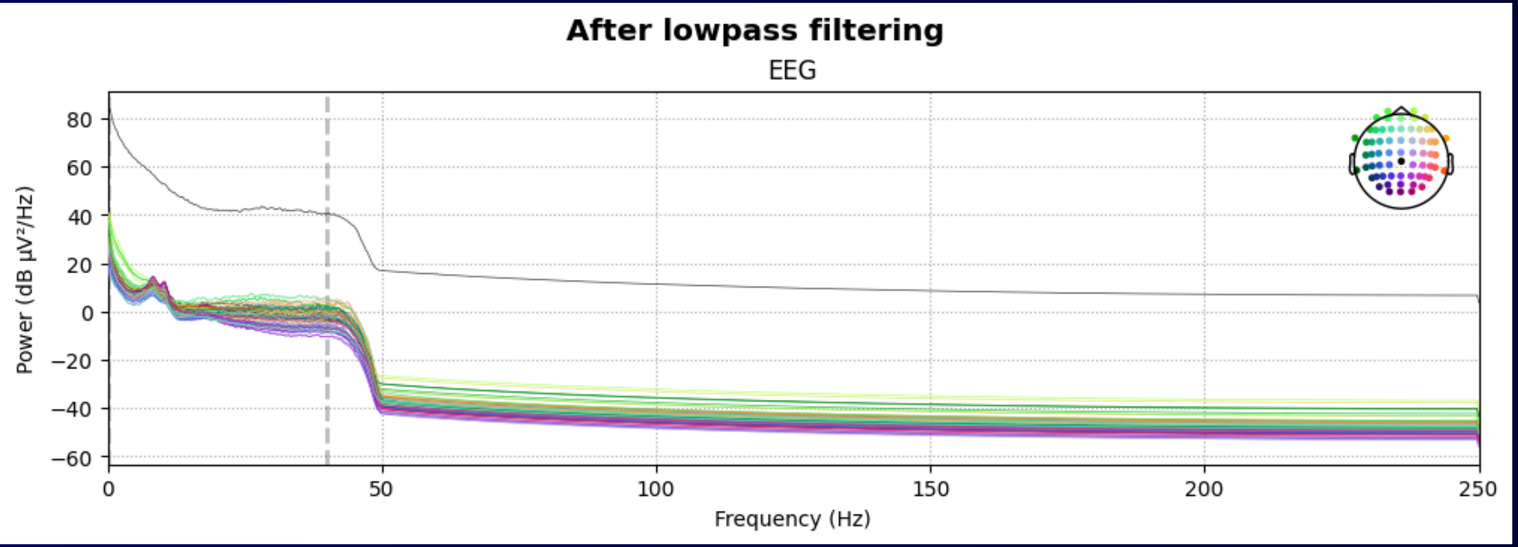
CHANNELS

63 Channels

	ID	Perform	Peripherals	EMG OK	SCR OK	Bandit Duration	Sex	Age
0	102	1	0	0	0	24.0	1	20
1	103	1	0	0	0	28.0	2	18
2	201	1	0	0	0	29.0	1	20
3	208	1	1	1	1	27.0	2	18
4	209	1	1	0	1	50.0	2	21

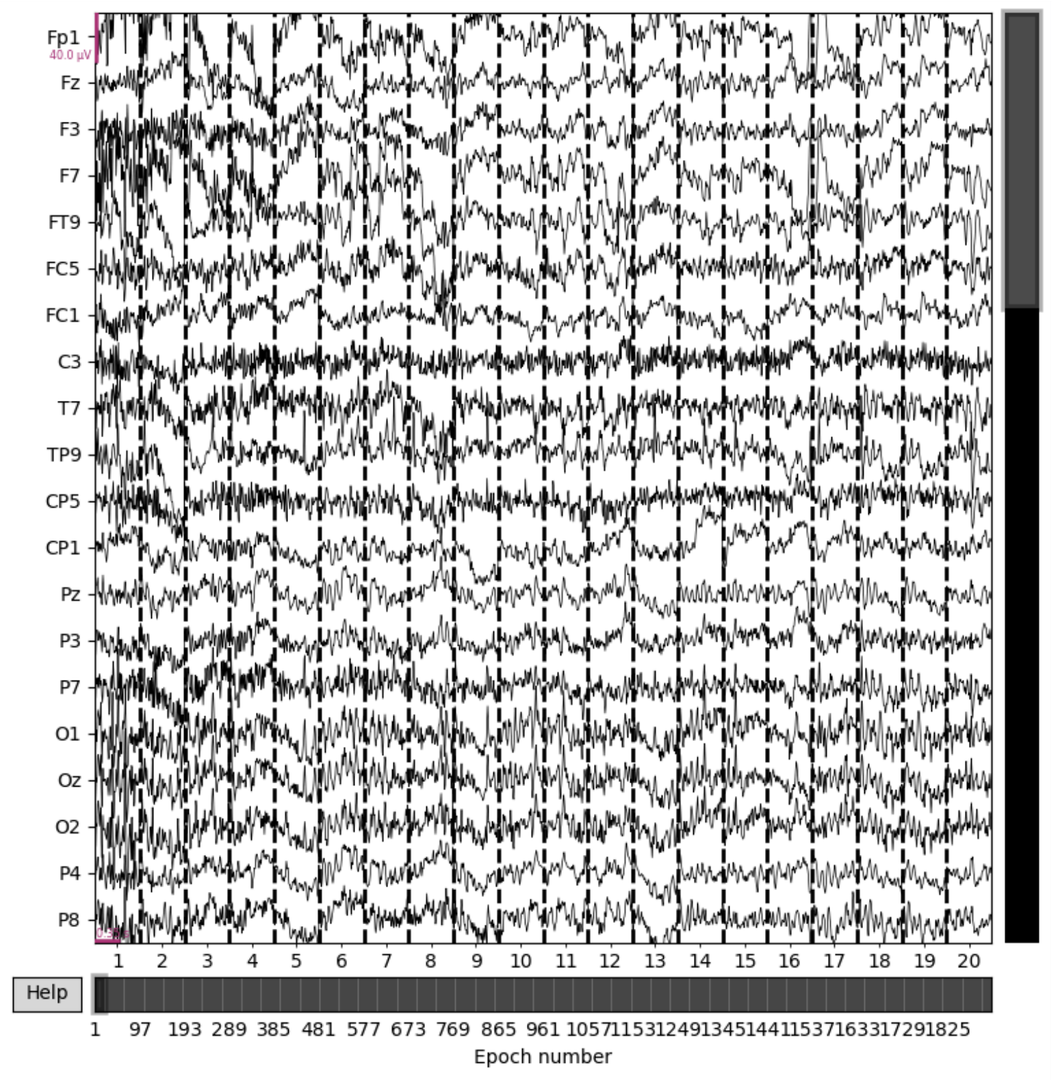
FILTERING THE DATA





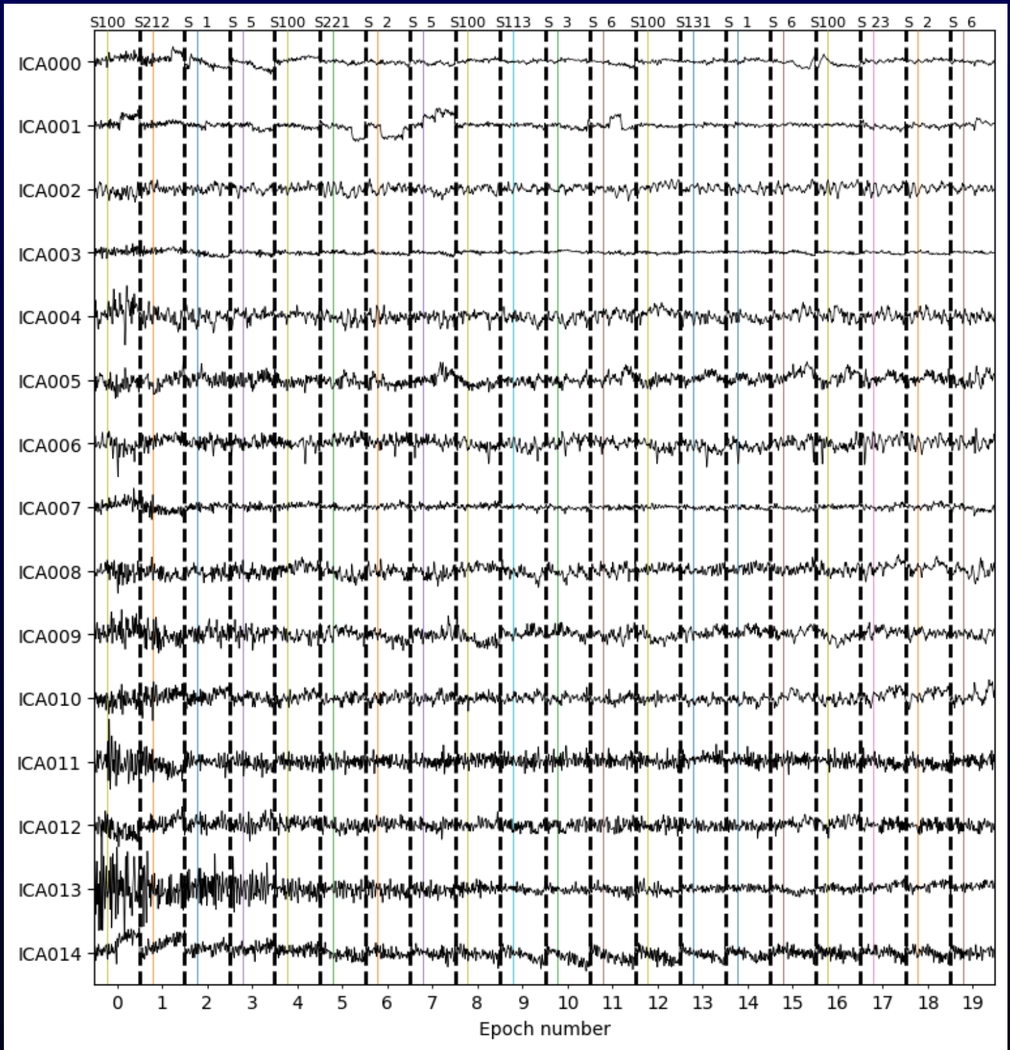
SETTING UP LOW-PASS FILTER AT 40 HZ

EPOCHING



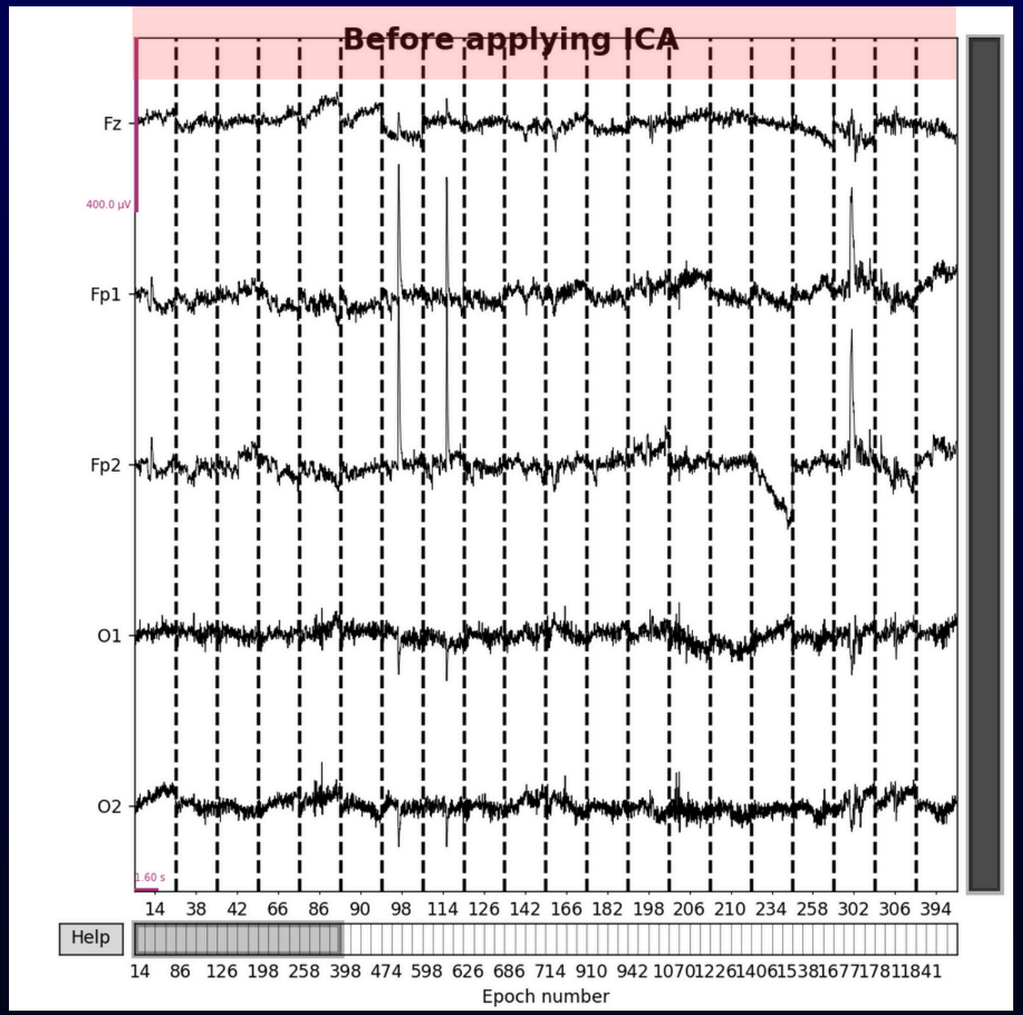
CREATE EPOCHS AROUND THIS EVENT FROM -0.2S TO 0.5S RELATIVE TO THE EVENT

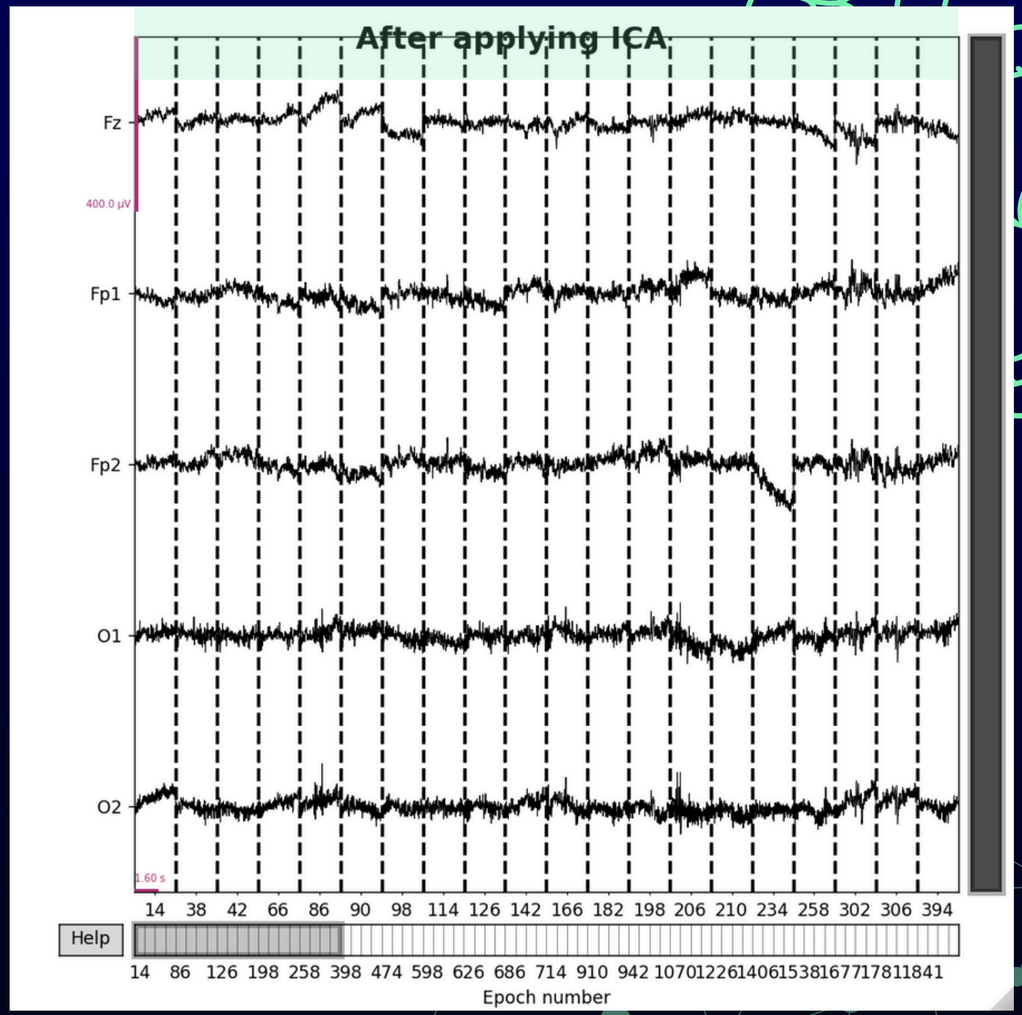
ICA



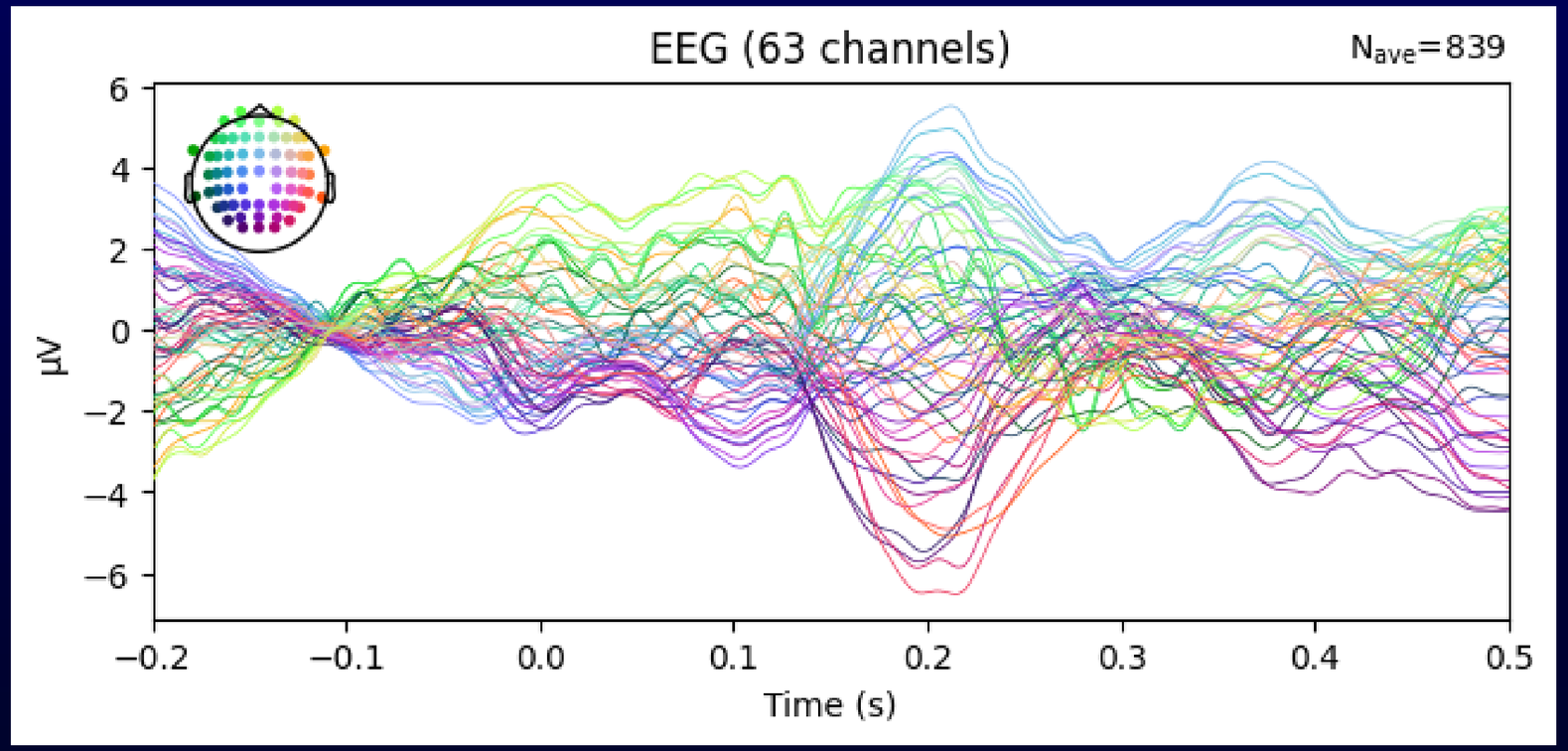
ICA EXCLUDE
ICA000 AND ICA001

ARTIFACT REJECTION USING ICA

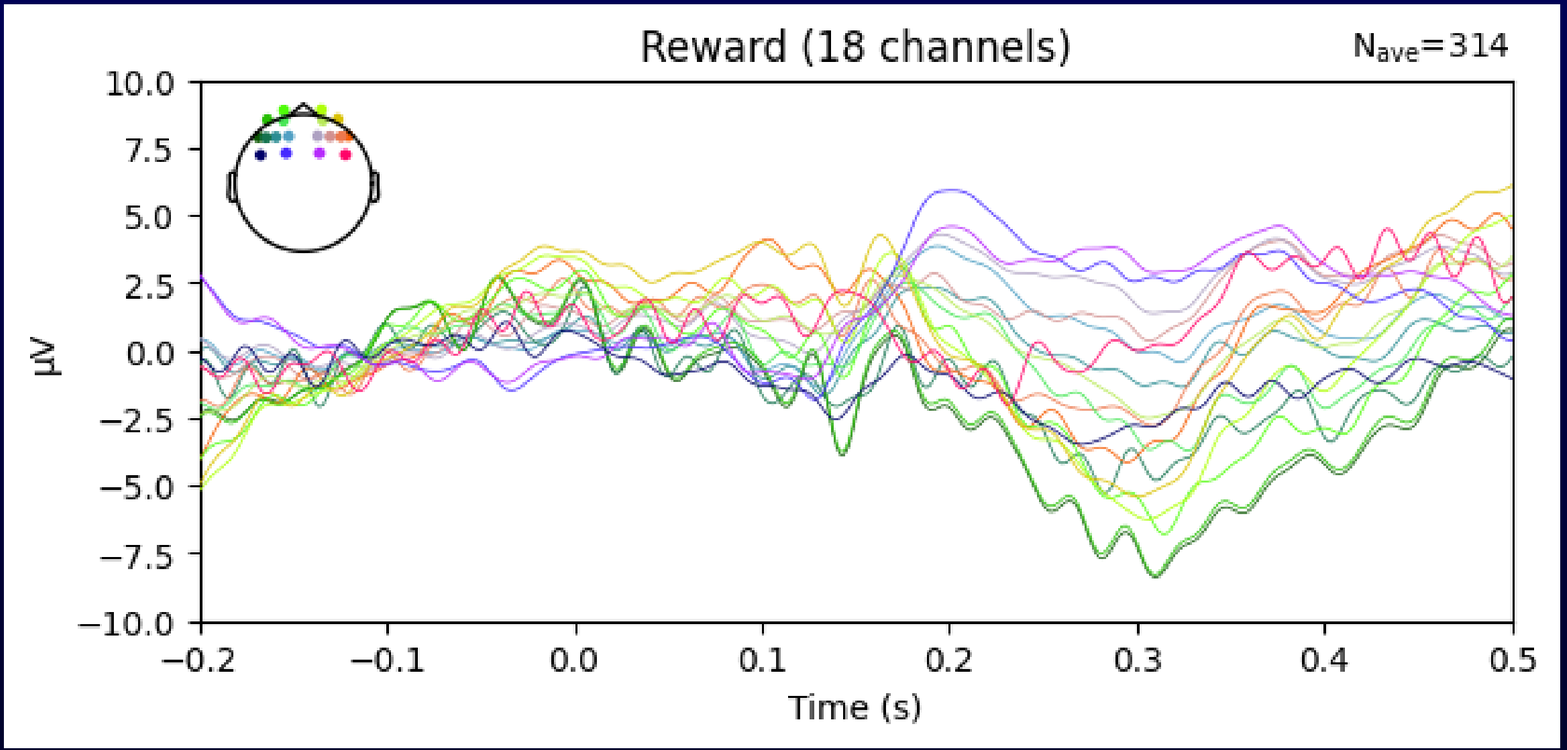




63 CHANNELS


EEG (63 channels)
N_{ave}=839
6
4
2
0
−2
−4
−6
µV
−0.2
−0.1
0.0
0.1
0.2
0.3
0.4
0.5
Time (s)

18 CHANNELS



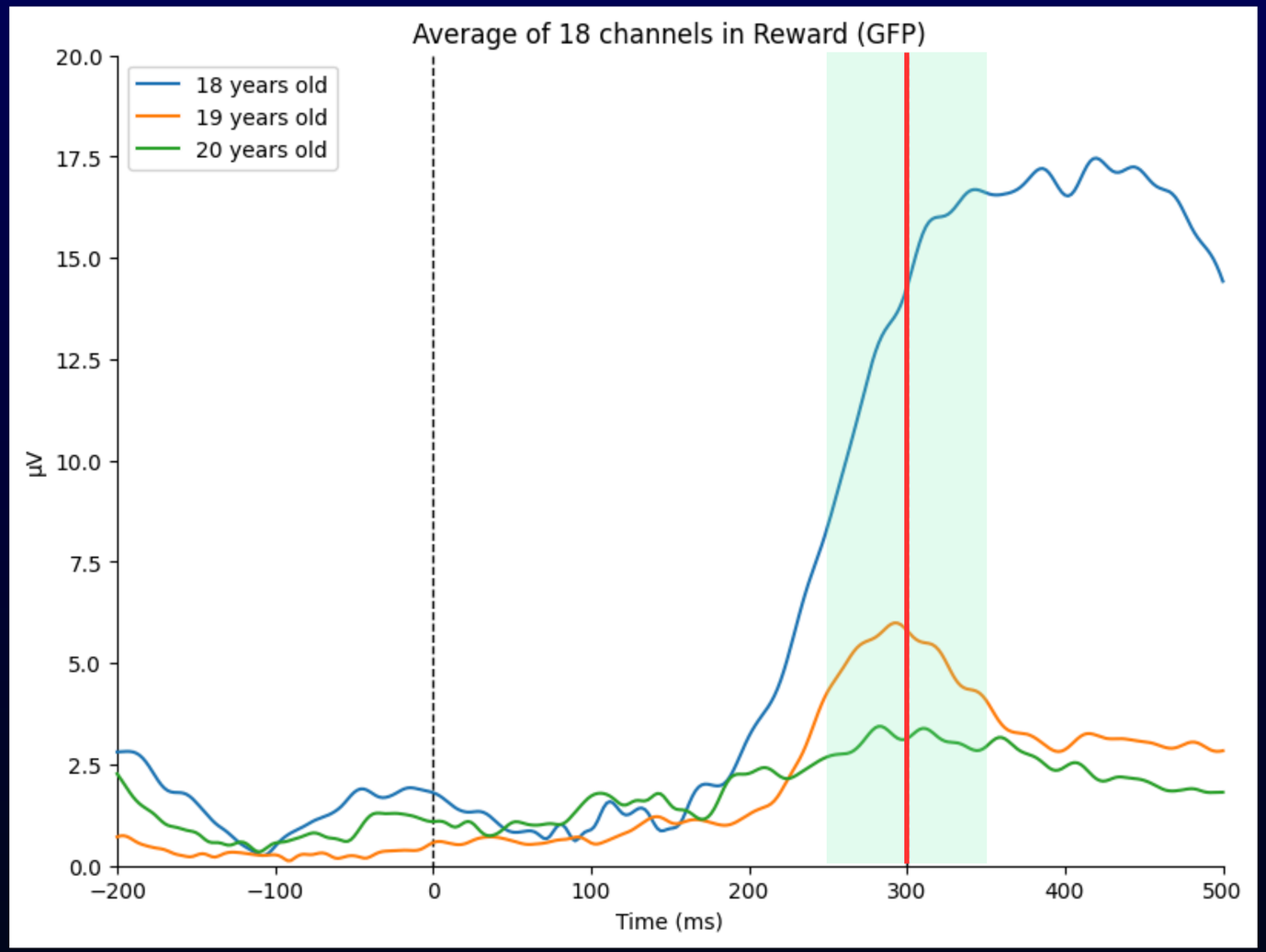
EEG Channels

Frontal: FP1, FP2, AF3, AF4, AF7, AF8, F5, F6, F7, F8

Frontocentral: F1, F2, F3, F4, FC1, FC2, FC5, FC6

Source: Dissociable effects of reward magnitude on fronto-medial theta and FRN during performance monitoring

REWARD



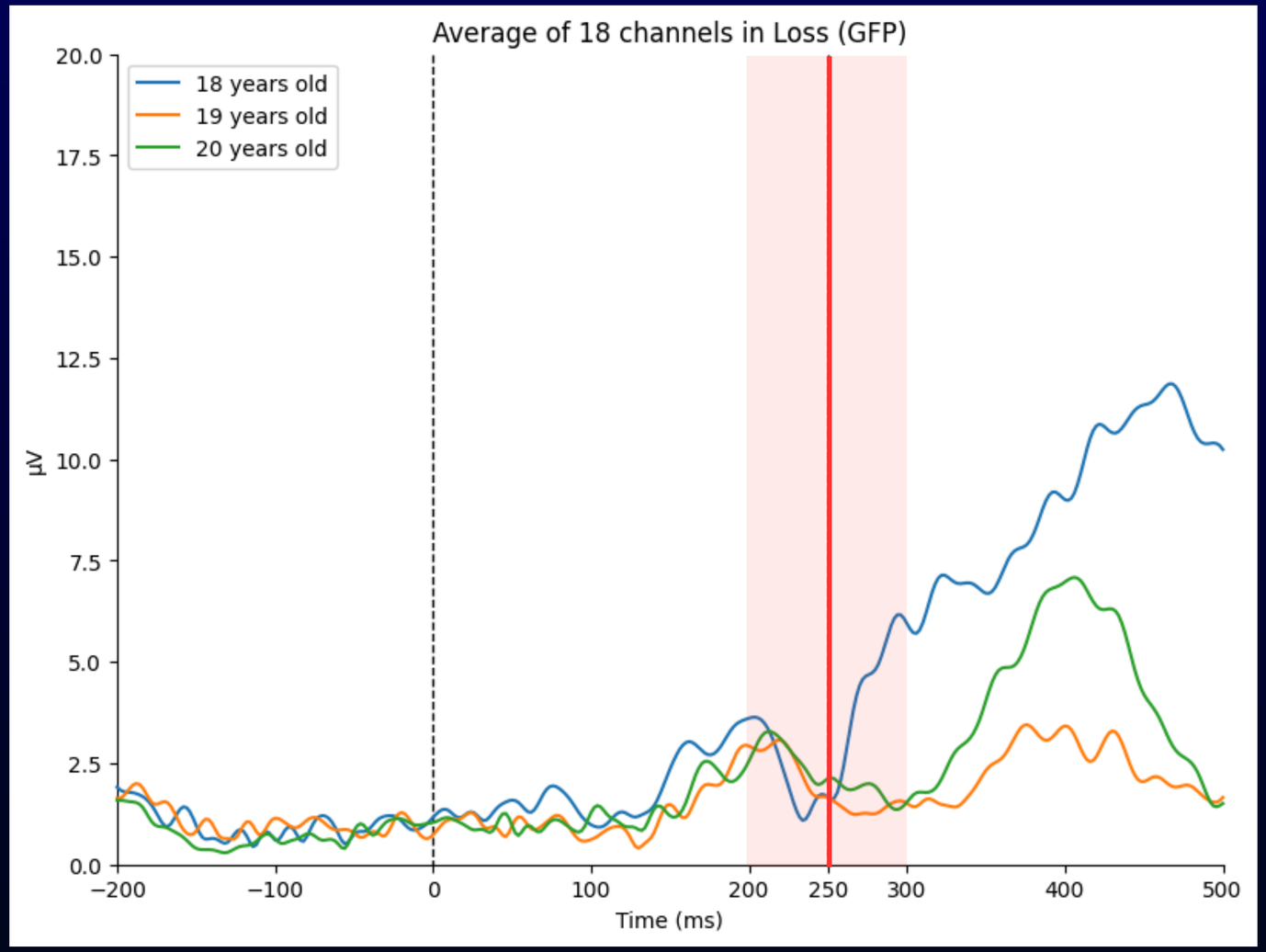
Source: Comprehensive Clinical Psychology

REWARD POSITIVITY (REW-P)

High Peak: 250-350 ms

Positive response to rewarding

LOSS



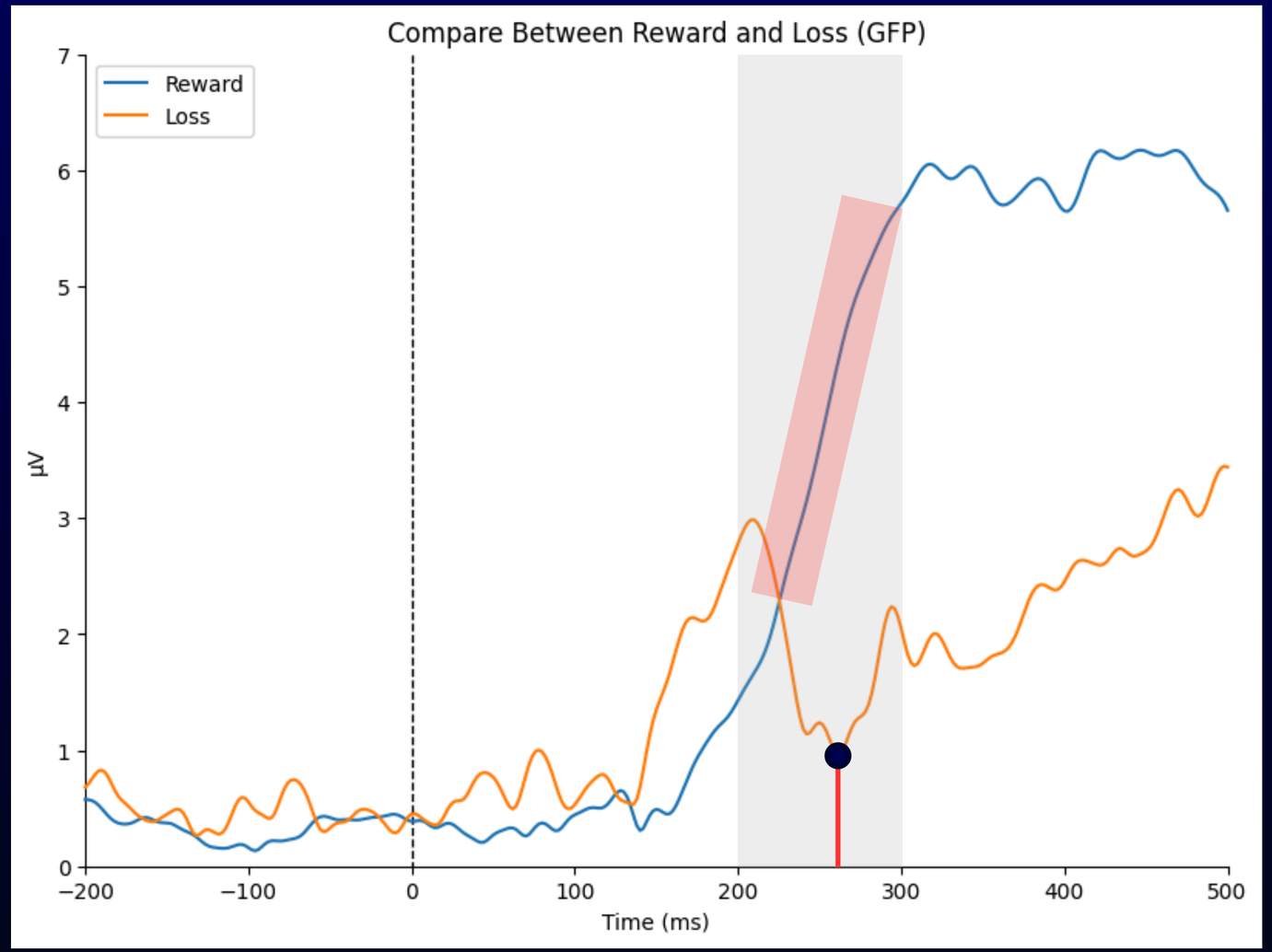
Source: Monetary Incentives Modulate Feedback-related Brain Activity

FEEDBACK-RELATED NEGATIVITY (FRN)

Low Peak: 200-300 ms

Negative response to lossing

REWARD AND LOSS



DIFFERNCE

Timing

- FRN: 200-300 ms,
- Rew-P: 250-350 ms

Direction of Response

- FRN: **Negative** for Losses
- Rew-P: **Positive** for Rewards

REWARD

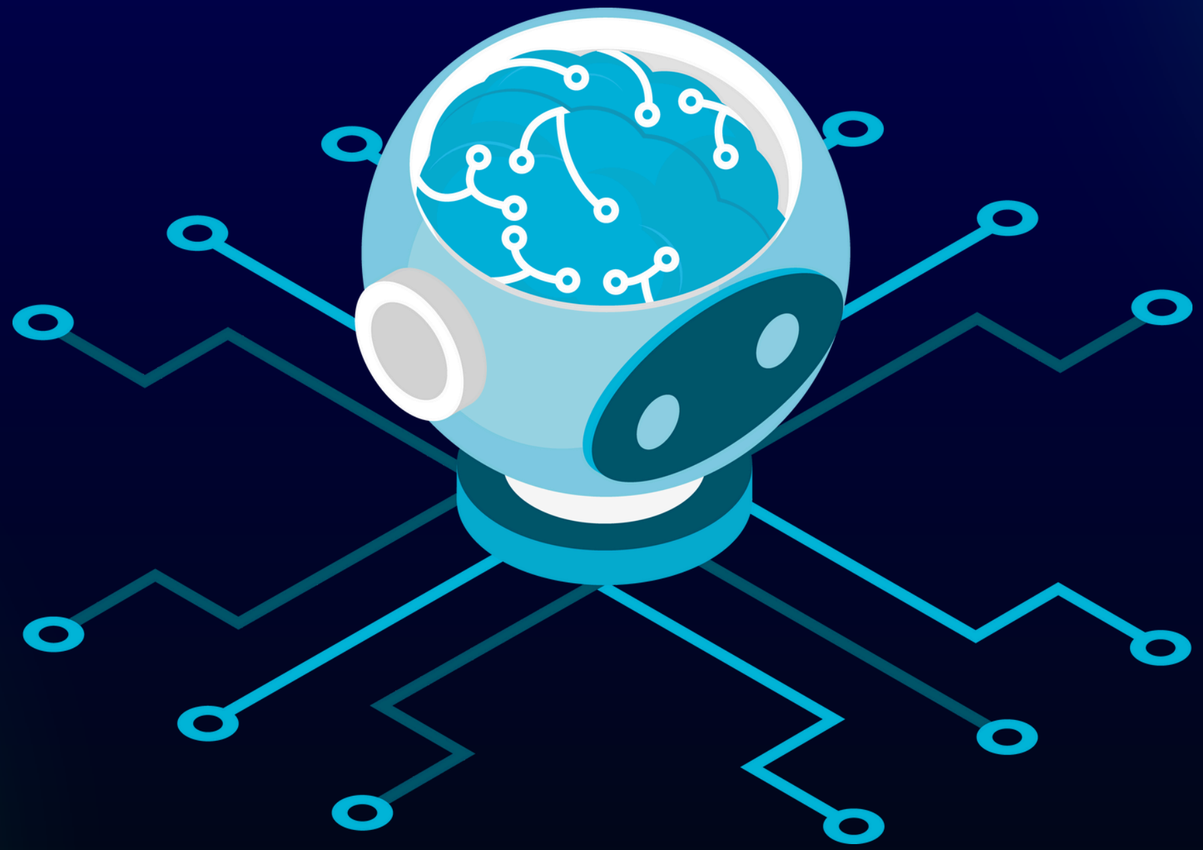
REW-P: POSITIVE

LOSS

FRN: NEGATIVE

THANK YOU

FOR YOUR ATTENTION



REFERENCE

Data Set: EEG: Three armed bandit gambling task
10.18112/openneuro.ds003458.v1.1.0

Brain Region:

- Dissociable effects of reward magnitude on fronto-medial theta and FRN during performance monitoring

https://doi.org/10.1111/psyp.13481

- Still Wanting to Win: Reward System Stability in Healthy Aging

10.3389/fnagi.2022.863580

Rew-P: Comprehensive Clinical Psychology
https://www.sciencedirect.com/topics/psychology/reward-positivity

FRN: Monetary Incentives Modulate Feedback-related Brain Activity
10.1038/s41598-018-30294-z

APPENDIX

- Brain Region

EEG Channels

Frontal: FP1, FP2, AF3, AF4, AF7, AF8, F5, F6, F7, F8

Frontocentral: F1, F2, F3, F4, FC1, FC2, FC5, FC6

A

EEG CHANNEL GROUPS		EEG ELECTRODES
Frontopolar	FP	FPz, FZ
Frontal left	FL	FP1, AF3, AF7, F7
Frontal right	FR	FP2, AF4, AF8, F8
Temporal left	TL	FT9, FT7, T7, TP7, TP9, P7
Temporal right	TR	FT10, FT8, T8, TP8, TP10, P8
Frontocentral left	FCL	F1, F3, FC1, FC5
Frontocentral right	FCR	F2, F4, FC2, FC6
Parietal left	PL	C1, C3, C5, CP1, CP3, CP5
Parietal right	PR	C2, C4, C6, CP2, CP4, CP6
Central	C	FCz, Cz, CPz
Parietooccipital left	POL	P1, P3, PO3
Parietooccipital right	POR	P2, P4, PO4
Parietooccipital central	POC	Pz, POz
Occipital	O	Oz, O1, O2, PO7, PO8

B