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A randomized controlled trial evaluating Mindfulness-Based Stress Reduction (MBSR) for the treatment of palpitations: A pilot study

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Benign palpitations are a common symptom of patients presenting to internists and cardiologists [1] which, while not associated with a serious cardiac condition, can be highly disturbing to the patient, and may lead to costly and repetitive diagnostic testing [2]. Providing reassurance of the benign nature of most palpitations often provides little relief, leading to dissatisfaction in patients seeking help. Mayou et al. focus on reframing the perception of palpitations from unpleasant and abnormal to accepting these sensations as normal and unremarkable. However, helping patients reframe the sensation of palpitations is not readily accomplished in a visit to a primary care physician or specialist. So, the problem remains of how best to treat patients presenting with benign palpitations.

Mindfulness-Based Stress Reduction (MBSR) is a mind–body intervention that fosters present moment, non-judgmental awareness and teaches basic meditation and yoga techniques in eight 2 1/2 hour sessions and daily home practice. Participants are encouraged to use mindfulness skills in moments of stress, anxiety or unwanted symptoms such as pain or palpitations. MBSR participants often report gaining insight and control over stress-related symptoms [3] and improvements in well-being [4]. We were interested in whether MBSR classes might be beneficial for patients with benign palpitations.

The aims of this study were 1) to evaluate the efficacy of MBSR for the treatment of benign palpitations, and 2) to see if improvement in heart palpitations is associated with improved autonomic balance during 24 h Holter recordings. We conducted a randomized trial of an 8 week MBSR class compared to a wait-list control group in patients with palpitations, in a protocol approved by the UVA IRB.

Twenty participations reporting heart palpitations of at least two months duration were recruited in the UVA Primary Care and Cardiology clinics. Inclusion criteria included willingness to attend MBSR classes and comply with the data collection protocol. Participants were consented and scheduled for an ECG and physician examination. Exclusion criteria included prior myocardial infarction or known coronary artery disease, valvular heart disease, cardiomyopathy or congestive heart failure, syncope, palpitations during exercise, an abnormal electrocardiogram as evidenced by significant Q waves, short PR interval, delta waves, left ventricular hypertrophy, prolonged corrected QT interval, or other than sinus rhythm. No participant showed evidence of serious arrhythmias during the diagnostic screening interview. Participants were randomly assigned a study group using a randomly ordered sequence of 20 assignments: 10 “MBSR” and 10 “Wait List Control”. The sequence of MBSR and control assignments was generated at random.com, and each assignment placed in consecutively numbered opaque envelopes, (constructed by staff not involved with patient recruitment or group assignment) and then used to assign participant to group, immediately following consent.

MBSR classes were conducted at the UVA Mindfulness Center [5]. Questionnaire data and 24 h Holter recordings were collected at three time points: 1) baseline (before MBSR classes), 2) 8 weeks after baseline and 3) 12 weeks after baseline.

Participants completed an 8 point rating scale of the frequency of their heart palpitations with 0 = never, 1 = rarely (about once a month), 2 = sometimes (about 2–3 times a month), 3 = about once a week, 4 = about 2–3 times week, 5 = about 4–6 times a week, 6 = daily and 7 = more than once a day.

Baseline 24 h Holter recordings were evaluated to confirm no evidence of serious arrhythmias. All recordings were manually reviewed, edited and digitized for further analysis. The power spectrum of the beat to beat (RR) interval was computed into high frequency (HF) (0.15–0.4 Hz) and low frequency (LF) (0.04–0.15 Hz) bands

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and the ratio of the two computed as a measure of sympatho-vagal balance.

Nineteen participants completed the study, with one lost to relocation. Seventeen were female and two were male. The average age of the participants was 49.4 years (SD = 8.3) with no significant age difference between the groups. Most of the participants were well-educated: 7 with a college degree (36.8%), 7 with graduate education (36.8%), 4 (21.1%) with some college, and 1 (5.3%) with some high school. All of the participants were employed, with 10 reporting income greater than 50 K (52.6%), 4 reporting income between 25 K and 49 K (21.1%) and 4 reporting income between 14 K and 24.9 K (21.1%) and 1 declined to report income (5.2%).

MBSR participants reported a significant reduction in heart palpitations at the conclusion of the MBSR training, on average a difference score of 2.2 (SD = 1.3) on an 8 point palpitation frequency scale, while the control group did not report any change with an average difference score of 0.1 (SD = .99). This difference was significant with F = 13.8, $p < .002$, partial eta = .45. This improvement in the MBSR participants was sustained at 1 month follow-up (with slight improvement) with MBSR participants reporting an average palpitation reduction of 2.8 (SD = 1.6) on the palpitation frequency scale compared to the control group average difference score of 0.2 (SD = 1.3) with F = 14.4, $p < .001$, partial eta = .46). (See Fig. 1.)

The 24 h Holter recordings were analyzed in both the time domain and frequency domain and these measures are presented in Table 1.

There were no significant differences between the MBSR and Control groups on any of the HRV measures at baseline, 8 weeks, or 12 weeks. We found an association between HRV balance (as measured by the Ln LF/HF ratio) and improvement in palpitations in the MBSR group ($r = .8$, $p < .001$) as shown in Fig. 2.

In this study, MBSR participants reported a significant reduction in heart palpitations at the conclusion of the MBSR training, and this improvement in the MBSR participants was sustained at 1 month follow-up. Some of this positive effect may be due to the MBSR participants gaining insight and control over how (and whether) they notice and interpret the symptoms, in other words how they react to the sensation of palpitations and how bothersome the palpitations are to them. The goal of MBSR training can be described as changing stressful reactions to events or sensations to calm, accepting responding or simply non-judgmental awareness. In addition, as other researchers have proposed [6], MBSR may improve autonomic balance and so normalize the ratio of LF/HF activity. MBSR training is comprised of a complex set of practices and the dynamics of these varied practices on HRV may also be complex. For example, one study of the effects of MBSR on HRV reported a decrease in LF activity [7], while another study of the effects of meditation on HRV showed an increase in LF activity associated with slow, regular breathing [6]. LF activity reflects a combination of sympathetic and parasympathetic activity [8] and is particularly influenced by slow and regular breathing [7,9]. The multifaceted nature of MBSR classes and individual differences in baseline autonomic balance presents a challenge in evaluating the effects of MBSR on HRV.

In describing a sample of 183 patients reporting palpitations, Mayou et al. report that panic attacks and anxiety are common characteristics of patients reporting palpitations. In a study by McCraty et al. comparing HRV of 24 h Holter recordings of healthy adults and in patients with panic disorder, they report an average Ln (LF/HF) ratio of 1.53 in healthy adults compared to an average Ln (LF/HF) ratio of 0.53 in those with panic disorder. In our study, the Ln (LF/HF) ratios associated with improvement in palpitations were in range of healthy patients in the McCraty study, whereas MBSR participants who showed no or slight improvement had Ln (LF/HF) ratio in the range of patients with panic disorder. [10] So, while our sample size is small and requires these results be interpreted with appropriate caution, the association of

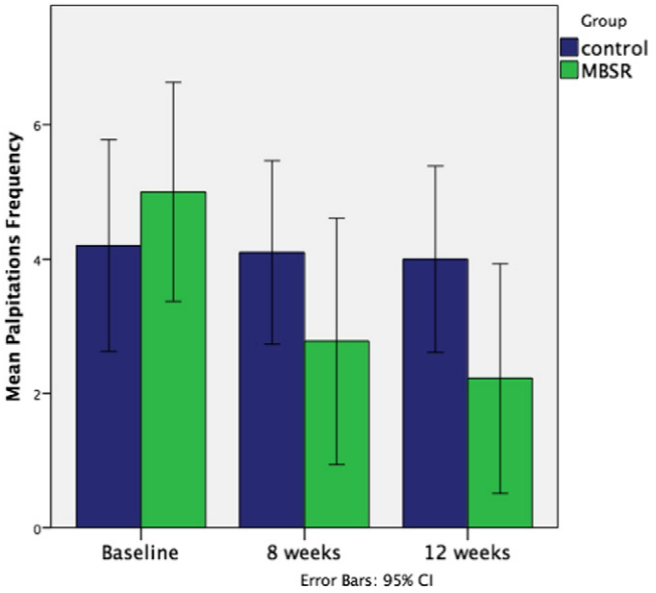

Fig. 1. Palpitation frequency in MBSR and control groups at baseline, 8 weeks and 12 weeks.

Table 1
Time domain and frequency domain measures of heart rate and heart rate variability, (SD), for MBSR and Control groups at baseline, 8 weeks and 12 weeks. SD-NN indicates standard deviation of normal to normal R-R intervals, where R is the peak of a QRS complex (heartbeat). RMSSD ("root mean square of successive differences") is the square root of the mean of the squares of the successive differences between adjacent NNs. HF (50%) is High Frequency (.15–.4 Hz) power at the 50th percentile. LF(50%) is Low Frequency (.04–.15) power at the 50th percentile.

	MBSR group			Control Group		
Measures	Baseline	8 weeks	12 weeks	Baseline	8 weeks	12 weeks
HR bpm	82.4 (4.3)	82.3 (4.3)	82.3 (4.3)	78.8 (4.0)	77.6 (4.0)	78.2 (4.0)
SD-NN	119.6 (11.3)	116.6 (11.3)	120.8 (11.3)	122.0 (10.7)	129.2 (10.7)	127.6 (10.7)
RMS-SD	40.1 (7.5)	51.1 (7.5)	35.2 (7.5)	34.1 (7.1)	47.2 (7.1)	45.6 (7.1)
HF (50%)	202.6 (139.6)	279.2 (139.6)	255.6 (139.6)	332.7 (132.4)	422.5 (132.4)	492.1 (132.4)
LF (50%)	591.8 (199.6)	667.0 (199.6)	651.5 (199.6)	671.3 (189.3)	699.0 (189.3)	749.8 (189.3)
Ln (LF/HF)	1.1 (.2)	1.0 (.2)	1.2 (.2)	.9 (.2)	.8 (.2)	.8 (.2)

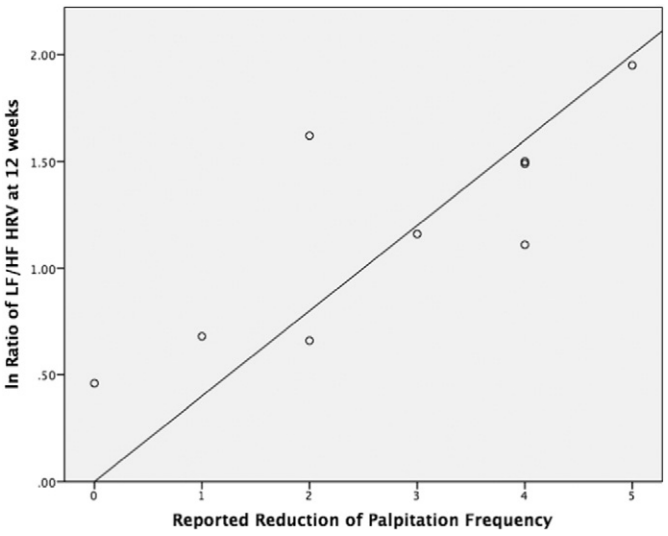

Fig. 2. Improvement in palpitations associated with higher lnLF/HF ratios in MBSR participants at 12 weeks.

the efficacy of MBSR training for the treatment of palpitations and autonomic balance of HRV is consistent with previous literature.

In conclusion, MBSR training may be an effective treatment for patients with benign palpitations, and further study is warranted. It may also prove fruitful to further investigate the efficacy of MBSR and autonomic balance on HRV in palpitations patients with and without anxiety and panic.

Conflict of interest

The authors report no relationships that could be construed as a conflict of interest.

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