BHBI-Funded Research*

Abstract 8

Mindfulness, Yoga, and Cardiovascular Disease

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Introduction: There is increasing evidence that reactions to the stressors of daily life are major contributors to the development and progression of coronary artery disease (CAD). Practices such as yoga and meditation are becoming increasingly popular as means to reduce stress and improve the sense of well-being. There is some evidence that they can beneficially modulate some of the potential pathways linking psychological stress and CAD, such as autonomic nervous system (ANS) activity and stress hormones. However, studies providing insights into whether such changes are associated with decreases in downstream cardiovascular risk factors, including inflammatory markers, are lacking.

Primary objectives: To evaluate the effectiveness of a regular practice of yoga or mindfulness, a meditative practice originating in Buddhism, in (1) improving mood and (2) modulating ANS activity, cardiovascular reactivity to a lab stressor, and inflammatory molecules, compared with conventional relaxation. *Secondary objectives:* To determine whether there is an association between any of the physiological outcomes measured and (1) any indicators of stress or well-being and (2) reactivity to a lab stressor.

Design and Method: This study was designed as a three-arm randomized controlled trial among individuals with moderate cardiovascular risk including stress and anxiety. The intervention included 1.5-hour weekly sessions and daily home practice for 12 weeks followed by another 12 weeks of home practice, allowing a follow-up assessment at 24 weeks. Of the 62 participants who enrolled, 16 in the mindfulness group, 17 in the yoga group, and 15 in the conventional relaxation group completed the 12-week intervention and 13, 14, and 11, respectively, completed the 24-week intervention. Self-reported mood, psychological stress, and spiritual and emotional well-being were assessed using psychometric instruments. ANS activity was assessed by blood pressure, heart rate, heart rate variability measurements, and plasma catecholamine level. All of these outcomes were measured at baseline and at 6, 12, and 24 weeks. Blood was collected at baseline and at 12 weeks to measure the inflammatory markers IL-1β, IL-6, and IL-10.

Preliminary Results: We have completed the study and a preliminary analysis of the inventories and of the inflammatory marker IL-6 has been performed. Results are summarized in **Table 1.**

Conclusions: The results of this study indicate that the practice of mindfulness, yoga, or health education, relaxation, and light exercise may lead not only to an overall decrease in negative emotions but also to an increase in well-being in individuals with risk factors for CAD. Moreover, these changes were associated with a 25% increase in IL-6. Upon completion of our analysis, we will be able to see whether these psychological changes translate into similar changes for the other physiological outcomes measured.

TABLE 1
***P* VALUES FOR 12 WEEKS VS BASELINE WITHIN-GROUP AND BETWEEN-GROUP COMPARISONS**

	Control (C) (N = 15)	Yoga (Y) (N = 17)	Mindfulness (M) (N = 15)	Y vs C	M vs C
Decrease in negative measures					
DASS-21–Depression	NS	NS	0.03	NS	NS
DASS-21–Anxiety	NS	NS	0.02	NS	0.05
DASS-21–Stress	0.01	0.001	0.02	NS	(0.08)
PSS	(0.11)	0.001	0.003	(0.08)	0.05
POMS–Fatigue	(0.13)	(0.06)	0.001	NS	0.05
Increase in well-being					
SWB–Existential	(0.08)	0.004	0.02	NS	NS
MASS	(0.06)	0.001	0.03	(0.10)	NS
Decrease in inflammatory marker					
Interleukin-6	NS	NS	0.05	NS	(0.20)

Results computed using paired t-test with significance level set at $P = 0.05$.
DASS-21 = Depression, Anxiety, and Stress Scale; PSS = Perceived Stress Scale; POMS = Profile of Mood State; SWB = Spiritual Well-Being; MASS = Mindful Attention Awareness Scale; NS = nonsignificant

* BHBI = Bakken Heart-Brain Institute