Brain Functional Changes Associated with Mindfulness Training-Related Improvement in Asthma Control

#452

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Introduction

Asthma and Psychological Distress

- Asthma carries a 2-fold higher risk for depression and anxiety[1]
- Stress can exacerbate symptoms, decrease asthma control, and negatively impact treatment efficacy[2]
- Interventions targeting emotion regulation, such as Mindfulness-Based Stress Reduction (MBSR), can reduce stress-related inflammation[3]
- Few studies have evaluated the impact of mindfulness on asthma outcomes

Asthma, Psychological Distress, and the Brain

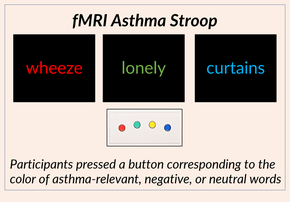
- Brain networks involved in processing and responding to emotion have been linked to immune modulation
- We previously found that components of these networks are associated with asthma-related inflammation[4,5]
- Mindfulness impacts the brain within these networks, including in the anterior midcingulate cortex (aMCC)[6]
- aMCC integrates cognitive and affective information, and is implicated in attention, emotion appraisal, and responses to salient cues[7,8,9]

Hypotheses

- MBSR training will improve asthma control and decrease effects of psychological distress on asthma outcomes
- Training-related improvements will be correlated with changes in brain responses to aversive cues

Methods

- **72 adults ages 18-65** (*M* = 38.1, 43 F) with asthma, with elevated airway inflammation *(FeNO ≥ 30ppb or blood EOS ≥ 150 cells/μL or sputum EOS ≥ 2% total leukocytes)*
- Assessments (T1, T2, T3):
  - **Asthma Control** (*ACQ-6*), **T2 Inflammation** *(blood & sputum eosinophils)*
  - **Depression** (*BDI*), **Mindfulness** (*FFMQ*), **Distress** (*SCL90R*)
  - **fMRI Asthma Stroop**



Participants pressed a button corresponding to the color of asthma-relevant, negative, or neutral words

T1 *(baseline)* (n=72)

- 8wk Mindfulness-Based Stress Reduction *(n=38)*
  - Attention on breath, body, and mind
  - Nonjudgmental awareness
  - Weekly 2.5hr classes & home practice
- Wait-List Control *(n=34)*

T2 *(month 2)* (n = 67)

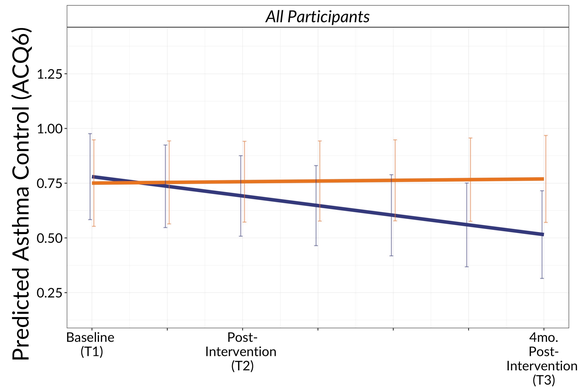
T3 *(month 6)* (n = 65)

Results

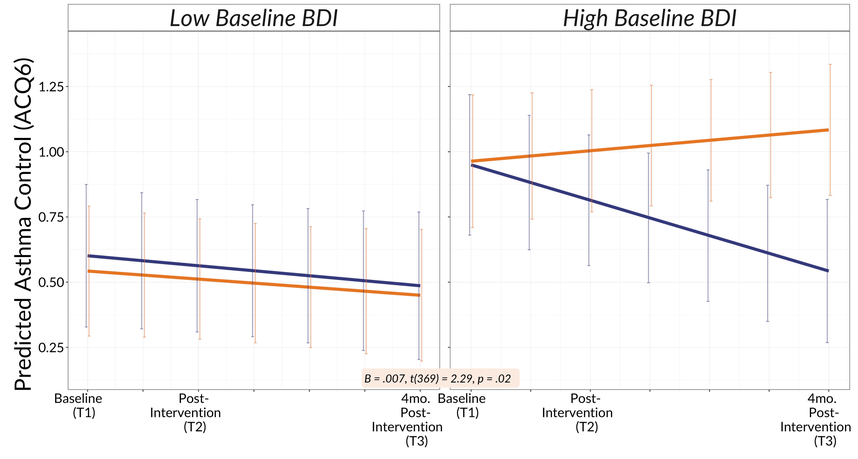
Asthma Control

Group – MBSR – Wait-List Control

MBSR improves asthma control *(d = .76)*,

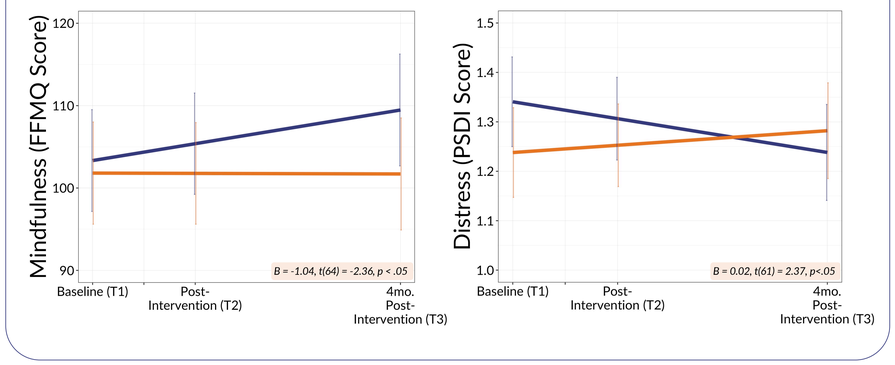


especially for those with highest baseline depression



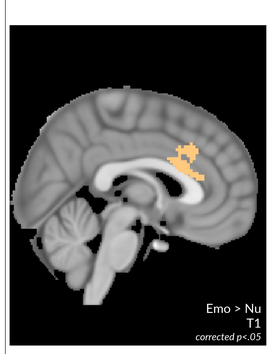
Psychological Changes

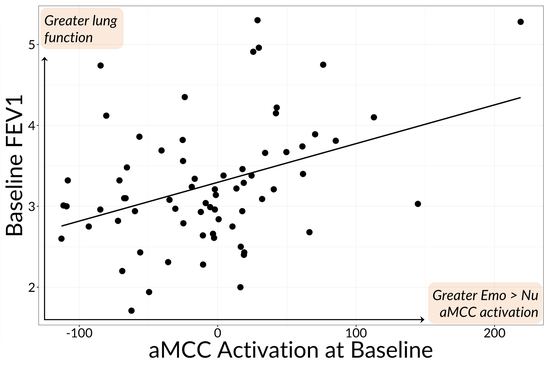
MBSR increases mindfulness and reduces distress



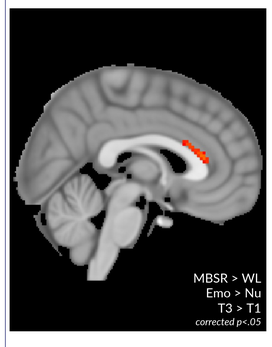
Neuroimaging

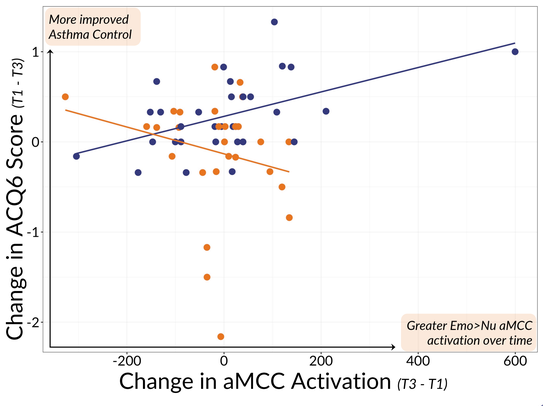
Greater lung function (FEV1) is associated with greater aMCC response to aversive cues at baseline





Asthma Control improvements are associated with increased aMCC response to aversive cues over time





Conclusions

- MBSR reduces distress and improves asthma control, which correlates with changes in brain activation
- Mindfulness training alters neural processing of aversive cues, which may reflect enhanced emotion regulation and is associated with improvements in asthma control
- Collectively, these data suggest that MBSR-related changes in brain function impact asthma control, bringing the brain back into asthma
- MBSR may be an effective behavioral addition to standard asthma treatment, especially for those with comorbid depressive symptoms

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