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Effects of Transcranial Direct Current Stimulation on Adults with Post-Acute

COVID-19 Syndrome

Isaac Min, Dr. Aaron Schurger, Ph. D.

Background

- Previous studies of infection with SARS-CoV and MERS-CoV have found evidence of persistent symptoms.
- Similar residual symptoms are seen in recovered COVID-19 patients beyond four weeks of initial symptoms.
 - Lethargy
 - Shortness of Breath
 - Working Memory Deficits
- Transcranial direct current stimulation (tDCS) has shown promise as a therapy to improve cognition, including working memory.

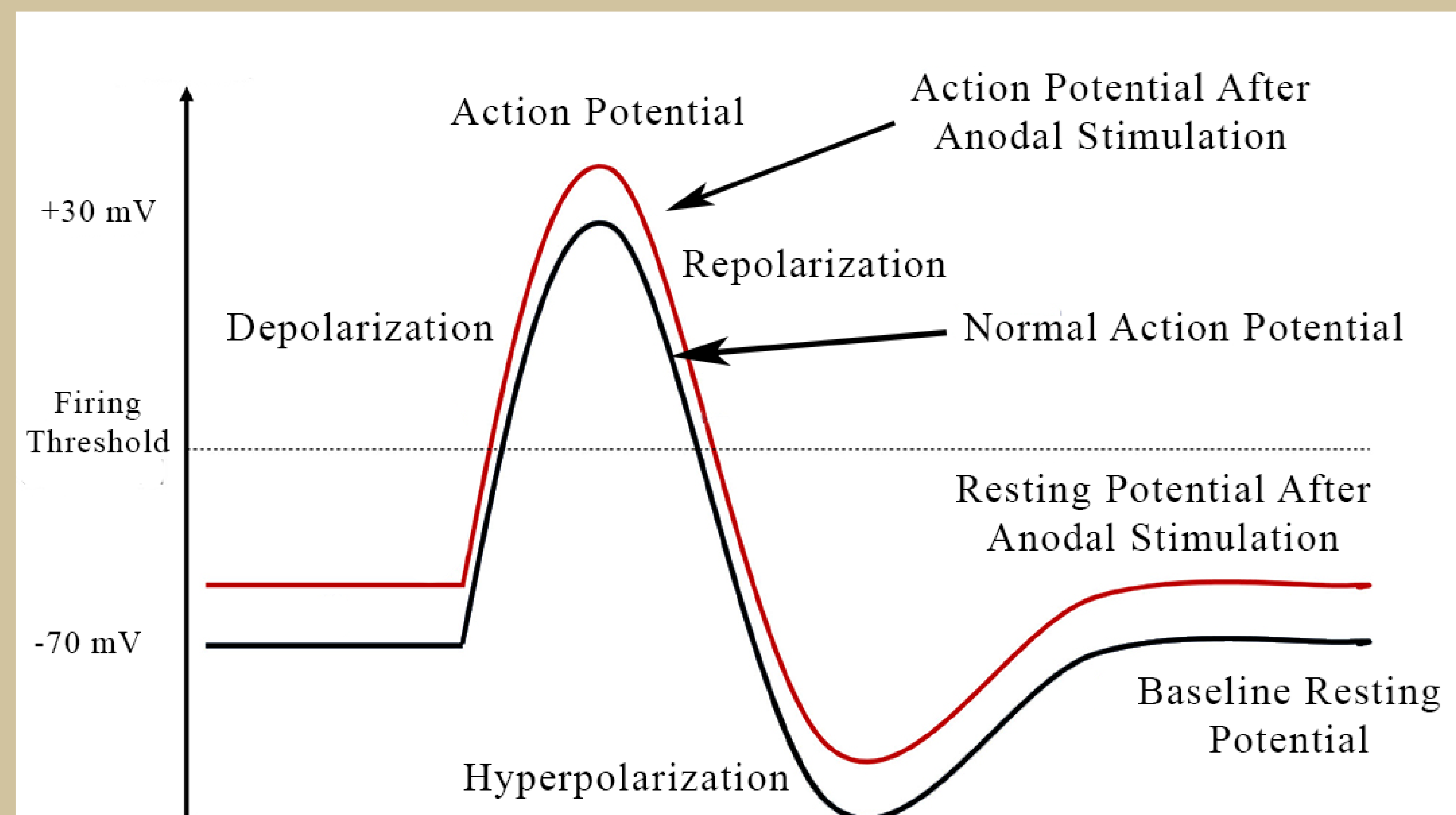


Figure 1: tDCS regulates neuronal transmembrane potentials towards depolarization or hyperpolarization via weak electrical currents, resulting in changes in the resting membrane potential and transmembrane proteins.

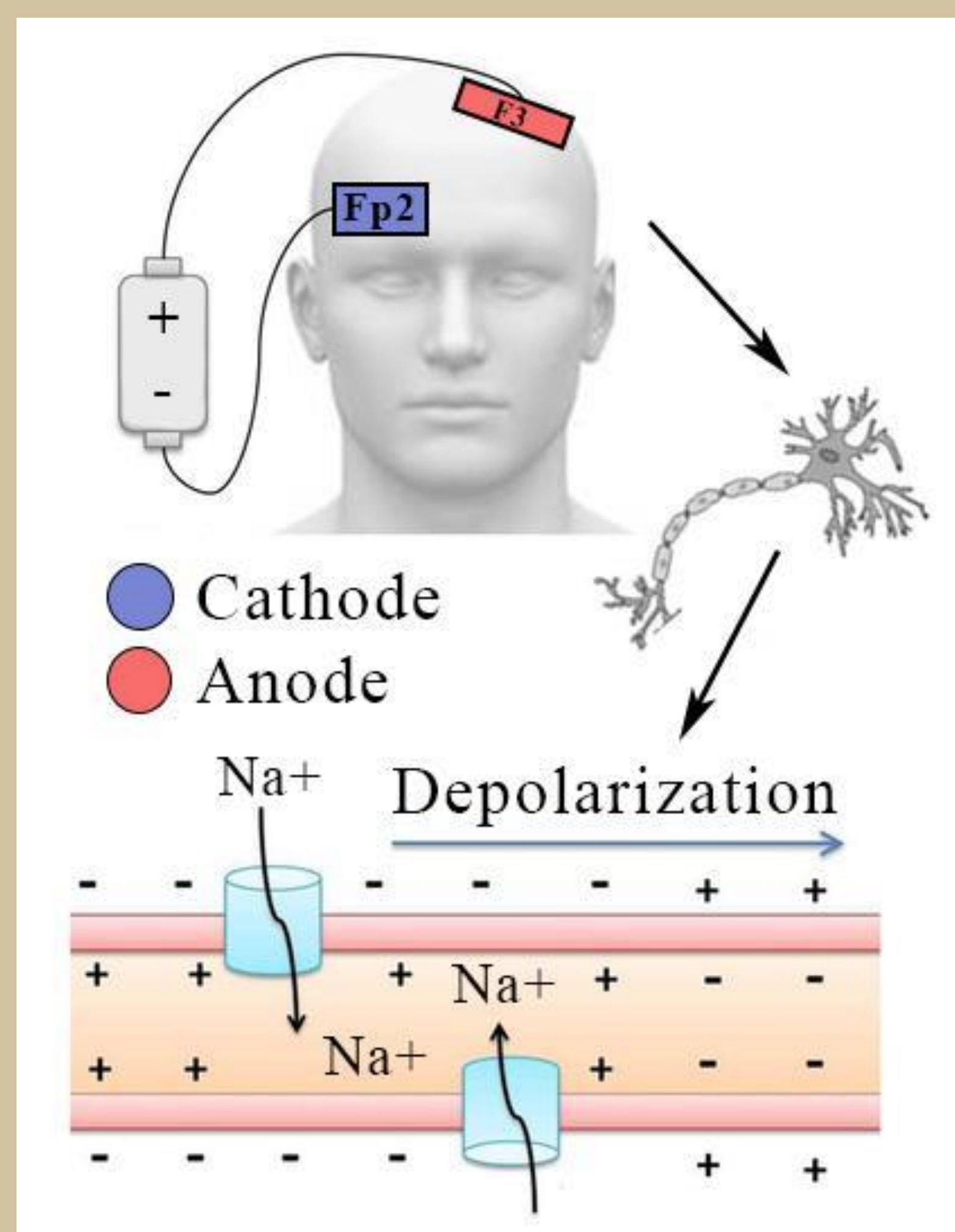


Figure 2: tDCS regulates the neuronal transmembrane potential of the F3 region (prefrontal cortex) towards depolarization.

Objectives

- Better understand the neurocognitive effects of PACS
- To provide a comprehensive review of the neurophysiological benefits of tDCS and gain competency in its protocols.
- To outline a conceptual framework for a future study with a larger sample size.

Experimental Methods

The following protocols are employed:

- Participants (n=10) with PACS and meet inclusion criteria.
- Random assignment to either the sham-tDCS (control) or active-tDCS (treatment) cohorts.
 - Anode to F3 and cathode to Fp1
 - Four sessions of 20-minute stimulations
 - 30 second ramp-up and ramp-down periods
 - 1.5 mA
- 2-Back Task
 - Two evaluations per session, ~20 total recordings per session
 - Reaction Time (ms) and Correct/Incorrect Response
 - Linear Regression Analysis

Figure 3: An anode is placed over the dorsolateral prefrontal cortex (F3) and a cathode is placed over the contralateral supraorbital site (Fp2). Electrical current (1.5 mA) flows from the F3 to the Fp2.

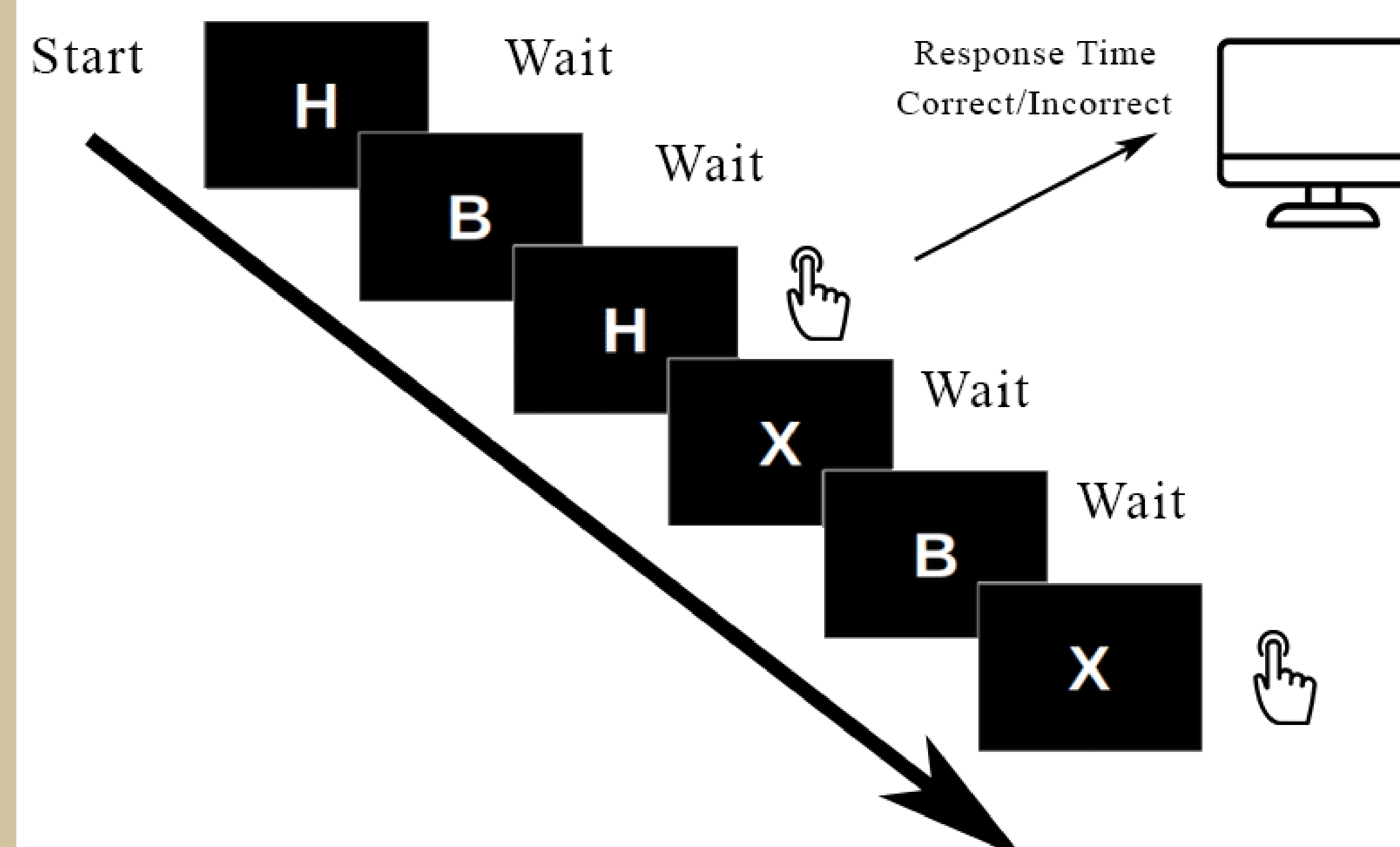
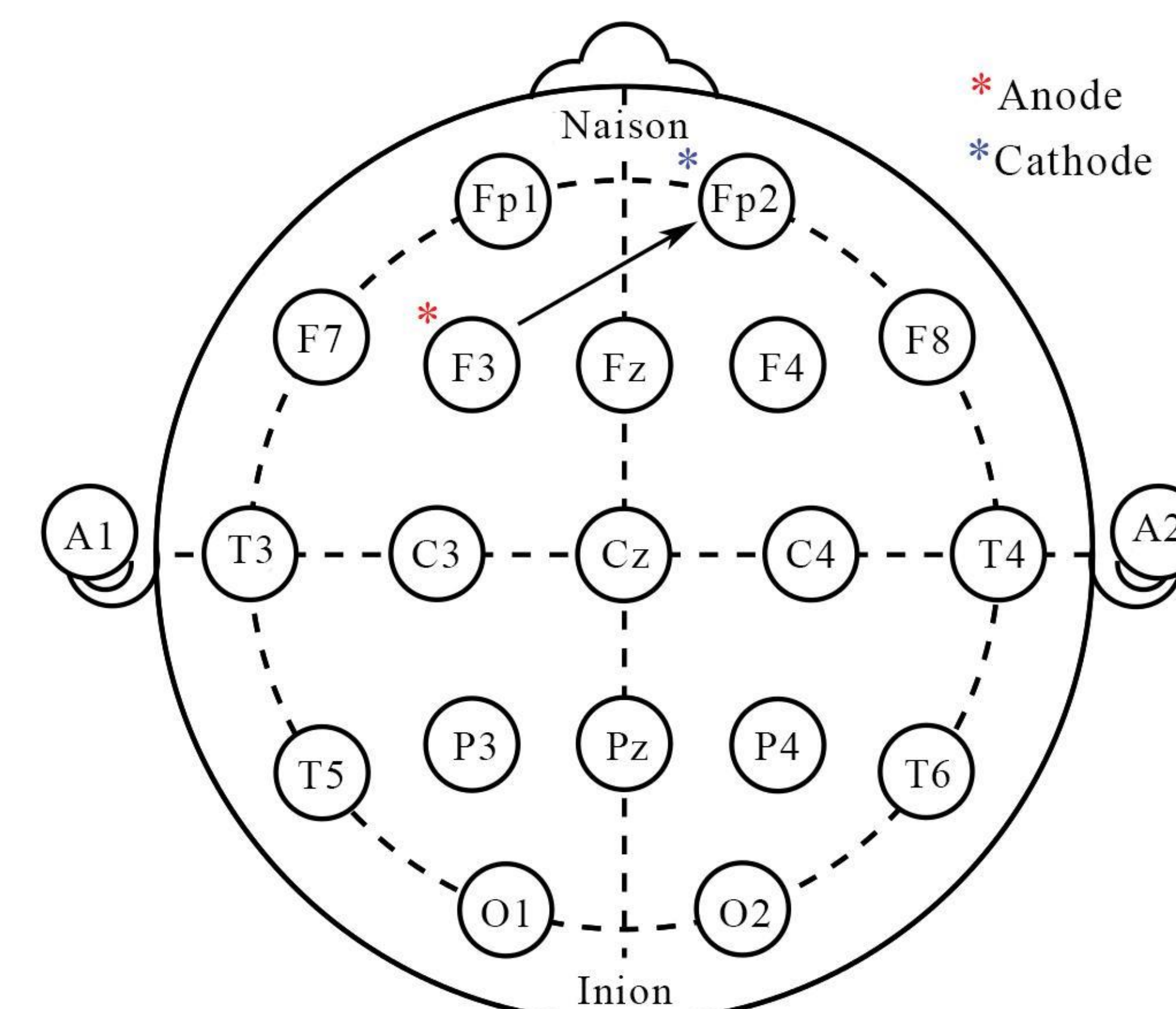


Figure 4: Participants are asked to complete two 2-back tasks per session, and statistics relevant to working memory are collected.

Future Work

- Currently pending IRB approval, publication to clinicaltrials.gov, and participant recruitment.
- We anticipate to conclude this study in Summer 2023

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