

IMPLICIT STATISTICAL LEARNING IN FAST PERIODIC VISUAL STIMULATION

Mara De Rosa¹, Maria Ktori¹, Yamil Vidal¹, Roberto Bottini² & Davide Crepaldi¹

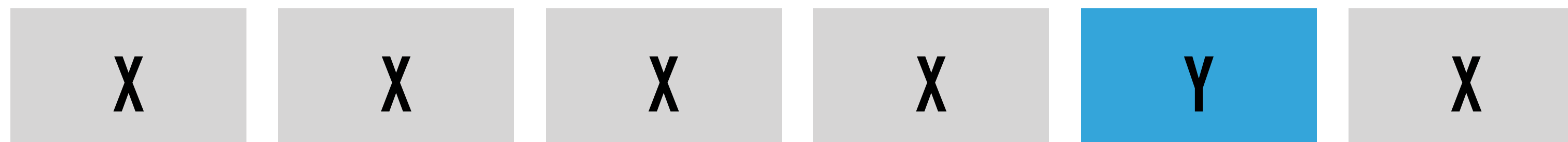
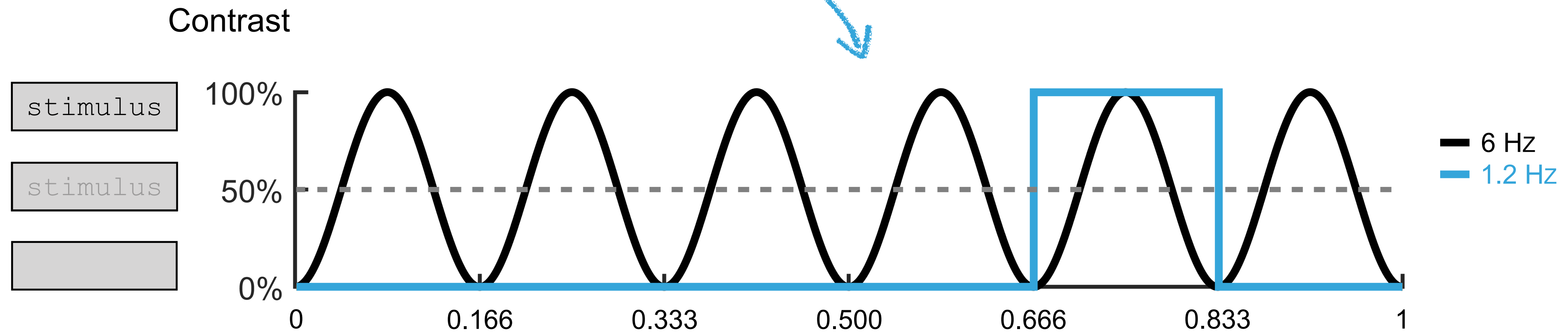
¹International School for Advanced Studies (SISSA), Trieste, Italy

²Center for Mind/Brain Sciences (CIMEC), University of Trento, Trento, Italy

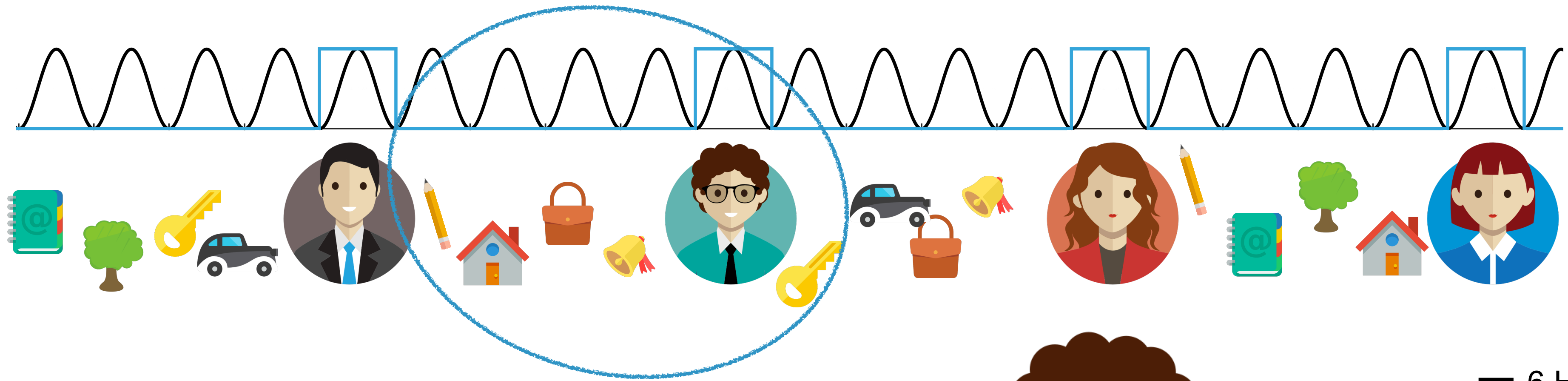
SNL 2020 Annual Meeting



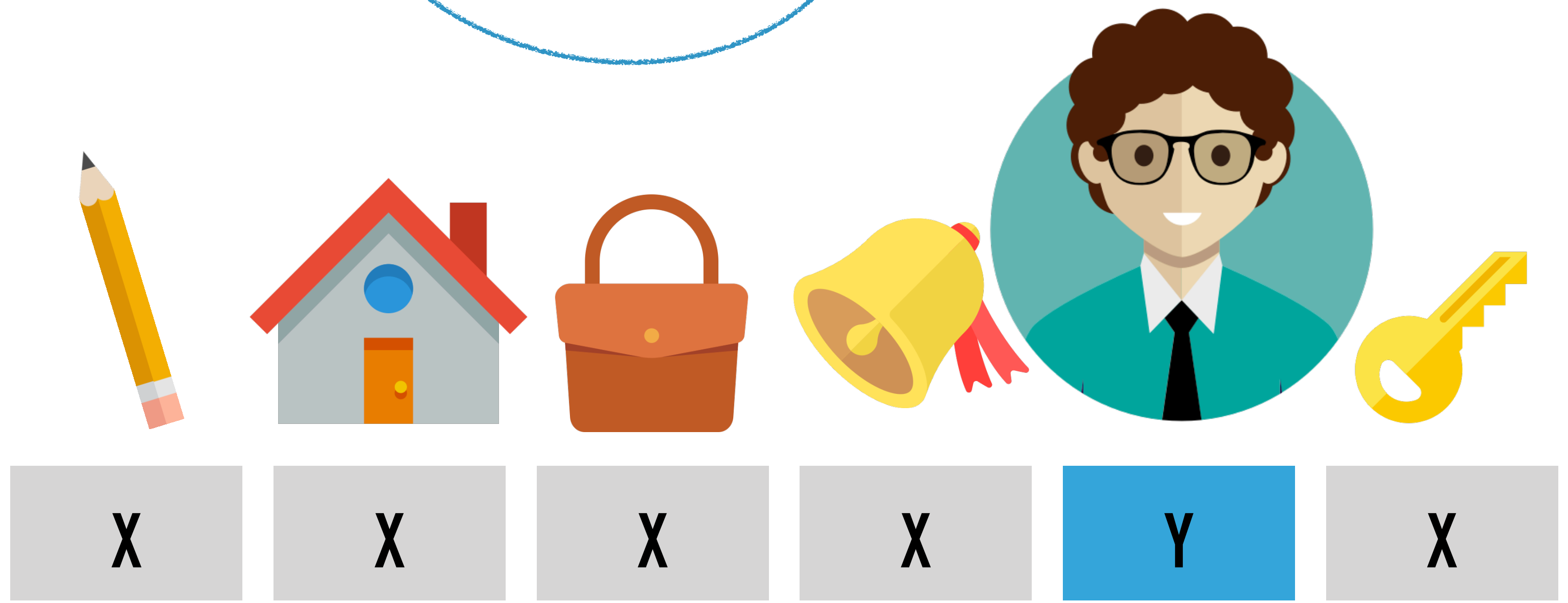
FAST PERIODIC VISUAL STIMULATION

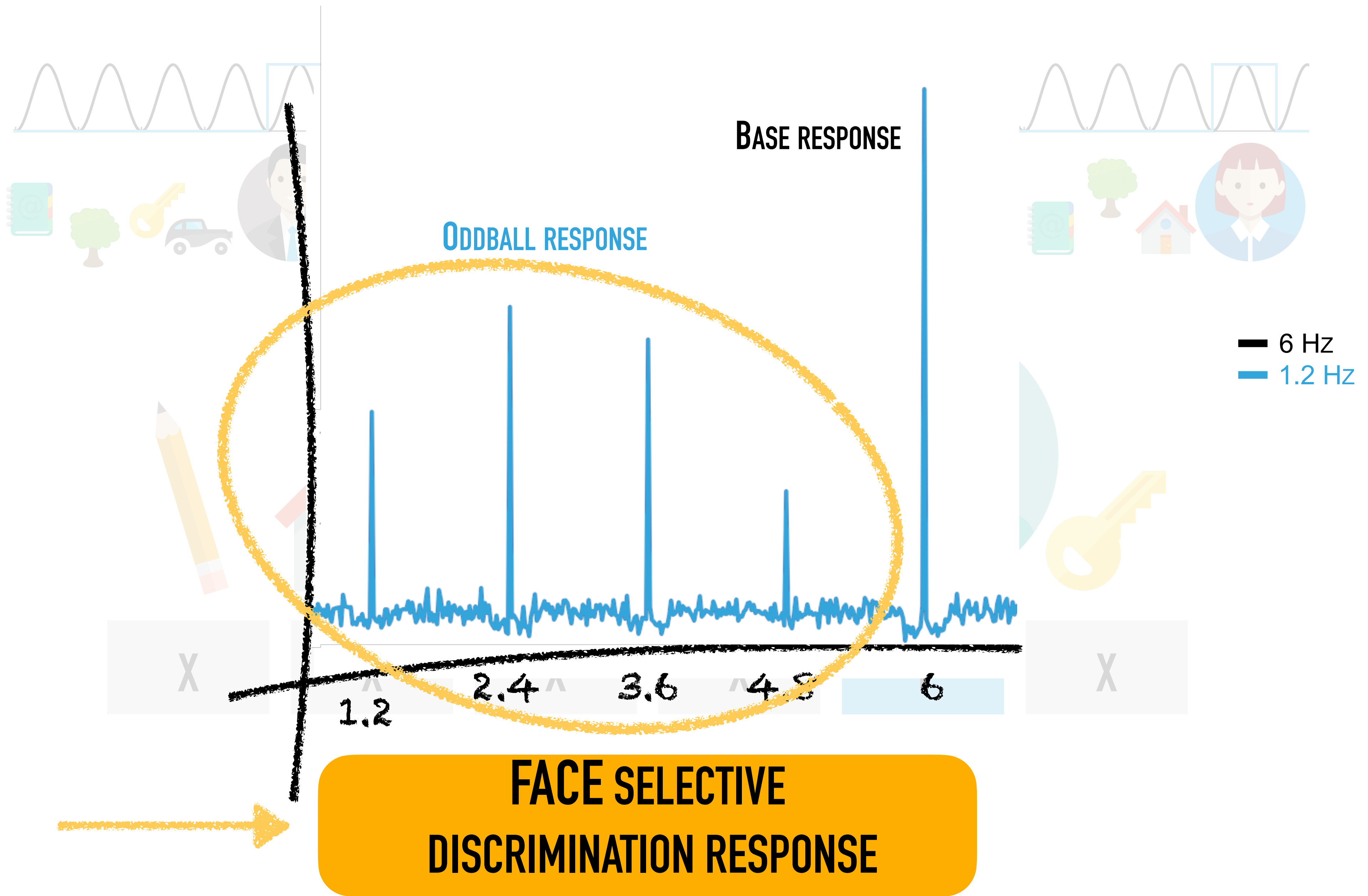


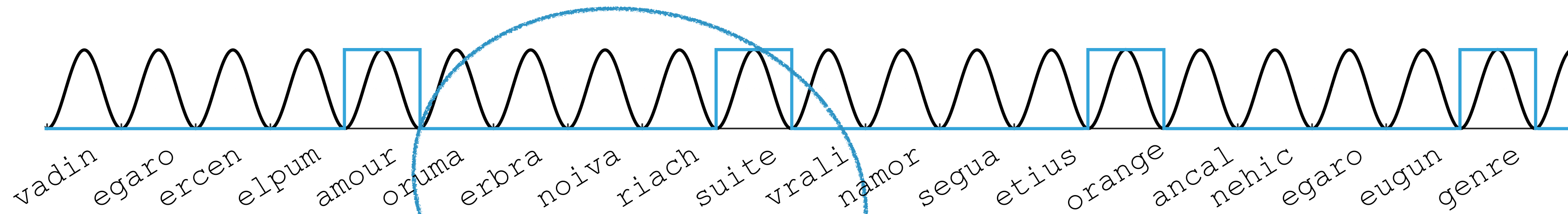
ODDBALL PARADIGM



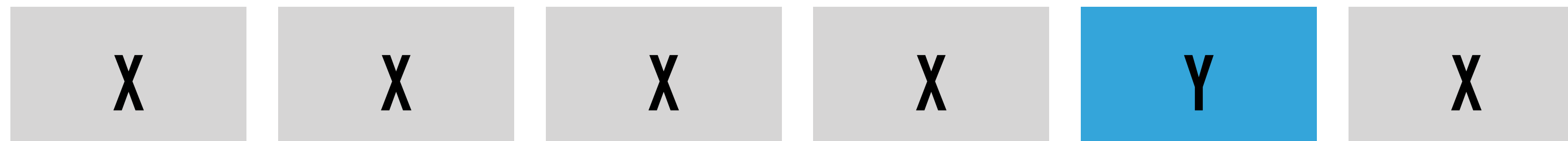
— 6 Hz
— 1.2 Hz



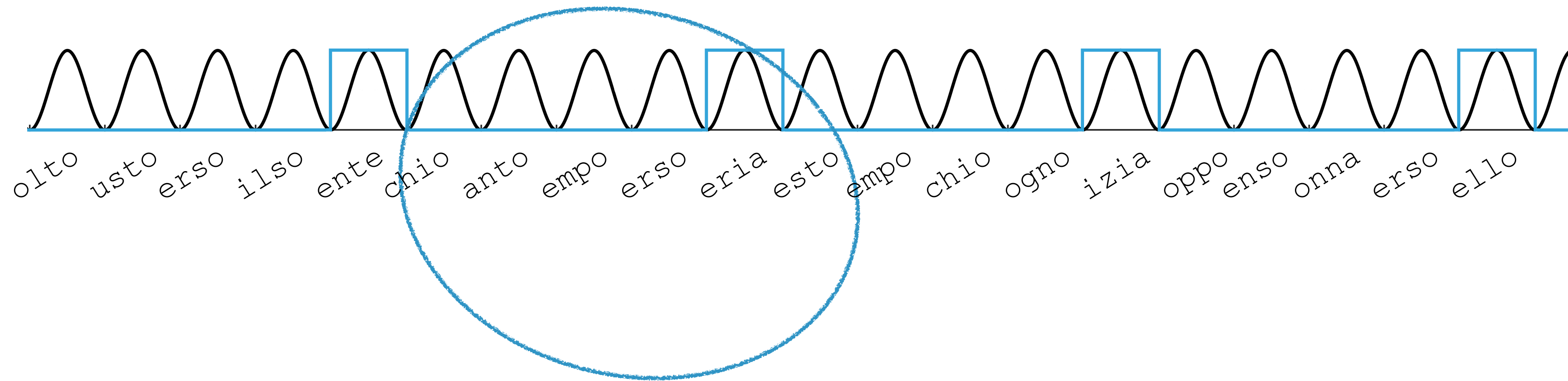




oruma
erbra
noiva
riach
suite
vrali



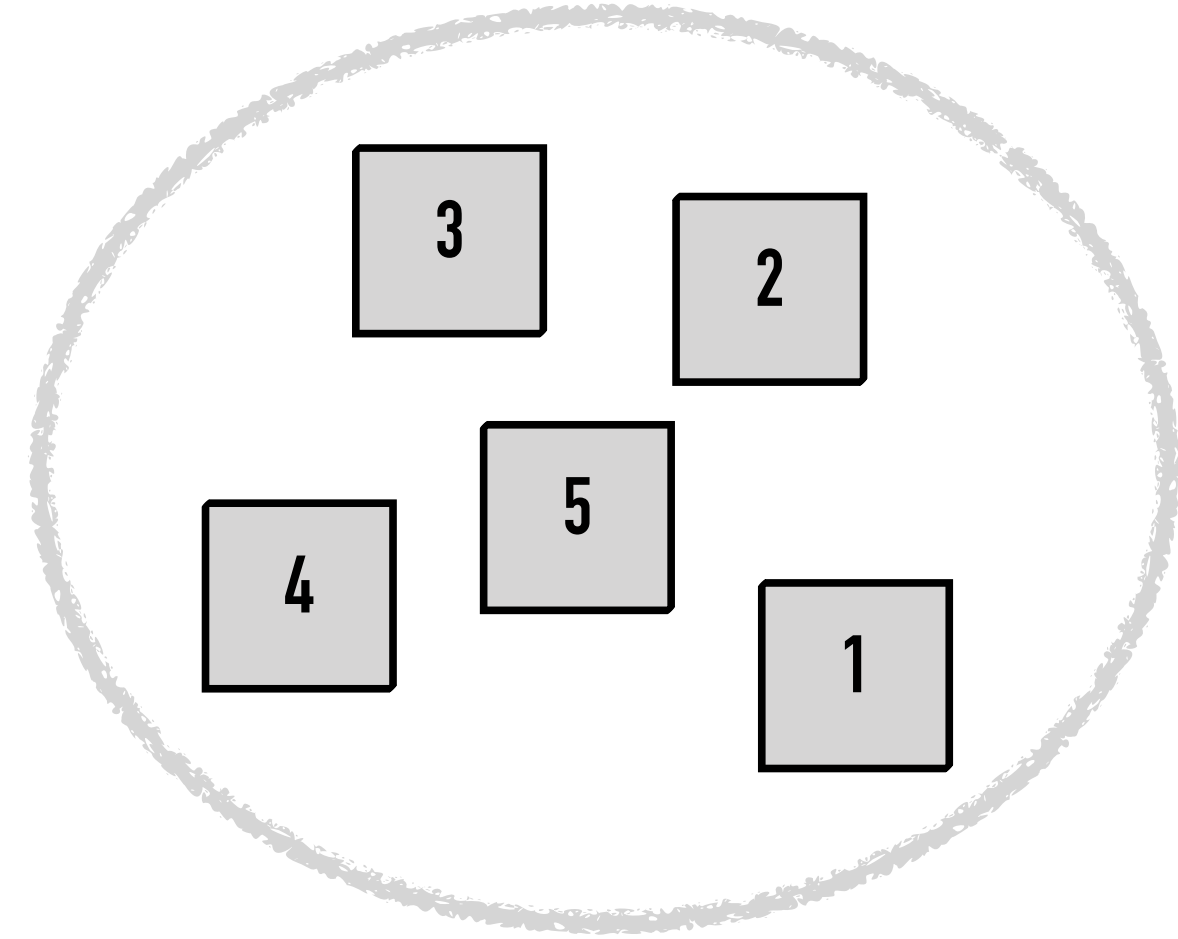
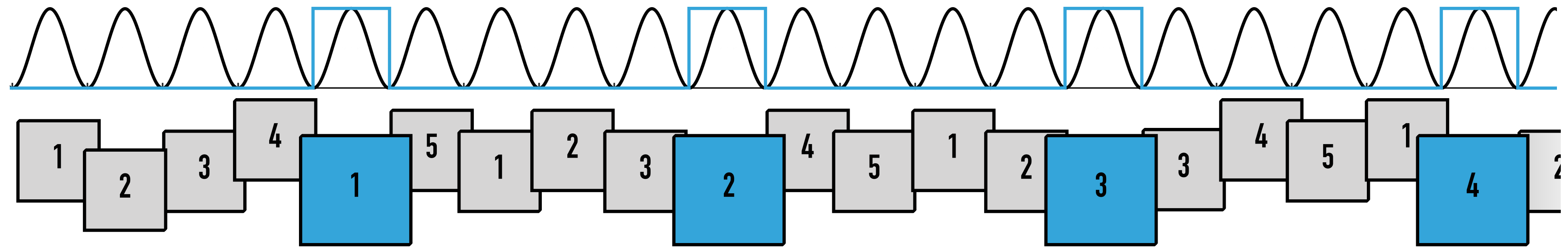
→ **WORD SELECTIVE
DISCRIMINATION RESPONSE**



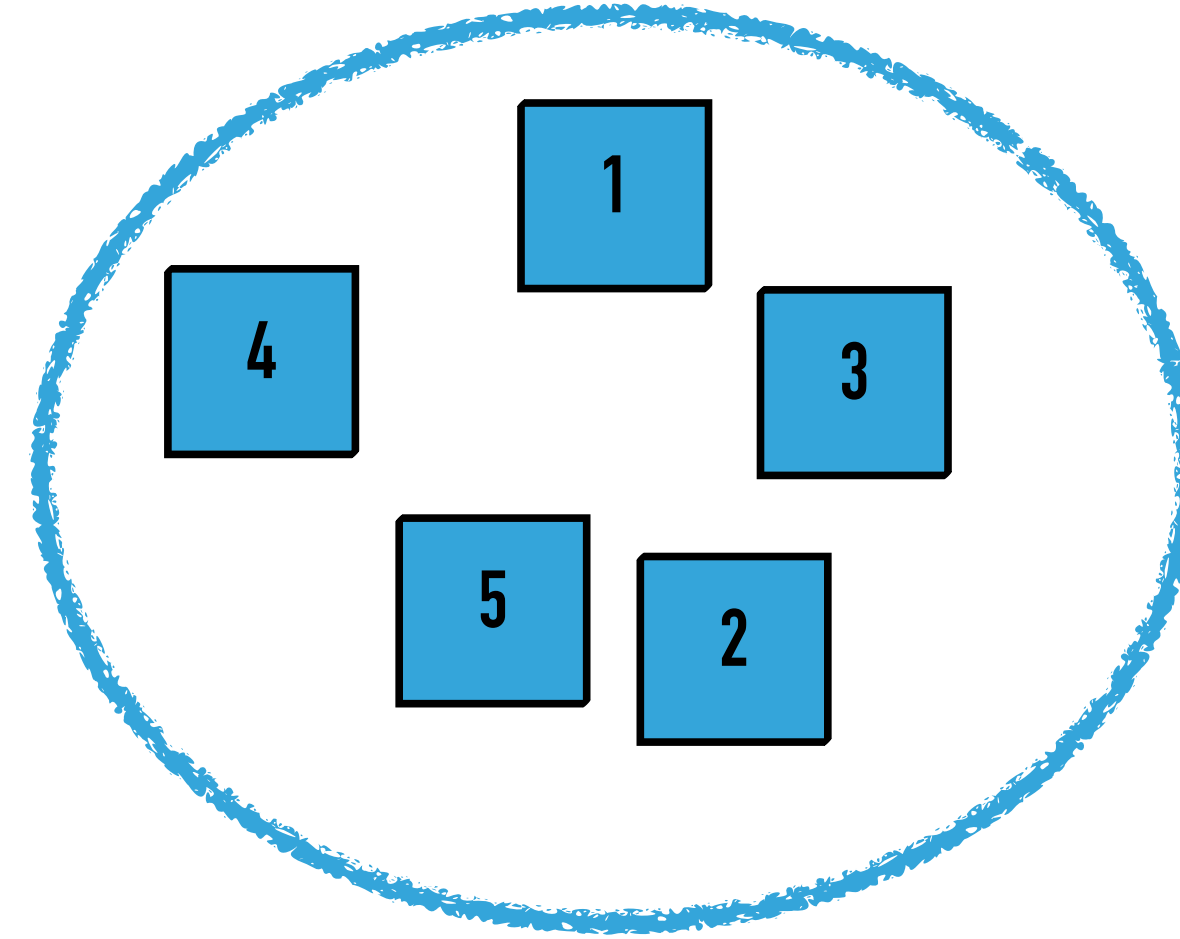
chio anto empo erso eria esto

X X X X Y X

→ MORPHEME SELECTIVE DISCRIMINATION RESPONSE



X 4



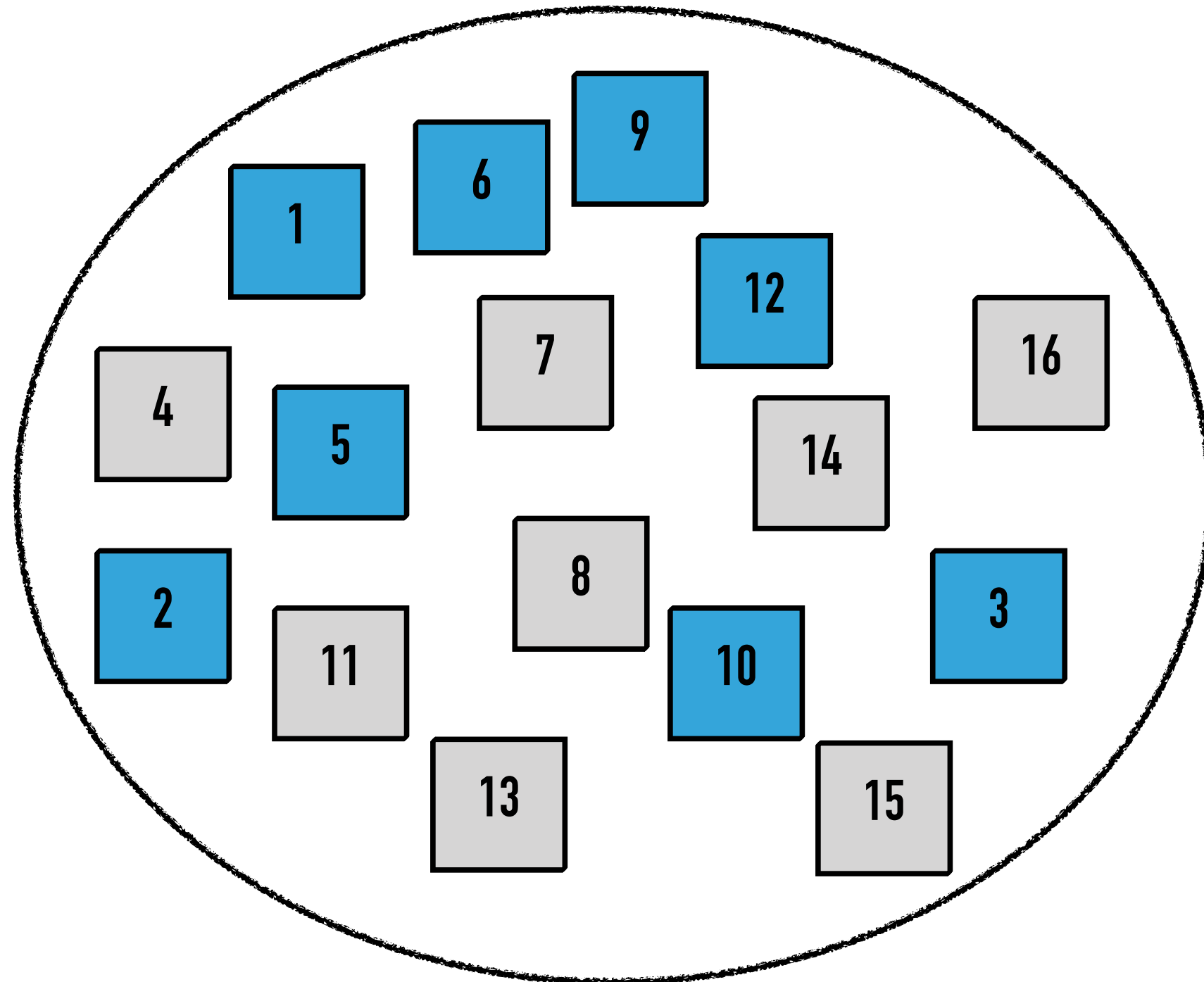
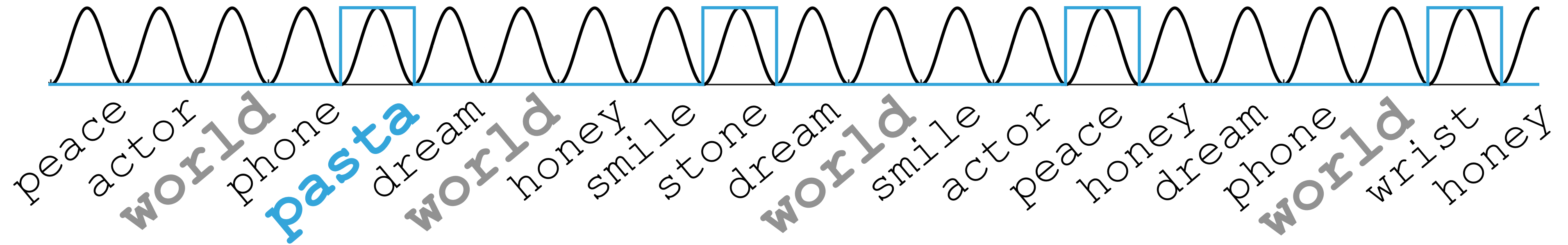
X 1



**CAN
CATEGORY-
SELECTIVE
RESPONSES BE GENERATED BY
IMPLICIT STATISTICAL
LEARNING?**

**DOES
STIMULUS FAMILIARITY
MODULATE SUCH RESPONSE?**

THE "X IN X" LOGIC



8 ITEMS

X 36 TIMES

8 ITEMS

X 9 TIMES

WORDS in WORDS

crema salto mosca ombra **pasta** dieta

PSEUDOWORDS in PSEUDOWORDS

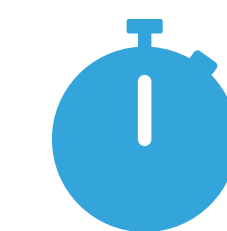
macre tolsa scamo broma **stapa** tadie

NONWORDS in NONWORDS

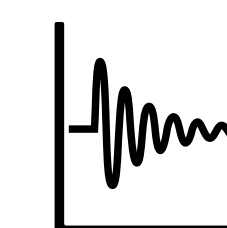
dfgbr lmngp rtmnv qsg hv **prnzl** tvlsr

PSEUDOFONTS in PSEUDOFONTS [Vidal & Chetail, 2015]

ƒcθ>σ σ∫τϕϑ ƒδRΛc Dωθ∫R **πτϕσϑ** Dωθ∫R



5 x 4 x 60" sequences



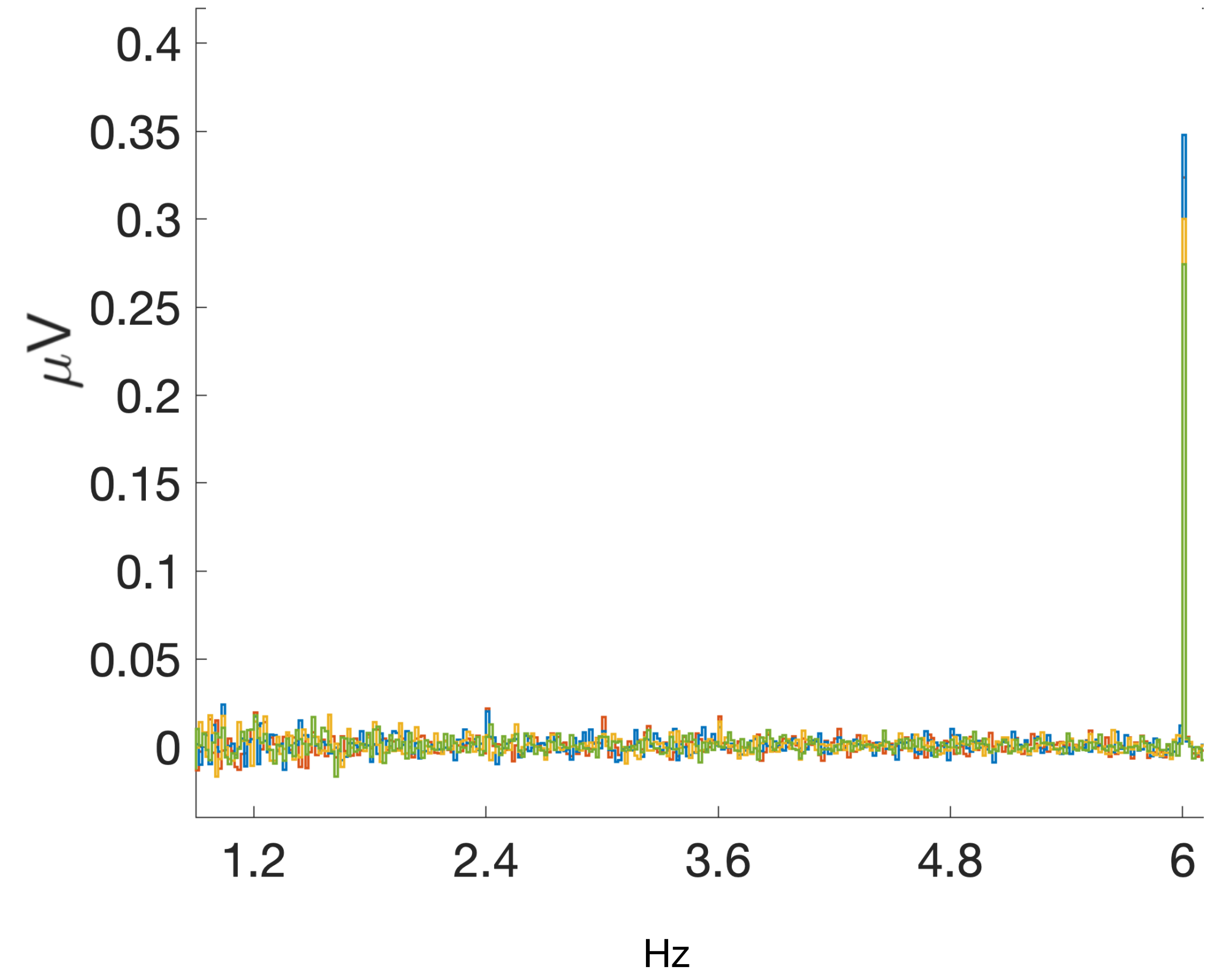
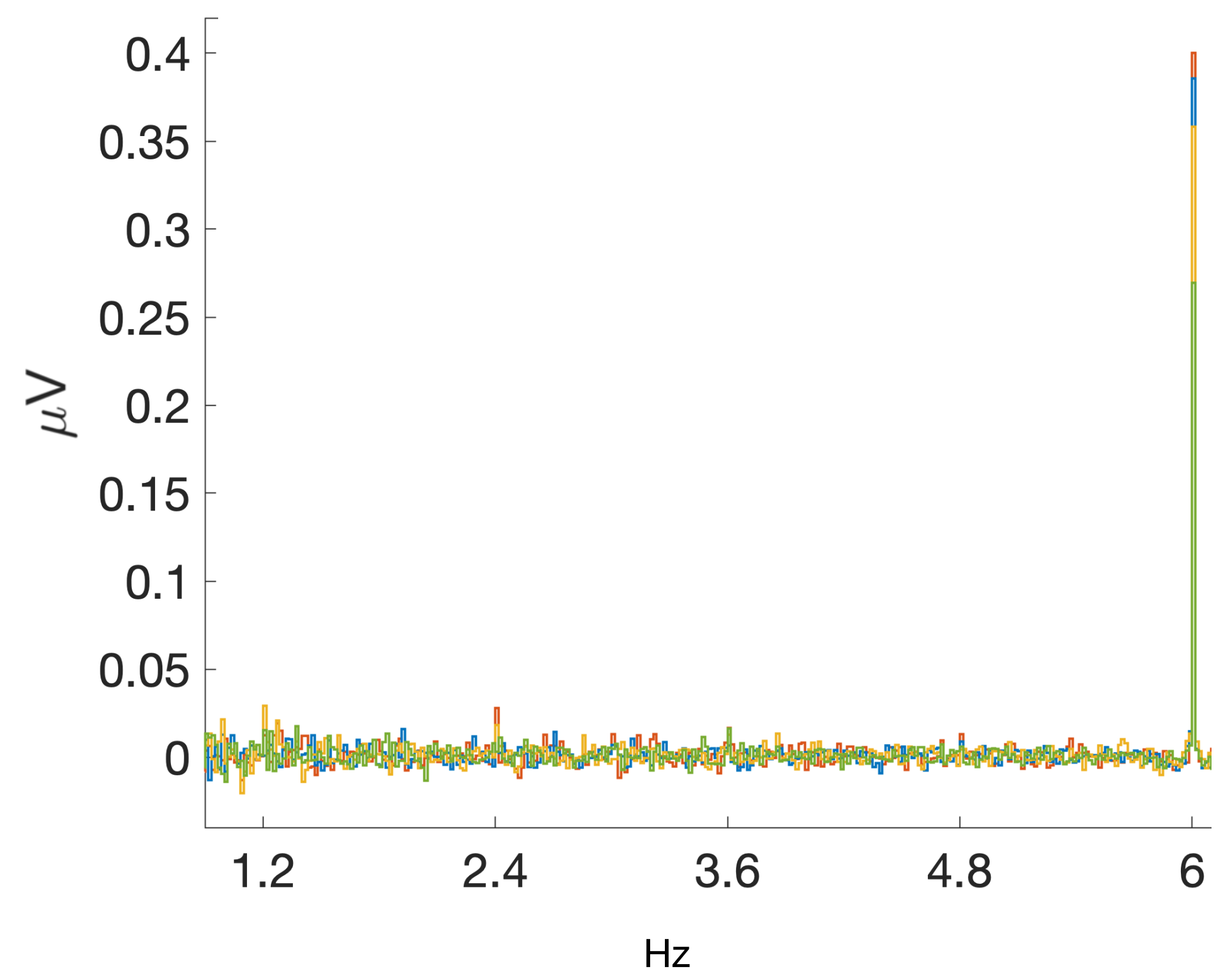
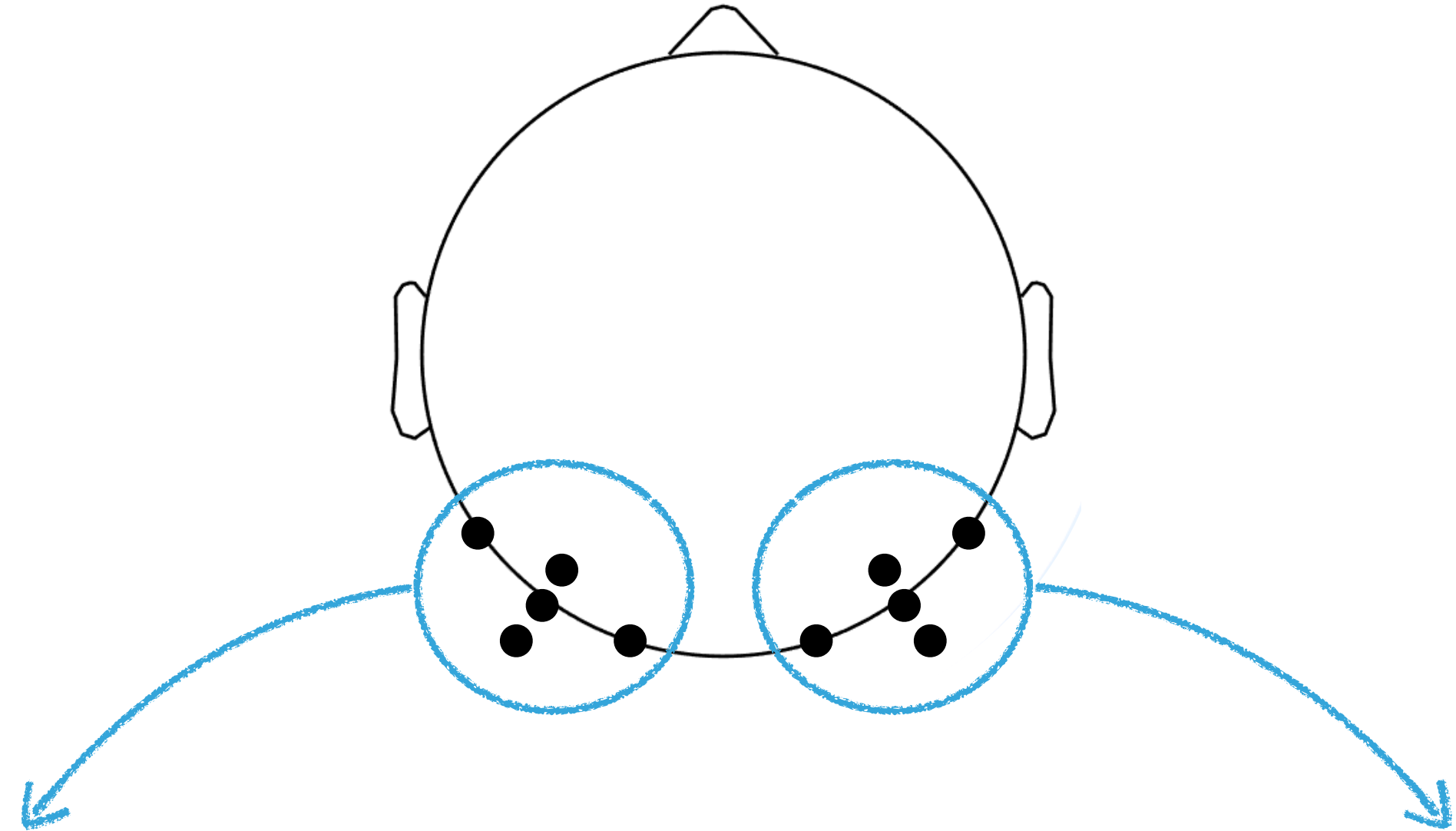
Base:
6 Hz

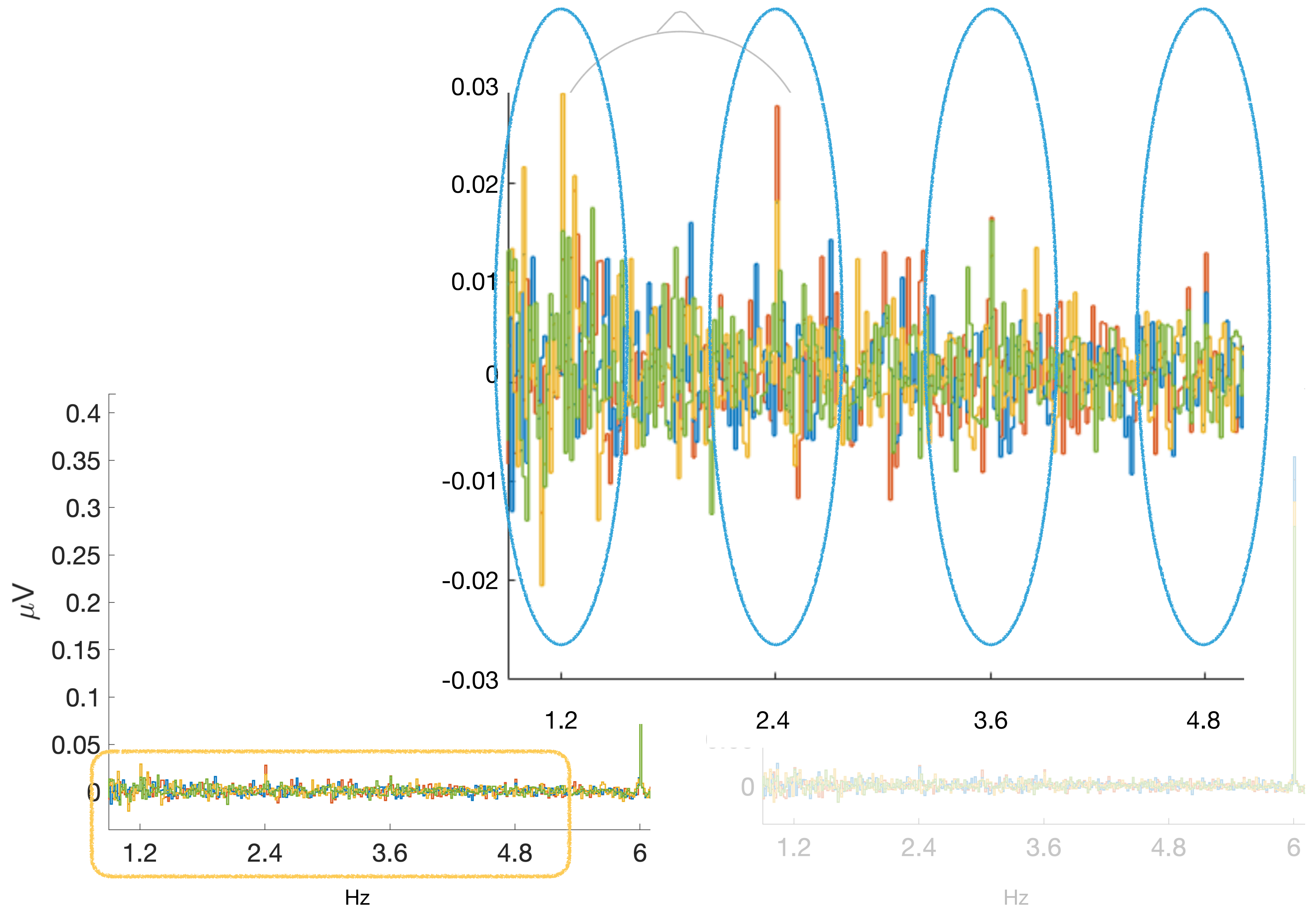


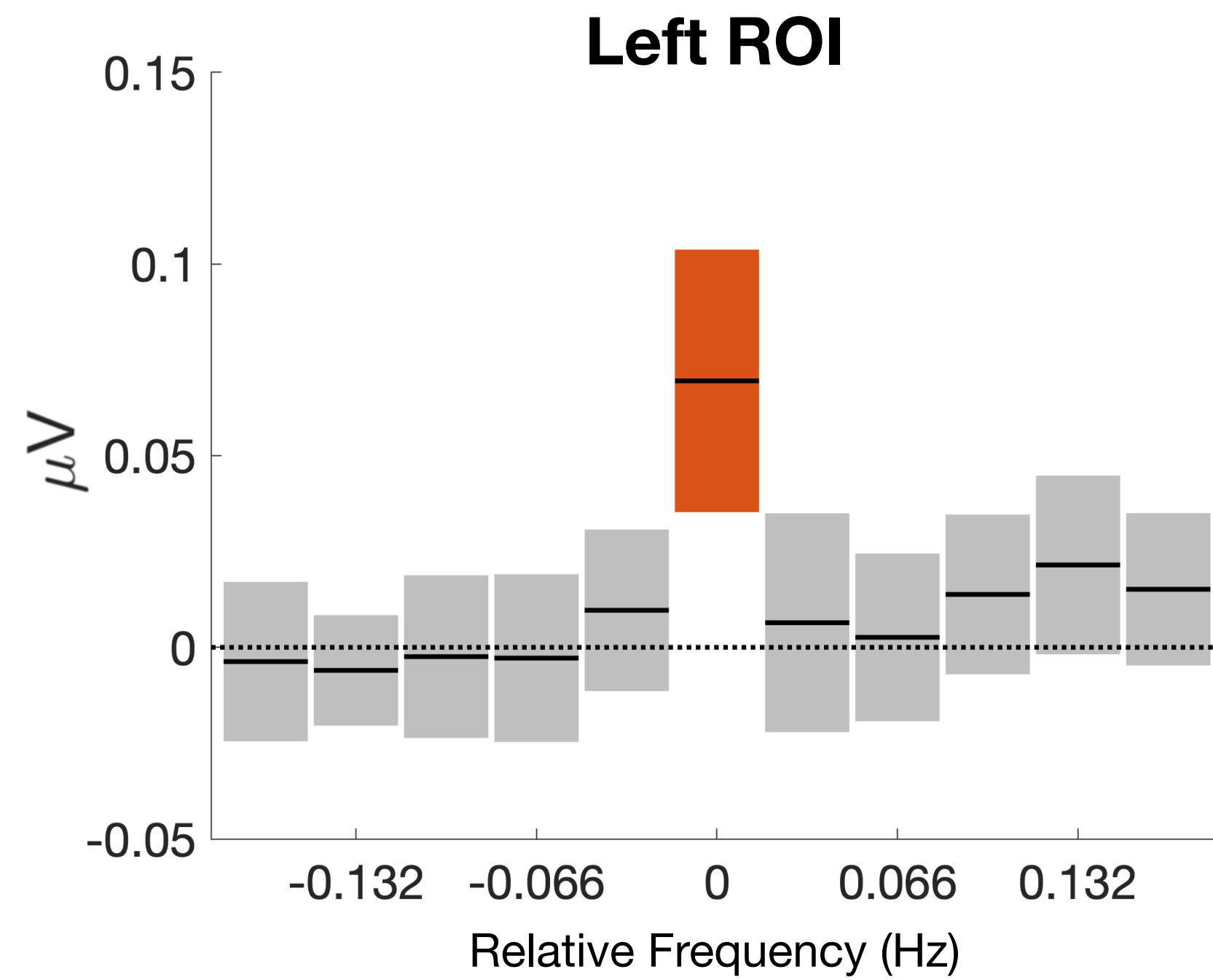
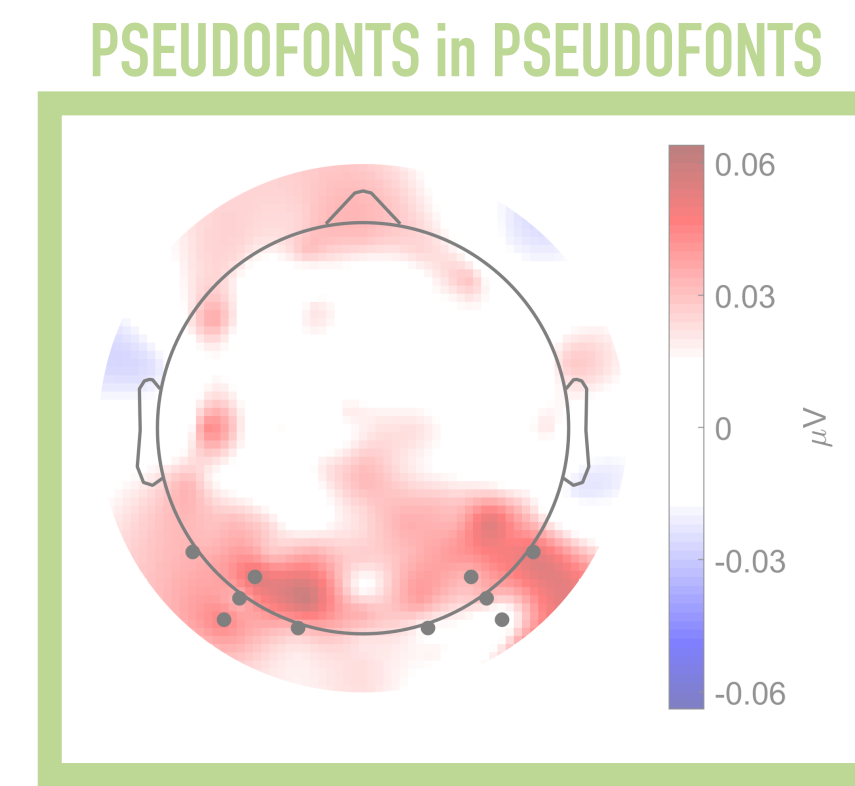
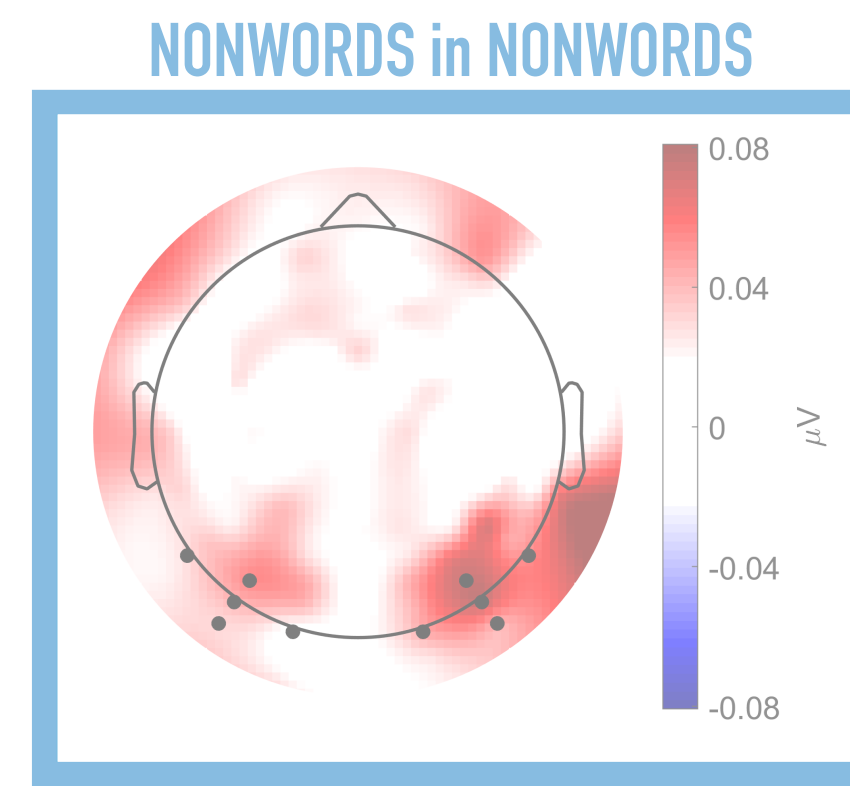
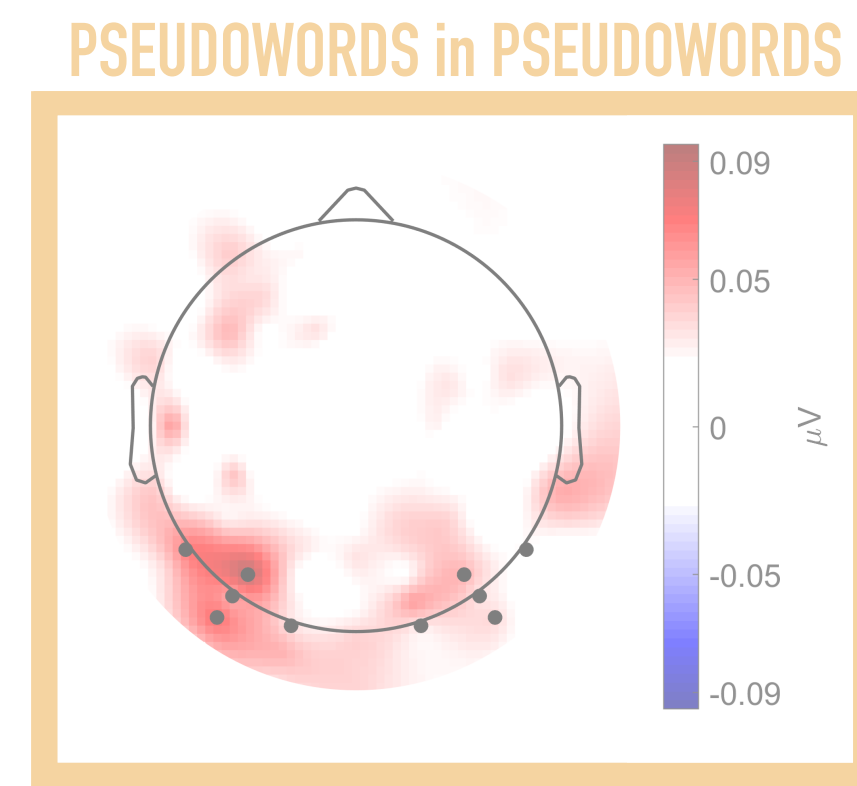
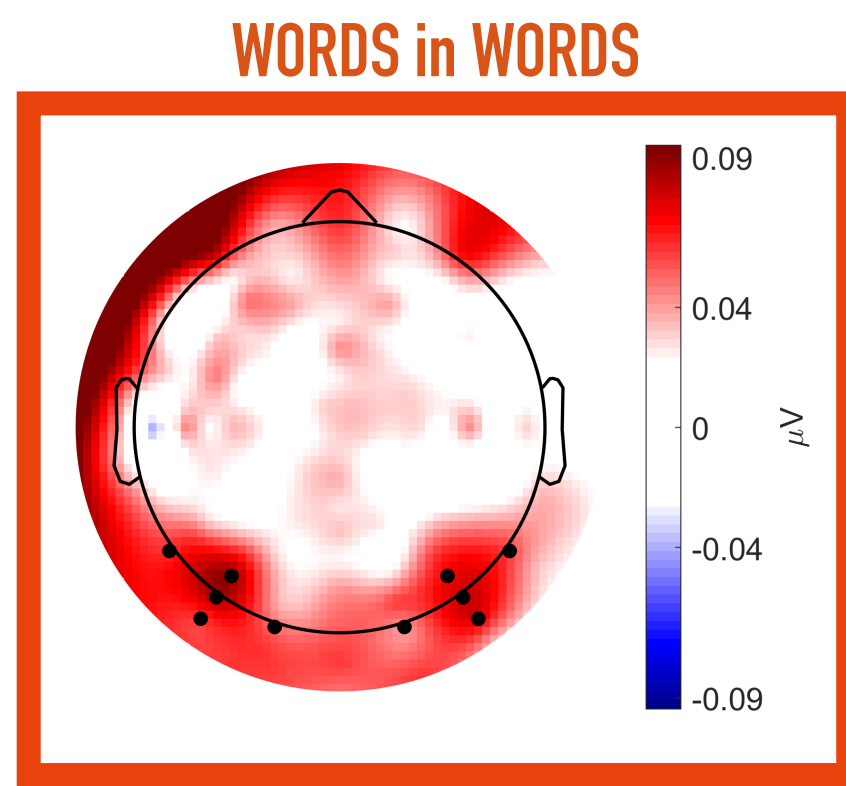
Oddball:
1.2 Hz



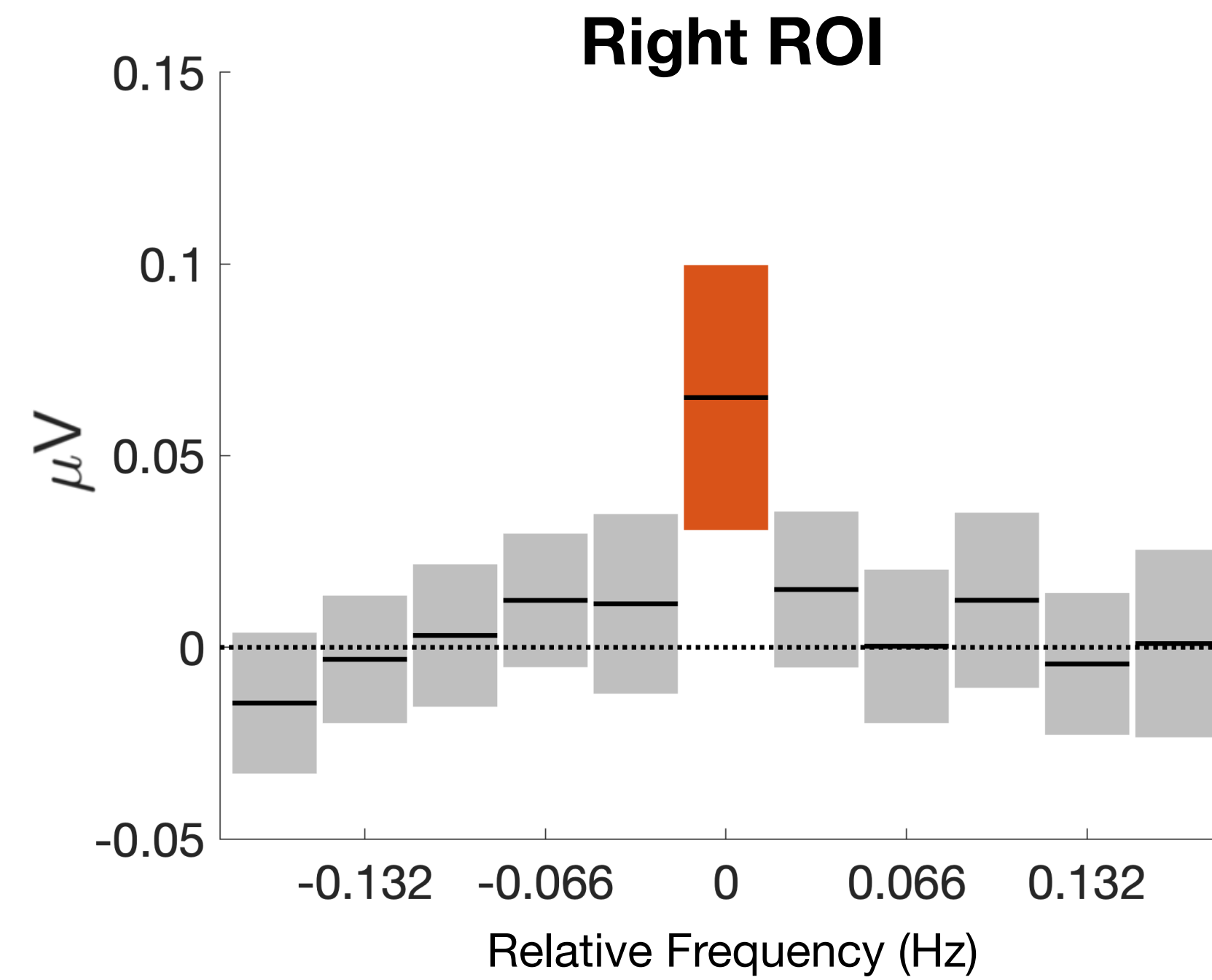
30 subjects



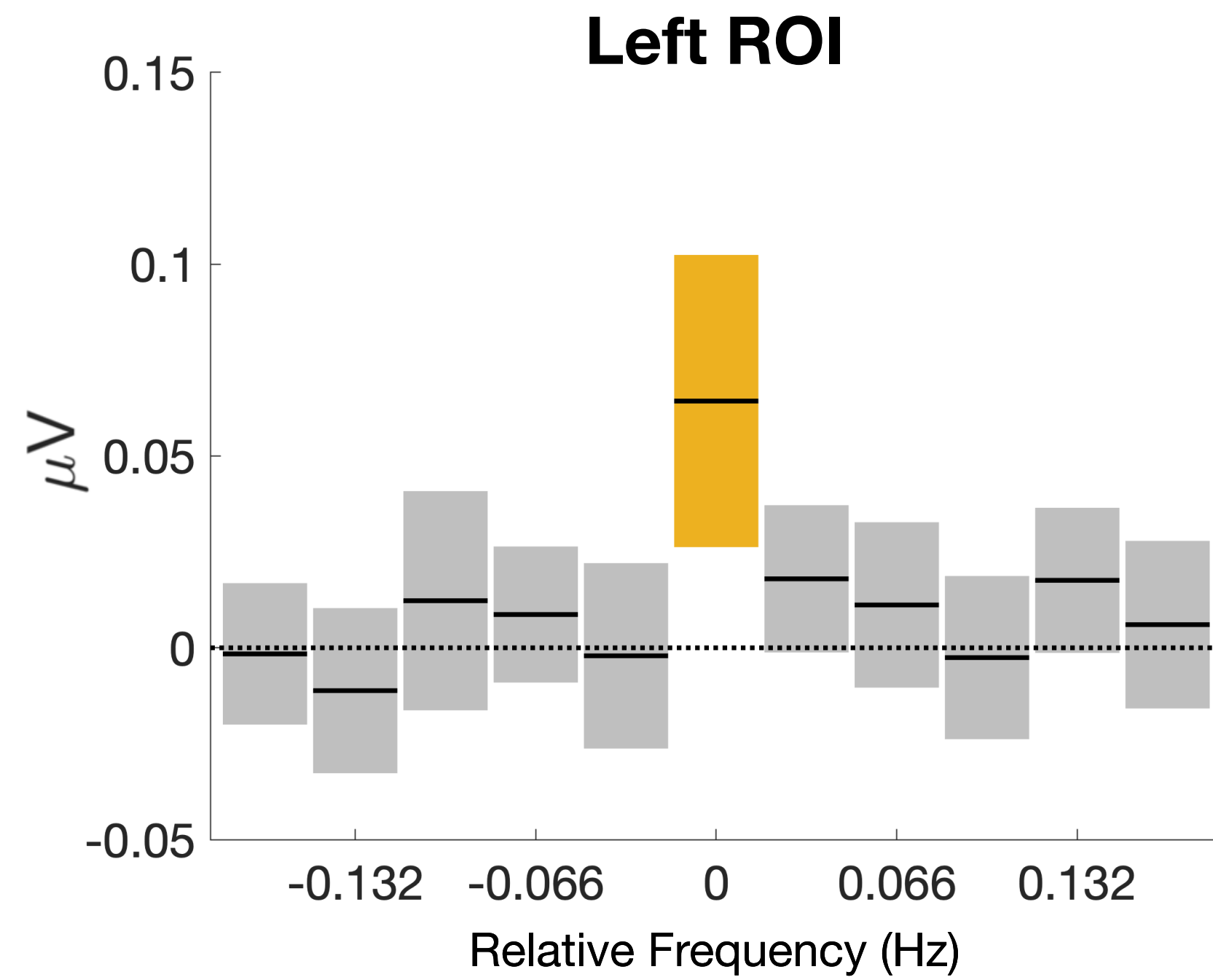
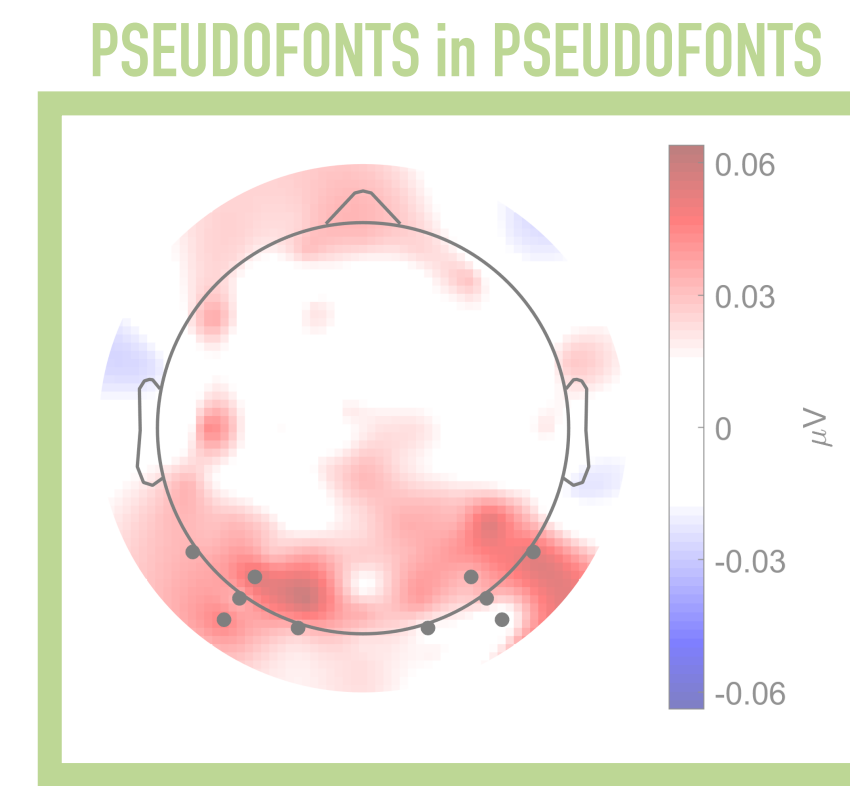
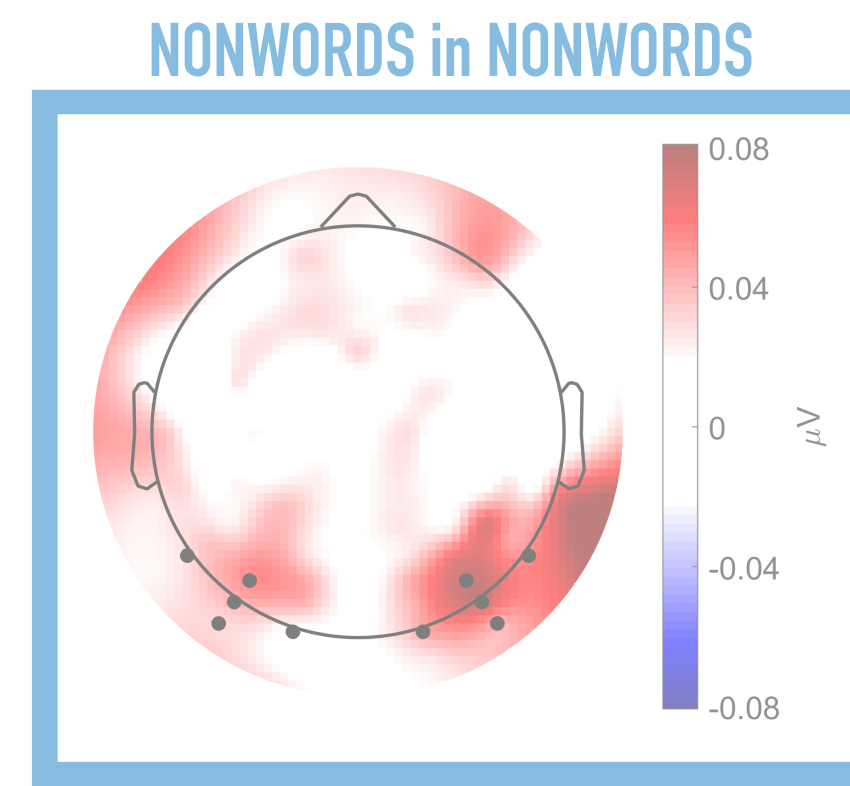
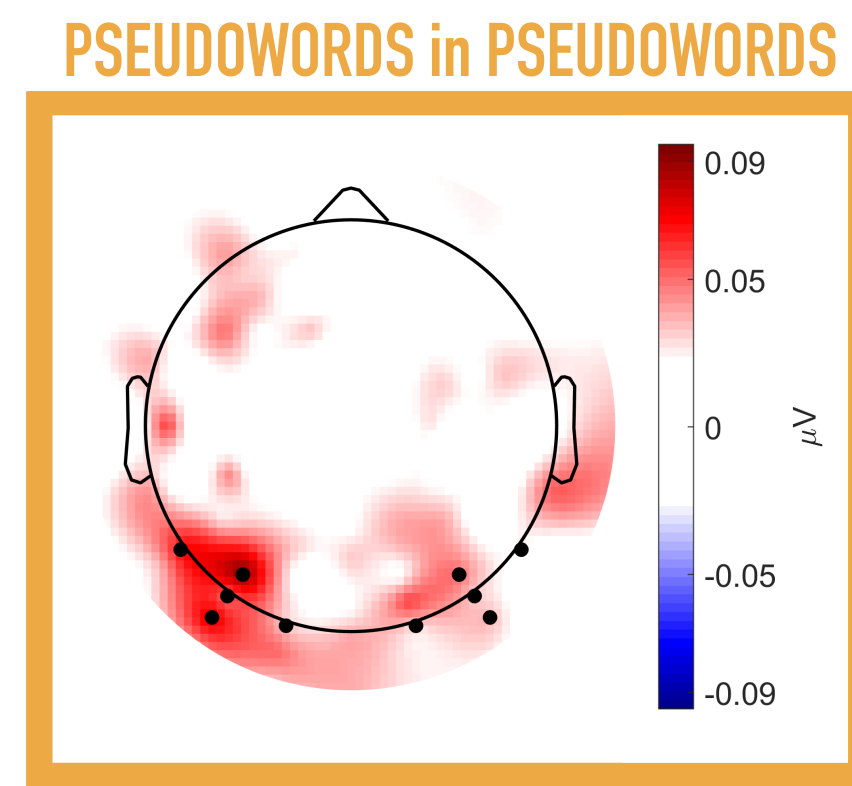
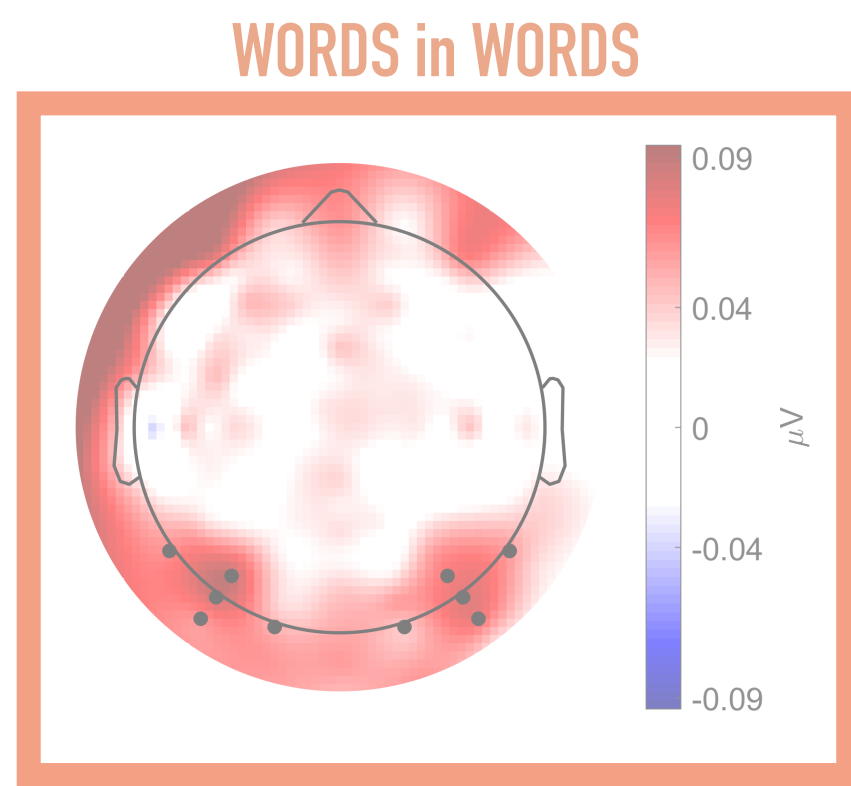




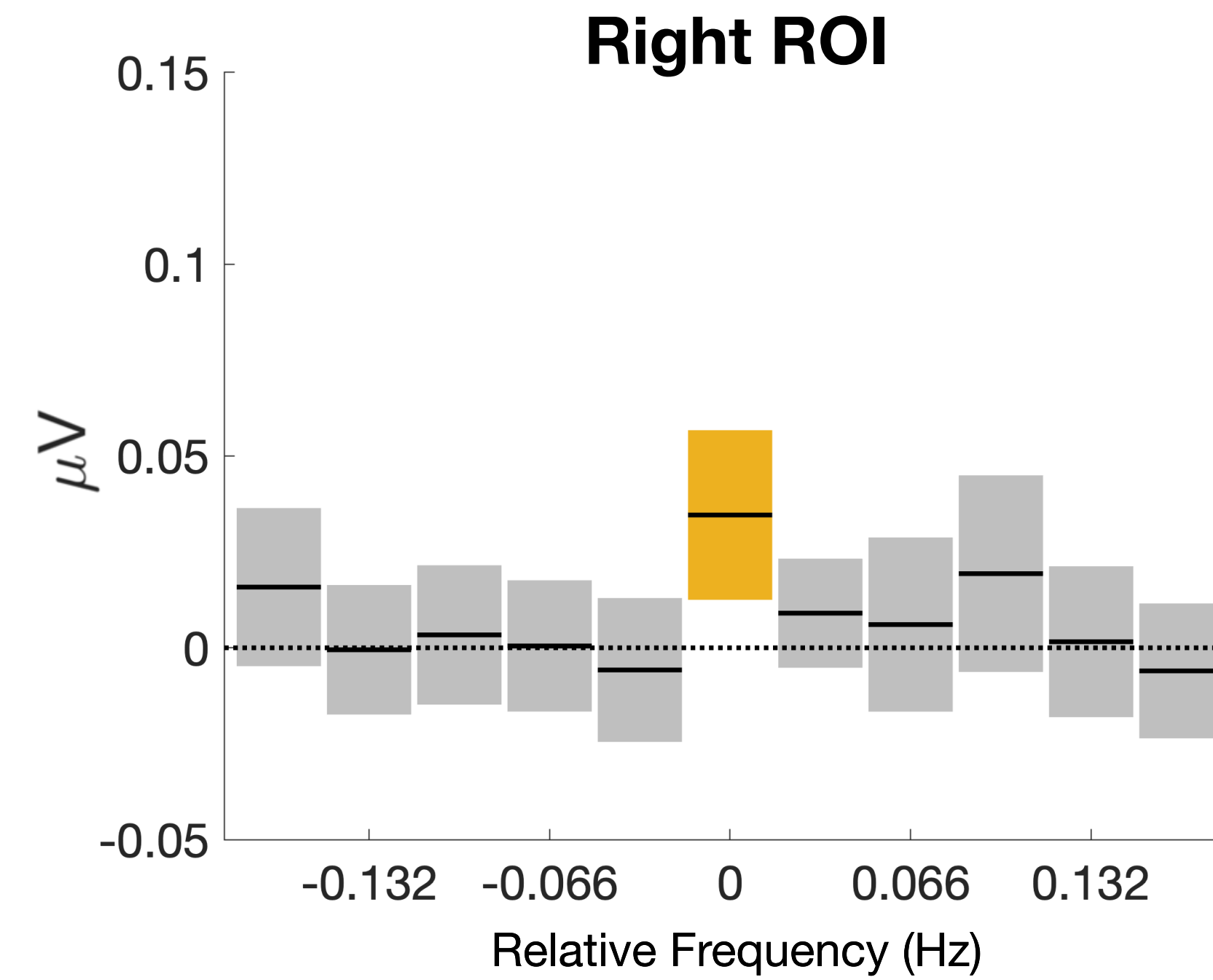
$t = 4.16, g=0.77 [0.35, 1.18] p=0.0003$



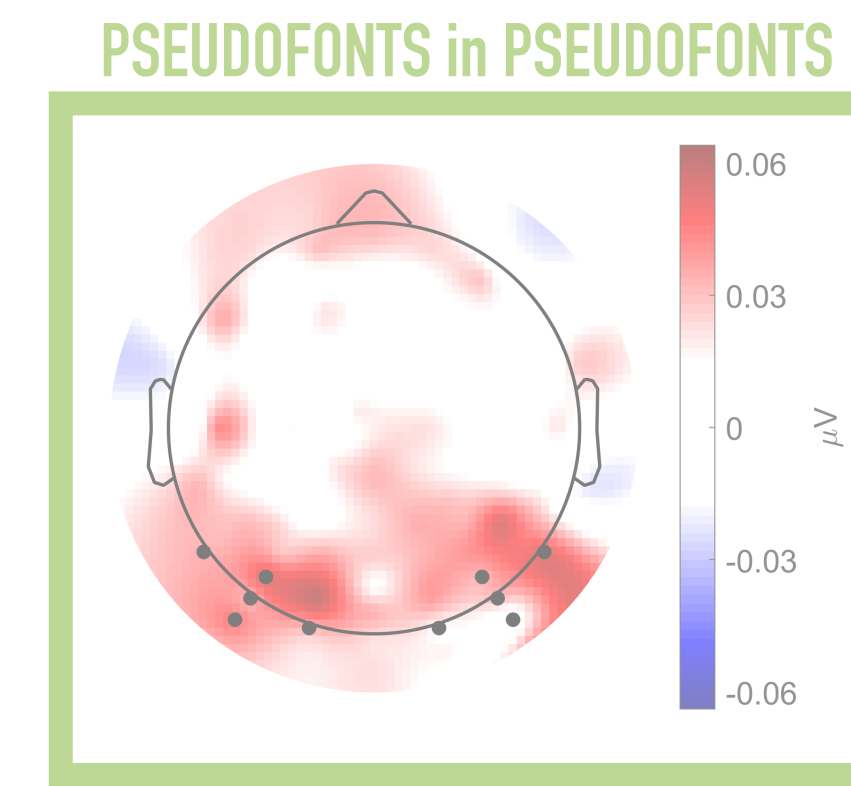
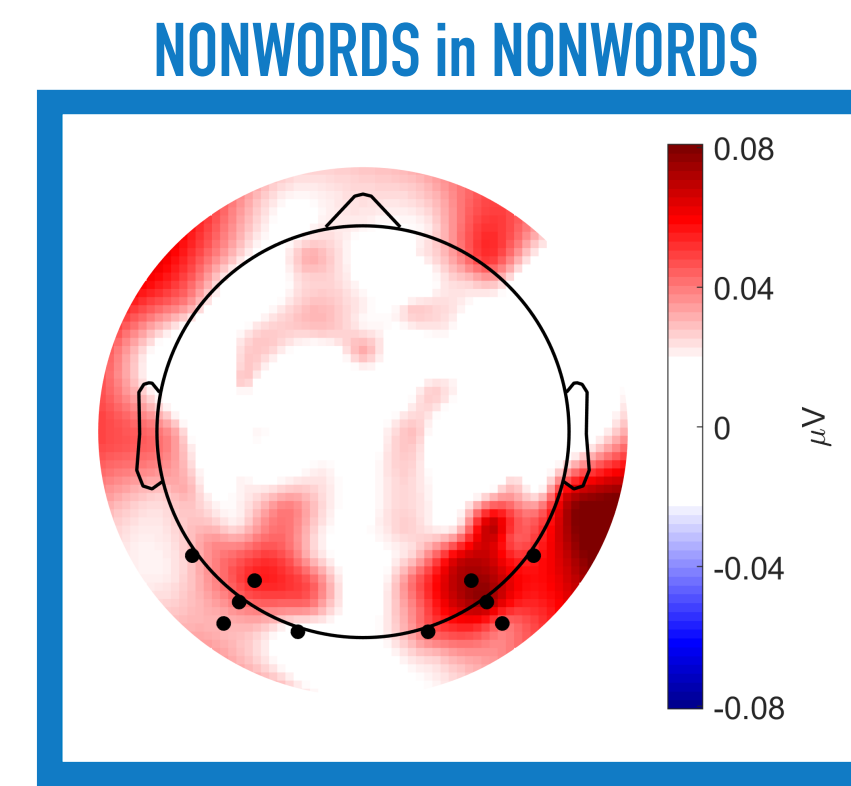
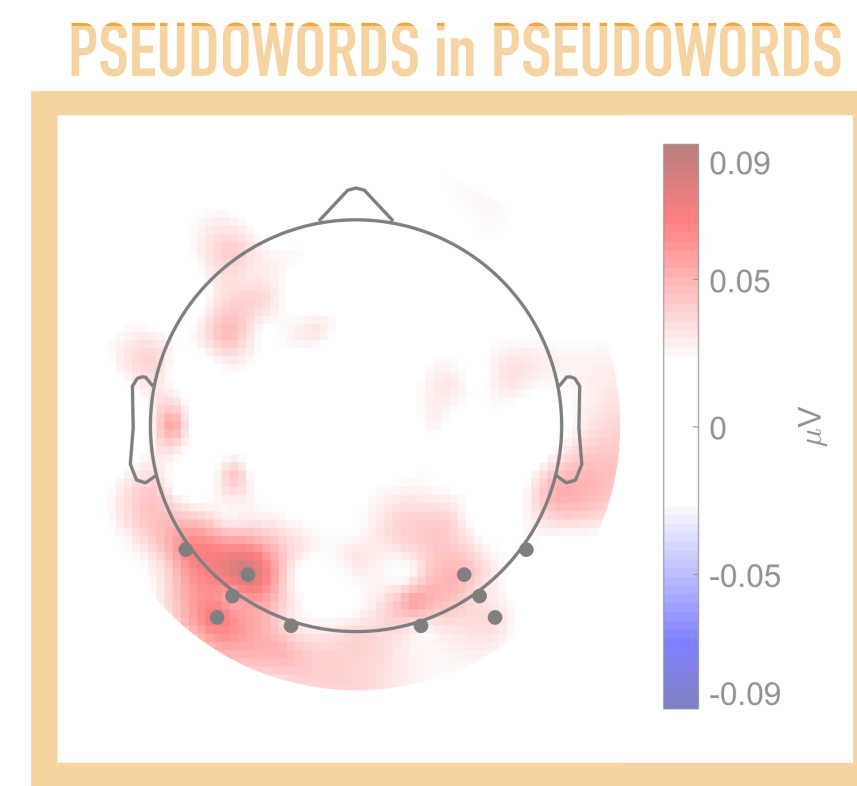
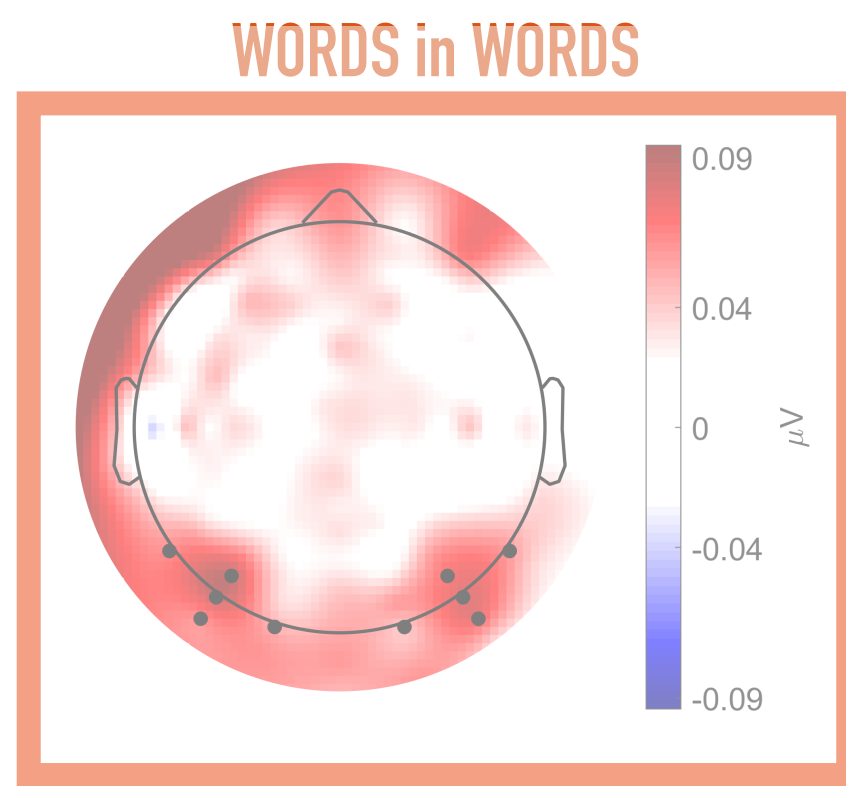
$t = 3.87, g=0.72 [0.30, 1.12] p=0.0006$



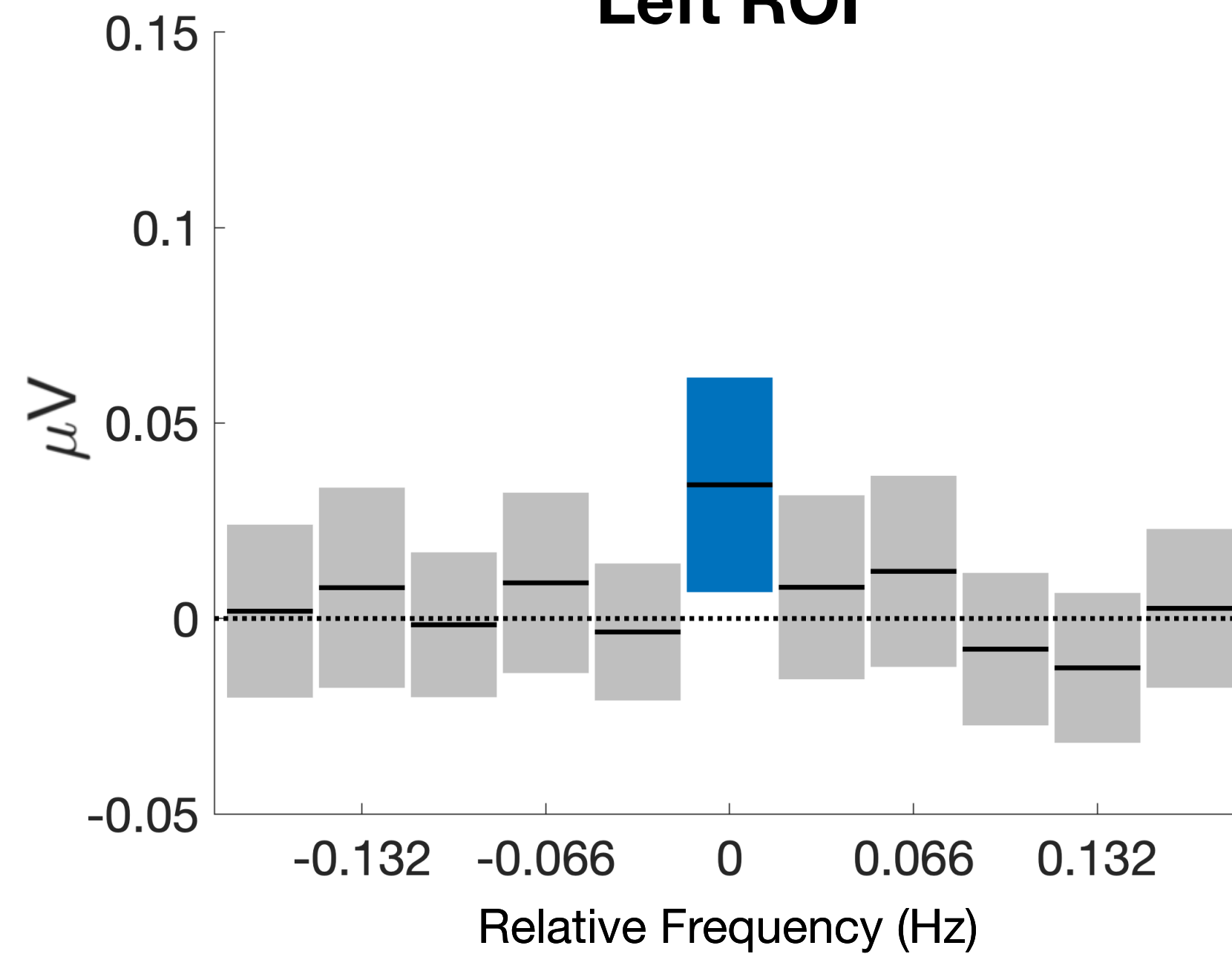
$t = 3.46, g=0.64 [0.28, 1.04] p=0.0017$



$t = 3.20, g=0.59 [0.19, 0.99] p=0.0033$

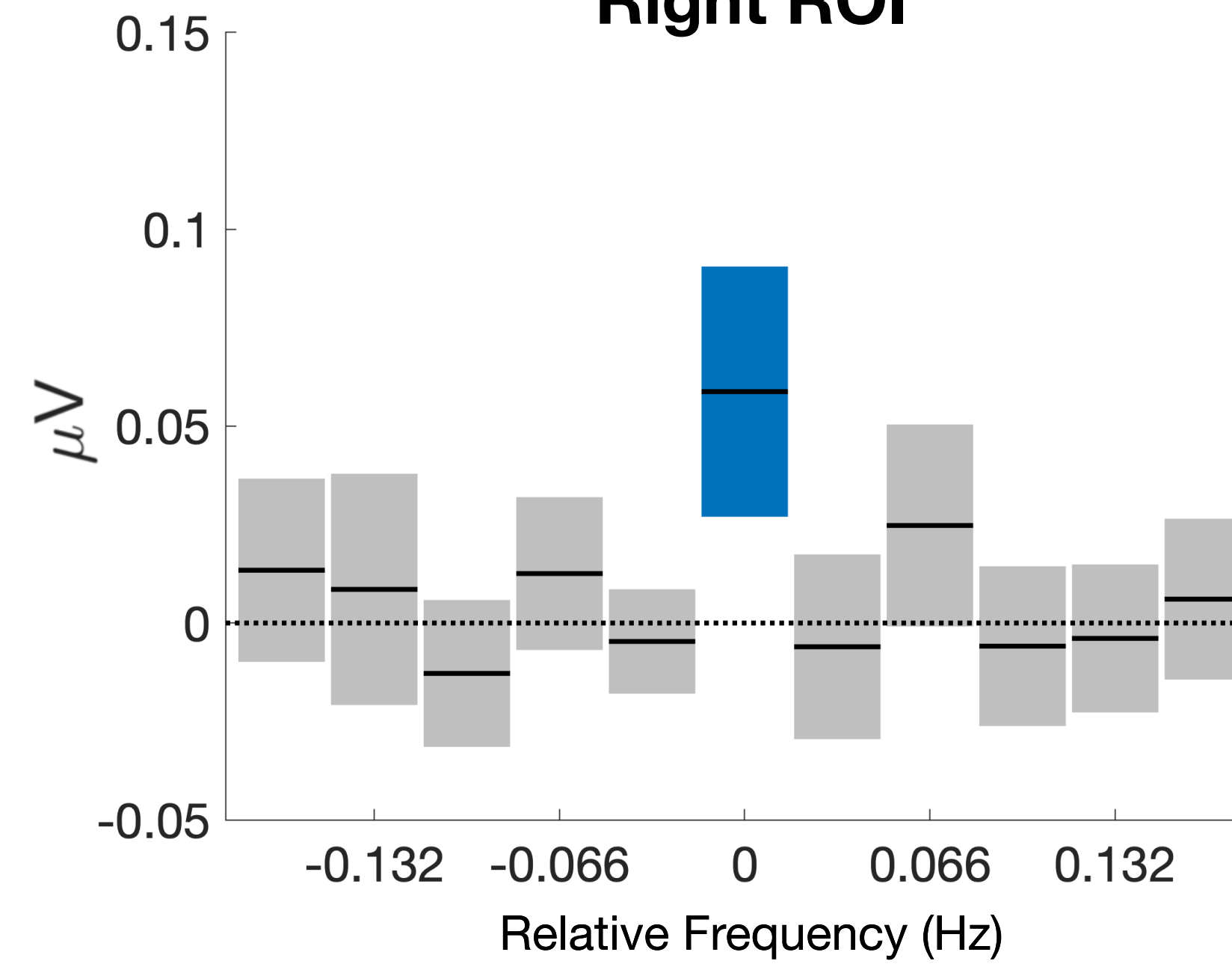


Left ROI

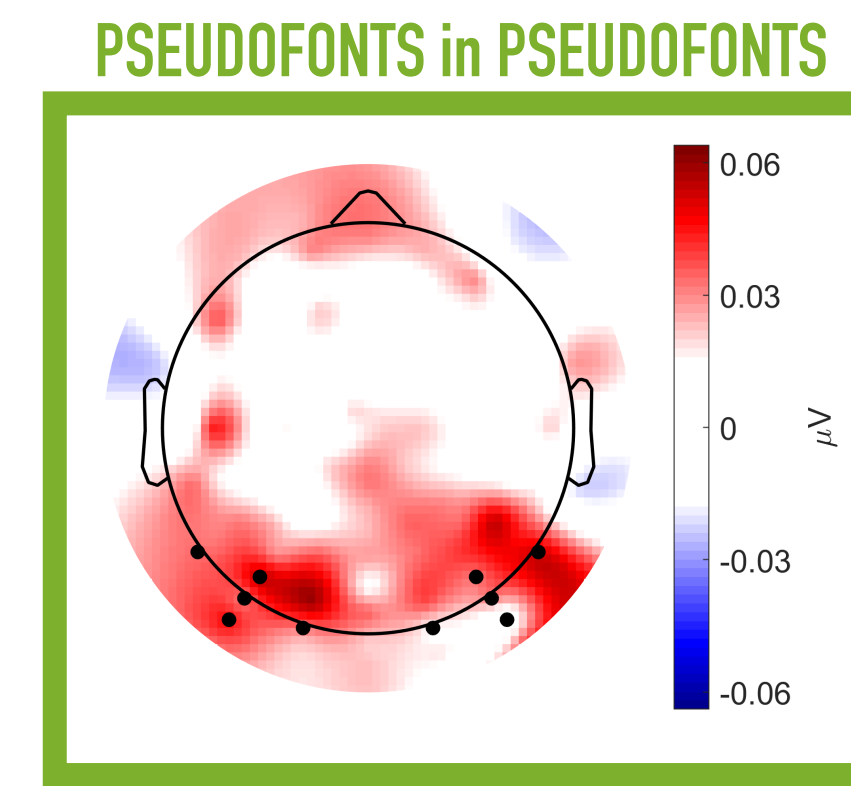
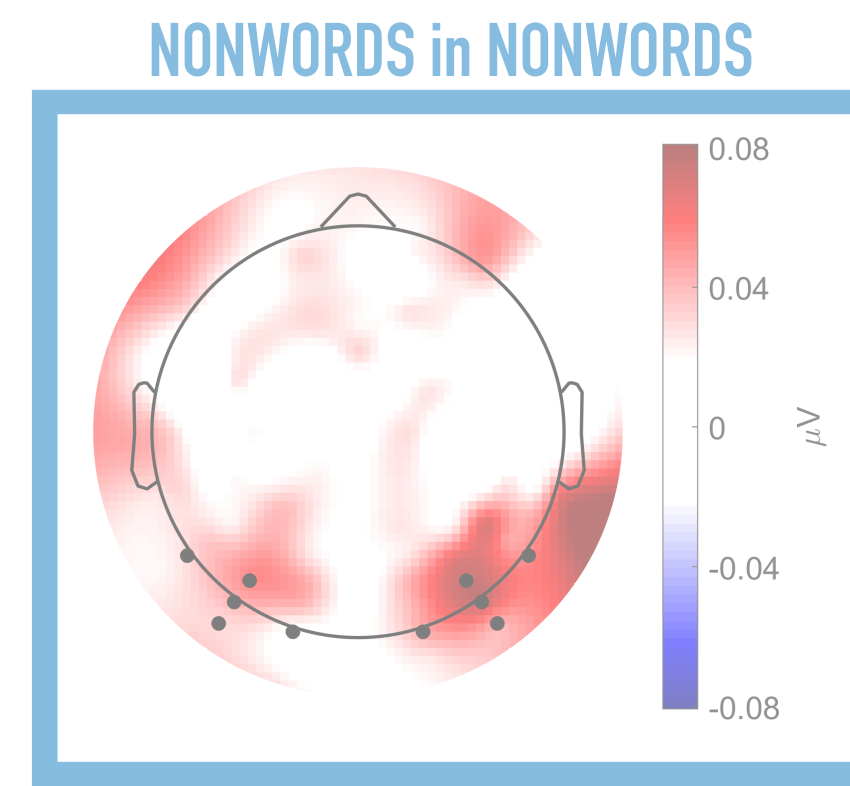
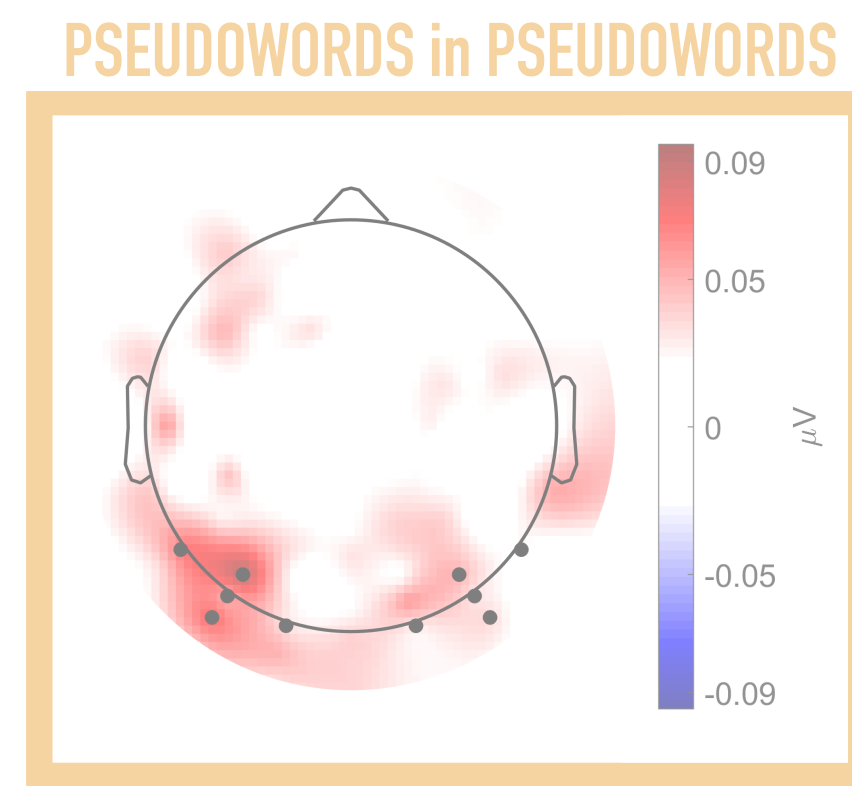
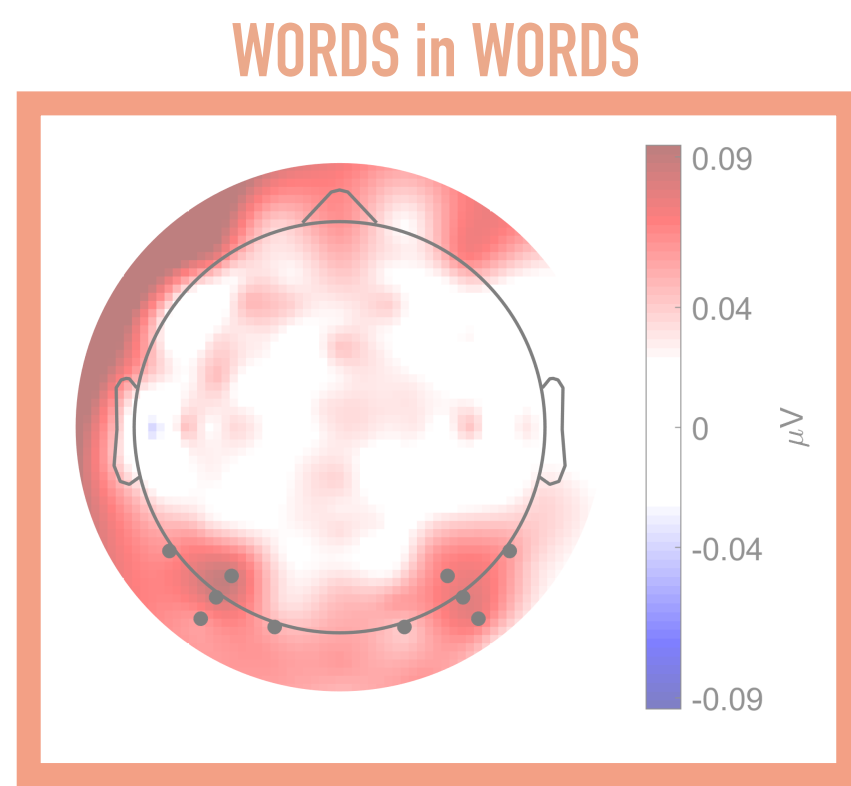


$t = 2.55, g=0.47 [0.08, 0.85] p=0.0164$

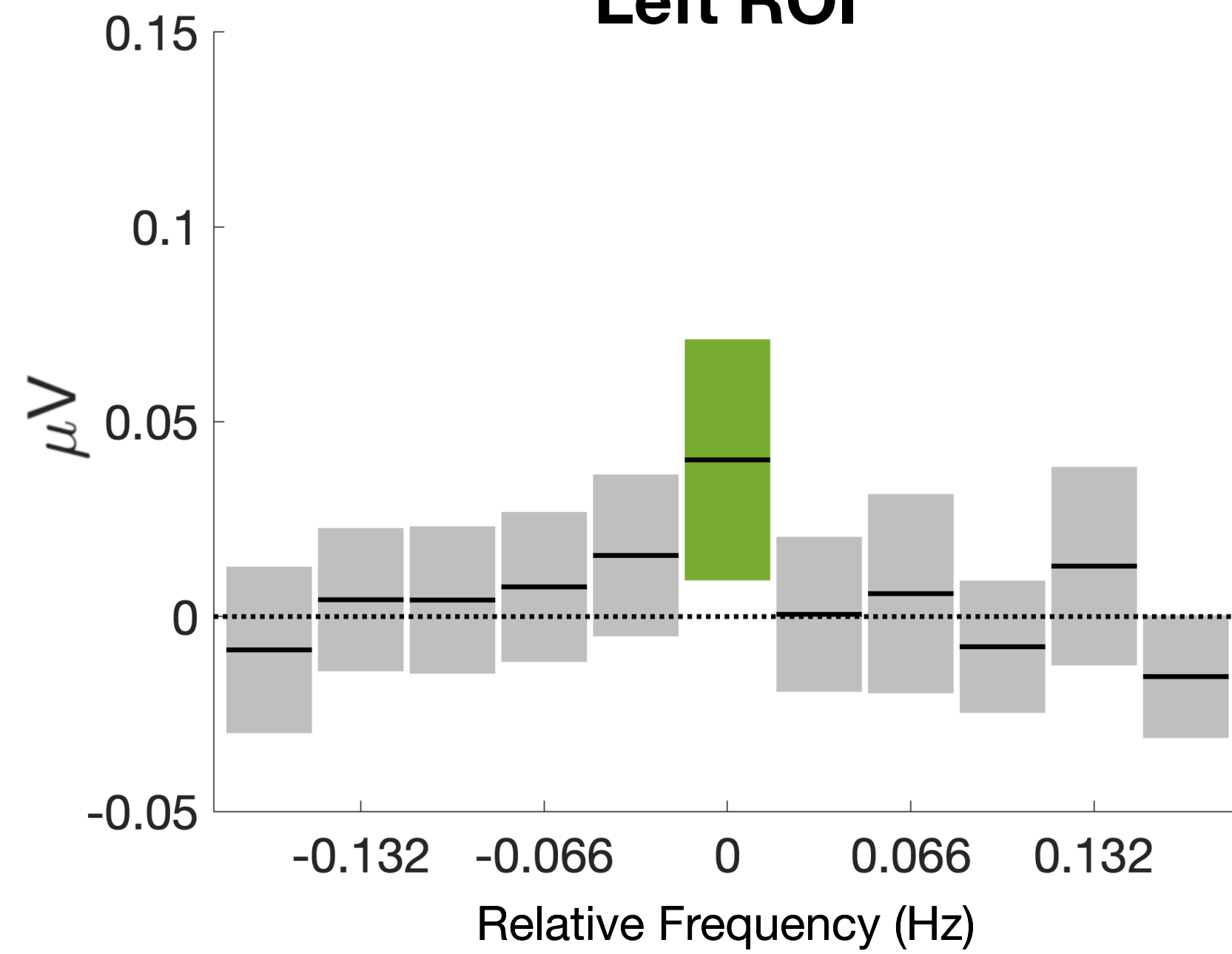
Right ROI



$t = 3.79, g=0.70 [0.29, 1.10] p=0.0007$

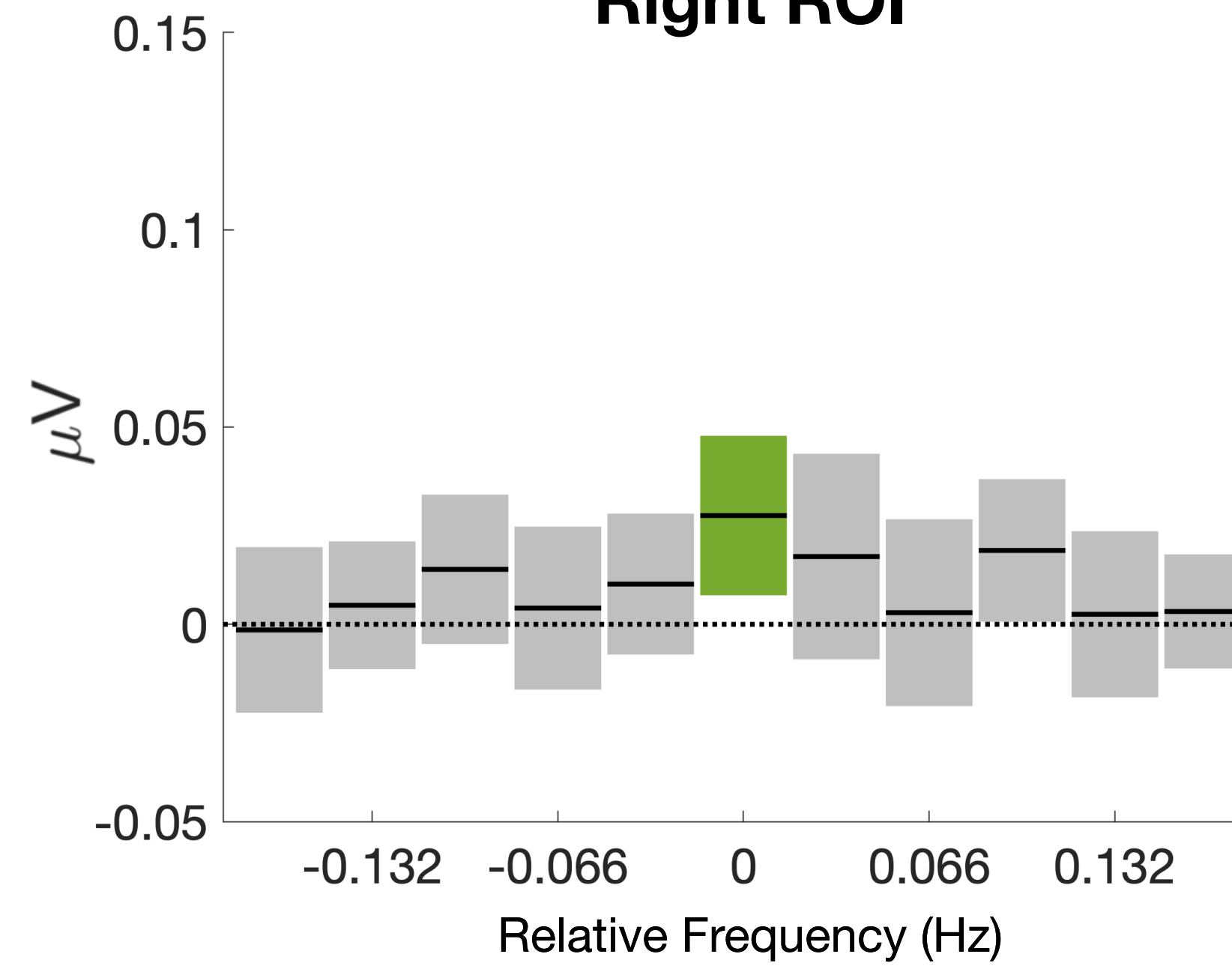


Left ROI

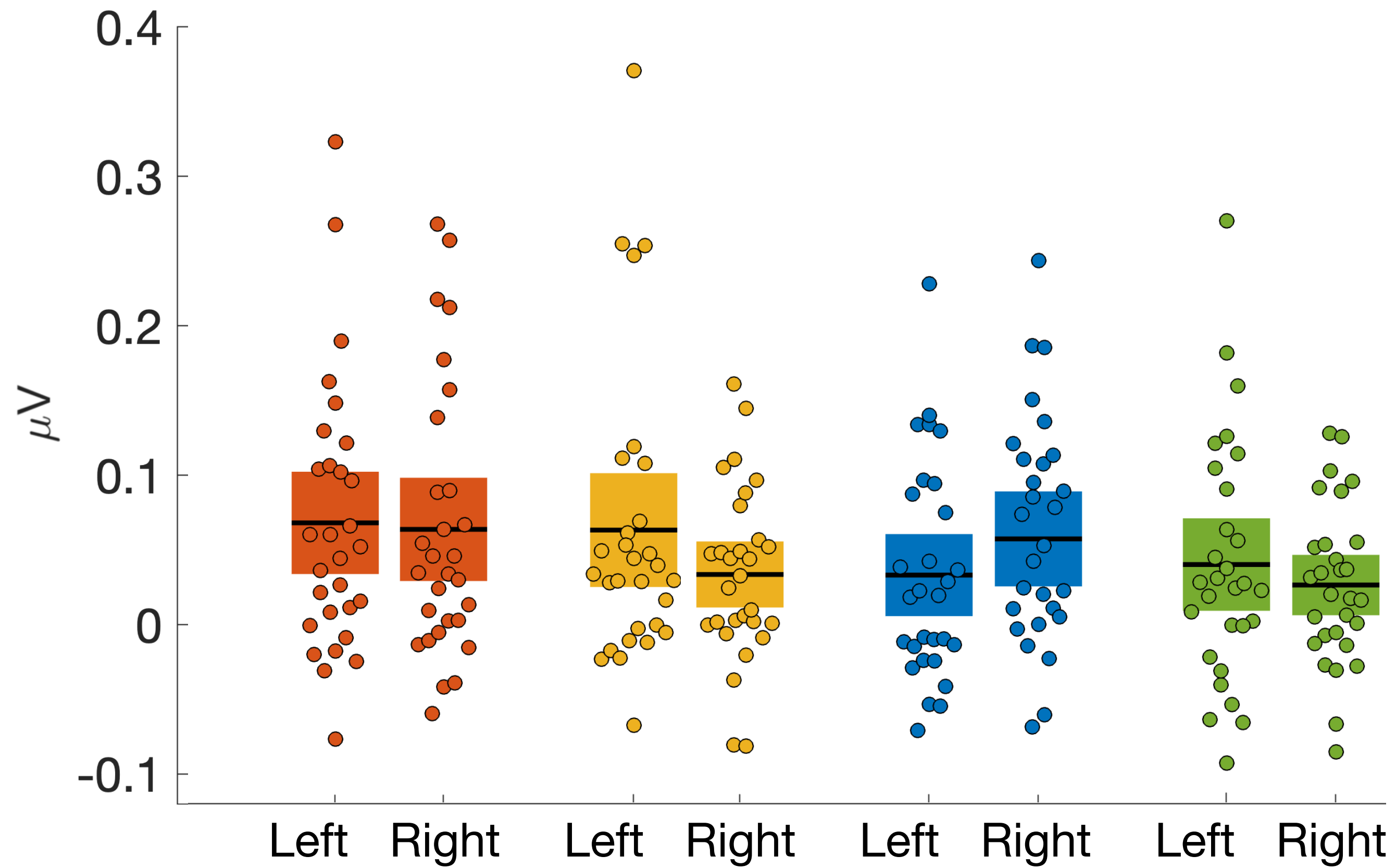
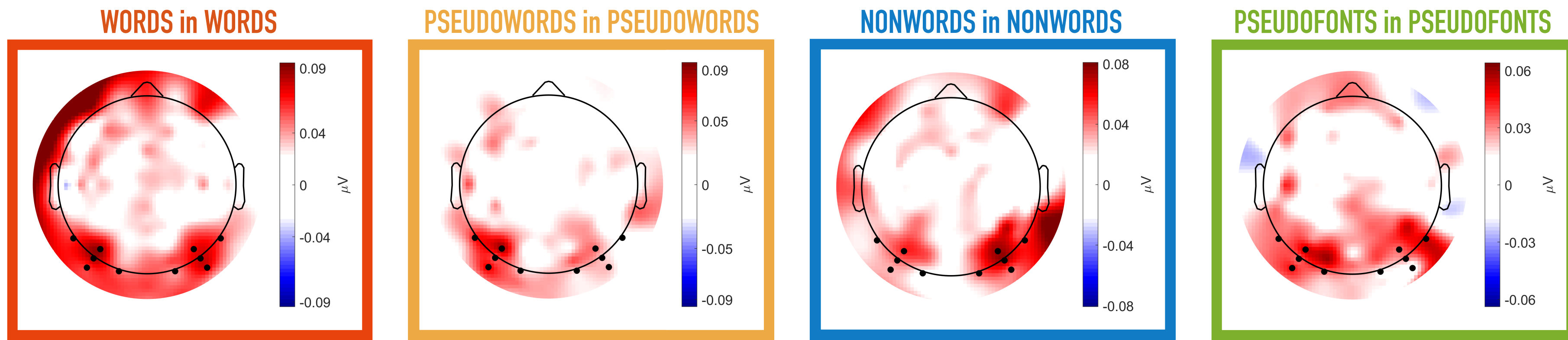


$t = 2.66, g=0.49 [0.10, 0.88] p=0.0127$

Right ROI



$t = 2.79, g=0.59 [0.13, 0.90] p=0.0093$

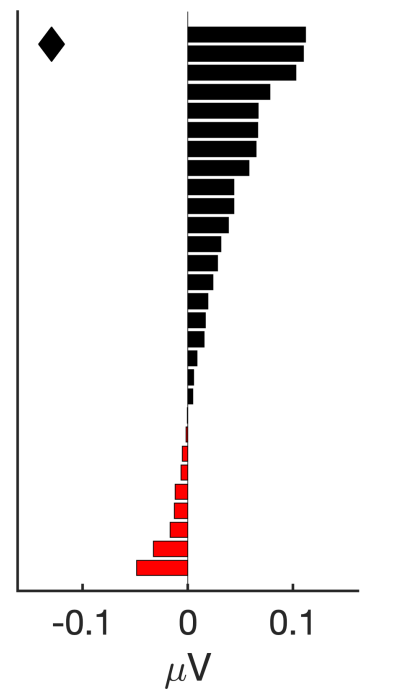
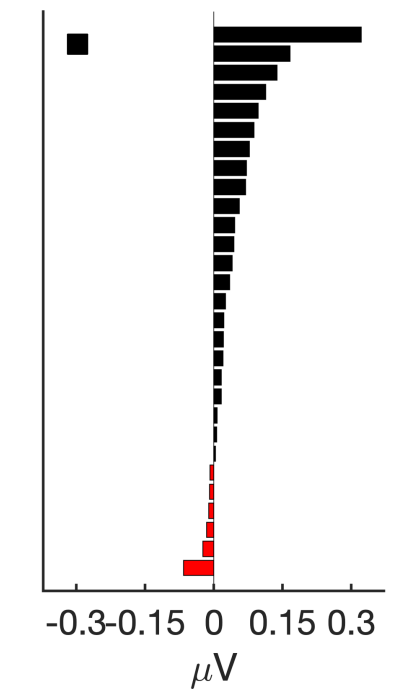
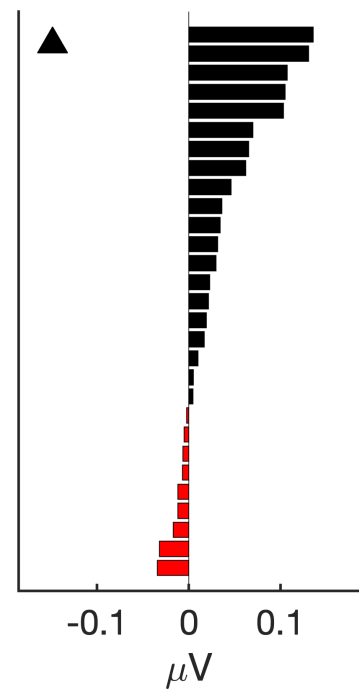
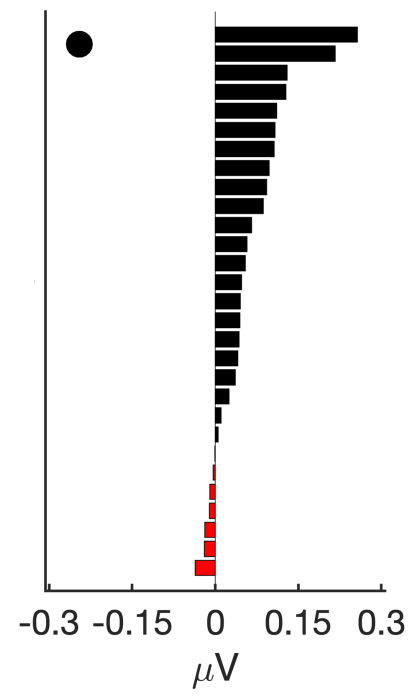
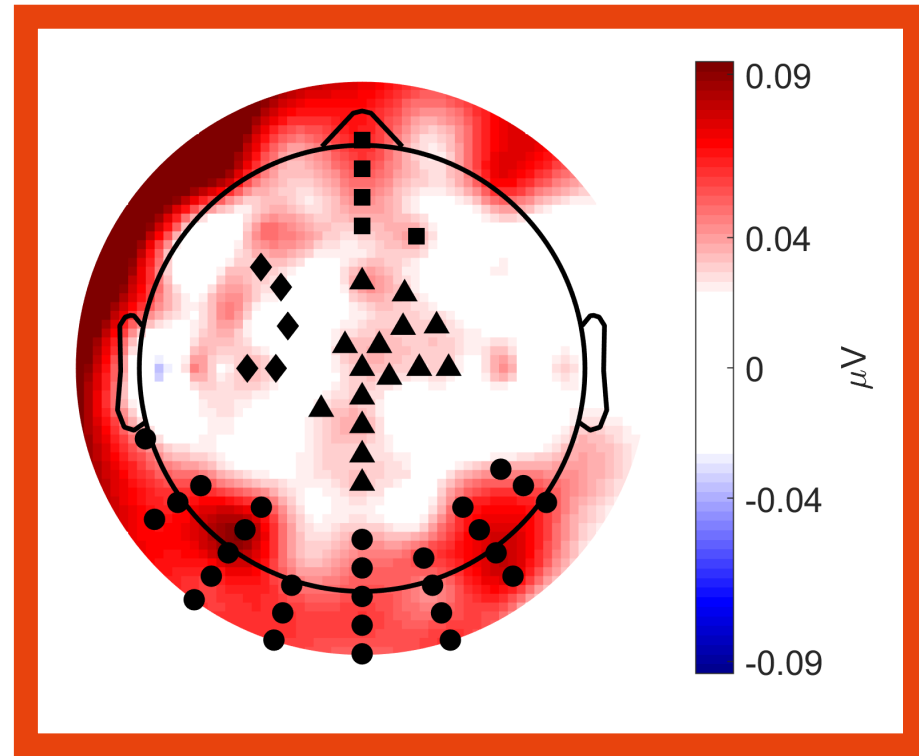


CONDITION:
 $F(3, 84) = 1.243$
 $\eta^2 = 0.022$

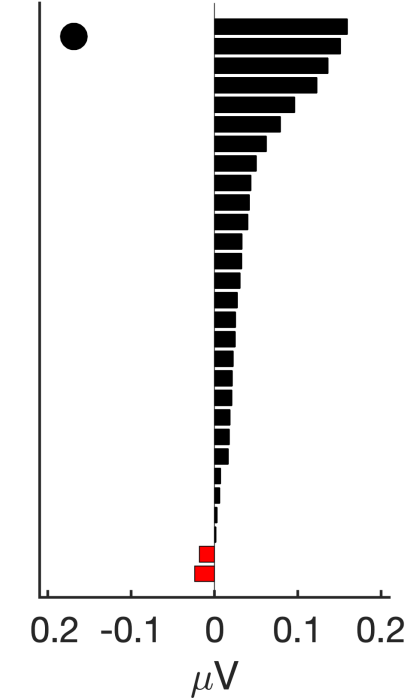
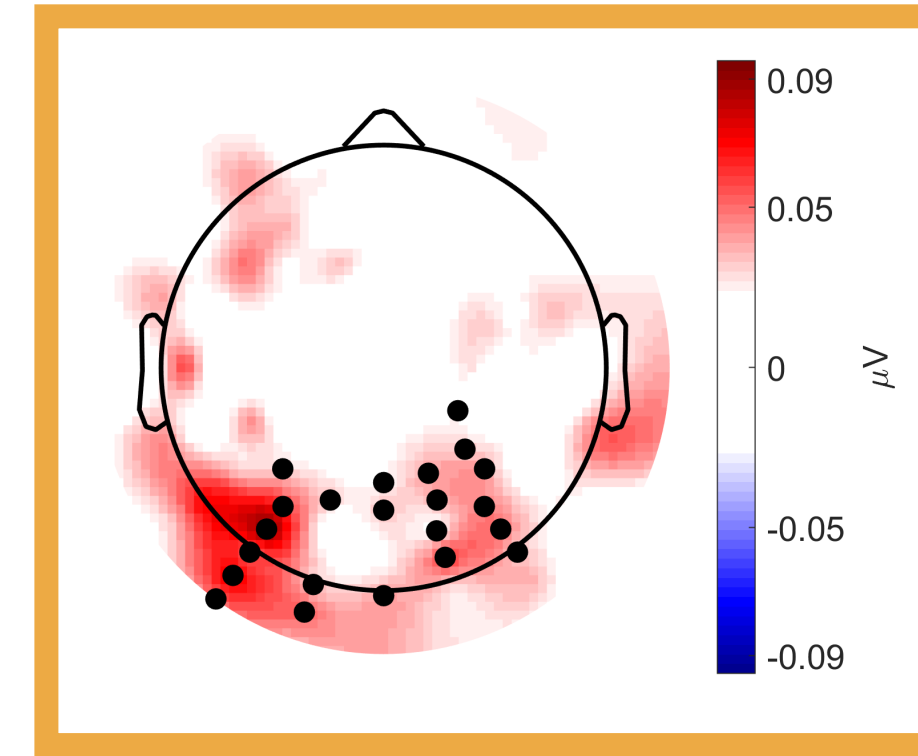
HEMISPHERE:
 $F(1, 28) = 0.440$
 $\eta^2 = 0.001$

CONDITION x HEMISPHERE:
 $F(3, 84) = 2.343$
 $\eta^2 = 0.015$

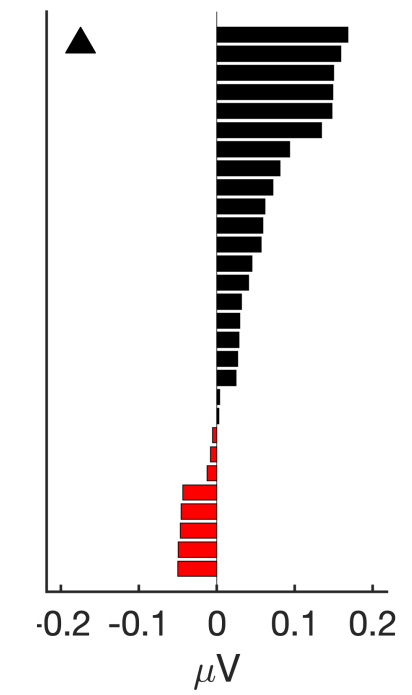
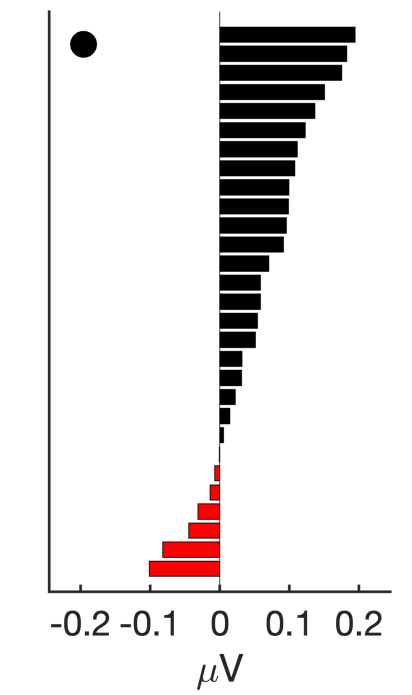
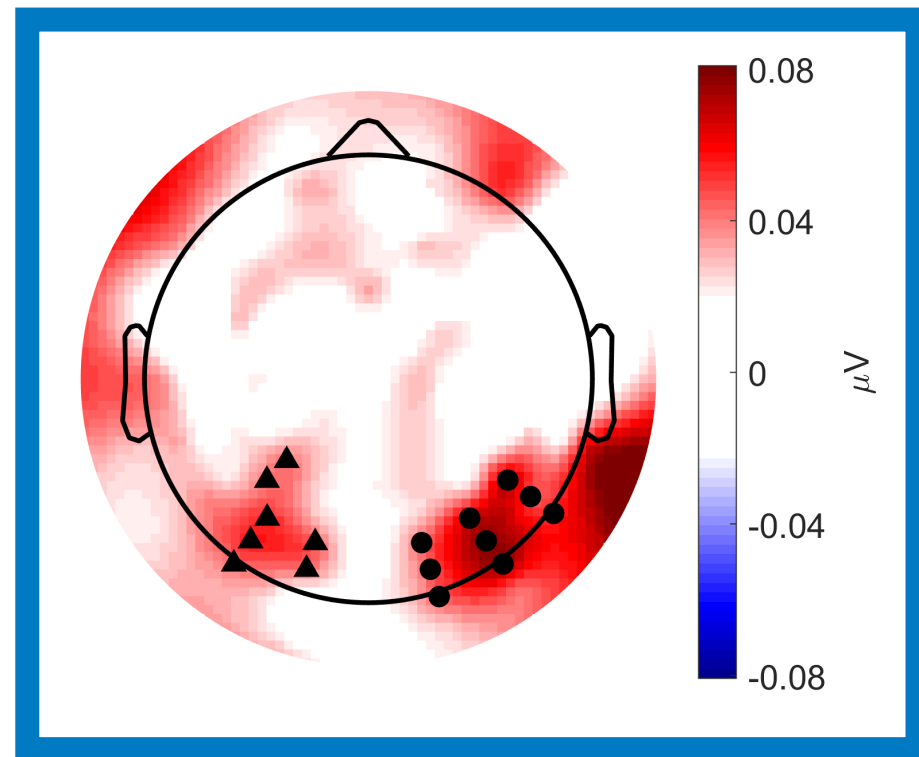
WORDS in WORDS



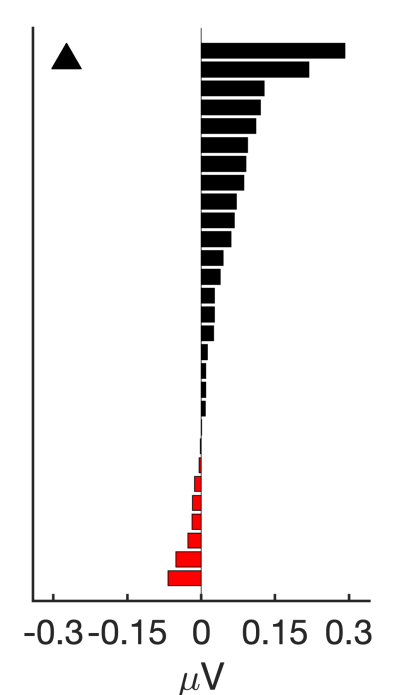
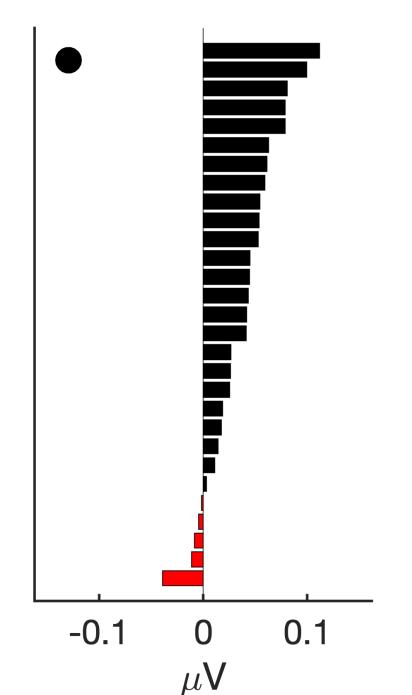
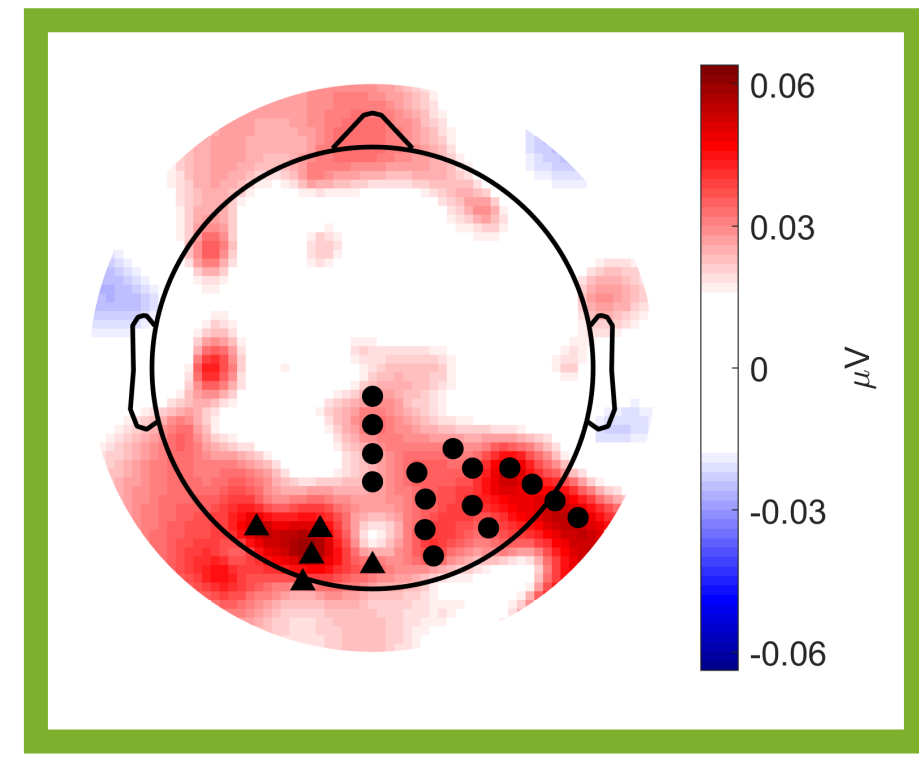
PSEUDOWORDS in PSEUDOWORDS

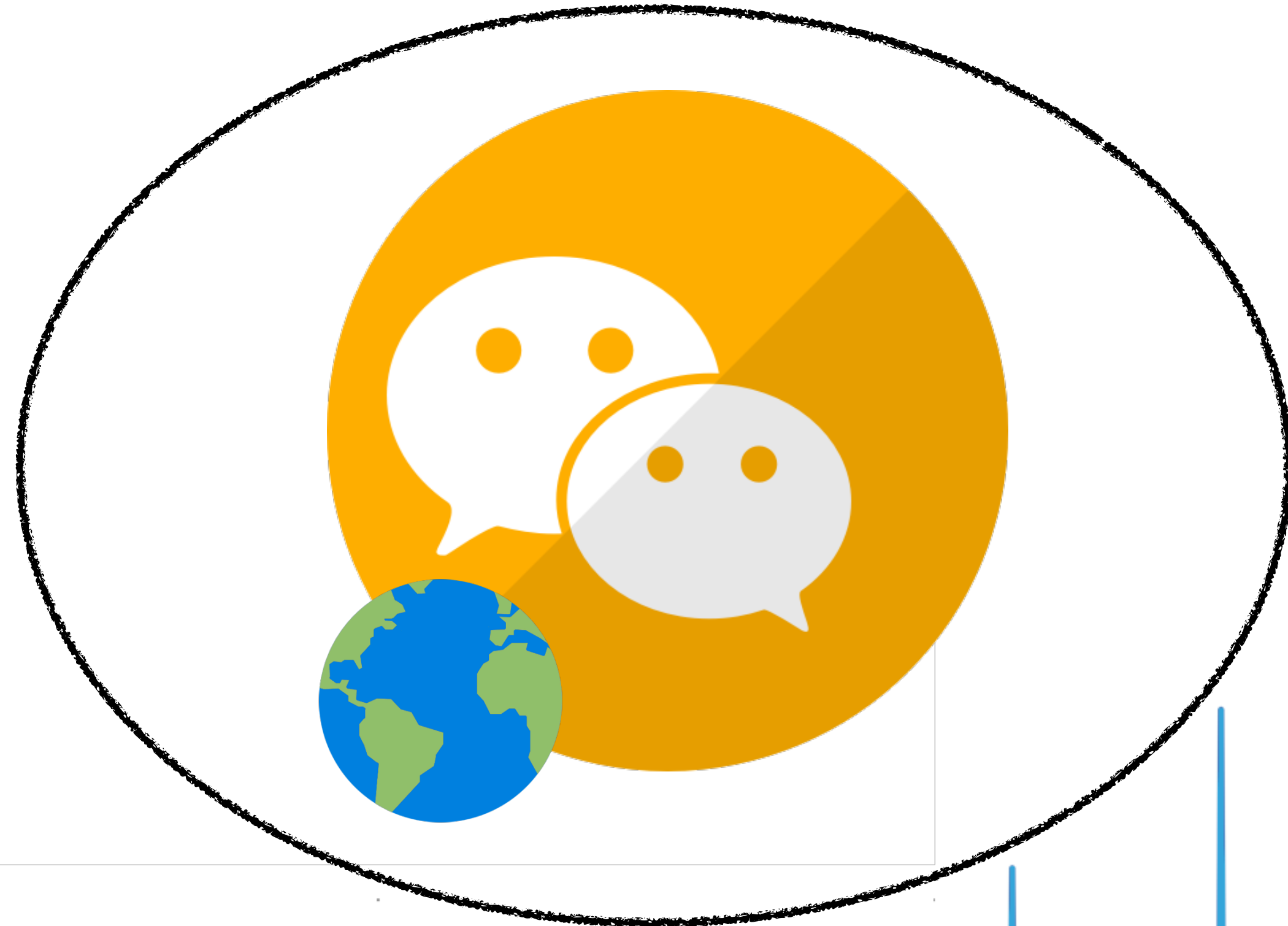
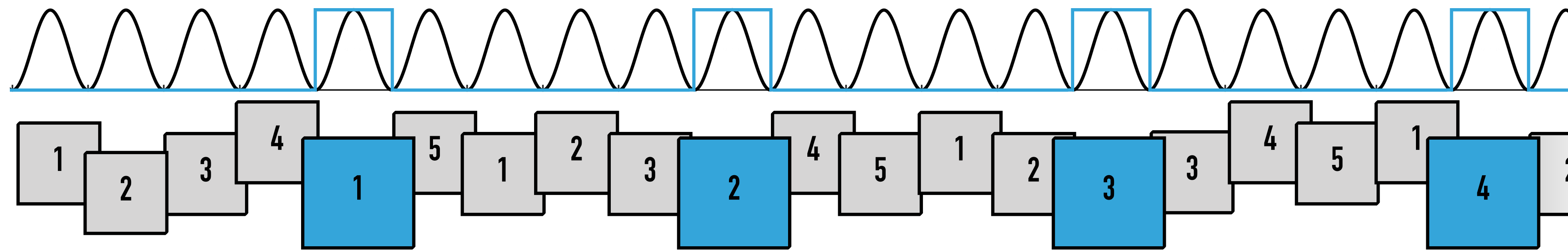


NONWORDS in NONWORDS



PSEUDOFONTS in PSEUDOFONTS



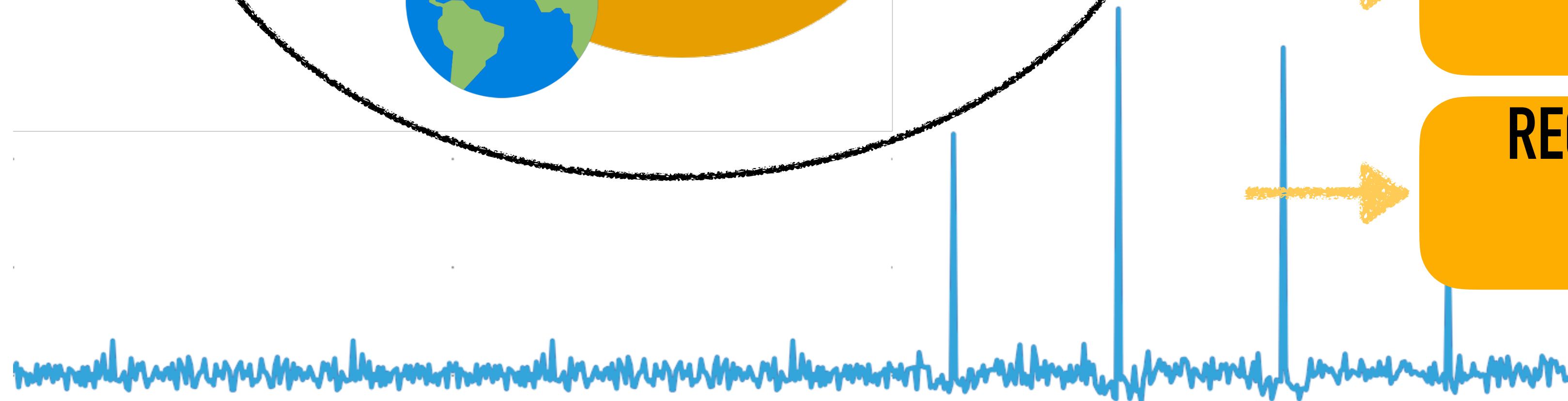


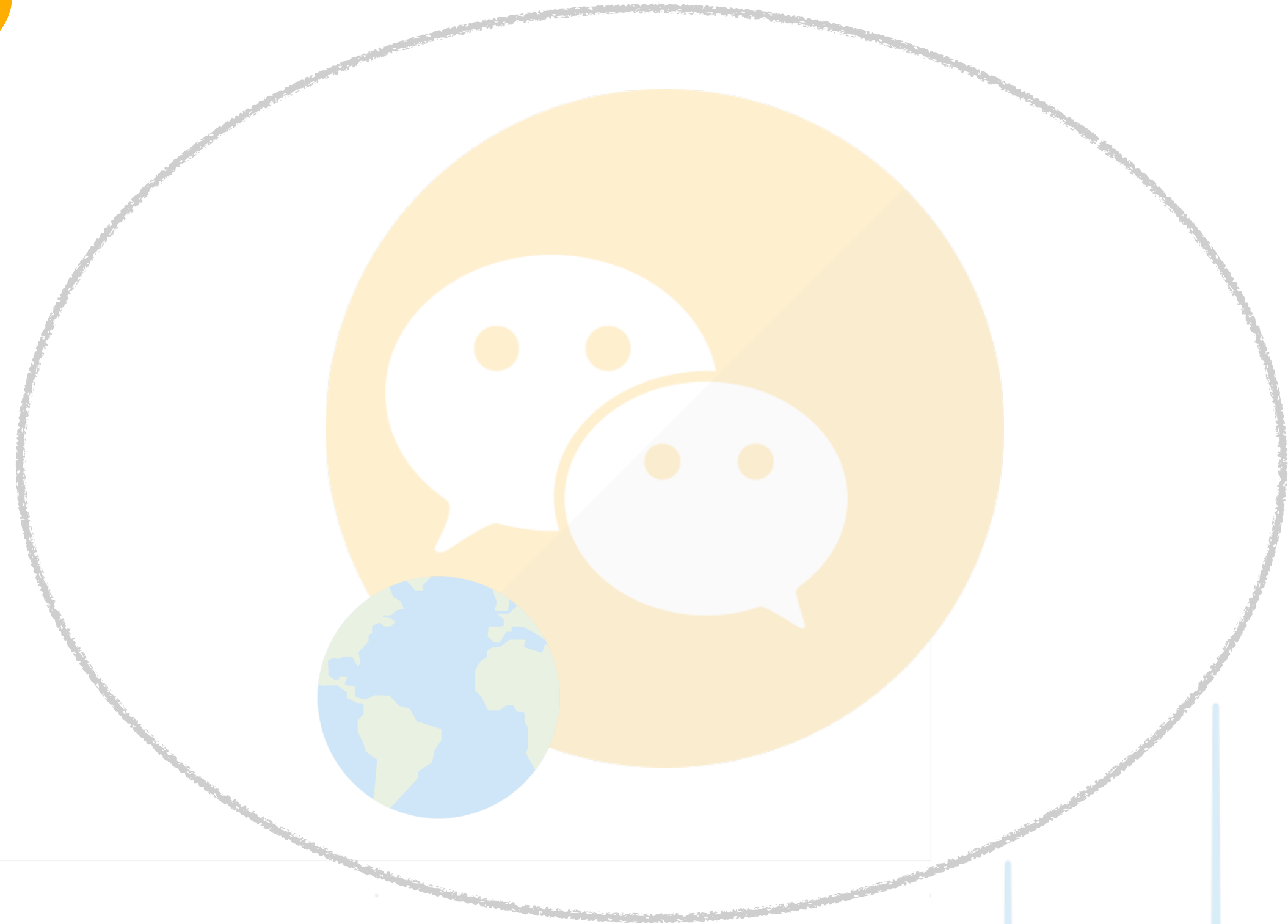
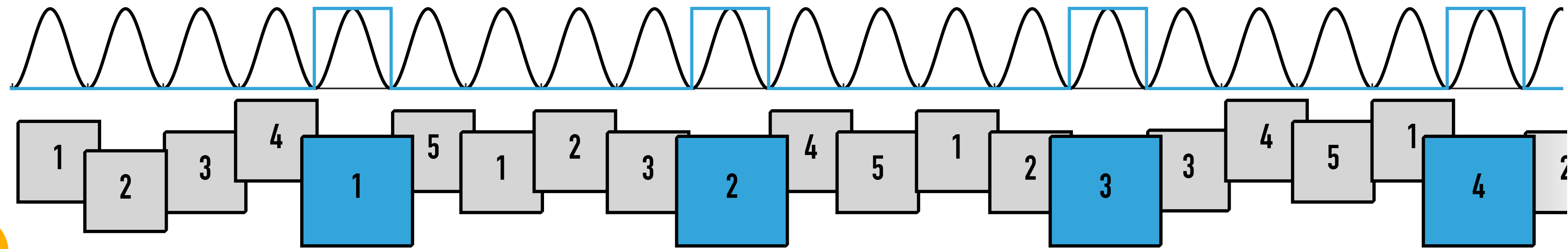
**CATEGORY - SELECTIVE
DISCRIMINATION RESPONSE**

**PURELY BASED ON LOCAL
STATISTICAL REGULARITIES**

**FOR ITEMS BELONGING TO
THE SAME CATEGORY**

**REGARDLESS OF STIMULUS
FAMILIARITY**





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REFERENCES

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