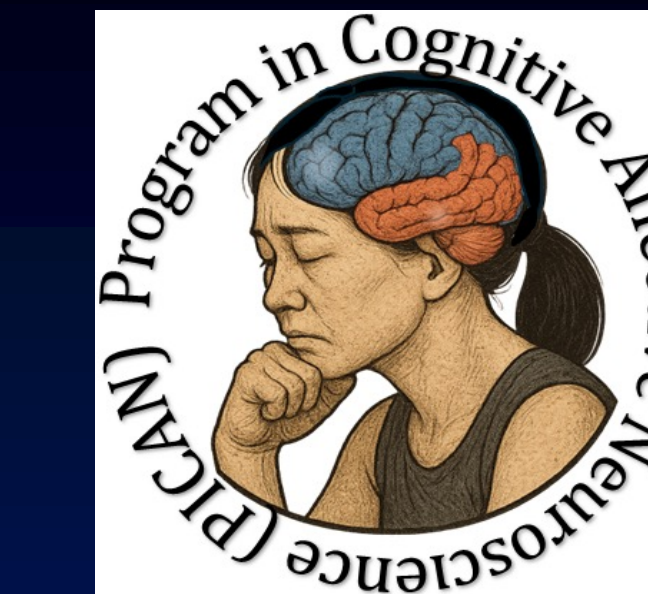
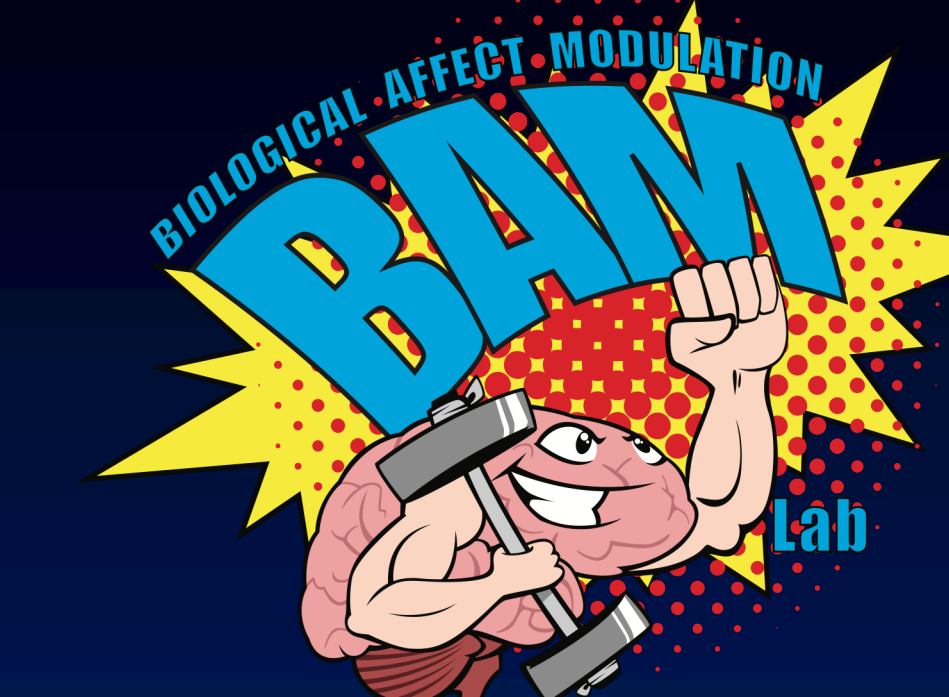




# Restorative Neurophysiology: Feasibility of “backup and restore” technologies for brains and bodies

Kymberly Young<sup>1</sup>, Laurie Compere<sup>1</sup>, Carolyn Webb<sup>2</sup>, Holly Stewart<sup>2</sup>, Greg Siegle<sup>1</sup>,

<sup>1</sup>University of Pittsburgh School of Medicine, Pittsburgh, PA <sup>2</sup>University of Pittsburgh Medical Center



## Background

- Mental Health treatments aim to return a patient to a pre-illness baseline state
  - Baseline function is typically unavailable because patients present when they are already ill
  - Instead, interventions attempt to bring patients closer to what research has determined the average healthy individual looks like
- Warfighters are likely to develop PTSD (~30% vs 6% in the general population)
- 2<sup>nd</sup> leading cause of being declared non-deployable following return from combat is mental health issues
- We can assess soldiers’ neurophysiology before deployment and create a ‘backup’ of their neural and physiological activity when they are healthy.
- Using high-density neural and physiological stimulation technologies we can then return warfighters to their own pre-deployment baseline healthy state

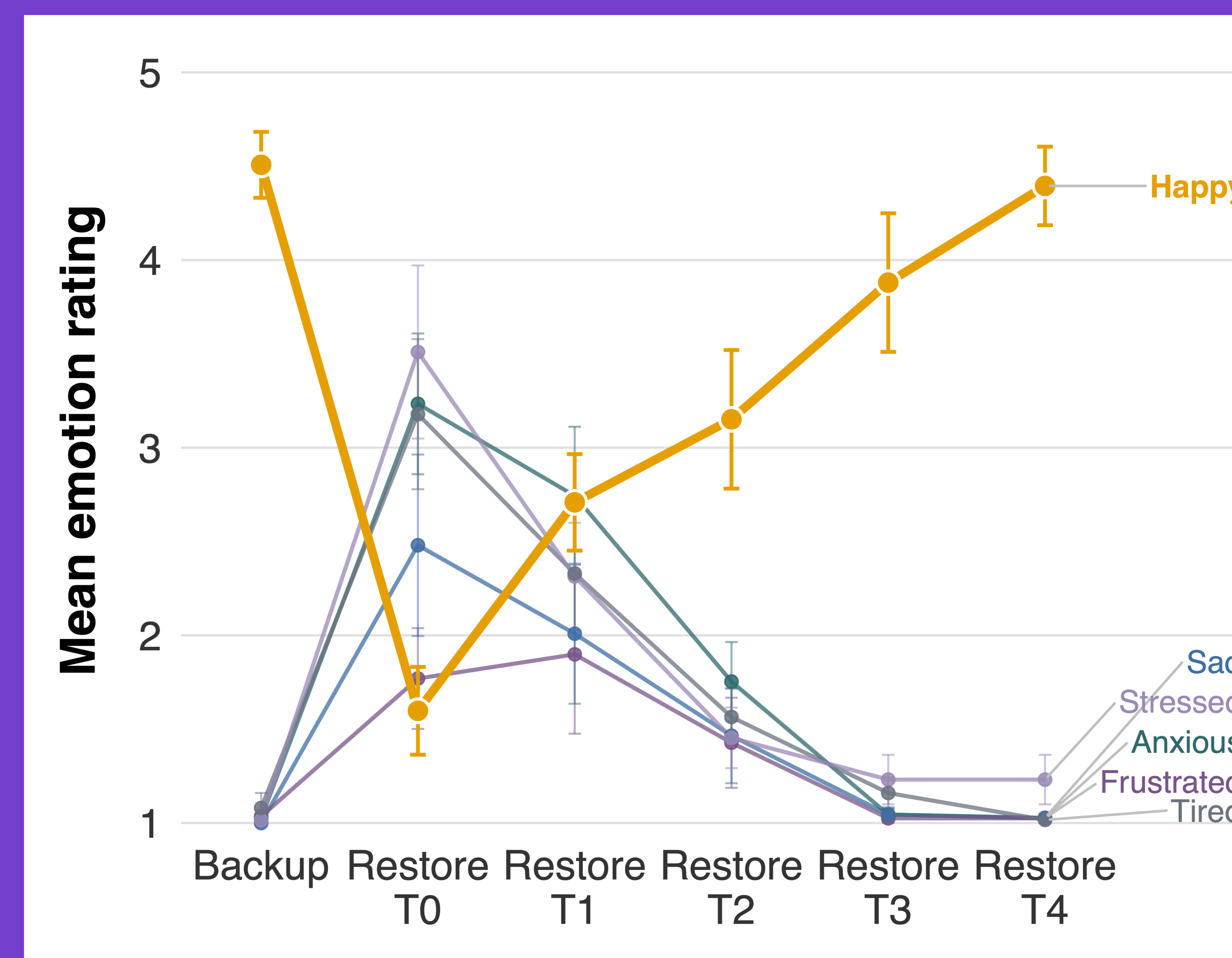
## Study Aim

Evaluate the feasibility and acceptability of this novel procedure/technology in a small civilian sample

## Methods

- 12 individuals (8F) have been backed-up during a subjective good day (happiness > 4 on a 5-point scale).
- 8 individuals (7F) have been ‘restored’ following a stressful experience during a subjective bad day (happiness < 2 on a 5-point scale)
- Activity was recorded during emotional memory recall at baseline via 64-channel EGI EEG system.
- At restore, stimulation was received via tACS to match the brain pattern from baseline.
  - Participants then performed neurofeedback to maintain that brain state in the absence of stimulation.
  - One whole-brain frequency band restored per block: theta, alpha, beta, gamma
- Additional physiological measures included at baseline and restoration include facial muscle activity, breathing, heart rate, skin response, and vocal parameters
- Mood was assessed via Visual Analogue Scale with a range from 1-5 at baseline and after each restore block.
- Diagnosis assessed via MINI at baseline, pre-restore, and 2 weeks post-restore

Restoring the brain to a previous state is feasible, improves mood, and may be an effective treatment for mood and anxiety disorders



At the 2-week follow-up:

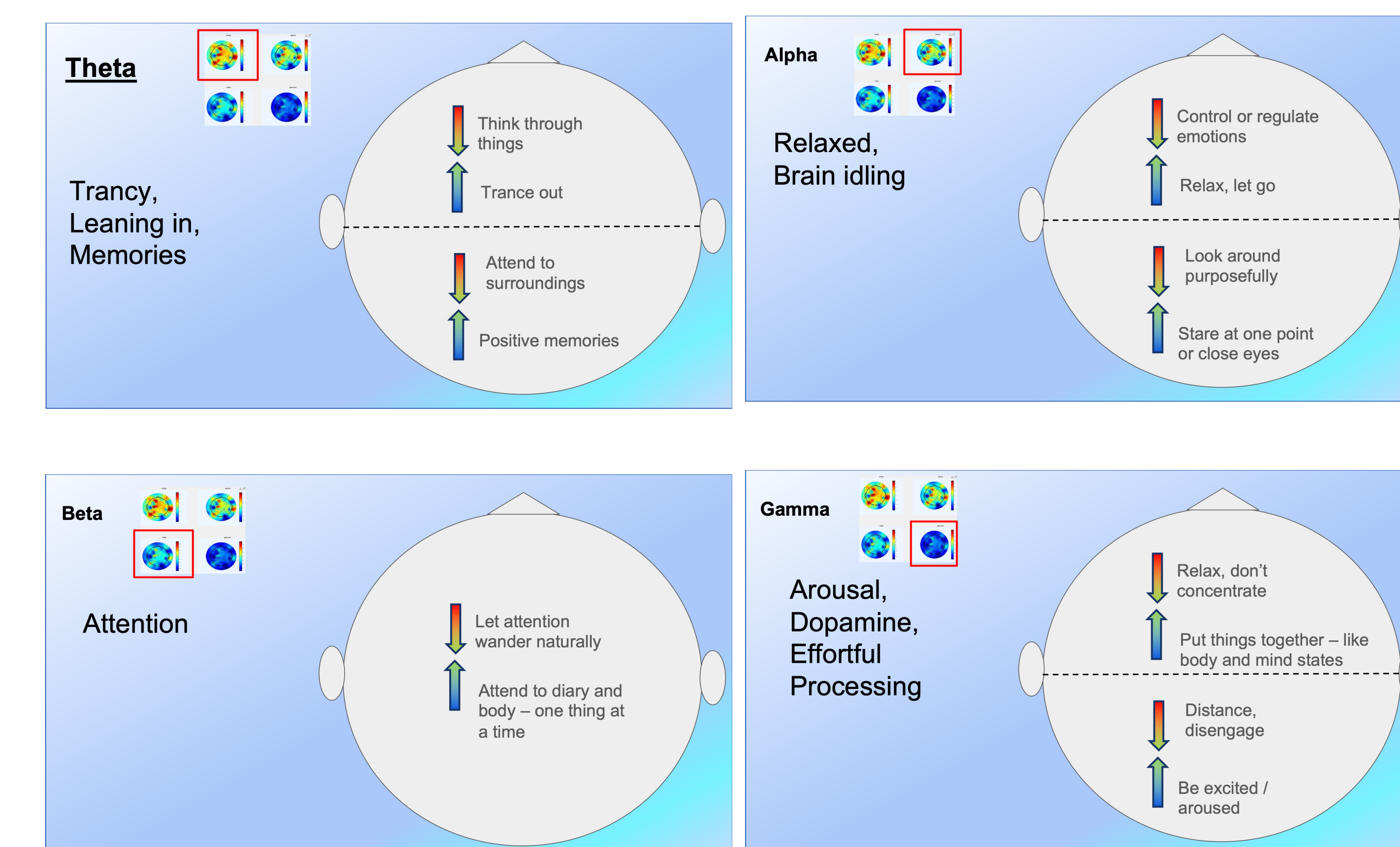
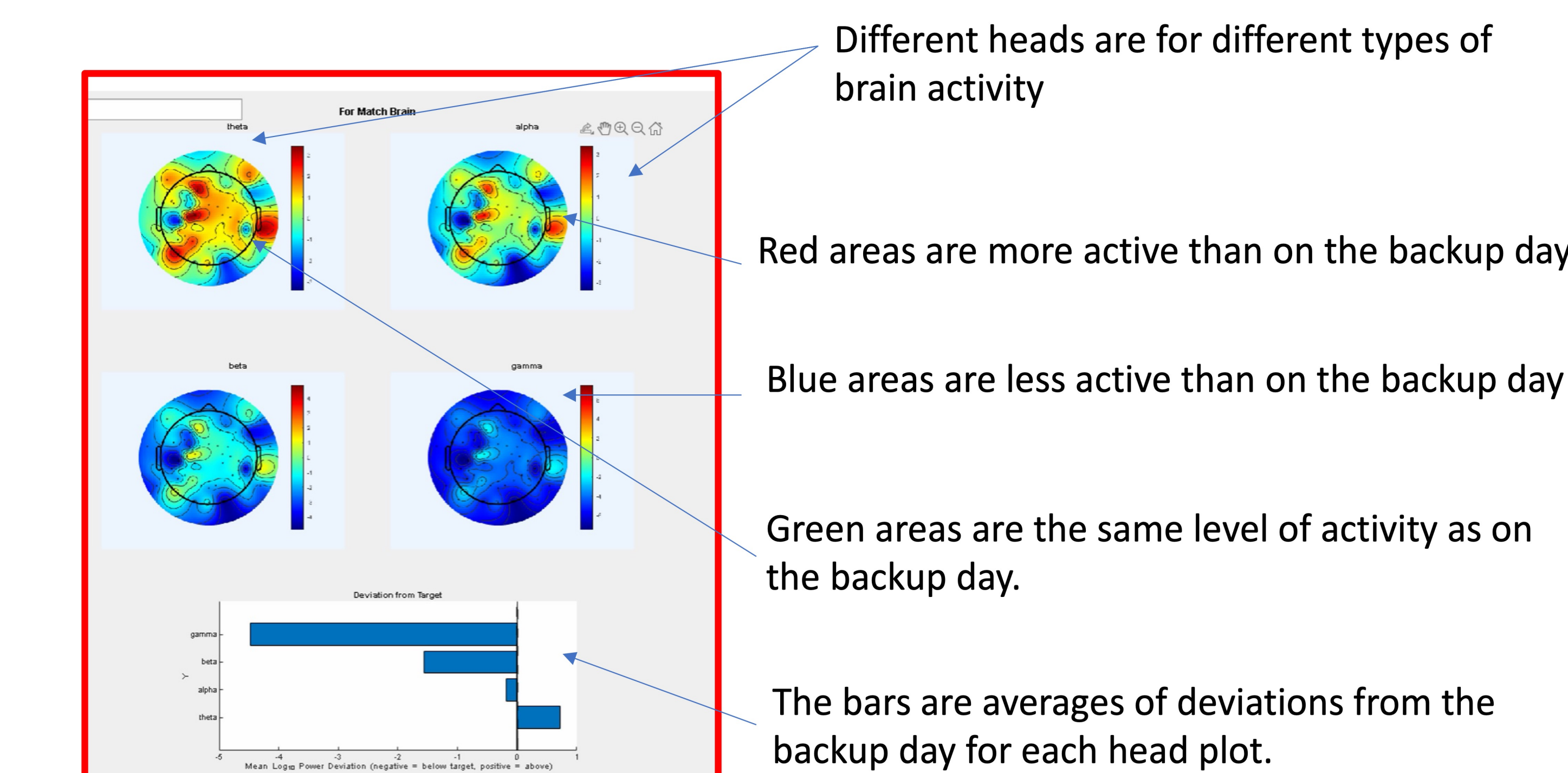
- 3 participants continued to be classified as healthy
- 2 participants no longer met criteria for MDD
- 2 participants no longer met criteria for GAD
- 1 participant no longer met criteria for PTSD

## Transcranial Alternating Current Stimulation (tACS)



- Electrical stimulation happens through the same electrodes on the scalp we use to measure activity
- Stimulation distributes no more than 2mA across the entire scalp (same as tDCS) with no more than 200 microamps at any one electrode

## Neurofeedback Instructions



## Conclusions

- Our goal is to evaluate n=60 participants; interim results are presented here
- Results suggest tACS combined with neurofeedback is feasible and improves mood in civilians when restored to the state backed up during the participants’ optimal baseline
- Our future plans are to seek military collaboration to test this procedure on warfighters prior to their first deployment.***