

## CLINICAL REVIEW

# The Heart-Mind Connection

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Traditionally, medicine has treated the heart and the mind as separate, unrelated entities. While this is true in many respects, in others it is not. It has long been recognized that patients with heart disease are prone to psychological manifestations including depression and anxiety. What has been less recognized is how often psychological states such as stress, anxiety and depression may negatively affect the heart. Emerging data suggests a powerful heart-mind connection: the heart can affect the mind and it appears that the mind can affect the heart.

In 2004, a global case control study identified nine factors associated with risk for acute myocardial infarction.<sup>1</sup> These included widely known, established risk factors such as smoking, dyslipidemia, hypertension, and diabetes. But this analysis also included “psychosocial factors” such as stress at work or home, financial stress, stressful life events, depression and perceived ability to control life circumstances as powerful risk factors for acute myocardial infarction. Taken together, these psychosocial stressors accounted for 33% of the risk for myocardial infarction, suggesting a powerful heart-mind connection.

### Depression and Heart Disease

Scientists have long observed a relationship between depression and heart disease. Depression is almost 3 times more common in patients after myocardial infarction,<sup>2</sup> and adults with depression are 64% more likely to develop heart disease.<sup>3</sup> Individuals with depression are at increased risk for heart disease, and this association appears to be independent of traditional cardiovascular risk factors such as hypertension, smoking, obesity or diabetes. Most studies have also shown a dose-response relationship, with more severe depression associated with earlier and more severe cardiac events.<sup>4</sup> Both biological and behavioral mechanisms have been proposed to explain the link between depression and heart disease.<sup>5</sup> Biologic association with depression that may increase risk for heart disease include reduced heart rate variability,<sup>6</sup> factors associated with increased platelet stickiness such as plasma platelet factor 4,<sup>7</sup> and inflammatory markers such as C-reactive protein.<sup>8</sup>

While research has shown that treatment of depression improves quality of life, there has not yet been research that shows that treatment of depression improves cardiovascular outcomes.<sup>9,10</sup> The mainstay of secondary prevention, for such

patients remains aggressive risk factor modification, as researchers continue to explore depression - specific therapies that may also prevent heart disease.

### Stress and Heart Disease

There is an enormous amount of research on psychological stress and heart disease.<sup>11</sup> Certain patients are at particularly high risk for sudden death after psychological stress, such as patients with long QT syndrome,<sup>12</sup> but almost all patients may be susceptible to the effects of stress on the heart. Most of the data on the effects of stress on the heart evaluate acute stress such as that which occurs during natural disasters like earthquakes (Figure I). In a seminal paper, investigators investigated cardiac deaths that occurred surrounding the devastating earthquake in Northridge, California.<sup>13</sup> They reviewed coroner records for the week before the earthquake, the day of the earthquake, and the week following the earthquake. They compared cardiac deaths that occurred during 1994, the year of the earthquake and corresponding periods in 1991, 1992, and 1993. As seen in Figure I, on the day of the earthquake, there was a sharp increase in the number of cardiac deaths.

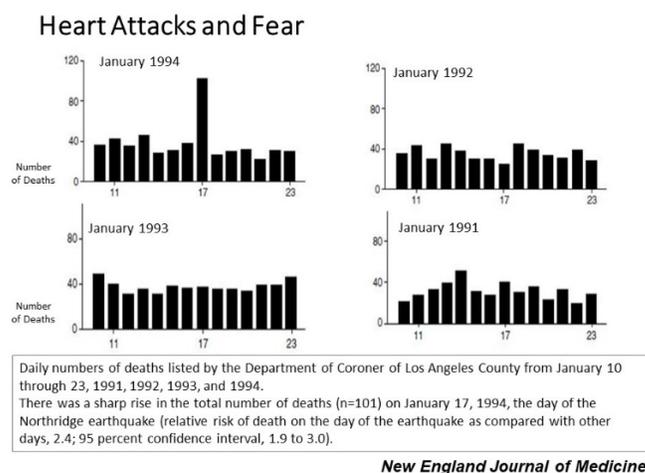


Figure 1.

More recent studies have focused on chronic stressors such as job stress, marital stress, and common life stressors. These suggest diverse pathophysiologic cardiac changes with stress

including sudden death, myocardial infarction, myocardial ischemia.<sup>11</sup> The INTERHEART investigators (1) evaluated the role of chronic stressors to incidence of myocardial infarction in a sample of ~25,000 people from 52 countries. Stress was defined as “feeling irritable, filled with anxiety, or as having sleeping difficulties as a result of conditions at work or at home.” After multiple adjustments, those who reported “permanent stress” at work or at home had more than a two-fold increased risk for developing a myocardial infarction.

To further evaluate the role of stress on the heart, investigators performed stress tests in 16 patients with known coronary artery disease. They performed both traditional exercise stress tests as well as “mental stress tests.” They compared myocardial blood flow before and after exposure to physical stressors (stationary bicycle riding) and before and after mental stressors (rapid mental arithmetic).<sup>14</sup> They found myocardial blood flow in response to exercise was decreased in all 16 patients with most having chest pain. With mental stress testing 75% of the patients showed decreased myocardial blood flow but only 33% had chest pain. So, the psychological stressor was almost as likely to cause decreased myocardial blood flow as physical stress, but was less likely to cause chest pain.

Although psychological stress is a risk factor for cardiovascular disease in both men and women, emerging data shows stress may affect women’s hearts differently. One of the clearest examples is with Takotsubo cardiomyopathy.<sup>15</sup> Takotsubo cardiomyopathy is a sudden, usually reversible form of cardiomyopathy which typically demonstrates an apical ballooning pattern. It is often called stress cardiomyopathy because many cases occur after a severe emotional stressor. Ninety percent of stress cardiomyopathy cases occur in women.

In order to understand the role of stress in heart disease, we evaluated urinary stress hormone levels in men and women. Urinary stress hormone levels provide an objective way to measure stress. We compared urinary stress hormone levels between men and women. The Multi-Ethnic Study of Atherosclerosis Stress study, provided measures of urinary epinephrine, norepinephrine, dopamine, and cortisol in a 24-hour collection period. The study cohort (n = 654) was 53% women. Women had statistically significant higher baseline levels of epinephrine, norepinephrine, dopamine, and cortisol.

### ***Our Approach***

#### **I. Acknowledging the heart-mind connection**

The cornerstone of our approach is to first acknowledge the heart-mind connection. We understand that optimally caring for our patient’s hearts, means trying to understand what psychosocial factors are impacting their lives. This approach begins by acknowledging the heart-mind connection, evaluating the intersection of the heart and mind, and intervening when possible, to improve psychosocial parameters that may be affecting heart health.

#### **II. Offering psychological support**

The field of Cardiac Psychology has become an important part of our individualized care for cardiac patients. We work in conjunction with a dedicated cardiac psychologist to develop an innovative program that addresses psychological support. We offer initial and follow up visits with our psychologist, with the initial visit being free of charge.

#### **III. Offering social support (support groups)**

In addition to offering professional psychosocial support, we believe peer support can be instrumental. We host a peer-led support group, guided by trained patient volunteers. This monthly support group provide women living with heart disease critical peer-to-peer support, information and encouragement.

#### **IV. Performing research on psychosocial stressors and the effects on the heart**

We perform research on the role of stress, mindfulness, and psychosocial support and heart disease. Acknowledging this powerful connection allows us to focus efforts on identifying and modifying the psychosocial stressors that may be contributing to cardiac risk.

#### **V. Integrating diet, physical activity, and mindfulness into clinical care**

We not only encourage our patients to incorporate positive lifestyle behaviors into their management plans, but we also proactively collaborate with dietitians, nutrition doctors, exercise physiologists, psychologists, and yoga therapists in caring for our patients. Integrating these lifestyle measures can benefit both psychological health and cardiovascular health.

### ***Conclusion***

The heart-mind connection is an important component of cardiovascular health that has often been overlooked. This connection may help explain some of the gender disparities in cardiovascular outcomes that have been documented in the literature. The care that women receive for cardiovascular disease often lags behind that of men and not surprisingly, women tend to have poorer outcomes from heart disease as compared to men. We believe that ignoring the heart-mind connection may be one reason that women’s outcomes are suboptimal. By performing research, we hope to better understand the heart-mind connection and investigate management strategies that may help cardiac patients. By providing education and incorporating heart-mind interventions into clinical care for patients with cardiovascular disease, we hope to improve cardiac care, quality of life, and cardiovascular outcomes.

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