

The Effects of Mindfulness Training on Post-Traumatic Stress Disorder Symptoms and Heart Rate Variability in Combat Veterans

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POST-TRAUMATIC STRESS DISORDER (PTSD) can be a chronic and disabling condition with detrimental effects on an individual's psychological, medical, social, and occupational functioning.¹ PTSD has been conceptualized as a dysregulated stress-response system² with increased sympathetic activation and decreased parasympathetic tone.³ These abnormal responses have been associated with increased mortality in multiple conditions.² Heart rate variability (HRV) is an objective measure that helps quantify the level of autonomic response *in vivo*. Although many factors affect HRV, overall variability depends on vagal modulation⁴ and provides a noninvasive way to measure the interplay between the two autonomic systems. While HRV has been investigated in veterans with PTSD,^{5,6} its change with mindfulness-based stress reduction (MBSR) treatment has not been investigated.

MBSR is an 8-week, manual-based group therapy that uses mindfulness meditation and Hatha yoga to reduce distress associated with physical and mental health disorders.⁷ MBSR has demonstrated benefit for a variety of diagnoses in both mental and physical health^{8,9} and is specifically designed to improve emotional acceptance. Therefore, it may be a useful way to facilitate clinical improvement during exposure therapy for PTSD.

The aim of this pilot study was to determine whether MBSR training would reduce PTSD symptoms and improve HRV in veterans with combat-related PTSD. A second objective was to determine whether changes in HRV correlate with changes in the Clinician Administered PTSD Scale (CAPS), such that HRV could potentially serve as a potential biologic marker of disease and treatment response. Eight male and female veterans who had PTSD, as determined by the Structured Clinical Interview for DSM Disorders, and a total score of 50 or higher on CAPS were recruited from the Madison Veterans Affairs hospital to participate in the MBSR course. Individuals with comorbid mood disorders were eligible, as long as PTSD was the primary diagnosis.

The main outcome measures were the CAPS and the pNN50 measure of HRV (the number of pairs of adjacent normal-to-normal [NN] intervals differing by more than 50 milliseconds divided by the total number of all NN intervals). These were collected by interview and 24-hour Holter

monitoring at baseline (week 0), upon completion of the course (week 8), and 1 month after completion (week 12). Data were analyzed using SPSS software (SPSS Inc., Chicago, Illinois) for the HRV and CAPS scales. Eight veterans completed the MBSR training, and 5 completed the HRV measures. All participants had PTSD and at least one other psychiatric illness; major depression and generalized anxiety were the most common comorbid conditions. The sample ($n=8$) had an average age of 59.5 years (range, 42–71 years) and was composed of 7 men from the Vietnam era and 1 woman from Operation Enduring Freedom/Operating Iraqi Freedom, and all participants were of Caucasian descent.

TABLE 1. TOTAL CAPS SCORES AND CAPS SUBSCALE SCORES AT WEEKS 0, 8 AND 12

Variable	CAPS Score			
	Week 0	Week 8	Week 12	Difference (Week 12–Week 0)
Patient				
1	85	85	67	–18
2	75	70	67	–8
3	80	58	48	–32
4	99	101	99	0
5	76	51	54	–22
6	79	65	71	–8
7	94	77	62	–32
8	76	88	78	2
Mean total CAPS score	83.0	74.4	68.3	–14.8 ± 13.3
Mean CAPS B score	22.9	17.4	18.1	–4.8 ± 4.8
Mean CAPS C score	34.4	33.4	28.6	–5.8 ± 7
Mean CAPS D score	25.8	23.6	21.5	–4.3 ± 6

Negative score reflects improvement in symptoms. Values expressed with a plus/minus sign are the mean ± standard deviation.

CAPS=Clinician Administered PTSD Scale; CAPS B=re-experiencing symptoms of PTSD; CAPS C=avoidance symptoms of PTSD; CAPS D=hyperarousal symptoms of PTSD; PTSD=post-traumatic stress disorder.

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One month after course completion, PTSD symptoms had decreased from baseline by an overall CAPS score of 14.8 points; this reduction was clinically significant according to prior studies.¹⁰ The CAPS data are shown in Table 1. Parasympathetic functioning increased for all five participants. The measure of sympathetic function (low frequency to high frequency) did not show any significant trend. Limitations of the study include absence of a control group, the mostly male sample, the small cohort size, and the short duration of the study.

In conclusion, for this small sample, MBSR for veterans with PTSD showed an overall reduction in symptoms as measured by the CAPS. HRV might be a potential marker for treatment and response for MBSR in PTSD, but larger studies are needed.

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