Mindfulness Meditation, Anxiety Reduction, and Heart Disease
A Pilot Study

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Summary: Heart disease is the leading cause of death among Americans each year, yet the misperception still exists that cardiovascular disease is not a serious health problem for women. Evidence indicates that anxiety contributes to the development of heart disease. The primary purpose of this study was to assess the effectiveness of Kabat-Zinn’s mindfulness-based stress reduction program to reduce anxiety in women with heart disease. Anxiety, emotional control, coping styles, and health locus of control were compared in a treatment and control group of women with heart disease. Post-intervention analyses provide initial support for beneficial effects of this program.

Keywords: anxiety, cardiovascular disease, heart disease, meditation, mindfulness

Heart disease is the leading health problem in our nation. However, misperceptions still exist that cardiovascular disease (CVD) does not seriously affect women, even though women account for almost 50% of all CVD deaths annually, and 43% of women compared with 24% of men will die within 1 year following a heart attack.1 From an ecological systems perspective, morbidity and mortality due to CVD significantly affect the family and community; thus, CVD is pervasive in its effects. Evidence2-5 supports the position that stress and negative emotions such as anxiety contribute to heart disease. The purpose of this pilot study was to investigate the effectiveness of Kabat-Zinn’s6 mindfulness-based stress reduction and relaxation training in reducing anxiety in women with heart disease. Other variables assessed were emotional control, coping styles, and health locus of control.

Review of Literature

Anxiety and heart disease

Substantial epidemiologic evidence implicates anxiety in the development and rehabilitation of heart disease in both men and women.3-5 It has been suggested that anxiety may become a risk factor in the pathogenesis of coronary disease when the affective component is suppressed during response to a threat or stressor.5 A meta-analysis of articles published from 1980 to 1998 concerning anxiety and heart disease concluded that evidence related to the relationship of distress-induced atherosclerosis and endothelial dysfunction strongly supports the role of anxiety in the onset of coronary heart disease.4 In sudden cardiac death, research7-9 suggests that those with anxiety have reduced heart rate variability that may lead to a variety of coronary-related conditions that include hypertension, arrhythmias, and

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impaired vagal tone, which has been linked to cardiac mortality. Also, in terms of gender, it is well documented that women are more associated with problems of anxiety and depression than men, and they have higher anxiety levels before and after bypass surgery. Thus, anxiety, in combination with heart disease, may place women at substantial risk for heart disease and impair rehabilitation following a coronary event.

How one deals with negative emotions is another important factor. Non-expression or suppression of negative emotions is associated with poor health outcomes and illness, and it may accelerate coronary heart disease. Emotional control means that one controls or regulates the display of his or her negative emotions—suppresses, holds within, or otherwise inhibits the expression of negative feelings. The inhibition of emotional expression may be especially problematic for women because of the expectations of the feminine role. Women are traditionally socialized to be feminine and attractive at all times, and not to express negative emotions as are men. Thus, control of negative emotions—higher scores on emotional control—may play a unique role in the course of heart disease in women.

Complementary interventions and heart disease

Research into the use of complementary therapies in cardiac patients is probably most associated with the well-known studies of Ornish. Ornish's noninvasive lifestyle program of meditation training and a low-fat vegetarian diet with exercise continues to show beneficial outcomes for participants in follow-up. Recently, a meta-analysis of psycho-educational programs targeting heart disease reviewed 37 studies that involved programs containing health education and management of stress-related symptoms. The programs reviewed yielded a 34% reduction in cardiac mortality and a 29% reduction in recurrence of myocardial infarctions. Yet, mixed findings in the literature do not permit definitive conclusions as to whether such programs lead to actual long-term benefits in coronary disease. Complementary strategies such as biofeedback, relaxation, and music therapy have been explored to reduce anxiety in cardiac patients; however, the use of meditation alone has yielded limited and mixed results. Further research is needed to clarify the effectiveness of meditation alone in reducing anxiety in persons with heart disease.

Mindfulness-based meditation: Overview and research

Since the 1960s, interest in meditation has grown, as indicated by the increase in community groups that practice meditation regularly and by the increased use of meditation as a complementary therapy to promote health. The Mindfulness-Based Stress Reduction (MBSR) program emerged in 1979 at the University of Massachusetts’ School of Medicine. Developed by Kabat-Zinn, MBSR incorporates the principles of mindfulness meditation and has roots in Theravada Buddhism. Although mindfulness cultivates awareness and focused attention to the present moment, it differs from other types of meditation such as transcendental.

Mindfulness provides a means of self-monitoring and regulating one’s arousal with detached awareness.
meditation. Mindfulness encourages detached, non-judging observation or witnessing of thoughts, perceptions, sensations, and emotions, which provides a means of self-monitoring and regulating one’s arousal with detached awareness. MBSR programs have demonstrated effectiveness in reducing anxiety, chronic pain, fibromyalgia, mood, and stress in persons with cancer and in fostering an increased sense of control.

THE CURRENT STUDY

The purpose of this pilot study was to investigate the effectiveness of the MBSR program in reducing anxiety in women with heart disease. The investigators hypothesized that anxiety scores for the participants who completed the intervention program would be lower in comparison with the scores of the control group. Second, since it has been suggested that emotional control may play a unique role in women with heart disease, it was hypothesized that, at the conclusion of the intervention, treatment group scores on the control of negative emotions would be lower in comparison with the scores of participants in the control group. That is, the emotional control scores (indicating the degree to which they suppress their negative feelings) for women in the MBSR group would significantly decrease after the intervention. Lowered scores would indicate a reduced tendency for them to hold in and not express their negative emotions, which has been associated with negative health outcomes. Last, the investigators examined two variables that are important to health in general: coping style and health locus of control. Illness is a major stressor, and how one copes with stress has consequences for health outcomes. Likewise, individuals with an internal locus of control—an internal sense of agency—are more likely to be a participant in their well-being and engage in health-promoting behaviors than those with an external locus where the locus for change is seen as outside the self. The effects of the MBSR intervention on coping styles and health locus were exploratory; hence no predictions were made.

METHODOLOGY

Sample and procedures

Following human subjects approval, participants were recruited within medical settings to participate in a study to explore the effects of a stress reduction and relaxation program for women with heart disease. Criteria for participation in the study included documented cardiovascular disease and approval by the participant’s attending cardiologist. Participants were 20 women in a Southwestern community of approximately 200,000; 10 in the experimental group and 10 in the control group. One participant from each group dropped out, leaving nine participants in each group for a total of 18. The age range was 48 to 74 years (mean, 60.5 years). The majority of study participants were primarily well-educated white upper middle class (88.9%), Protestant (83.3%), married (72.2%), with a modal family income of $50,000 or more (50%). Over half of the sample (61%) had completed a bachelor’s or graduate degree, and 60% worked full time (Table 1). The participants had cardiac diagnoses that included major classifications such as angina, hypertension, cardiovascular disease, and cardiac valve disorders. Once individuals volunteered, they were randomly assigned to either the experimental or the control group. Participants in the control group were placed on a
Table 1. Frequencies for demographic variables by group

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Intervention group</th>
<th>Control group</th>
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<td>Percent</td>
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waiting list and offered the opportunity to participate in the program after the study was completed. Both groups completed questionnaire packets prior to initiation of the study and again after completion of the stress reduction program.

Mindfulness-based stress reduction program

The intervention was provided for 2 hours each week (one night) for 8 weeks. Weekly meetings were held on a university campus and included didactic, inductive, and experiential modes of learning regarding stress responses and mindfulness skill development training. During the 8-week group meetings, participants received training in the three basic mindfulness practices: the body scan, sitting meditation, and hatha yoga. The body scan involved a gradual thorough sweeping of attention through the entire body from feet to head, focusing noncritically on any sensations or feelings in body regions with periodic suggestions of breath awareness and relaxation. Sitting meditation involved mindful attention of the breath and other perceptions and a heightened state of observational yet nonjudging awareness of cognitions and the stream of thoughts and distractions that constantly flow through the mind. Hatha yoga involved simple stretches and
postures designed to strengthen and relax the musculoskeletal system and the development of mindfulness during movement of the body, or meditation in motion. Participants were given audiotapes to facilitate daily homework practice of the meditative techniques learned during the weekly sessions. The one all-day (8-hour) retreat devoted to practicing the mindfulness techniques in silent awareness, generally a part of Kabat-Zinn’s program, was not included in the present study due to practical restrictions of participants’ schedules.

**Measures**

**Anxiety**

State anxiety was assessed by using Spielberger’s state-trait measure of anxiety, the State-Trait Anxiety Inventory (STAI). The state anxiety version of the STAI is a 20-item self-report measure that assesses situational feelings of anxiety. Each item consists of a self-descriptive statement rated on a 4-point Likert-type scale ranging from “not at all” to “very much so.” Ten of the 20 items are reverse scored. The state anxiety index yields a single summary score; the higher the score is, the greater is the anxiety level. The STAI has demonstrated convergent validity and internal consistency.

**Emotional control**

To measure control of expression of negative affect, the investigators used the Courtauld Emotional Control Scale (CECS). a 21-item instrument designed to measure the degree of control for feelings of anxiety, sadness, and anger. Responses are rated on a 4-point scale ranging from “almost never” to “almost always.” The higher the score, the greater is the tendency to control or suppress negative emotions, which, as mentioned previously, has been associated with poor health outcomes. Improved scores would be lower, indicating a movement toward expression. The CECS has good reliability (alpha of .95), as well as concurrent and discriminant validity.

**Coping styles**

Differences in coping tendencies were measured by the Problem-Focused Styles of Coping (PF-SOC) measure. This 18-item questionnaire assesses the degree to which adults use cognitive, behavioral, and affective strategies for coping. Three scales of coping are included: the reflective or thoughtful style, the reactive or impulsive style, and the suppressive or controlled style. Participant response is based on a 4-point scale ranging from “almost never” to “almost all of the time.” This measure has acceptable validity (concurrent and construct) and reliability with alphas in the range of .77.

**Health locus of control**

To measure locus of control of health-related behavior, the investigators used the well-known Multidimensional Health Locus of Control (MHLOC) scale. This 18-item instrument measures three dimensions of locus of control as it pertains to health with six items each: an internal health locus, powerful others locus, and chance locus of control. Responses are rated on a 7-point scale ranging from “strongly agree” to “strongly disagree.” Higher scores reflect greater externality; thus, improved scores would be lower, indicating a movement toward internality. This measure has documented acceptable reliability (alphas ranging from .83 to .86) and criterion validity.
RESULTS

Preliminary analyses

To identify potential covariates, the investigators conducted an analysis of variance (ANOVA) to compare the intervention and control groups on demographic variables. While age was not significantly related to group status, women in the control group were older (mean = 63.66; standard deviation [SD] = 6.53) than women in the intervention group (mean = 57.33; SD = 6.81). To test for categorical covariates, chi-square analyses were conducted with group status and religion, ethnicity, marital, and work status and education; no variables were found to be significantly associated with group status. Next, analyses were conducted to test whether the demographic variables were related to any of the dependent variables (anxiety, emotional control, health locus of control, or coping styles). Finally, the investigators tested for group differences on "before" levels of the dependent variables. No significant differences were found. Then the main analyses of repeated measures ANOVA to assess before and after scores of the dependent variables were conducted on both groups.

Primary analyses

To test for treatment effects, a series of repeated measures ANOVAs were conducted with group as the independent variable and each of the dependent variables before and after as the repeated measure.

Anxiety

Significant effects were observed for state anxiety, F (1,16) = 6.79, p < .01. Pre-intervention anxiety scores for the women in the MBSR group (mean = 37.88; SD = 10.91) were significantly lower after assessment (mean = 29.11; SD = 7.37). Little change was observed in the before (mean = 43.22; SD = 12.26) and after anxiety scores for those in the control group (mean = 43.55; SD = 13.29). As predicted, the findings indicate a statistically significant improvement in anxiety for the MBSR group at the end of the 8-week intervention.

Emotional control

Repeated measures analyses revealed that those who participated in the MBSR program, compared with the controls, showed a significant decrease in scores that reflect the tendency to suppress or control the expression of negative emotions, F (1,16) = 6.26, p < .02. As predicted, participants in the mindfulness program showed an improvement in expressing negative feelings from pre-intervention (mean = 62.11; SD = 4.85) to post-intervention (mean = 57.44; SD = 5.00) scores. The control group, in contrast, showed little change in scores from initial assessment (mean = 53.77; SD = 4.46) to 8 weeks later (mean = 55.55; SD = 6.04).

Coping

The first exploratory analyses were conducted for coping style. Each scale of the PF-SOC—reactive, reflective, or suppressive coping styles—was assessed separately for before and after differences by group. Analyses showed that there were no significant group mean differences in scores on the reflective or suppressive coping style before and after intervention. A significant effect was found, however, for the reactive style of coping by group, F (1,16) = 5.52, p < .03. Initial scores for women in the MBSR group (mean =
15.33; SD = 2.34) showed a statistically significant decrease at the end of the 8-week program (mean = 13.77; SD = 1.78) in the use of an impulsive, reactive coping style. In contrast, scores for women in the control group showed a slight increase before (mean = 14.11; SD = 5.34) to after assessment (mean = 16.22; SD = 3.86). The data indicate that at the end of the 8-week period those in the intervention group showed less reactive, immediate behaviors in response to coping with difficulties than before the study.

Health locus of control

Last, the second exploratory analyses regarding health locus of control did not yield any significant differences by group, indicating, at least in this sample, that completion of the MBSR program had no effect on the status of participants’ health locus of control.

DISCUSSION

The purpose of this small exploratory study was to assess the effectiveness of a mindfulness meditation-based program in reducing anxiety in women with heart disease. The results indicated that women in the intervention group showed improvement in their anxiety scores at the end of the 8-week training; that is, the anxiety scores for this group significantly decreased from the pre-treatment to post-treatment time period. Alternately, no change was demonstrated in the anxiety ratings for those in the control group from before assessment to after assessment at the end of the 8 weeks. Studies investigating the benefits of meditation in reducing symptoms of negative emotions such as anxiety in heart disease patients are mixed. For example, there are reports of significant positive effects, and no effects at the end of the training. The results of this pilot study support positive, significant benefits of a mindfulness-based meditation stress reduction and relaxation program.

The second major finding of this study was that the treatment group, in contrast to the control group, reported a significant decrease in the control of negative emotions at post-assessment measurement. Decrease in the behavioral tendency to suppress the expression of negative emotions is viewed as an improvement in health behavior given that emotional control is associated with illness and poor health outcomes. Whether this finding was due to an actual effect of the training or secondary to a reduction in negative feelings—as in the lowered anxiety scores—remains unclear and beyond the data of this study. However, this finding was seen for participants in the MBSR group, and not for those in the control group. Because this variable had unique importance in terms of gender, it is recommended that research be conducted with males.

In the exploration of coping, significant differences and changes in direction were found for the reactive style. The scores for the women in the intervention group decreased in this coping strategy while scores for the women in the control group actually increased at the end of the 8 weeks. No previous studies were found regarding the effects of meditation on this variable; therefore, interpretation of this finding is limited. The results do indicate, however, that following completion

Women in the intervention group showed improvement in their anxiety scores at the end of the 8-week training.
of the MBSR program, those participants reported a reduction in immediately reacting in response to difficulties. Physiologic studies could determine if such changes in reactive coping include a measurable decrease in physiologic reactivity and arousal, which could yield physical implications for patients with heart disease. Last, no significant differences were found for the variable of locus of control regarding health. Like coping, this was an exploratory analysis, and no previous studies were identified to compare the effects of meditation training. Future research is needed to add to the literature in this area.

Limitations of this study include a small sample size and volunteer participants who were mostly white middle- to upper-class females. These limitations reduce the generalizability of findings to other ethnic and socioeconomic samples as well as male cohorts. The inclusion of stress inventories and information about current stressors would have strengthened the study and likely aided in the interpretation of the results.

**CONCLUSION**

Post-intervention assessments revealed significant differences between the treatment and control groups on scores of anxiety, emotional control, and reactive coping in women diagnosed with heart disease. Based on these preliminary data, the MBSR program holds promise as a complementary therapy to traditional health care for individuals with heart disease.

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