The Relationship between Worry and Anger Rumination with Adjustment Problems to Heart Disease: The Mediating Role of Difficulties in Emotion Regulation

Mohammad Ali Besharat, Somayeh Ramesh
Department of Psychology, University of Tehran, Tehran, Iran

Abstract

Objectives: Heart disease is one of the chronic diseases that require adjustment and extensive changes in the patient’s life. The purpose of the present study was to investigate the mediating role of difficulties in emotion regulation on the relationship between anger rumination and worry with adjustment problems to heart disease. Methods: A total of 327 patients with coronary artery disease (138 women and 189 men) participated in this study. Participants were asked to complete the Penn State Worry Questionnaire, Anger Rumination Scale, Difficulties in Emotion Regulation Scale, and Adjustment to Illness Scale. Results: Worry, anger rumination, and difficulty in emotion regulation showed a negative correlation with adjustment to heart disease. The results of path analysis indicated that the relationship between worry and anger rumination with adjustment to heart disease was mediated by difficulties in emotion regulation. Conclusion: Based on the results of the present study, management of worry and anger rumination, as well as emotion regulation strategies, should be implemented in regular medical treatments for patients with heart disease.

Keywords: Adjustment, anger rumination, emotion regulation, heart disease, worry

Introduction

Chronic diseases are one of the most common causes of death in the world. A chronic illness is a health problem that lasts for at least 3 months, affects individual’s normal activities, and requires frequent hospitalizations, home health care, and/or extensive medical care. There are three main features of chronic diseases as follows: they are long-term diseases, they are not removed spontaneously and often are not curable completely. Heart disease is one of the chronic diseases. Cardiovascular disease (CVD) currently accounts for nearly half of noncommunicable diseases. CVD is the leading global cause of death, accounting for 17.3 million deaths per year, a number that is expected to grow to 23.6 million by 2030. Heart disease due to its chronic nature have a major impact on all aspects of an individuals’ life and adjustment with it is considered an important transition period in life.

After the medical diagnosis of heart disease, patients are confronted with new situations that challenge their habitual coping strategies. As a result, they must look for other coping strategies to adjust to their altered condition. de Ridder et al. introduce five components for successful adjustment to a chronic disease: successful implementation of adaptive tasks (such as adaptive disability, maintaining emotional balance, and maintaining healthy relationships); lack of mental impairment; low-negative emotions and high-positive emotions; have a proper functional status (e.g., occupation); and feelings of satisfaction and well-being in different areas of life. Therefore, a chronic disease requires care in various areas of physical, cognitive, emotional, social, behavioral, and interpersonal functioning and change in one area affects adjustment in other areas.

Multiple studies have shown that anxiety and worry are associated with a higher risk of incident CVD. There have

Access this article online

Quick Response Code: 
Website: www.heartmindjournal.org
DOI: 10.4103/hm.hm_7_18

How to cite this article: Besharat MA, Ramesh S. The relationship between worry and anger rumination with adjustment problems to heart disease: The mediating role of difficulties in emotion regulation. Heart Mind 2017;1:141-8.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

Address for correspondence: Prof. Mohammad Ali Besharat, Department of Psychology, University of Tehran, P. O. Box 14155-6456, Tehran, Iran. E-mail: besharat@ut.ac.ir
also been some studies confirming a relationship between anger and anger rumination with an increased risk of incident heart disease. It is anticipated that worry and anger rumination have a detrimental effect on the process of adjustment to heart disease. In this regard, one of the aims of the present study was to investigate the relationship between worry and anger rumination with levels of adjustment to heart disease. It is also important to ask whether the relationship between worry and anger rumination with levels of adjustment to heart disease is a simple relationship, or it is likely that another variable, such as emotion regulation, will affect this relationship. To answer this question, the second aim of the present study was to investigate the mediating role of difficulties in emotion regulation on the relationship between worry and anger rumination with levels of adjustment to heart disease.

Worry is defined as repeated thoughts about possible future threats, risks, and uncertainties. Worry as a primary cognitive characteristic of anxiety, is a chain of thoughts and images, negatively affect-laden and relatively uncontrollable. Individuals with high levels of worry tend to interpret ambiguous situations as a threat, and worry would lead to an increased negative emotions, the arousal level and activation of the nerves and the glands. Worry strongly associates with rumination and also has a strong relationship with anxiety, generalized anxiety disorder, and depression. Worry plays a role in causing a wide range of psychological problems. Worry leads to increased distress, interpersonal conflict, and impaired concentration and sleep. Accordingly, the worry is a vague phenomenon about future events and fear of the unknown that can lead to failure to cope.

In coronary heart disease (CHD), stress and worry can increase the risk of major cardiac events and mortality. Research evidence of nonheart disease patients revealed that worry was associated with increased activity of the autonomic nervous system and cardiac activity such as decreased heart rate variability. Verkuil et al. also revealed that worry, as well as rumination, predicted delayed cardiac recovery (reviewed in). On the other hand, it has been shown that anxiety is associated with increased risk of CVD. Having said that worry is a distinctive feature of generalized anxiety disorder, as well as the sole impact of the worry on cardiac activities, one can infer that worry might be a distinguished factor predicting problems of adjustment to heart disease.

Anger rumination is one of the variables that can affect adjustment to cardiovascular. Anger is a negative emotional state that includes increased physical arousal, blaming thoughts, and a tendency to aggressive behavior. Evidence confirmed that anger increases the risk of CHD. Anger is significantly associated with a higher risk for CHD in healthy individuals and poorer outcomes in patients with existing heart disease. Anger rumination is closely associated with anger. Anger rumination is preservative thinking about a personally meaningful anger-inducing event and is a risk factor for aggression. Similar relationship between anger rumination and enhanced risk of cardiac diseases have been also confirmed. According to available evidence, anger rumination is associated with multiple maladaptive consequences such as physiological arousal, increased endothelin-1 in patients with coronary artery disease, and increased risk of myocardial infarction and CHD, as well as the severity of coronary artery stenosis. It is supposed that cognitive representations of stress in the form of anger rumination and worry are the underlying cause of cardiovascular reactions.

Different aspects of emotional functioning including evolutionary, social-communicative, and decision-making have been evidenced. Research also showed the influential impact of emotions in health and disease. Emotion regulation refers to the capacity to monitor, evaluate, understand, and modify emotional responses in a manner that is useful for normal functioning, and generally involves a process through which individuals express their emotions. Emotion regulation and maintaining and modifying the various components of emotional experience is a fundamental issue for human performance, health, and well-being. Emotion regulation skills also play an important role in preventative interventions and psychological treatments in the context of various types of problems and psychological disorders.

Emotions are managed and regulated through unconscious cognitive processes such as selective attention, distortion of memory, denial and projection, or through more cognitive processes such as self-blame, other-blame, rumination, and catastrophizing. Emotion regulation strategies may be adaptive or maladaptive. Maladaptive emotional regulation strategies play a major role in the formation or continuation of psychological disorders.

Emotions play an important role in human life, and emotional disturbance leads to pathological consequences. The DSM diagnostic criteria suggests that >50% of psychological disorders are associated with emotional regulation deficits, a figure that is much more pronounced in personality disorders. Difficulties in emotion regulation reflect an inability to understand, accept, and manage emotional experiences. Ability to emotional regulation is a predictor to health and well-being and difficulties in emotion regulation associated with negative consequences including symptoms of depression, anxiety, substance abuse, posttraumatic stress disorder, eating disorders, aggression, and suicidal thoughts.

As mentioned earlier, an unanswered question with regard to the present study is that whether the relationship between worry and anger rumination with adjustment problems is a simple relationship or it is likely mediated by emotion regulation. Probing such question is important because of (a) a majority of psychological disorders are influenced by emotional regulation deficiency; (b) worry and anger rumination, as negative emotions, are proven to have a significant role in mental and physical health; and (c) to the best of our knowledge, no
studied has probed this important question, at least in patients with heart disease. The main aim of the present study, therefore, was to investigate the mediating role of difficulties in emotion regulation on the relationship between worry and anger rumination with levels of adjustment to heart disease.

**Methods**

**Participants**

Using a purposeful sampling method, 327 cardiovascular patients (189 men [58%], 138 women [42%]) were recruited from a local heart hospital. Including criteria were suffering from CVD, being literate, not suffering from other serious medical diseases except coronary artery disease, not suffering from a major psychiatric disorder and not having substance dependence. The participants’ age ranged from 31 to 63 years old (mean = 52.39 years, standard deviation [SD] = 6.23). The mean of marital duration was 28 years (SD = 9.12), and the mean of disease duration was 2.38 years (SD = 1.75). 35% (n = 115) were business professionals, 14% (n = 46) were employees, 15% (n = 50) were retired, 40% (n = 114) were unemployed, and 6% (n = 2) left their job status unknown. 11.5% (n = 38) had elementary education, 34.5% (n = 112) had junior high school education, 31% (n = 101) held a high school diploma, 6% (n = 20) held an associate’s degree, 11.5% (n = 37) had a bachelor degree, 4% (n = 12) had a master or doctorate degree, and 1.5% (n = 7) left their educational status unknown. Economic status of the participants revealed that 27.5% (n = 90) had a low level of economic status, 58.5% (n = 191) had a middle level, 13% (n = 42) had a high level, and nearly 1% (n = 4) left their economic status unknown. The study was approved by the Department of Psychology, University of Tehran. The participants received no particular incentive.

**Measures**

**Penn State Worry Questionnaire**

Assessing pathological worry, the Penn State Worry Questionnaire (PSWQ) consists of 16 items which are scored on a 5 point scale, ranging from 1 (not at all typical) to 5 (very typical). The internal consistency of the PSWQ has been reported regarding the Cronbach’s alpha coefficients from 0.88 to 0.95. The test-retest reliability of the questionnaire has been verified from 0.74 to 0.93. Structural, convergent, and discriminant validity of the PSWQ were calculated by the simultaneous implementation of the Beck Anxiety Scale, Stress Anxiety Depression Scale, positive and negative affective schedule, and Mental Health Scale for patients. These results confirmed the convergent and differential validity of the PSWQ. In the present study, the internal consistency coefficient was 0.83.

**Anger Rumination Scale**

The Anger Rumination Scale is a 19-item self-report measure of the tendency to think about current anger-provoking situations and to recall past anger experiences. Each item is rated on a 4-point Likert scale anchored by 1 = almost never to 4 = almost always. Adequate psychometric properties of the scale have been reported in several studies. Adequate psychometric properties of the scale have been reported for the English, the Chinese, and the Farsi versions. For the present study, internal consistency coefficients was 0.87.

**Difficulties in Emotion Regulation Scale**

The Difficulties in Emotion Regulation Scale (DERS) is a 36-item self-report measure of deficiency in emotion regulation. The items are scored on a 5-point scale ranging from 1 (almost never) to 5 (almost always). Psychometric properties of the DERS consisting of internal consistency, test-retest reliability, and construct and predictive validity were calculated and confirmed in several studies. The internal consistency of the whole scale was 0.89 in the present study.

**Adjustment to illness scale**

The Adjustment to Illness Scale (AIS) is a 12-item measure developed to assess levels of adjustment to a medical illness. Each item is rated on a 7-point Likert scale ranging from 0 (absolutely incorrect) to 6 (absolutely correct). Psychometric properties of the AIS were supported in samples of patients with medical conditions. The internal consistency of the AIS reported from 0.79 to 0.87. Convergent and discriminant validity of the AIS was confirmed by simultaneous implementation of measures of anxiety, depression, psychological well-being, psychological distress, and positive and negative emotions. The predictive validity of the AIS was calculated by comparing the adjustment scores between normal and patient groups. The results showed that the adjustment score is sensitive to differences between the two groups. Cronbach’s alpha coefficient was 0.79 for the present study.

**Intensity of cardiovascular disease**

Intensity of CVD in each patient was scored using the modified Gensini method. In this scoring system, a cumulative numeric score is determined by the degree of luminal narrowing and the anatomical location of each stenosis. The modified Gensini score has been described and validated. The most severe stenosis in each of eight coronary segments was graded from 1 to 4 (1 = 1% to 49% lumen diameter reduction; 2 = 50% to 74% stenosis; 3 = 75% to 99% stenosis; 4 = 100% occlusion) to give a total score of 0–32. This score therefore gives a measure that combines both the severity and extent of coronary atherosclerosis.

**Procedure**

After receiving the hospital management approval and support, necessary data about CVDs were collected by consulting with cardiovascular specialists. All participants signed an informed consent document before performing the research procedure. After explaining the subject and the purpose of the research to the participants and expressing their tendency, they completed the questionnaires. All participants were assessed individually. The patients completed a paper-and-pencil set of measures. All data were treated confidentially with full anonymity. The order of measures was randomized for participants.
**Statistical analysis**

The purpose of this study was to investigate the mediating role of difficulties in emotion regulation on the relationship between anger rumination and worry with adjustment problems to heart disease. Mediating analyses were performed conducting a path analysis to test the hypothesized model. Analyses were performed using SPSS Inc., Released 2009. PASW Statistics for Windows, Version 18.0. Chicago: SPSS Inc., Arbuckle, J. L. (2013). Amos 22.0 User’s Guide. Chicago: IBM SPSS was used for performing structural equation modeling (SEM) analysis and the path analysis to calculate the standardization coefficient, the direct and indirect effects among all of the variables and the fitness of the proposed model. To keep the effect of sociodemographic and clinical variables under control, we used the residual variance of adjustment problems to heart disease at adjusted for those variables with a significant relationship.

**RESULTS**

The means and standard deviations of all the study variables, as well as bivariate correlation coefficients between variables are presented in Table 1. The results showed a significant negative correlation between anger rumination, worry, and difficulties in emotion regulation with adjustment to heart disease ($P < 0.01$).

Using the residual variance of adjustment to heart disease adjusted for duration of illness and Gensini score (intensity of CVD), the hypothesized model was tested. In Figure 1, the paths of the hypothesized model have shown the mediating role of difficulties in emotion regulation on the relationship between anger rumination and worry with adjustment problems to heart disease. In the initial model, the route of anger rumination path coefficient to adjustment problems to heart disease was eliminated due to the lack of this path.

To investigate the mediating role of difficulties in emotion regulation on the relationship between anger rumination and worry with adjustment problems to heart disease, path analysis was performed. Figure 2 shows standardized path coefficients for the hypothesized model. According to the results of path analysis, the coefficients of all paths were significant.

Regression coefficients of direct impact are presented in Table 2. Indirect impacts of the structural equation model are presented in Table 3. The results of the meditational model presented in Table 3 indicated that anger rumination ($\beta = -0.06; SE = 0.021$) and worry ($\beta = -0.12; SE = 0.036$) have an indirect impact via difficulties in emotion regulation on adjustment problems to heart disease. According to the results of the SEM, difficulties in emotional regulation mediate the role of worry and anger rumination on adjustment problems to heart disease, as hypothesized. The results support the hypothesized indirect relationships of worry and anger rumination with adjustment problems to heart disease mediated by difficulties in emotional regulation ($P < 0.05$).

Fit indices for the measurement model are shown in Table 4. According to the conventional criteria, $\chi^2$/df <2; Goodness of Fit Index (GFI) >0.90, Adjusted GFI (AGFI) >0.85, Comparative Fit Index (CFI) >0.95, and root mean square error of approximation (RMSEA) <0.08 indicate an acceptable fit; GFI >0.95, AGFI >0.90, CFI >0.97, and RMSEA <0.05 indicate a good fit.[79] The results of Table 4 indicate that the model has a good fit to the data.

---

**Table 1: Mean scores, standard deviations, and zero-order correlations of demographic and clinical variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>52.39</td>
<td>6.23</td>
<td>0.23**</td>
<td>-0.04</td>
<td>-0.01</td>
<td>-0.03</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>0.04</td>
<td>0.07</td>
<td>0.07</td>
<td>0.04</td>
<td>0.26**</td>
<td>0.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td>0.02</td>
<td>0.04</td>
<td>0.02</td>
<td>0.06</td>
<td>0.01</td>
<td>0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic status</td>
<td>0.00</td>
<td>-0.05</td>
<td>0.11**</td>
<td>0.07</td>
<td>0.00</td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration of illness</td>
<td>3.26</td>
<td>2.73</td>
<td>0.09</td>
<td>0.09</td>
<td>0.10</td>
<td>0.14*</td>
<td>0.13*</td>
<td></td>
</tr>
<tr>
<td>Gensini score</td>
<td>15.07</td>
<td>5.13</td>
<td>0.65**</td>
<td>0.36**</td>
<td>0.58**</td>
<td>-0.51**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difficulty in emotional regulation</td>
<td>112.25</td>
<td>28.78</td>
<td>0.48**</td>
<td>0.66**</td>
<td>-0.64**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anger rumination</td>
<td>46.54</td>
<td>12.47</td>
<td>0.37**</td>
<td>-0.33</td>
<td>0.37**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worry</td>
<td>54.38</td>
<td>12.14</td>
<td>-0.60**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

$^*P<0.05; \quad **P<0.01. \quad SD=\text{Standard deviation}$

---

**Figure 1:** The direct paths for the hypothesized model mediating the role of difficulties in emotion regulation on the relationship between anger rumination and worry with the adjustment problems to heart disease

**Figure 2:** Standardized path coefficients for the mediating role of difficulties in emotion regulation on the relationship between worry and anger rumination with adjustment problems to heart disease
We used the bootstrapping procedure outlined by Preacher and Hayes\[80\] to test indirect effects. This procedure uses a bootstrapping resampling technique to create bias-corrected 95% confidence intervals (95% CI) for the indirect effects of the mediating variable. If the interval does not include zero, then the effect is significantly >0 and considered to be a good mediator for the model. About the relationship between worry with adjustment problems to heart disease, the bootstrapped estimate of the indirect effect of difficulty in emotion regulation was significantly different than zero (95% CI between −0.3094 and −0.0199), indicating that difficulty in emotion regulation was a good mediator of this relationship. About the relationship between anger rumination with adjustment problems to heart disease, the bootstrapped estimate of the indirect effect of difficulty in emotion regulation was significantly different than zero (95% CI between −0.3518 and −0.0960), indicating that difficulty in emotion regulation was also a good mediator of this relationship.

**DISCUSSION**

The present study had two main objectives as follows: (1) investigating the relationship between worry and anger rumination with adjustment to heart disease, (2) examining the mediating role of difficulties in emotional regulation on the relationship between worry and anger rumination with adjustment to heart disease. The first objective is a new exploration of the association of worry and anger rumination with adjustment to heart disease. The second aim is also a novel exploratory study of the meditational role of emotion regulation which clarifies the mechanisms which explain how worry and anger rumination might be related to the problems of adjustment to heart disease. Worry showed a significant negative association with adjustment to heart disease. This result, which is consistent with the findings of previous research,\[6,9,11\] can be explained in terms of several possibilities. Worry, as the main characteristic and the cognitive component of anxiety,\[18\] such as negative and threatening repeated thoughts and imaginations,\[17\] undermines the Person’s adjustment to disease by increasing negative emotions.\[21\] Worry can also affect adjustment to disease by exacerbating rumination about stressors\[22\] or through increasing negative emotions.\[23\] Worry is associated with a number of psychiatric disorders such as anxiety,\[23\] general anxiety disorder,\[24\] and depression.\[81\] Worry, therefore, increases distress and helplessness,\[21,27\] Distress and helplessness undermine the patient’s ability to cope with stress and reduce the level of person’s adjustment to disease.\[26\]

The findings of the present study showed that anger rumination had a significant negative correlation with adjustment to heart disease. This finding is consistent with the results of previous studies on the relationship between anger\[6,10,12,81-83\] and anger rumination\[14,15,40\] with heart diseases. These results can be explained according to several probabilities. Anger rumination leads to continued and increased anger and aggressive behavior\[24,36,37\] thereby increasing negative emotional and psychological distress.\[42,84\] Negative emotions as well as psychological distress, in turn, can reduce the person’s adjustment to disease. Anger rumination through perpetuating stress responses\[40\] may intensify physiological arousal.\[39\] Aggressive behavior,\[43\] meanwhile decrease psychological well-being,\[37\] factors that can negatively affect adjustment to disease.

The results of the present study showed that difficulties in emotion regulation had a mediating role on the relationship between worry and anger rumination with adjustment to heart disease. These are in line with the findings of previous research\[53,66,85-87\] and can be explained according several possibilities. Worry as one of the main characteristics of anxiety disorders\[24\] can exacerbate anxiety and psychological distress. In such a situation, the process of emotional regulation is disturbed. Disturbance in emotion regulation may diminish the individual’s ability to understand and accept emotional experiences.\[53\] More serious deficiency in the process of emotion regulation in the case of heart disease may undermine coping strategies\[54\] and result in poor adjustment to the disease.

Rumination activates negative cognitions\[88,89\] and results in increased negative emotion.\[89\] Emotional and cognitive distress disturbs the organization of person’s emotions and cognitions and makes it difficult for a person to regulate emotional processes. The difficulty in emotion regulation is associated with a range of emotional disorders, including anxiety and...
depression.\textsuperscript{[89-91]} Emotional distress disables the person in the face of stress related to heart disease. The disability, in turn, reduces adjustment to disease. The higher levels of negative emotions resulting from rumination\textsuperscript{[92]} may cause loss control of automatic thoughts\textsuperscript{[93]} In situations where a person has a life-threatening illness, disability to control thoughts will lead to anger rumination\textsuperscript{[84]} Anger rumination is also associated with increased negative emotions, suicidal thoughts, poor adaptation, high blood pressure, and increased aggression.\textsuperscript{[84]}

If emotion regulation strategies are considered as strategies for coping with stress,\textsuperscript{[94,95]} one can imagine that worry and anger rumination negatively affect the process of coping with stress.\textsuperscript{[96,97]} Emotion management and regulation are modulated through the use of coping strategies. These strategies may be adaptive or maladaptive, such as self-blaming, other blaming, focusing on thought/rumination, and catastrophizing.\textsuperscript{[61]} Maladaptive cognitive emotion regulation strategies undermine the power of emotion inhibition and management. The weakness in the negative emotion inhibition and management related to stress caused by heart disease can reduce the patient’s ability to adjustment to the disease.

Implications
Findings of the present study may have important implications. First, the findings of the present study confirmed the assumption of emotion-based theories of adjustment to heart disease. From this point of view, difficulties in emotion regulation may play a crucial role in adjustment to heart disease. Second, the mediating role of emotion regulation strategies on the association of worry and anger rumination with adjustment to heart disease found in the present study can serve the integrity of assumptions of biopsychosocial models in medical care and treatments. Findings may contribute to the existing literature on unified programs for the treatment of medical patients. Third, emotion regulation strategies, either adaptive or maladaptive, might be considered as the main explaining mechanisms by which worry and anger rumination influence adjustment to a threatening disease. This particular finding is the unique contribution of the present study to the field of health psychology.

Limitations
The present study has several limitations worth noting. First, the cross-sectional design of the study does not allow to draw conclusions about the directions of causality between the research variables. Future longitudinal studies need to be conducted to clarify this important issue. Second, the sampling method was based on volunteer participation and nonprobability sampling from limited settings. Therefore, generalizing the findings should be made with caution. Third, lack of comprehensive control over patients’ demographic variables, life styles, daily stresses, food diets, and weights may have a confounding influence on the study results.

Acknowledgment
The authors would like to acknowledge the financial support of the University of Tehran for this research under grant number 5106003/1/75.

Financial support and sponsorship
This study was supported by research grant from the University of Tehran.

Conflicts of interest
There are no conflicts of interest.

REFERENCES
Besharat and Ramesh: Emotions, emotion regulation, and adjustment to heart disease


Besharat and Ramesh: Emotions, emotion regulation, and adjustment to heart disease


