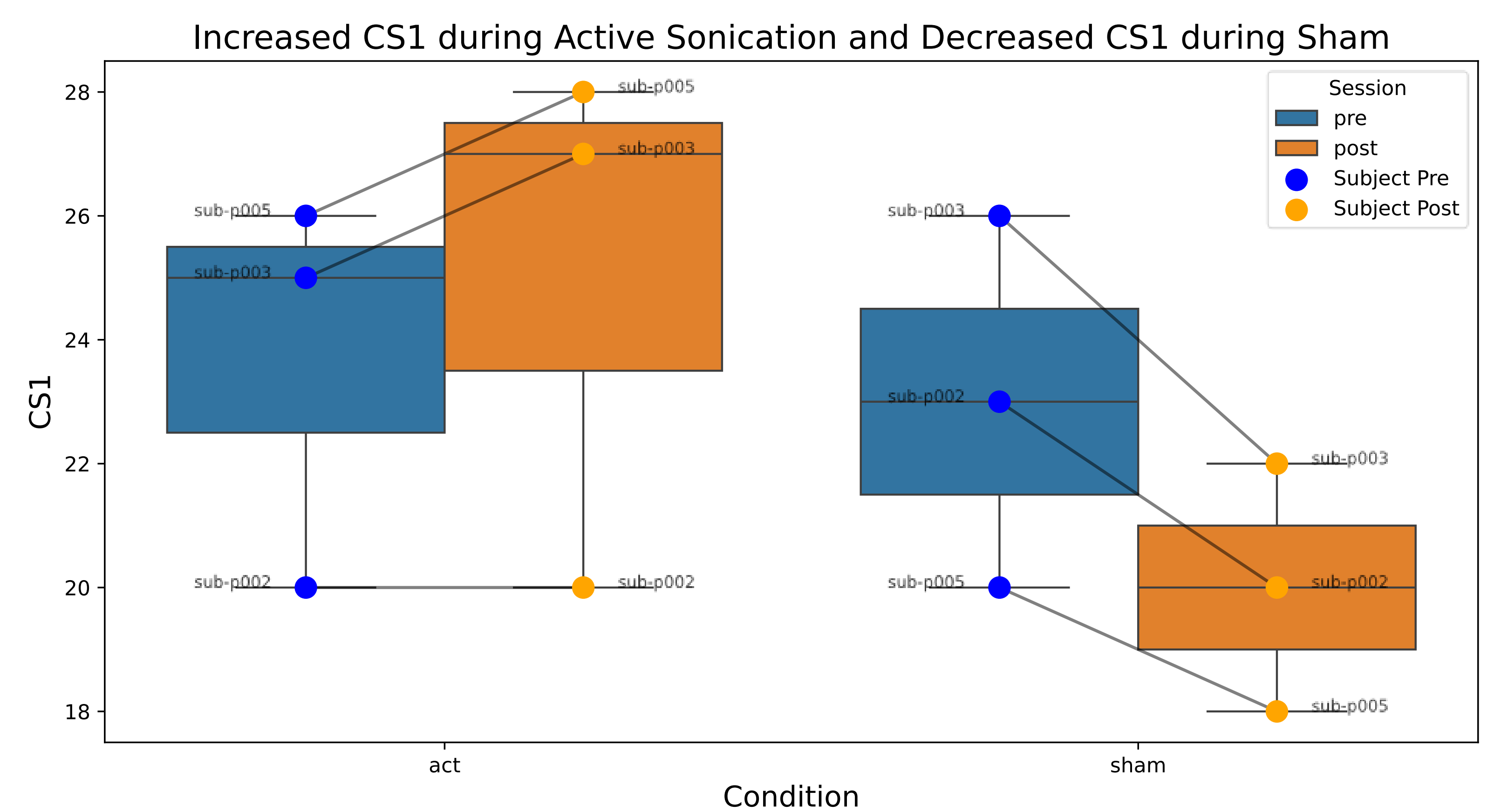
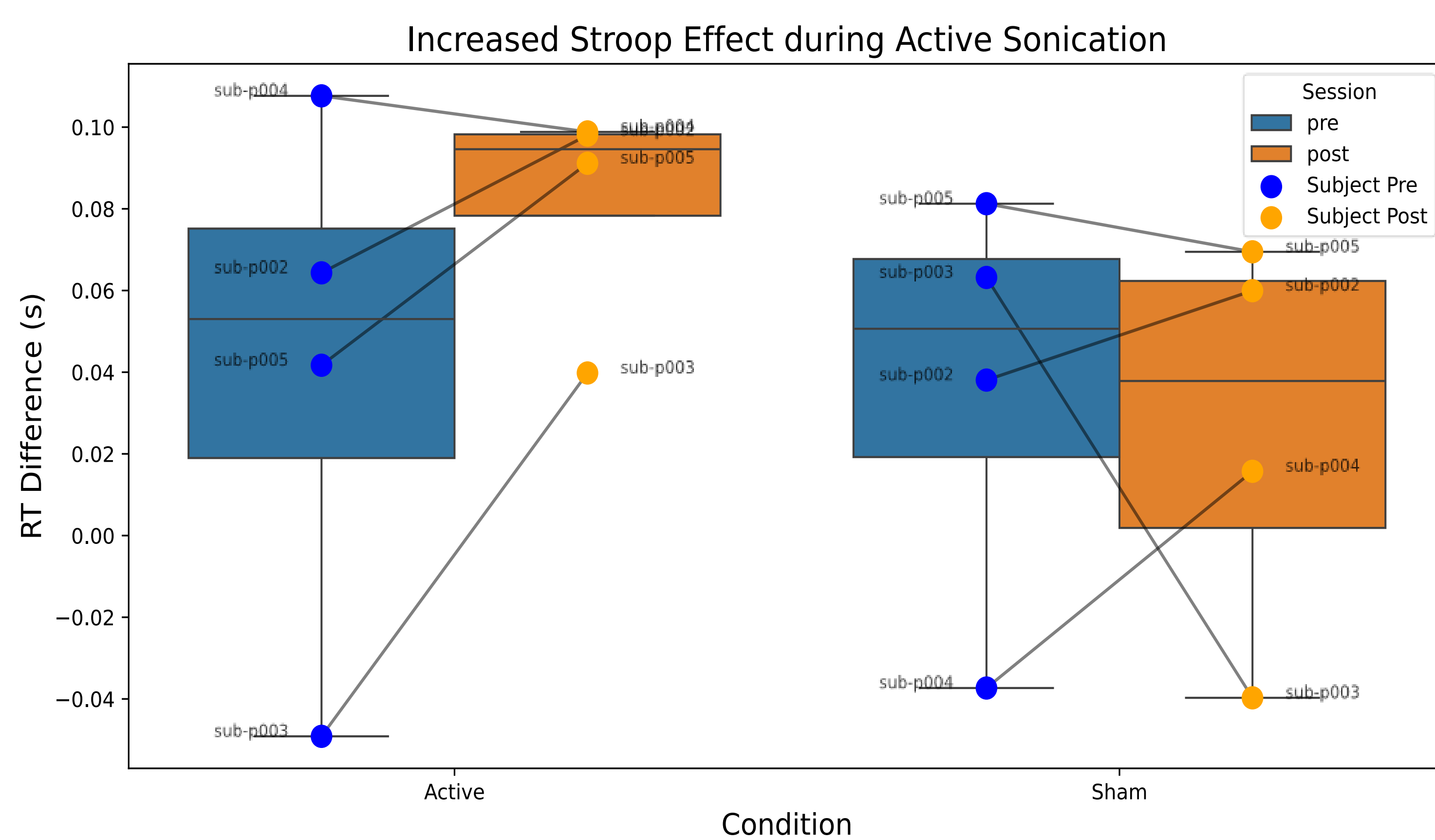


Sonication of the right caudate nucleus seems to affect cognitive flexibility.

Background: In this study, we apply low-intensity focused ultrasound stimulation to investigate how modulation of the dopaminergic system affects cognitive flexibility and creative cognition. To that end, we target the right caudate nucleus head – a central hub of the nigrostriatal dopaminergic pathway. Ultimately, this study aims to shed light on the role of the dopaminergic system in cognitive flexibility and creative cognition and to unravel how our sonication parameters affect the system.

Pilot Data



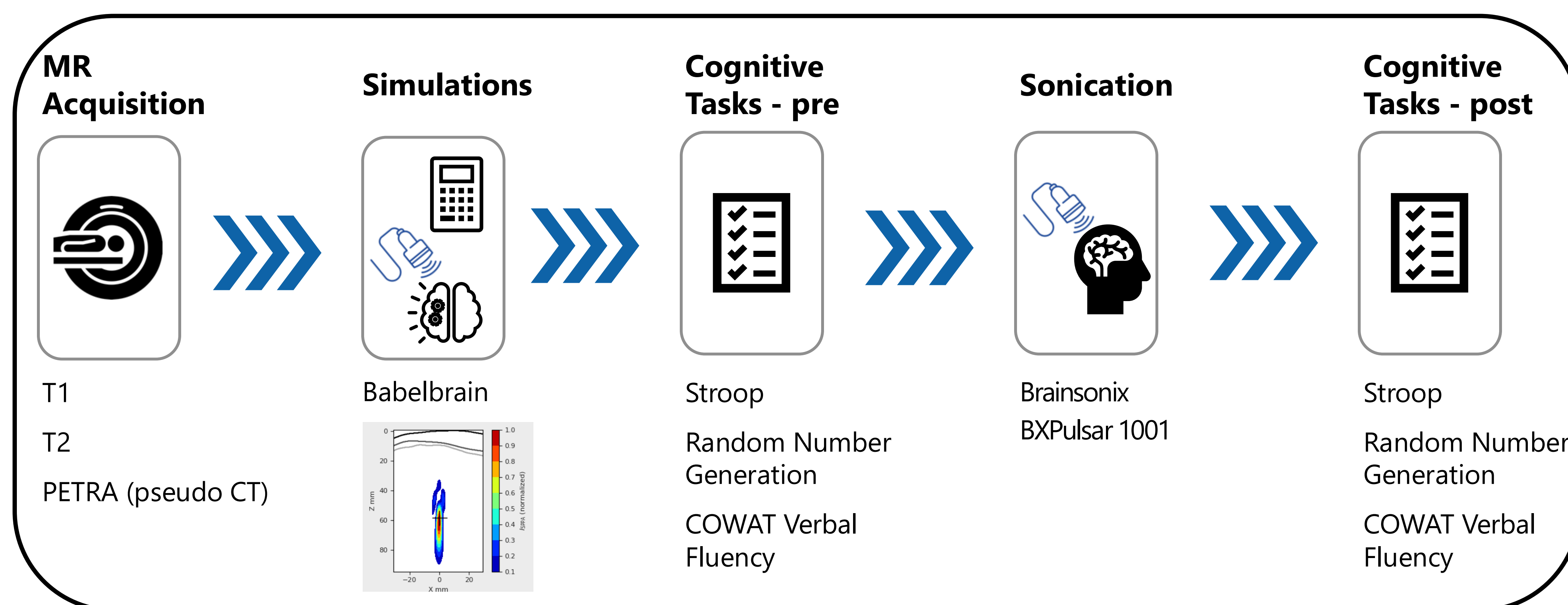
Stroop Interference Task: The Stroop effect refers to the **increase** in reaction time (RT) in **incongruent** (word ≠ color) trials compared to **congruent** (word = color) trials. An **increase** indicates **decreased cognitive flexibility**. Here, we plot the RT difference (incongruent – congruent) for each condition and session (**N=4**).

Random Number Generation Task: Effects of active vs. sham sonication for the Count Score 1 (CS1) seriation measures (**N = 3**). CS1 measures the instances of **two subsequent numbers** in the randomly generated number series. An **increase** indicates a **decrease in randomness** and limited ability to deviate from predictable sequences in associative thought patterns.

Methods

TUS

Within-subject



Sonication parameters

- Carrier frequency: 650Hz
- PRF: 100 Hz
- Pulse width: 0.5ms
- Pressure amplitude: 0.71 MPa
- Duty Factor: 0.05
- Sonication: 10s on/off
- Cycles: 30
- Mechanical Index: 0.45
- Isppa (W/cm²): 4

Cain et al. (2021, *Scientific Reports*11:1, 6100)

Interpretations

- Do these observations indicate inhibitory effects of sonication?
- How might individual differences in baseline cognitive flexibility modulate the effects of sonication?
- Could the decrease in cognitive flexibility reflect a perturbation of striatal dopamine signaling?
- ...

Creative Cognition, Cognitive Flexibility, and the Dopaminergic Pathways
Investigating the Role of the Caudate Nucleus using Low-Intensity Focused Ultrasound Stimulation.