BACKGROUND
In recent years, empirical research has increasingly validated the benefits of meditation, linking it to improvements in attention, emotional regulation, and overall well-being. Recent imaging research has identified regions of the posterior cingulate cortex (PCC) and medial prefrontal cortex (mPFC) as playing a critical role in emotional and cognitive regulation (Prakash et al., 2013; Brewer et al., 2011; Hölzel et al., 2007). These studies have suggested differing patterns of activation in regards to the effect of mindfulness on neural correlates, but they have not demonstrated a consolidated activation pattern as a result of mindfulness and acceptance in response to pain.

QUESTION
We used a novel enhanced mindfulness strategy that combines pain education, imaginal exposure, mindfulness, reappraisal, and habituation for improving psychological pain analysis.

We initially hypothesized that the enhanced-acceptance strategy would show decreased activation in the PCC, and increased activation in the mPFC.

METHODS

PARTICIPANTS
n = 8 participants, mean age = 39 years

SCAN & ANALYSIS PARAMETERS
- EPI BOLD imaging on 3T Siemens Magnetom Prisma (TR = 1000 ms, 2.5 × 2.5 × 2.5 mm isotropic voxels, 240 mm FoV; 90 x 90 matrix, 90° flip angle)
- Pre-processing and 1st level analysis with SPM2
- Second-level analysis was conducted using CANlab’s neuroimaging tools from Dartmouth College, implemented in MATLAB (R2019b)

STIMULUS
Thermal stimulus with a Peltier thermode at painful heat intensities repeatedly for 13-13 seconds for 8 runs over two sessions (days)

TRIAL STRUCTURE
Condition: Experience and Regulate were assigned interchangeably to the two sessions, with Session #1 and #2 being run on the same day and one of the following: Run #1, Run #2, Run #3, Run #4

ANALYSIS PATHWAY
Step 1: Creation of Linear Models to Investigate Pain Intensity Variations
- Created linear models to explore individual and interactive effects of experimental conditions on pain intensity, revealing significant variability across subjects and conditions, visualized through detailed heatmaps.

Step 2: Group-Level Analysis of Pain Intensity Ratings
- Concluded a robust analysis to compare brain activity under experimental conditions on pain intensity, revealing significant variability across conditions, visualized through detailed heatmaps.

Step 3: Whole Brain Robust Regression Voxelwise Analysis at the Group Level
- Conducted a robust voxelwise analysis of whole brain data to identify experimental conditions on pain intensity, revealing significant variability across the brain, visualized through detailed heatmaps.

Step 4: Comparative Analysis of NPS and SIIPS1
- Performed a robust voxelwise analysis of whole brain data to identify experimental conditions on pain intensity, revealing significant variability across the brain, visualized through detailed heatmaps.

SUMMARY AND CONCLUSIONS
- The significant reduction in pain intensity under the ‘Regulate’ condition illustrates the efficacy of cognitive strategies in managing pain, a finding corroborated across various body sites.
- Different body sites exhibited higher pain intensities, indicating the influence of anatomical sites on pain perception.
- The robust voxelwise analysis affirmed the initial hypothesis that the PCC would show negative effects as a result of the implementation of acceptance and mindfulness-based strategies. This suggests that mindfulness and regulatory strategies not only modulate sensory pathways but also engage cognitive and emotional circuits, aiding in pain reduction.

REFERENCES