

## COMPARING THE EFFECTS OF MINDFULNESS AND COGNITIVE TRAINING ON STRESS REDUCTION IN STRESSFUL VIRTUAL SCENARIOS: EXPLORING THE ROLE OF INTEROCEPTIVE, GASTRIC, AND CARDIAC MECHANISMS

Eleonora Parrotta<sup>1</sup>, Vanessa Era<sup>1,2</sup>, Maria Serena Panasiti<sup>1,2</sup>, Maria Chelaru<sup>1,2</sup>, Cristiano Crescentini<sup>3</sup>, Alessio Matiz<sup>3</sup>, Salvatore Maria Aglioti<sup>1,2,4</sup> & Giuseppina Porciello<sup>1,2</sup>

<sup>1</sup>Department of Psychology, Sapienza University of Rome, Italy; <sup>2</sup>IRCCS Fondazione Santa Lucia Research Hospital, Rome, Italy; <sup>3</sup>Department of Languages and Literatures, Communication, Education and Society, University of Udine, Italy;

<sup>4</sup>Sapienza University of Rome and Center for Life Nano- & Neuro-Science, Fondazione Istituto Italiano di Tecnologia, Rome, Italy

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**Background/Rationale:** Stress significantly impacts both physical and mental health. While mindfulness-based interventions have been shown to reduce stress responses, the specific mechanisms, particularly involving interoception and visceral (gastric and cardiac) regulation remain unclear. Moreover, many studies lack well-matched active control interventions, limiting interpretations. The present work aimed to i) test the effects of an 8-week Mindfulness-Oriented Meditation (MOM) program on stress-related psychophysiological responses, and ii) validate a structurally matched cognitive training as an active control to isolate mindfulness-specific effects.

### Research Questions:

- Does an 8-week MOM program reduce psychophysiological stress reactivity at both the cardiac and gastric levels, compared to a structurally matched active cognitive control training?
- Are mindfulness-related changes moderated by interoceptive abilities?
- Can the newly developed cognitive training be validated as an effective active control, enabling the isolation of mindfulness-specific effects?

**Methods:** A randomized, controlled, quantitative pre–post design was employed. Sixty-six healthy participants were randomly assigned to MOM or an active cognitive control training. Both interventions lasted 8 weeks, were delivered online, and matched for structure, duration, group interaction, and expectancy. Acute stress was induced using the IMVEST (Rodrigues et al., 2021) protocol in virtual reality. Continuous physiological measures such as heart rate (HR), heart rate variability (HRV) and surface electrogastrography (EGG) were recorded. Self-report measures assessed perceived stress, anxiety, mindfulness skills (FFMQ), and interoception (MAIA; heartbeat counting and tapping tasks). Cognitive performance was assessed via a neuropsychological battery.

**Analysis:** Analyses were not pre-registered. Final pre– and post–analyses included participants undergoing Mindfulness ( $n = 24$ ) and Control training ( $n = 23$ ), with ~30% attrition. Mixed (parametric and non-parametric) ANOVAs, t-tests and Pearson correlations were conducted.

**Results:** MOM selectively increased mindfulness skills (FFMQ;  $p \approx .026$ ) and interoceptive sensitivity (MAIA Self-Regulation;  $p = .015$ ; Not-Worrying  $p = .008$ ), whereas controls showed no change on those scales. Interoceptive accuracy (heartbeat counting) improved over time in both groups ( $p = .0063$ ). Cognitive training selectively improved verbal memory ( $p = .039$ ), with no change in MOM. Both groups showed

reduced perceived stress ( $p = .010$ ) and anxiety ( $p < .001$ ), with a trend favoring MOM for anxiety ( $p = .066$ ). Critically, MOM reduced HR during stress in the post compared to pre-training ( $p = .0029$ ), the control training did not show a similar effect ( $p > 0.05$ ). HR attenuation correlated with higher levels in body awareness ( $r = -.63$ ,  $p = .0022$ ). Gastric signal (EGG) analyses are ongoing.

**Discussion:** These findings demonstrate that MOM produces specific psychophysiological reductions in stress reactivity, particularly at the cardiac level, and that these effects are closely associated with increases in interoceptive awareness. The cognitive training was empirically validated as a well-matched active control, enabling the isolation of mindfulness-specific mechanisms. Ongoing analyses of gastric signals will further clarify the contribution of visceral processes to stress regulation and the modulatory effects of mindfulness training.

**Keywords:** Mindfulness, Interoception, Stress reactivity, Heart rate, Gut

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**E-mail contact:** [giuseppina.porciello@uniroma1.it](mailto:giuseppina.porciello@uniroma1.it)