

End-tidal CO₂ Levels in Rest, During and After Respiratory Challenges: A Comparison Between and Within Patients with Stress-Related Disorders versus Panic Disorder Patients and Healthy Controls

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Background & aims

A dysregulated autonomic stress physiology is hypothesized to play a crucial role in the etiology and perpetuation of stress-related disorders. However, the respiratory system tends to be overlooked in the existing literature.

The aims of this study were:

1. To examine the respiratory psychophysiology in patients with stress-related disorders experiencing physical complaints in daily life diagnosed with respectively overstrain, burnout, and functional somatic syndromes, compared to patients with panic disorder and healthy controls.
2. To explore a possible triangular relationship between psychological variables (maladaptive perfectionism, experiential avoidance, and exposure to traumatic experiences), the stress response system, and patient status.

Methods

Sample: Clinical records from outpatients overstrain (n = 35), burnout (n = 44), fibromyalgia/chronic fatigue syndrome (CFS) (n = 36), and panic disorder (n = 36) seeking cognitive behavioral treatment at Tumi Therapeutics and healthy controls (n = 30), recruited before COVID-19, were analyzed.

Procedure: All participants filled out trait questionnaires and went through a capnography test consisting of a baseline phase (300s), a mild respiratory challenge (sighing) with recovery phase (300s), and a hyperventilation provocation test (HVPT) with recovery phase (300s) whilst end-tidal PCO₂ (PetCO₂) was monitored.

Questionnaires:

- Frost Multidimensional Perfectionism Scale (FMPS)
- Acceptance and Action Questionnaire (AAQ-II)
- Traumatic Experiences Checklist (TEC)

Results

Figure 1.

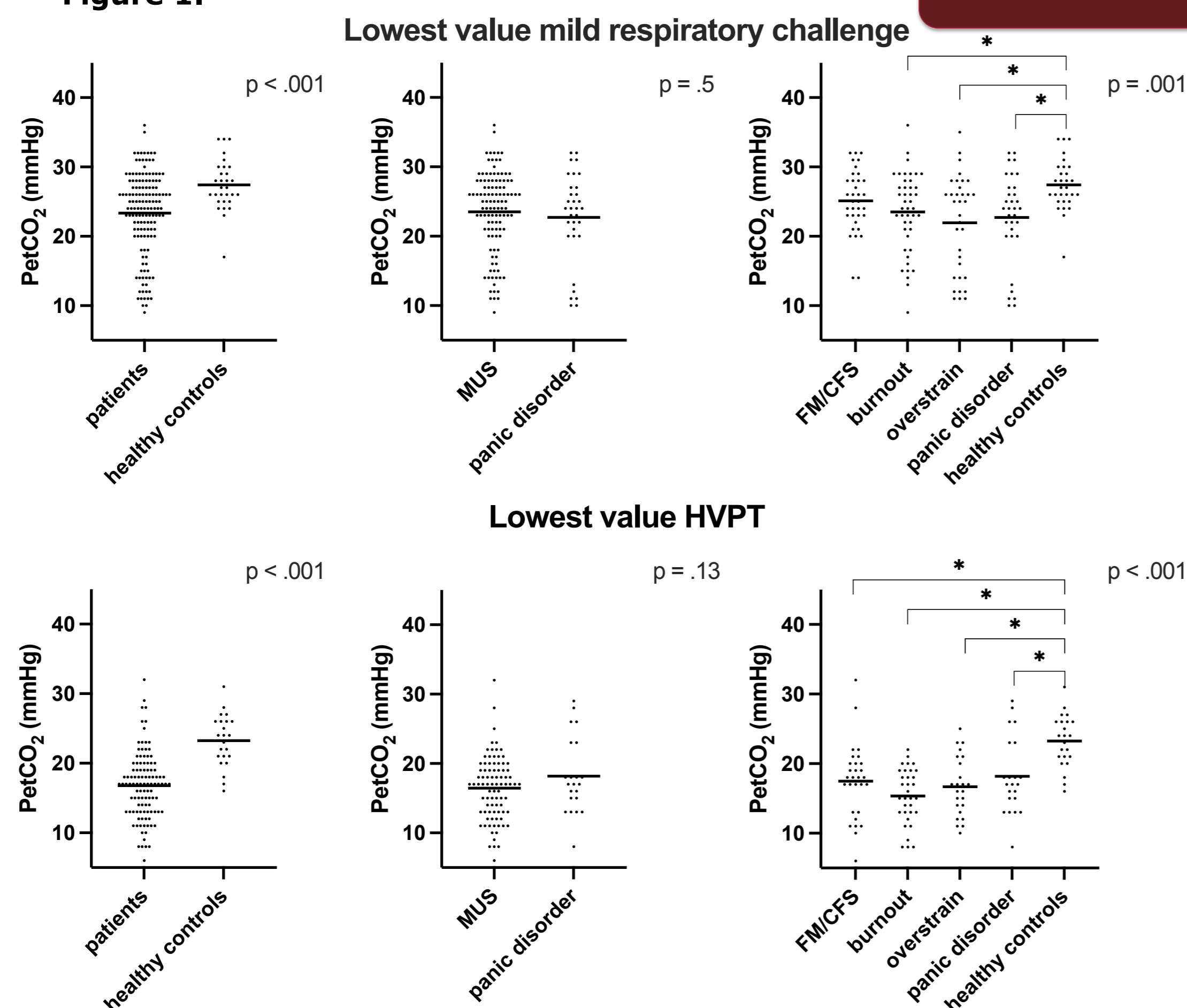


Figure 1. Graphic representation of each separate PetCO₂ value expressed in mmHg in different groups for lowest PetCO₂ value during the mild respiratory challenge and lowest PetCO₂ value during the HVPT. The p-values are displayed for interpretational purposes.

Figure 2.

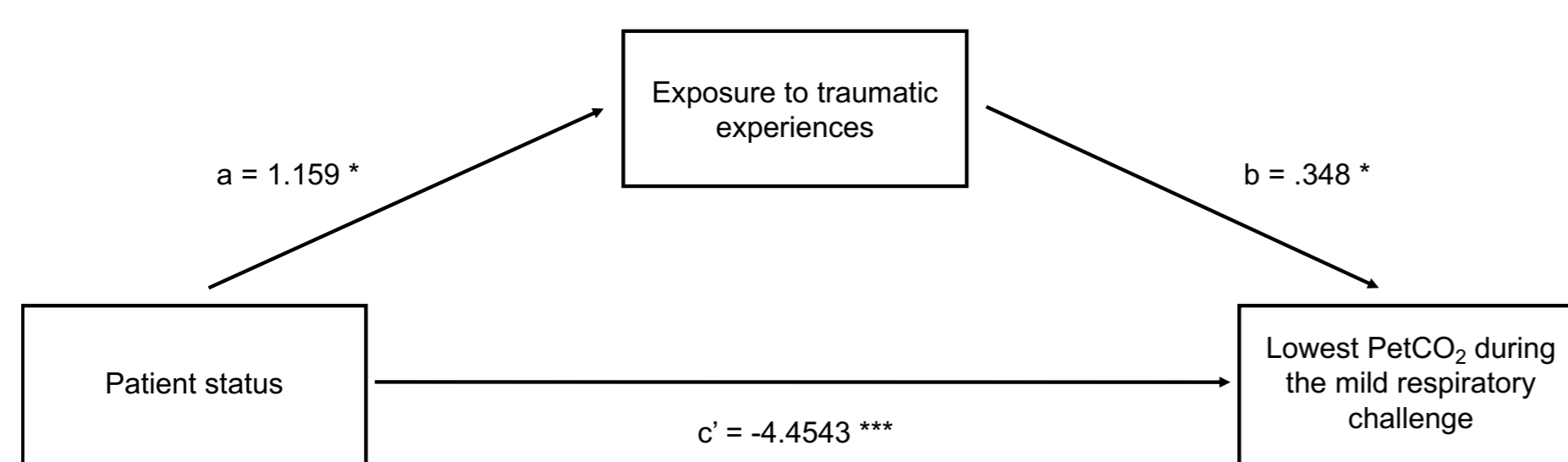


Figure 2. Simple mediation model for the direct and indirect effect of patient status (patients (n = 151), controls (n = 30)) on the difference in lowest PetCO₂ during the mild respiratory challenge, mediated by exposure to traumatic experiences. The model coefficients are reported in unstandardized form.

Figure 3.

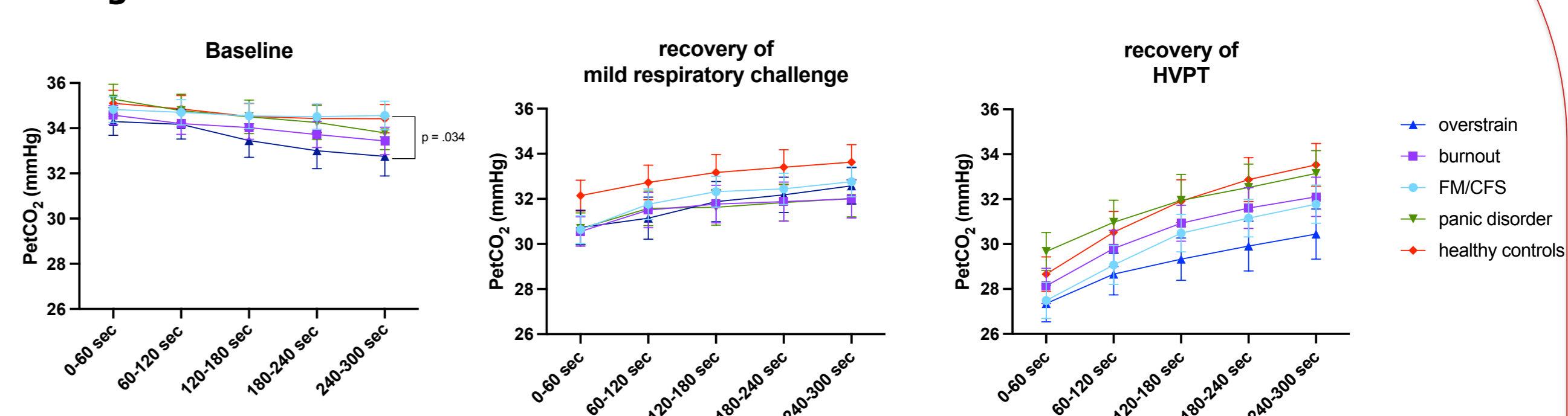


Figure 3. Graphic representation of the mean PetCO₂ values expressed in mmHg for each time segment, expressed in seconds, during the baseline phase, the recovery of the mild respiratory challenge, and the recovery of the HVPT for each participant group. P-values refer to the time*group interaction effects. Vertical bars denote standard error of the mean.

Figure 4.

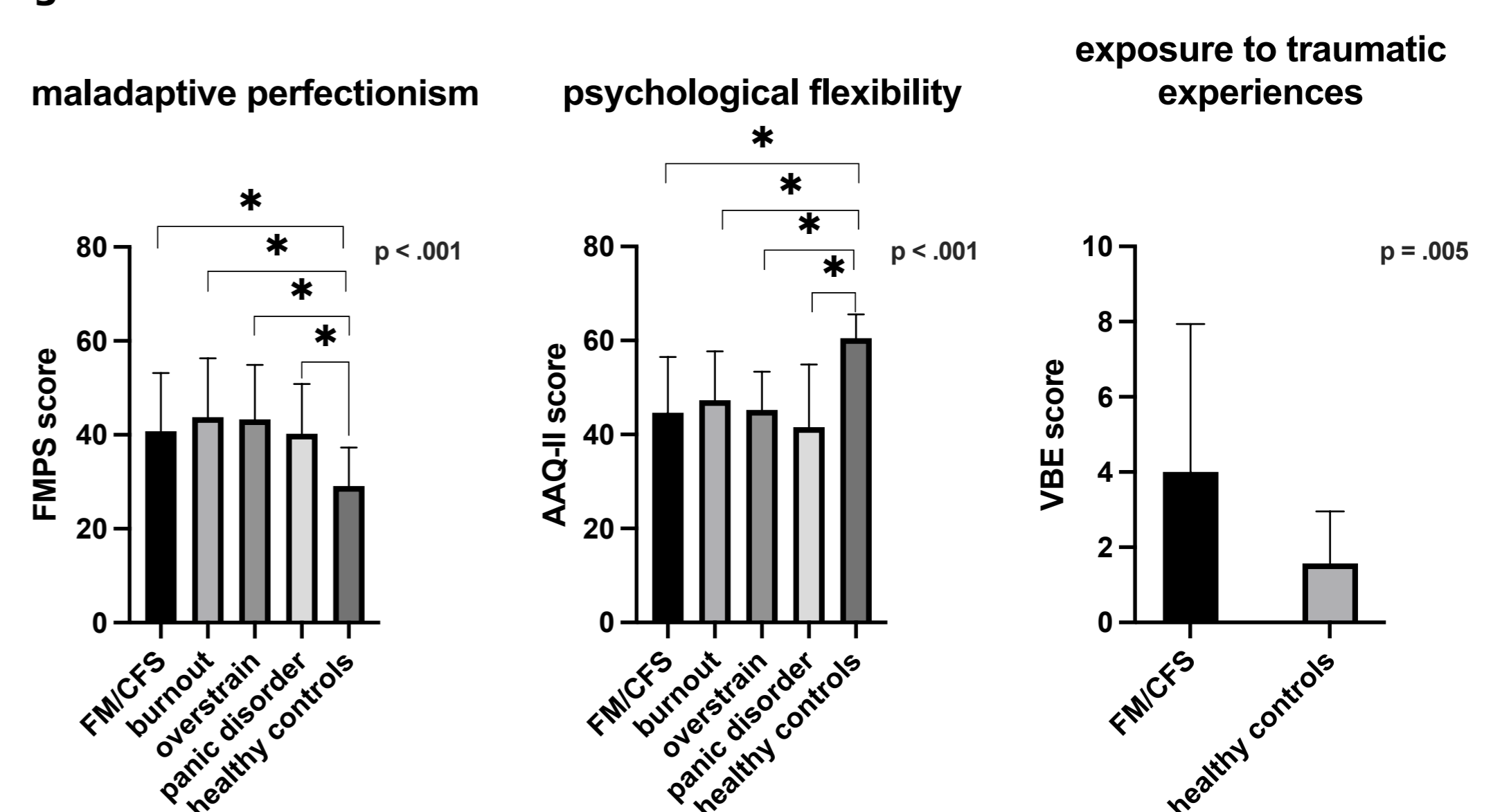


Figure 4. Graphic representation of mean scores per participant group on the maladaptive subscales of the FMPS, the AAQ-II, and the TEC. Higher scores on the AAQ-II refer to less experiential avoidance and higher psychological flexibility. The SD's and p-values are displayed for interpretational purposes.

Conclusion

- Results showed lower PetCO₂ in patients with stress-related disorders and panic disorder compared to healthy controls, suggesting dysfunctional breathing as a transdiagnostic mechanism for both patients with stress-related disorders and anxiety-related disorders.
- Results showed higher maladaptive perfectionism and experiential avoidance in all patients, and more exposure to traumatic experiences in patients with fibromyalgia/CFS compared to healthy controls.
- The respiratory abnormalities are found to be partially mediated by exposure to traumatic experiences.
- The respiratory system does not show greater dysfunctions in the most chronic and severe disorders (fibromyalgia/CFS) compared to a less chronic and severe disorder (overstrain), which could be suggestive for central processes growing in importance.