

1. BACKGROUND

FUNCTIONAL DISSOCIATION BETWEEN DIFFERENT PARAMETERS OF ALPHA ACTIVITY

INDIVIDUAL ALPHA FREQUENCY (IAF)

SENSORY SAMPLING

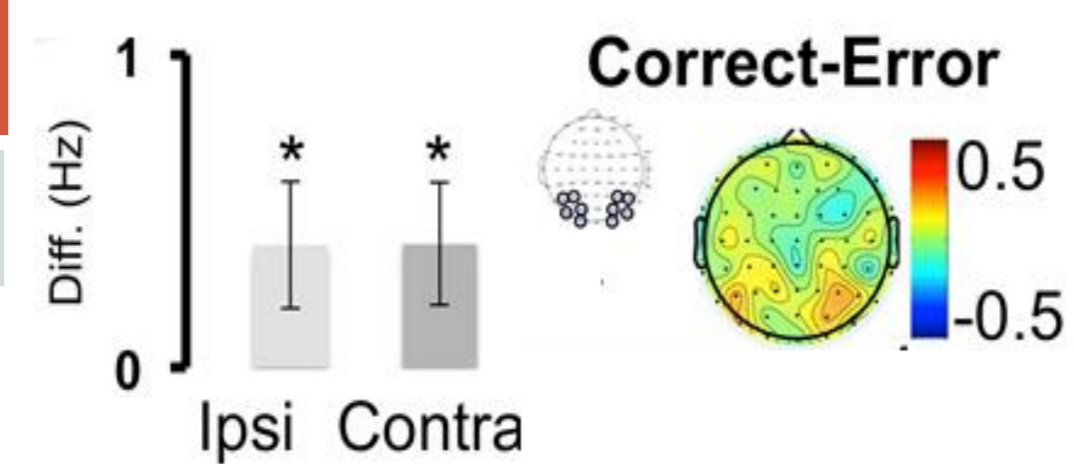
(Cecere et al., 2015; Samaha & Postle, 2015)

ALPHA AMPLITUDE

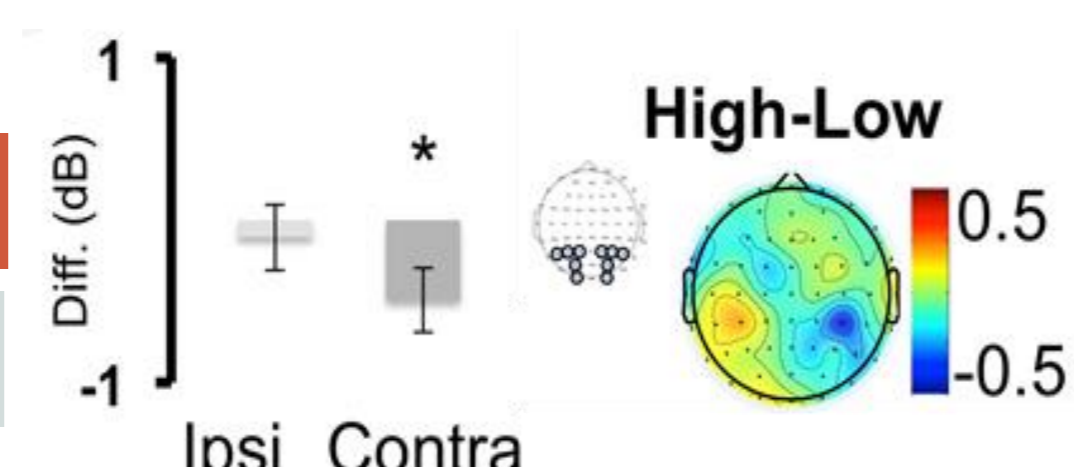
PERCEPTUAL BIAS

(Samaha et al., 2020; Benwell et al., 2017)

ALPHA FREQUENCY (8-12 Hz):
Crucial role in human perception and cognition



faster (vs. slower) alpha for correct (vs. error) responses



lower (vs. higher) amplitude for high (vs. low) confidence

Di Gregorio et al., in preparation

3. METHODS

STIMOLI AND TASK PROCEDURE

- Visual detection task:** Stimuli (checkerboards with or without grey circles) appearing on the left or on the right lower visual field.
- R1: objective accuracy: quantified via d-prime
- R2: subjective confidence: quantified via meta-d prime

MAIN TASK: ENTRAINMENT PROTOCOL

- Pre-stimulus alpha activity was entrained via **5-pulse rTMS train**
- 3 groups of participants differing in the time lag between pulses:
 - slowing-down** (Group IAF-1, N=17) IAF by 1Hz
 - speeding-up** (Group IAF+1, N=17) IAF by 1Hz
 - enhancing alpha amplitude** (Group IAF, N=17),

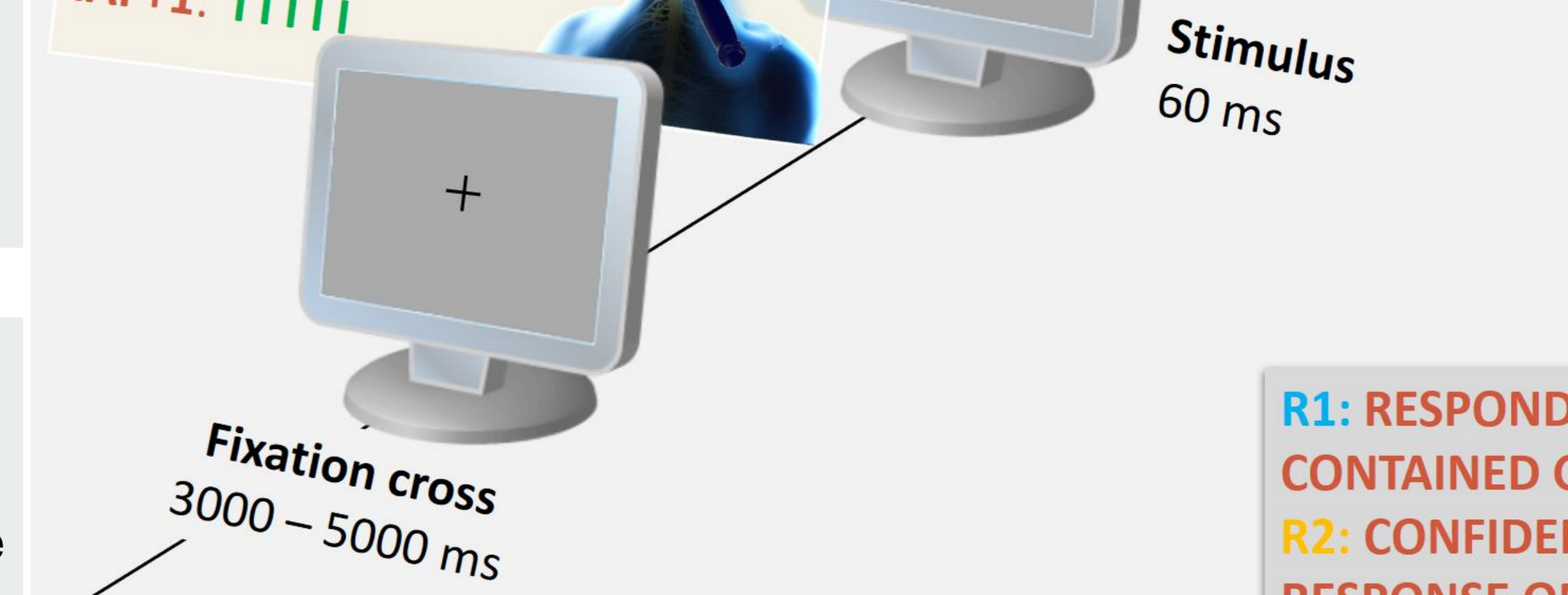
FOLLOWUP: ENTRAINMENT PROTOCOL

- Short-term nature of entrainment protocol
- Follow-up study (N=17): TMS pulses tailored to selectively **modulate alpha amplitude** (stimulation at IAF) applied right before **confidence prompt**.

STIMULATION SITE: RIGHT OCC CORTEX
STIMULATION INTENSITY: 60% (fixed)
CONTROL: WITHIN-SUBJECT SHAM STIMULATION

MAIN TASK

TMS-train 5 pulses at:
IAF-1: | | | | |
IAF: | | | | |
IAF+1: | | | | |



R1: RESPOND IF THE CHECKERBOARD CONTAINED GREY CIRCLES
R2: CONFIDENCE RATING OF THE FIRST RESPONSE ON A SCALE 1-4

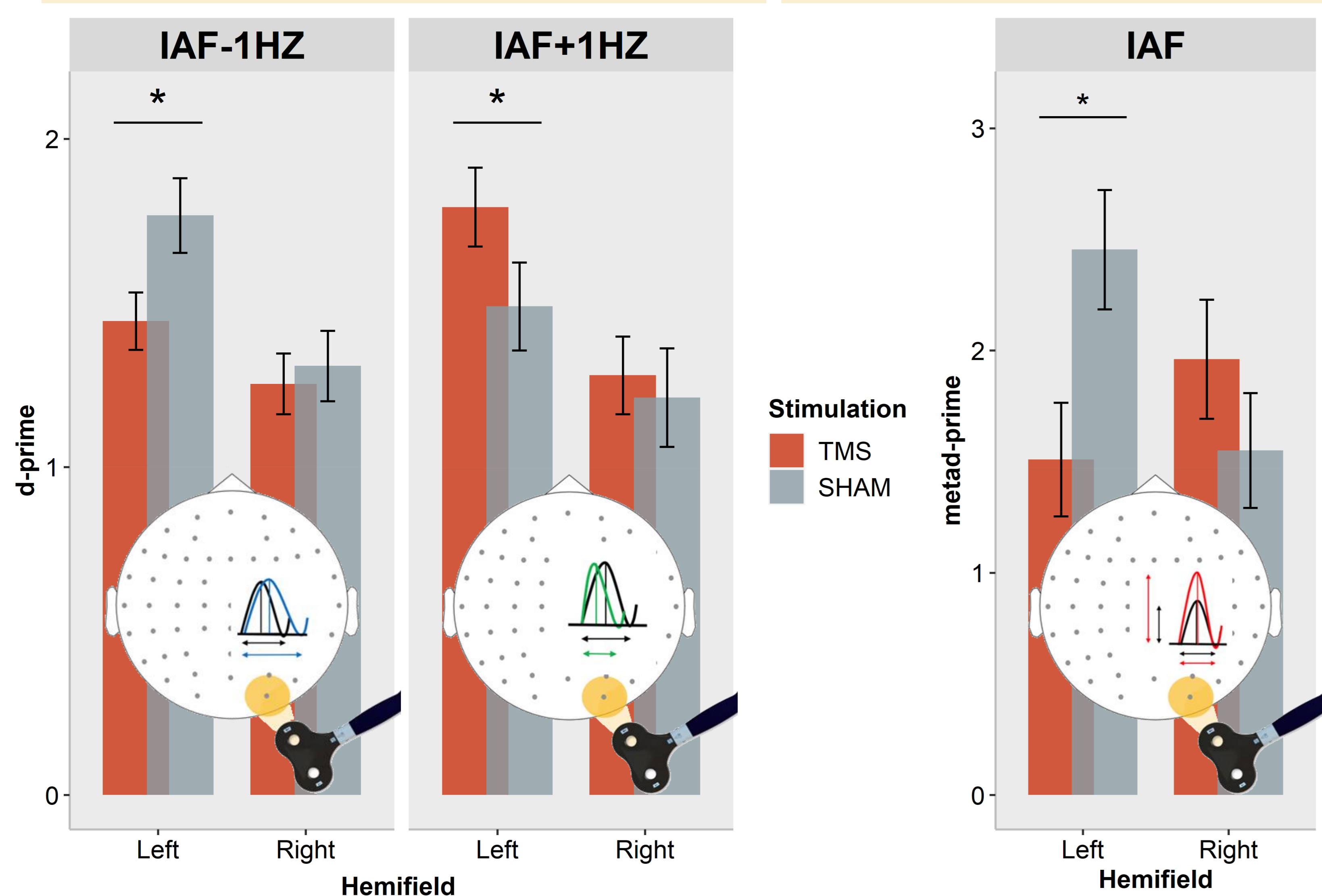
2. OBJECTIVES

Causally demonstrate the functional dissociation between frequency and amplitude of alpha rhythm in determining objective perceptual accuracy and subjective awareness

4. RESULTS

MAIN TASK: OBJECTIVE ACCURACY

FOLLOW UP: PERCEPTUAL CONFIDENCE



MAIN TASK: OBJECTIVE ACCURACY

STIMULATIONxGROUPxHEMIFIELD ($F(1,48) = 3.25; p = .047$)

slowing-down IAF (IAF - 1 Hz)

lower d' prime scores during active (vs. sham) stimulation in the contralateral (left) hemifield ($t(16) = 2.67; p = .017$)

speeding-up IAF (IAF + 1 Hz)

higher d' prime scores during active (vs. sham) stimulation in the contralateral (left) hemifield ($t(16) = 2.52; p = .023$)

higher amplitude (IAF)

NO EFFECT on task accuracy

FOLLOW UP: PERCEPTUAL CONFIDENCE

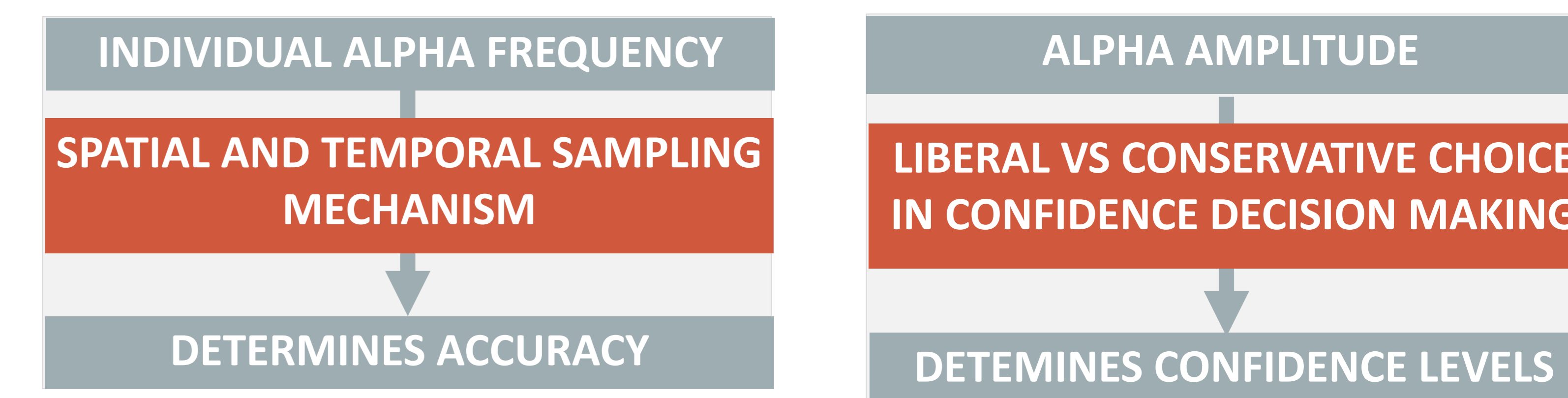
STIMULATIONxHEMIFIELD ($F(1,48) = 4.73; p = .045$)

higher amplitude (IAF)

lower confidence during active (vs. sham) stimulation in the contralateral (left) hemifield ($t(16) = 2.74; p = .014$)

5. CONCLUSIONS

FIRST CAUSAL EVIDENCE OF A DISSOCIATION BETWEEN DISTINCT ELEMENTS OF ALPHA ACTIVITY IN SHAPING OUR CONSCIOUS VISUAL PERCEPTION



FOUNDATION FOR FUTURE CLINICAL APPLICATIONS

DRIVING DYSFUNCTIONAL ACTIVITIES TOWARDS FUNCTIONAL MECHANISMS IN THE STUDY OF ALTERED VISUAL PERCEPTION AND AWARENESS