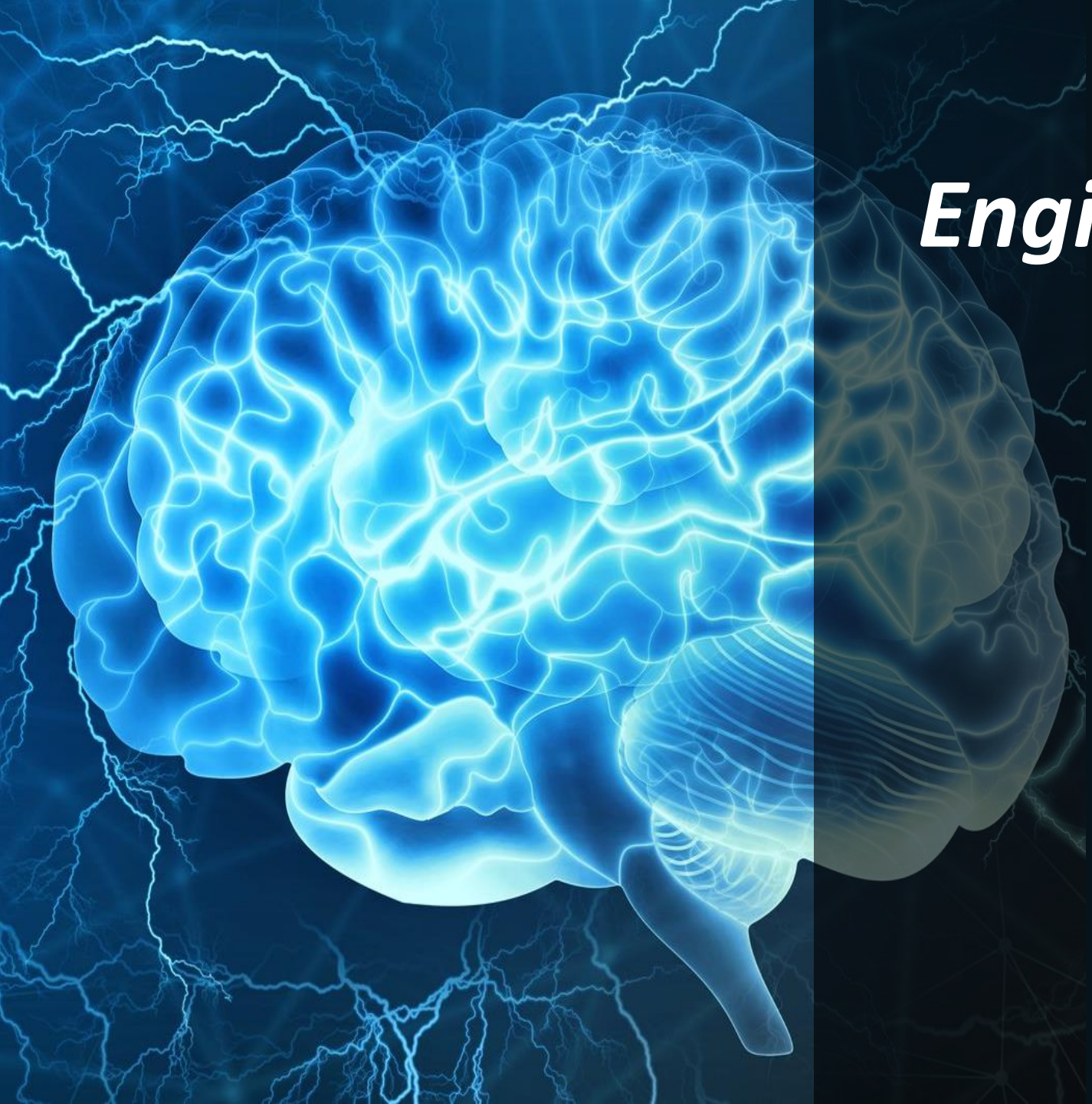


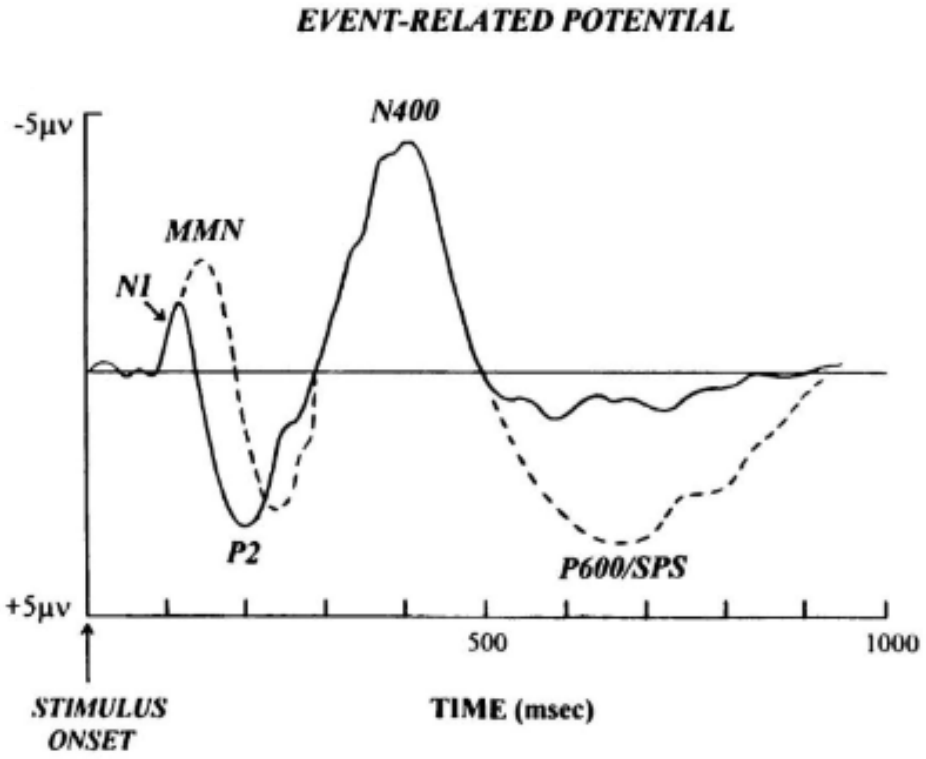
Neural Engineering Team Week.3

2022.10.07 6pm

Lee Seong Jin

ERP (Event Related Potential)

ERP(사건관련전위)
: 실험자가 피험자에게 가한 Event(자극)에 대해서 발생한 뇌파(EEG)



Name

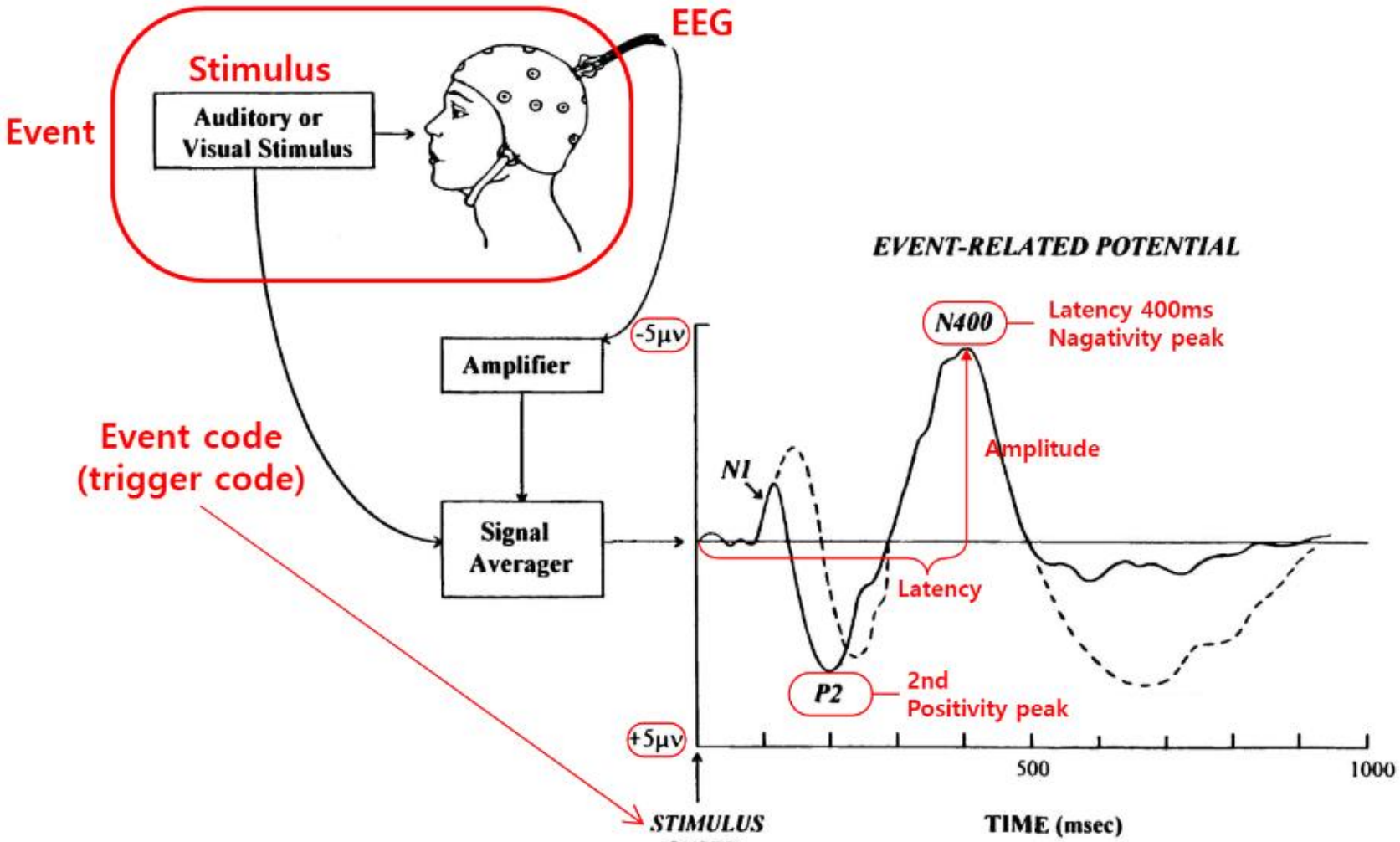
Positive peak voltage : P
Negative peak voltage : N
Sequence : P1, P2, P3... / N1, N2, N3...
Timing : P300, N170, N400 ...

Waveform

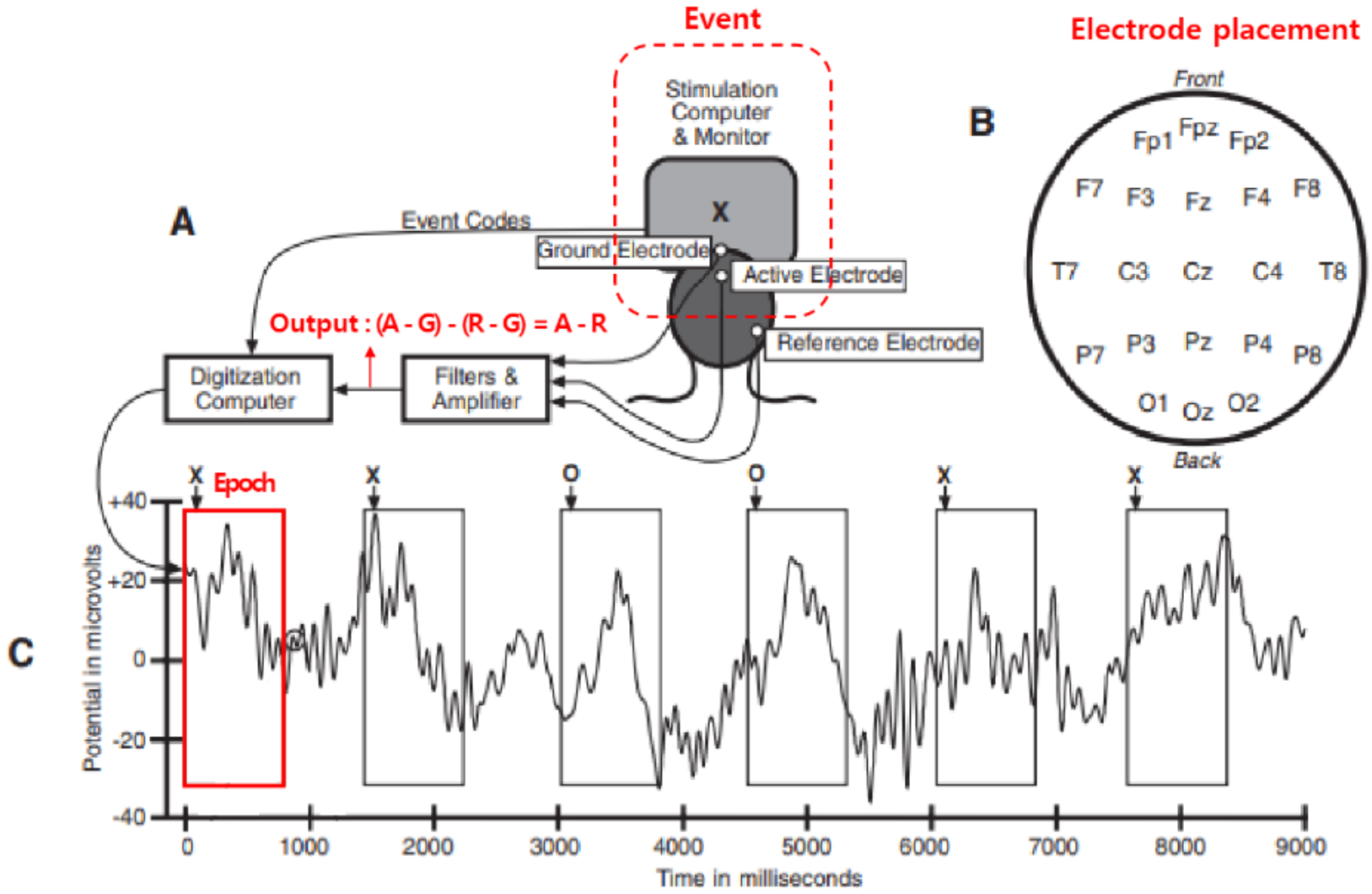
① Peak voltage amplitude
② Latency
- Absolute latency
time interval between stimulus presentation and the point of maximal value (peak) of a defined component
- Relative latency (inter-peak latency)
time interval between two components
③ Event code (=Trigger code)

ERP (Event Related Potential)

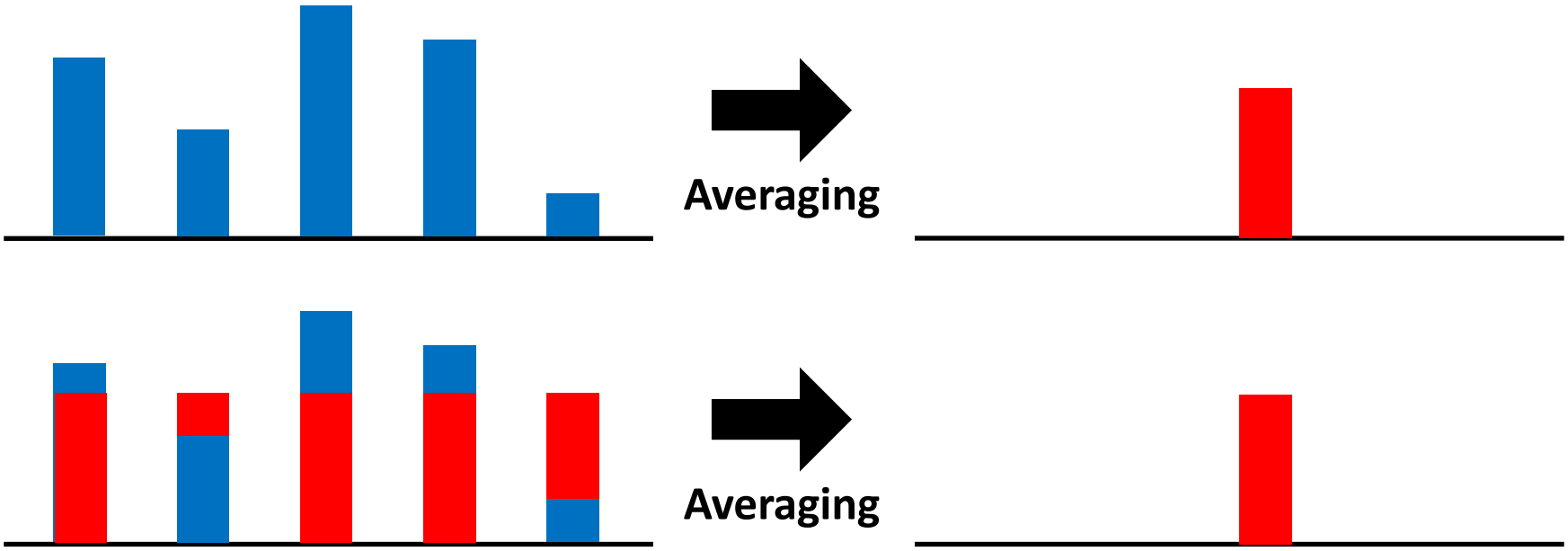
<Basic ERP Recording Process>



ERP experiment example
(Visual oddball task)

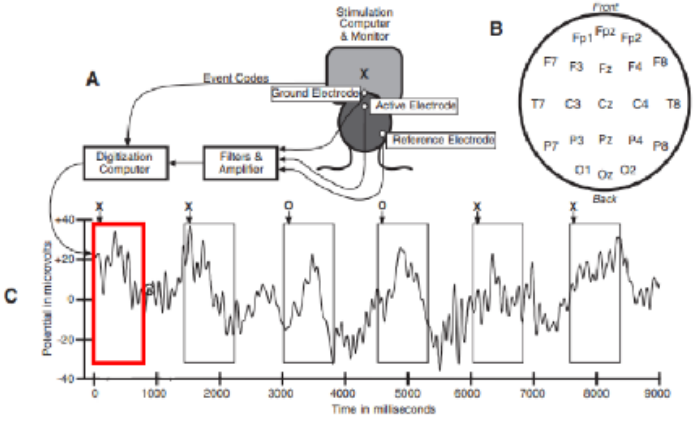


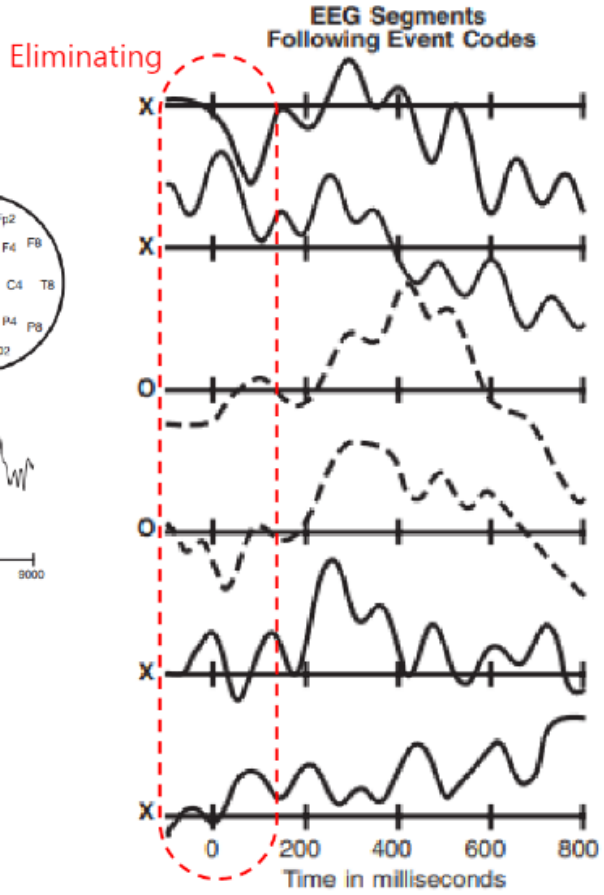
Averaging?

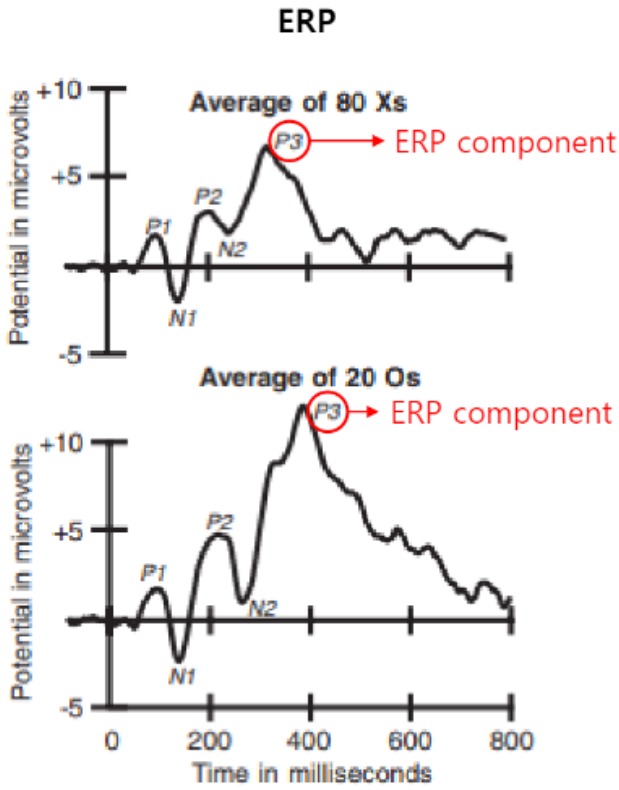


Averaging은 Common components를 도출하는 방법이다!

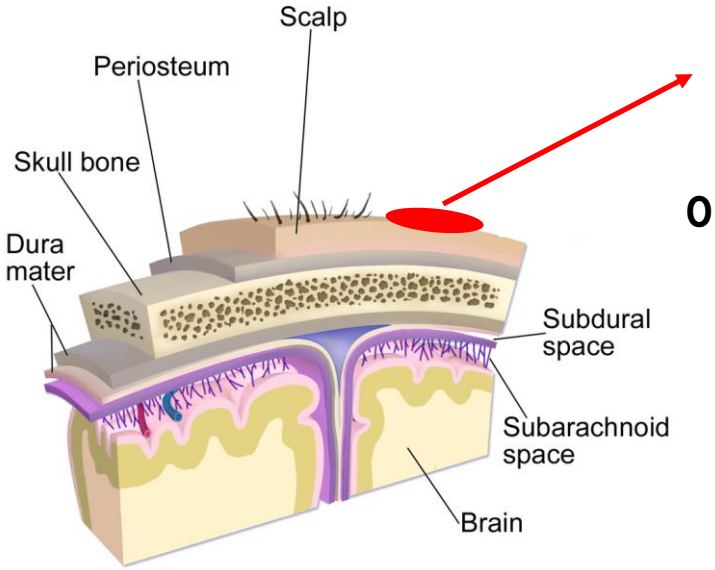
Averaging


Stimulation Computer & Monitor
A
Event Codes
Ground Electrode
Active Electrode
Reference Electrode
Digitization Computer
Filters & Amplifier
B
Front
Back
Fp1 Fp2
F7 F3 Fz F4 F8
T7 C3 Cz C4 T8
P7 P3 Pz P4 P8
O1 Oz O2
C
Potential in microvolts
+40
+20
0
-20
-40
X X O O X X
0 1000 2000 3000 4000 5000 6000 7000 8000 9000
Time in milliseconds


Eliminating
EEG Segments
Following Event Codes
X
X
O
O
X
X
0 200 400 600 800
Time in milliseconds


ERP
Average of 80 Xs
P3
ERP component
P1
N1
P2
N2
+10
+5
-5
Potential in microvolts
Average of 20 Os
P3
ERP component
P1
N1
P2
N2
+10
+5
-5
Potential in microvolts
0 200 400 600 800
Time in milliseconds

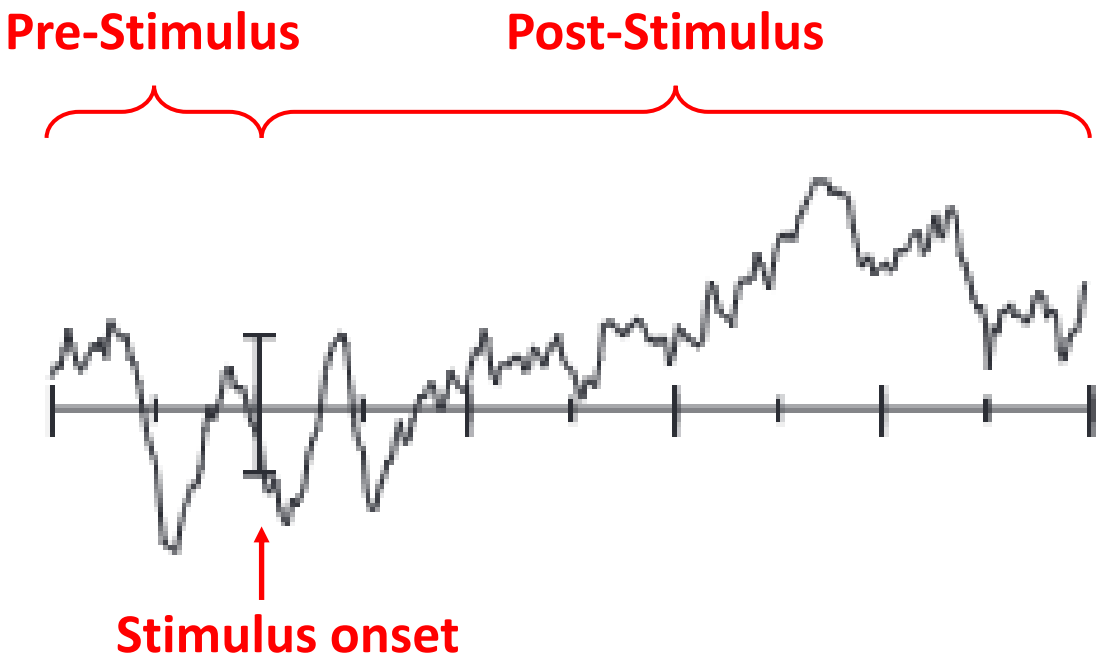
Baseline correction
(기준선 보정)



두피와 전극 사이의 수분,
정전기 등으로 인한 offset voltage 발생

이러한 offset voltage는 EEG 측정 내내 영향을 줌

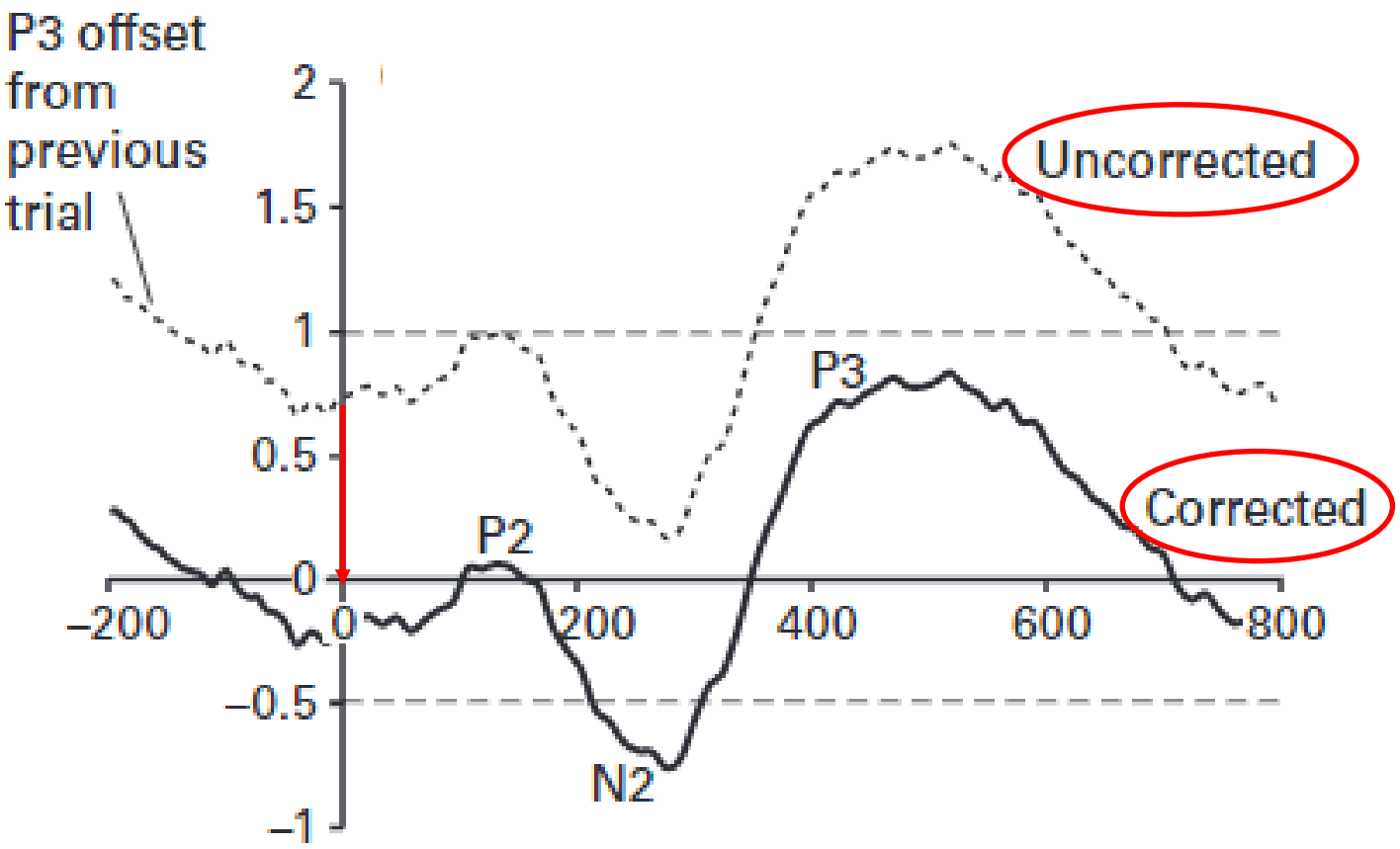
Baseline correction
(기준선 보정)



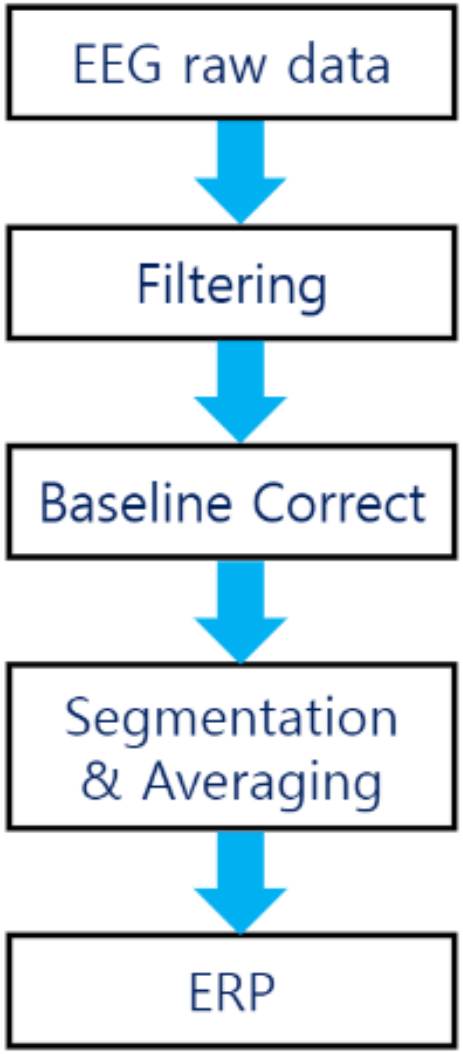
Pre-Stimulus Period : Offset voltage 존재

Post-Stimulus Period : Offset voltage + ERP존재

Baseline correction
(기준선 보정)



Procedure of ERP acquisition



Dimension

21명의 환자에게 3초간 'O' 20번, 'X' 80번을 보여주는 총 100번의 Event를 가함
이 때 Sampling frequency는 200Hz 였고, 64개 채널(전극) 사용하여 EEG 기록

EEG의 shape은?

21 x 64 x 120000

↓ Segmentation

21 x 64 x 100 x 600

↓

21 x 64 x 100 x 3 x 200

Dimension

① Subjects로 평균

21 x 64 x 100 x 600

↓

64 x 100 x 600

② Channel로 평균

21 x 64 x 100 x 600

↓

21 x 100 x 600