Health Psychology
2006, Vol. 25, No. 3, 255–266

0278-6133/06/$12.00 DOI: 10.1037/0278-6133.25.3.255

Medical Students' and Residents' Gender Bias in the Diagnosis, Treatment, and Interpretation of Coronary Heart Disease Symptoms

Gabrielle R. Chiaramonte and Ronald Friend
Stony Brook University, State University of New York

Two competing hypotheses explaining gender bias in cardiac care were tested. The first posits that women's coronary heart disease (CHD) symptoms are simply misinterpreted or discounted. The second posits that women's CHD symptoms are misinterpreted when presented in the context of stress. In two studies, medical students and residents randomized to 2 (male vs. female) $\times$ 2 (stress vs. nostress) experiments read vignettes of patients with CHD symptoms and indicated their diagnosis, treatment, and symptom origin interpretation. Both studies disconfirmed the first hypothesis and strongly supported the second. Only when stress was added did women receive significantly lower CHD diagnoses and cardiologist referrals than men and did the origin interpretation of women's CHD symptoms (e.g., chest pain) shift from organic to psychogenic. Neither participants' gender nor their attitude toward women influenced assessments.

Keywords: gender bias, heart disease, women, stress, anxiety

In the United States, cardiovascular disease (CVD) claims almost as many lives each year as the next five leading causes of death combined. Coronary heart disease (CHD) is the most common type of CVD, and it is the single largest cause of death for men and women. In women, the onset of CHD lags behind men by approximately 10 years, and CHD rates in women after menopause are 2–3 times those of women before menopause. Despite this seeming advantage, every year since 1984 CVD has claimed the lives of more women than men. Moreover, although men's CVD mortality rates have declined steadily since 1979, women's mortality rates have increased, with a dramatic widening of the gap between men and women since 1989 (American Heart Association, 2002). A greater emphasis on the prevention of risk factors, as well as the development of refined diagnostic techniques and improved medical and surgical treatments, has certainly contributed to the mortality decline in men. But, for reasons that are not clear, women receive less aggressive diagnosis and treatment of heart disease than men.

Gabrielle R. Chiaramonte and Ronald Friend, Department of Psychology, Stony Brook University, State University of New York.

Ronald Friend is now at the Department of Psychology, Portland State University, Portland, Oregon.

This article is based on a master's thesis by Gabrielle R. Chiaramonte under the supervision of Ronald Friend. We gratefully acknowledge and thank Camille Wortman and Marvin Goldfried for their thoughtful advice and support throughout these studies. We thank Arnold Jaffe, Alex Selioutski, and Olga Selioutski for their invaluable assistance with preliminary participant recruitment and data collection. We also thank Cynthia Mohr for her comments, Arthur Aron for his advice concerning the write up of the results, and Tara West for her helpful comments on an earlier version of this article.

Correspondence concerning this article should be addressed to Gabrielle R. Chiaramonte, Department of Psychology, Stony Brook University, State University of New York, Stony Brook, NY 11794-2500. E-mail: gabrielle.chiaramonte@stonybrook.edu

The strongest evidence of a gender bias appears to be in the use of diagnostic testing and referral for cardiac care (e.g., Ayanian & Epstein, 1991; Heston & Lewis, 1992; Jaglal, Slaughter, Baigrie, Morgan, & Naylor, 1995; Lauer, et al., 1997; Roger et al., 2000; Shaw et al., 1994; Steingart et al., 1991). Once a patient suffers a myocardial infarction (MI) or once a diagnosis of CHD is validated with diagnostic testing, most studies (e.g., Ayanian & Epstein, 1991; Ghali et al., 2002; Leape, Hilborne, Bell, Kamberg, & Brook, 1999; Maynard, Beshansky, Griffith, & Selker, 1996; Mehilli et al., 2002; Steingart et al., 1991; Travin et al., 1997), but not all studies (e.g., Barron et al., 1998; Tobin et al., 1987) have found no significant gender differences in the treatment of heart disease. One challenge therefore is to understand and reduce factors that delay health care providers' identification and diagnosis of women's heart disease symptoms.

Despite the many studies that have reported a gender bias in the medical care of patients with CHD, few studies have examined the psychological processes underlying the bias; by understanding these processes, techniques aimed at reducing gender bias can be developed. Research by Martin, Gordon, and Lounsbury (1998) and our own research (Chiaramonte & Friend, 1996, 1999, 2004) is the only research that has specifically examined the psychological mechanisms underlying gender bias in the medical care of heart disease patients. Although Martin et al.'s (1998) main focus was on laypersons, they generalized their findings to health care providers by including one sample of physicians in their four-sample study. Before presenting our data, we discuss Martin et al.'s theory and research.

The Heuristic or Stereotype Model

Martin et al. (1998) argued that the prevalent stereotype that associates men, but not women, with heart disease produces a gender bias in cardiac care. The influence of this stereotype, they proposed, leads laypersons and health care providers to use gender as a heuristic or decision rule so that symptoms such as chest pain and shortness of breath are attributed to cardiac causes when presented by men but not by women. Among laypersons this produces a delay in cardiac symptom recognition and treatment seeking, whereas among health care providers it leads to the misinterpretation or discounting of women's cardiac symptoms. Martin et al. conducted four studies investigating how information about gender and concurrent stressors influence the attribution of symptoms to cardiac causes. In a between-subjects design, participants read about a patient with symptoms typical of an MI; patient gender and stress (low stress vs. high stress) were manipulated, and participants were asked to indicate whether they believed the patient was experiencing cardiac problems (*cardiac attribution*). Martin et al.'s primary hypothesis was that participants would be more likely to attribute symptoms to cardiac causes when the patient was male rather than female. On the basis of research by Leventhal and colleagues, who demonstrated that symptoms occurring during challenging circumstances tend to be attributed to stress rather than disease (e.g., Baumann, Cameron, Zimmerman, & Leventhal, 1989), Martin et al. also hypothesized that the presence of high stress would produce cardiac symptom discounting in both male and female patients. Finally, the authors hypothesized that gender and stressor information might combine to have unspecified cumulative effects of either an additive or interactive nature.

Martin et al.'s (1998) results regarding the effect of gender on cardiac attributions were not consistent. Out of the four studies they conducted, only one with undergraduate students showed the predicted gender main effect (Study 2). Notably, none of the studies showed any evidence of a gender bias in the low-stress conditions; in these conditions, men and women received similar cardiac attributions. The heuristic or stereotype argument is based solely on the perceived lack of CHD in women as compared with men; had gender been used as a heuristic or decision rule in making cardiac attributions, a gender difference should have been observed in both the low-stress and the high-stress conditions. With regard to symptom discounting in high-stress patients, no evidence was found that high stress produced cardiac symptom discounting in men, whereas post hoc tests showed that high-stress women consistently received lower cardiac attributions than the combined average of the other three groups (i.e., low-stress women, low-stress men, and high-stress men). Martin et al.'s results thus suggest that high stress differentially influenced the assessment of male and female patients' cardiac symptoms.

The Contextual or Shift-in-Meaning Model

Our research (Chiaramonte & Friend, 1996, 1999, 2004), which has focused on health care providers' responses, has examined the psychological processes underlying gender bias in CHD assessment from a different theoretical framework. We have proposed that the bias is not due to the stereotype that associates men with CHD but to a more complex interaction of factors that occur in the patient assessment situation. When evaluating patients, health care providers use processes similar to those involved in forming impressions of persons, as first developed by Solomon Asch (1946; 1952/1987). Asch argued that in forming impressions of persons, the individual qualities or characteristics presented are organized into a single, relatively unified impression. Because they are evaluated not individually but as they relate to one another, once two or more characteristics are presented together, they enter into a dynamic interaction with one another so that identical characteristics placed in a different context may cease to be identical. The characteristics also do not possess the same weight: Some are *central* and thus drive the development of the unified impression, whereas others are *peripheral* and are influenced and sometimes redefined by the central characteristics. Moreover, the position of a characteristic or quality may change so that it is evaluated as central in one situation and as peripheral in another situation.

In patient assessment, relevant facts include the patient's gender and age, the presenting symptoms, objective measurements such as blood pressure, and other factors such as stress symptoms the patient may be experiencing. These enter into a dynamic interaction with one another until a single, unified patient impression is formed. The entire impression may change, however, by simply changing one or more characteristics. In the case of patients presenting cardiac symptoms, the concurrent presentation of stress symptoms may be more likely to produce a gender bias in CHD assessment than the presentation of cardiac symptoms without stress. We propose that stress and psychological symptoms common with stress (e.g., anxiety) are central to the assessment of women and that they influence the interpretation of accompanying cardiac symptoms. By contrast, for reasons to be outlined below, we propose that cardiac symptoms are central to the assessment of men, even when these are presented in the context of stressful life events.

The Central Role of Stress Symptoms in the Assessment of Women

Supporting the central role of stress and anxiety in the assessment of women is research showing that women generally present more anxiety symptoms than men (e.g., Pigott, 2003; Robbins, Spence, & Clark, 1991), that they present more anxiety in medical situations (e.g., Schag & Heinrich, 1989), and that they are more likely than men to discuss stressors and emotional issues with their physicians (Kroenke & Spitzer, 1998; Wool & Barsky, 1994). Further, women are more likely than men to be diagnosed with psychological disorders that present with symptoms also common in heart disease. Panic disorder, for example, is characterized by the sudden onset of cardiorespiratory and physiological symptoms such as shortness of breath, tachycardia, nausea, and sweating, and is two to four times more prevalent in women as it is in men (Eaton, Kessler, Wittchen, & Magee, 1994; Sheikh, Leskin, & Klein, 2002). These factors work to give greater importance to women's stress and psychological symptoms and may affect the interpretation of cardiac symptoms so that these are perceived as a manifestation of the stress and not as symptoms of CHD. The overlap of CHD symptoms with symptoms of stress and anxiety disorders makes this shift in meaning possible.

The Central Role of Cardiac Symptoms in the Assessment of Men

Cardiac symptoms remain central to the assessment of men because of at least four factors discussed in Martin et al. (1998). First, although heart disease is also the leading cause of death for women, it is more common in younger men; men may thus be overrepresented among cardiology patients. Second, until recently, data collected and information available about heart disease were based almost exclusively on men, creating the impression that heart disease occurs mostly in men. The third factor is related to the image people have of the CHD patient influenced by Friedman and Rosenman's (1974) characterization of the aggressive, competitive, Type-A man. Finally, health care providers may convey to laypeople that women's hormones protect them from heart disease. Martin et al. argue that these factors produce the stereotype associating men, but not women, with heart disease and that it is this stereotype that leads to cardiac symptom discounting in women. We instead propose that these factors work to maintain the centrality of men's cardiac symptoms, even when presented in the context of stressful life events. For men, stress symptoms may in fact be viewed as additional information (e.g., risk factor) and may augment and affirm, rather than detract from, the cardiac evaluation. Thus, the main issue in the misdiagnosis of women is not the perceived incidence or prevalence of CHD as in the heuristic or stereotype model but the centrality given to women's stress and psychological symptoms.

A major purpose of the current studies was to test two competing hypotheses to clarify the theoretical basis and conditions responsible for producing a gender bias in the medical care of heart disease patients. The first hypothesis, which concurs with the heuristic or stereotype model (Martin et al., 1998), suggests that cardiac symptoms in women are misinterpreted or discounted because heart disease is stereotypically perceived as a man's disease. According to this hypothesis, the presence of stress symptoms is immaterial to gender bias: Women's cardiac-related symptoms are simply misinterpreted or discounted even when presented clearly and in the absence of stress. We refer to this hypothesis as the *simple association hypothesis* because it suggests that the mere association of female gender with cardiac symptoms is sufficient to produce a gender bias. The second hypothesis, identified as the *contextual hypothesis,* is predicated on the dual assumption that a change in the meaning of cardiac symptoms, from organic to psychogenic in origin, underlies gender bias and that the simple association of female gender with cardiac symptoms is not sufficient to produce a gender bias. In Aschian terms, for women—but not for men—cardiac symptoms undergo a meaning change when presented in the context of stressful life events.

To test the two hypotheses, we developed a vignette of a patient with CHD symptoms and varied the patients' gender (male/female) and the context of how symptoms were presented (with/without stress symptoms), thus creating four variants. In a between-subjects design, Study 1 examined the influence of patient gender and symptom context on advanced medical students' and residents' CHD diagnosis and cardiologist referral. In contrast to the simple association hypothesis of a straightforward gender bias, the contextual hypothesis argues that the simple association of female gender with CHD symptoms is not sufficient to produce a gender bias and predicts a bias only when CHD symptoms are presented in the context of stressful life events. The contextual hypothesis thus predicts an interaction between patient gender and symptom context, so that women presenting concurrent CHD and stress symptoms (e.g., anxiety) would be least likely to receive a CHD diagnosis and cardiologist referral. As well as replicating Study 1, Study 2 examined advanced medical students' interpretation of cardiac symptoms. In line with the contextual hypothesis, we predicted that cardiac symptoms (e.g., chest pain) presented without stress symptoms would be interpreted as organic in origin in both men and women, whereas the presentation of cardiac symptoms in the context of stress would shift the interpretation from organic to psychogenic in origin for women but not for men. In sum, the objectives of this research were to identify the conditions for producing a gender bias in medical practitioners' cardiac assessments and to examine the theoretical basis for the bias by testing two alternative explanations.

Study 1

Study 1 tested the simple association and contextual hypotheses by investigating how information about patient gender and concurrent stress symptoms would influence advanced medical students' and residents' diagnosis and referral of patients presenting CHD symptoms.

Method

Participants. Fifty-six participants from a university hospital in New York State were recruited at the beginning of a clinical seminar for a study ostensibly on memory and symptom recall. Forty-five were medical students (51% women, 49% men) in their 3rd or 4th year of medical school and 11 were physicians (46% women, 54% men) in their 1st or 2nd year of residency. All participants had clinical exposure to patients; the residents were regularly seeing patients and the medical students had completed at least one clinical rotation ($M = 3.70$, $SD = 1.90$). Participants ranged in age from 23 to 45 years, with a mean of 27.56 years ($SD = 6.26$). Ethnic or racial origin varied as follows: 63% White/Caucasian, 6% African American, 18% Asian, 6% Hispanic, and 6% unspecified.

Design and procedure. To reduce demand characteristics, we told participants that they would be participating in two unrelated studies: a memory study examining how the format of symptom presentation influences symptom recall and a study examining medical professionals' attitudes. Participants were told that the memory study presented a patient's symptoms in a videotaped, a written, or an audiotaped format and that they had been randomly assigned to receive the written format. In fact, all participants received a written vignette. The vignette included the patient's report of symptoms, objective patient information, and a statement describing the patient's disposition. The symptoms were typical of CHD and included chest pain, chest tightness and pressure, fatigue, shortness of breath, sweating, and irregular heart rate. The objective information included the patient's weight, blood pressure, and pulse rate. So that participants might consider them risk factors for CHD, these were on the high end of the normal distribution; patients were 10%–20% above average body weight, with a blood pressure of 140/90 and a heart rate of 90 beats per minute. Other CHD risk factors such as lack of regular exercise, smoking, and family history of heart disease were also included. The disposition statement varied according to study condition and is discussed below. The vignette was developed with the assistance of several physicians and the medical literature (Massie & Sokolow, 1993) and was meant to present a patient with a multitude of symptoms and risk factors that would be identified as CHD by most medical professionals.

Two characteristics of the vignette were manipulated as independent variables (IVs) and each IV had two levels, yielding a 2×2 between-subjects design with random assignment to conditions. The first IV was patient gender, which was used to contrast male and female patients. Because women develop heart disease approximately 10 years later than men (American Heart Association, 2002), the age of the patients was varied to equalize CHD risk across conditions; the patients' height and weight were also varied to reflect gender appropriate measurements. Participants read about a 48-year-old man who was 6 ft tall and weighed 210 lbs or a 58-year-old woman who was 5 ft 5 in. tall and weighed 160 lbs.

The second IV was symptom context, which was manipulated to present CHD symptoms without stress/anxiety (CHD/noSA) or CHD symptoms plus stress/anxiety (CHD + SA). The CHD/noSA vignettes included the patient's report of symptoms, the objective patient information, and the disposition statement, which indicated the patient appeared calm and composed. The CHD + SA vignettes included the same symptoms and objective information presented in the CHD/noSA vignettes but also indicated that the patient had been "feeling anxious after being passed up for a promotion at work" and that they had been "feeling especially concerned about their health." The CHD + SA vignette also indicated the patient appeared nervous and agitated. Our goal was to present a patient who had been exposed to an objective stressor and who was experiencing associated symptoms of stress. Each participant was randomly assigned to read one of the four vignette variations after which they completed three questionnaires. Participants could not refer back to the vignette once they had read it, and they could not look through any of the questionnaires in advance. This worked to support the memory study cover story and allowed the collection of data on the basis of participants' initial patient impression.

Questionnaires and dependent variables (DVs). To further support the cover story and to determine whether patient gender had an effect on the number and types of symptoms recalled, the first questionnaire participants received after reading the vignette instructed them to write down as many symptoms as they could recall. This questionnaire also asked participants to recall the patient's age and gender; the information was used as a manipulation check, and we excluded from analyses data from the two individuals in Study 1 and the three individuals in Study 2 who incorrectly identified the patient's gender. Participants were then presented with the second questionnaire asking them to indicate their agreement with a CHD diagnosis (i.e., "This patient is suffering from CHD") and cardiologist referral (i.e., "This patient should be referred to a cardiologist"). Ratings were made on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). To further minimize demand characteristics, we asked participants to indicate their agreement with 15 other statements regarding the patient (e.g., "This patient should be hospitalized"; "This patient should be referred for lab work"); the two cardiac DVs were embedded within these statements. Only after completing the questionnaires associated with the so-called memory study were participants given the 25-item Shortened Attitudes Toward Women Scale (Spence, Helmrich, & Stapp, 1973). This questionnaire assessed traditional and egalitarian attitudes toward women. Note that results of analyses examining the effects of participants' attitude toward women, as well as results of analyses examining the number and types of symptoms recalled, are reported at the end of Study 2. Once participants completed all questionnaires, they were debriefed; participants' comments indicated that they had not suspected the true nature of the study.

Results and Discussion

Initial analyses including participant gender as a factor revealed no significant main or interaction effects; the data were thus collapsed across participant gender for all subsequent analyses. Responses to the CHD diagnosis and cardiologist referral DVs were analyzed in a 2 (patient gender) × 2 (symptom context) between-subjects analysis of variance (ANOVA); an alpha level of .05 was adopted. Although we report main effects and interaction terms on Table 1, our focus is on four planned contrasts conducted to test the two hypotheses.

The pattern of means for the two cardiac variables is shown in Figures 1a and 1c. As the simple association hypothesis posits that women's cardiac symptoms are discounted because heart disease is viewed as a man's disease, it predicts a gender bias whether or not stress symptoms are present. The contextual hypothesis, on the other hand, makes the following four predictions: (a) females presenting CHD (fCHD) + SA should receive significantly lower cardiac scores than females presenting CHD/noSA (fCHD + SA < fCHD/noSA); (b) males presenting CHD (mCHD) + SA should not receive lower cardiac scores than males presenting CHD/noSA (mCHD + SA = mCHD/noSA); (c) significant gender differences should be observed in the CHD + SA conditions, with females receiving lower cardiac scores than males (fCHD + SA < mCHD + SA); and (d) in contrast to the simple association hypothesis prediction of a straightforward gender bias, the contextual hypothesis predicts that gender differences should not be observed in the CHD/noSA conditions (mCHD/noSA = fCHD/noSA). The pattern of results predicted by the contextual hypothesis (fCHD/noSA = mCHD/noSA = mCHD + SA > fCHD + SA) thus indicates a Patient Gender × Symptom Context interaction.

Table 1
Analyses of Variance Examining the Effects of Patient Gender and Symptom Context on CHD Diagnosis and Cardiologist Referral

Source	CHD diagnosis			Cardiologist referral		
	MS	*F*	η_p^2	*MS*	*F*	η_p^2
Study 1 (n = 56)						
Patient gender[a]	17.74	12.96***	0.20	11.71	6.80**	0.12
Symptom context[a]	8.95	6.54**	0.11	16.42	9.52**	0.16
Patient Gender × Symptom Context[b]	16.08	11.75***	0.31	16.78	9.74**	0.27
Study 2 (n = 82)						
Patient gender[b]	15.75	10.52**	0.12	20.93	14.52***	0.16
Symptom context[b]	17.78	11.88***	0.13	17.89	12.42***	0.14
Patient Gender × Symptom Context[b]	6.24	4.17*	0.10	6.44	4.47*	0.10

Note. CHD = coronary heart disease; *MS* = mean square; η_p^2 = effect size (partial eta squared).
[a] df = 1, 52. [b] df = 1, 78.
* $p < .05$. ** $p < .01$. *** $p < .001$.

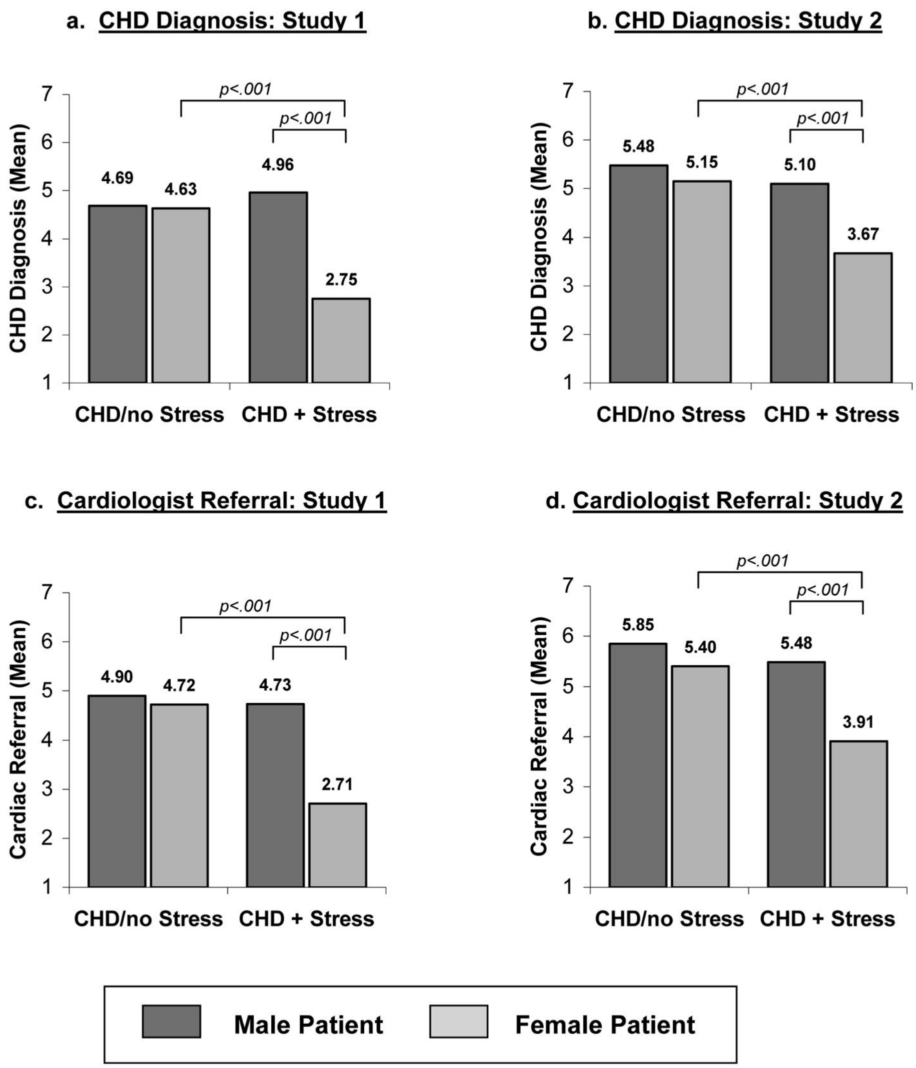

Figure 1. Effects of patient gender and symptom context on coronary heart disease (CHD) diagnosis and cardiologist referral. Means that differ significantly are indicated by brackets connecting shaded bars. Study 1, $n = 56$; Study 2, $n = 82$.

The simple association hypothesis was tested for both cardiac variables as a planned contrast between male and female patients in the CHD/noSA conditions (in the context of an overall four-condition one-way ANOVA). Results were not significant and had a small effect size for both variables. As Figure 1a shows, females ($M = 4.63$, $SD = 1.23$) and males ($M = 4.69$, $SD = 1.25$) received comparable CHD diagnosis scores ($F < 1$, effect size Cohen's $d = 0.11$). Similarly, as Figure 1c shows, females ($M = 4.72$, $SD = 1.31$) and males ($M = 4.90$, $SD = 1.21$) received comparable cardiologist referral scores ($F < 1$, $d = 0.14$). As gender differences were not observed in the CHD/noSA conditions, the simple association hypothesis was disconfirmed. The contextual hypothesis was tested with three additional contrasts (i.e., fCHD + SA vs. fCHD/noSA, mCHD + SA vs. mCHD/noSA, and fCHD + SA vs. mCHD + SA); all three contrasts supported the contextual hypothesis. For CHD diagnosis, results showed that fCHD + SA ($M = 2.75$, $SD = 0.87$) received significantly lower scores than fCHD/noSA, $F(1, 52) = 17.28$, $p < .001$, $d = 1.77$, whereas mCHD + SA ($M = 4.96$, $SD = 1.23$) and mCHD/noSA received comparable scores ($F < 1$, $d = 0.38$). Similarly, for cardiologist referral, results showed that fCHD + SA ($M = 2.71$, $SD = 0.81$) received significantly lower scores than fCHD/noSA, $F(1, 52) = 18.58$, $p < .001$, $d = 2.01$, whereas mCHD + SA ($M = 4.73$, $SD = 1.74$) and mCHD/noSA received comparable scores ($F < 1$, $d = 0.01$). Finally, results of the male versus female contrasts in the CHD + SA conditions were significant and had a large effect size for both variables: As Figures 1a and 1c show, compared with males, females received significantly lower CHD diagnosis, $F(1, 52) = 22.31$, $p < .001$, $d = 2.08$, and cardiologist referral scores, $F(1, 52) = 14.81$, $p < .001$, $d = 1.49$. In summary, the absence of gender differences in the CHD/noSA conditions, together with the significant gender differences in the CHD + SA conditions and the significant Patient Gender × Symptom Context interaction (see Table 1), provided strong support for the contextual hypothesis and not the simple association hypothesis. The findings of Study 1 prompted us to replicate the research on a larger sample of equally trained participants and to expand the research to include measures examining the interpretation of cardiac symptoms.

Study 2

Study 2 replicated the previous study with a new sample of advanced medical students and explored the psychological processes underlying gender bias by examining participants' interpretation of cardiac symptoms. In line with the contextual hypothesis, we predicted that CHD symptoms presented without stress would be interpreted as organic in both men and women, whereas the addition of stress would shift the interpretation of women's—but not men's—symptoms from organic to psychogenic in origin. Three additional analyses were conducted that combined the data from Study 1 and 2 to gain statistical power. First, we examined the number and types of symptoms recalled by participants. As research from the social cognition literature has indicated that memory is typically more accurate for stereotype-consistent than stereotype-inconsistent information (e.g., Bransford & Franks, 1971; Bransford & Johnson, 1972), better recall of male patients' CHD symptoms or female patients' psychological symptoms would provide evidence of the male-CHD stereotype or the female-somatizing stereotype. Conversely, evidence of similar recall of men and women's symptoms would weaken the stereotype hypothesis. Second, we examined participants' attitude toward women to determine whether stereotypes or beliefs brought into the patient assessment situation influenced CHD diagnoses and cardiologist referrals. Finally, to illustrate the clinical relevance of results in a way that more closely corresponds to clinical decision making, we examined the percentage of participants in each of the four conditions who agreed with a CHD diagnosis and cardiologist referral.

Method

Participants. A new sample of 82 participants was recruited during a seminar from the same university hospital in New York State presented in Study 1; 39 (48%) were women, and 43 (52%) were men. Participants were in their 3rd or 4th year of medical school and had completed at least one clinical rotation ($M = 2$, $SD = 0.83$). Participants ranged in age from 21 to 41 years ($M = 25.06$, $SD = 4.48$). Ethnic or racial origin varied as follows: 67% White/Caucasian, 8% African American, 14% Asian, 6% Hispanic, and 5% unspecified.

Design and procedure. See Study 1 Method section for design and procedure. As well as replicating Study 1, Study 2 examined participants' symptom origin interpretation by adding a questionnaire instructing participants to list the symptoms they had considered most important to their patient assessment and to indicate next to each symptom what they believed its etiology to be. Symptom etiology was selected from the following choices: *mostly physical/organic* (+2), *somewhat physical/organic* (+1), *somewhat psychogenic* (–1), or *mostly psychogenic* (–2).

Results and Discussion

As in Study 1, results of initial analyses including participant gender as a factor showed no main or interaction effects; the data were thus collapsed across participant gender for all subsequent analyses.

CHD diagnosis and cardiologist referral. The pattern of means for cardiac variables is presented in Figures 1b and 1d. As the figures show, results of analyses with CHD diagnosis and cardiologist referral mirrored those observed in Study 1 and fully supported the contextual hypothesis, not the simple association hypothesis. As in Study 1, results of contrasts between male and female patients in the CHD/noSA conditions were not significant and had a small effect size for both variables. Results showed that males ($M = 5.48$, $SD = 1.37$) and females ($M = 5.15$, $SD = 1.23$) received comparable CHD diagnosis scores ($F < 1$, $d = 0.25$), and that males ($M = 5.85$, $SD = 0.67$) and females ($M = 5.40$, $SD = 0.94$) received comparable cardiologist referral scores, $F(1, 78) = 1.40$, $p = .24$, $d = 0.55$. Results of the three additional sets of contrasts also paralleled results observed in Study 1. For CHD diagnosis, results showed that fCHD + SA ($M = 3.67$, $SD = 1.46$) received significantly lower scores than fCHD/noSA, $F(1, 78) = 15.06$, $p < .001$, $d = 1.10$, whereas mCHD + SA ($M = 5.10$, $SD = 0.70$) and mCHD/noSA received similar scores ($F < 1$, $d = 0.35$). For cardiologist referral, results showed that fCHD + SA ($M = 3.91$, $SD = 1.92$) received significantly lower scores than fCHD/noSA, $F(1, 78) = 15.06$, $p < .001$, $d = 1.10$, whereas mCHD + SA ($M = 5.48$, $SD = 0.70$) and mCHD/noSA received similar scores ($F < 1$, $d = 0.50$). As in Study 1, results of contrasts between male and female patients in the CHD + SA conditions were significant and had a large effect size for both variables. Compared with males, females received significantly lower CHD diagnosis, $F(1, 78) = 14.31$, $p < .001$, $d = 1.25$, and cardiologist referral scores, $F(1, 78) = 17.99$, $p < .001$, $d = 1.07$. Finally, as in Study 1, ANOVA results with cardiac variables showed a significant Patient Gender × Symptom Context interaction (see Table 1).

Symptom origin interpretation. We examined the origin interpretation of the three symptoms most commonly reported as important to patient assessment as well as the overall symptom origin interpretation (i.e., the mean origin score of all symptoms listed as important). The three symptoms most commonly listed as important were chest pain ($n = 71$), shortness of breath ($n = 56$), and heart rate irregularities ($n = 49$). Symptom origin means and standard deviations are reported in Table 2. As with previous variables, four planned contrasts were conducted. For chest pain, results of the fCHD/noSA versus mCHD/noSA contrast were not significant and had a small effect size, showing that chest pain was interpreted as organic in both male and female patients ($F < 1$, $d = 0.11$). By contrast, in the CHD + SA conditions, results of the male versus female patient contrast were significant and had a large effect size, showing that the presence of SA significantly decreased the organic interpretation of women's chest pain but had little effect on the interpretation of men's chest pain, $F(1, 67) = 13.59$, $p < .001$, $d = 1.08$. Additionally, whereas the chest pain of fCHD + SA received a significantly less organic evaluation than that of fCHD/noSA, $F(1, 67) = 16.59$, $p < .001$, $d = 1.27$, the chest pain of mCHD + SA and that of mCHD/noSA was evaluated similarly ($F < 1$, $d = 0.04$). As predicted by the contextual hypothesis, gender differences in the interpretation of symptom origin were not observed in the CHD/noSA conditions; it was only when SA was added that symptom origin shifted from organic to psychogenic for women, but not for men. As shown in Table 2, symptom origin means for shortness of breath, heart rate irregu-

Table 2
Mean Symptom Origin Scores as a Function of Patient Gender and Symptom Context

	Condition							
	CHD (no stress/anxiety)				CHD (plus stress/anxiety)			
	Male patients		Female patients		Male patients		Female patients	
Symptom	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Chest pain[a]	1.53_{a}	0.88	1.61_{a}	0.50	1.50_{a}	0.71	0.44_{b}	1.20
Shortness of breath[b]	1.43_{a}	1.02	1.33_{a}	0.99	1.40_{a}	0.83	0.13_{b}	1.41
Heart rate irregularities[c]	$0.46_{a,b}$	1.44	$0.50_{a,b}$	1.09	0.82_{a}	1.08	-0.23_{b}	1.30
Overall symptom origin[d]	1.03_{a}	0.90	0.99_{a}	0.78	0.66_{a}	1.00	-0.28_{c}	1.19

Note. Means in a row with the same subscript are not significantly different at $p < .05$. Score range is +2 (*mostly organic*) to −2 (*mostly psychogenic*). For all measures, higher means indicate a more organic origin evaluation, whereas lower means indicate a less organic origin evaluation. The overall symptom origin score was computed by taking the mean origin score of all symptoms listed by participants. CHD = coronary heart disease.
[a] $df = 1, 67$. [b] $df = 1, 52$. [c] $df = 1, 45$. [d] $df = 1, 77$.

larities (e.g., palpitations, rapid heart), and overall symptom interpretation followed the same pattern observed with chest pain.

The meaning shift that occurred in the interpretation of chest pain, shortness of breath, and heart rate irregularities, as well as the overall symptom evaluation, is best illustrated in Figures 2a–d. The figures present, for illustrative purposes, the number of participants (percentage) within each of the four conditions who indicated the symptoms had an organic origin, a psychogenic origin, or both. As all four figures show, for females, the addition of SA produced a striking decrease in the number of participants who indicated an organic origin of symptoms. For males, the change in symptom origin interpretation that occurred as a result of the added SA was negligible.

Analyses on the combined data. We combined Study 1 and Study 2 data ($N = 138$; 49% women, 51% men) and examined the number and types of symptoms recalled by participants in each of the four conditions. As Table 3 shows, there was little difference in symptom recall for male and female patients in the CHD/noSA conditions and little difference in the CHD + SA conditions. Notably, cardiac symptoms and anxiety were listed as frequently for men as for women, indicating that stress and psychological symptoms were evaluated equally present in both men and women[1] but that they had a different influence on the assessment and interpretation of men's and women's cardiac symptoms. On the combined data set, we also investigated the influence of participants' attitude toward women on CHD diagnosis and cardiologist referral. The median score on the Attitudes Toward Women Scale was used to distinguish traditional participants (those below the median) from egalitarian participants (those above the median). Responses to the two cardiac DVs were analyzed in 2 (patient gender) × 2 (symptom context) × 2 (participant attitude) between-subjects ANOVAs. As Table 4 shows, none of the main effects or interactions including participants' attitude were significant. On the other hand, as in the individual studies, main effects of symptom context and the Patient Gender × Symptom Context interactions were significant for both variables. In all cases, the power gained by combining the studies worked to strengthen results observed in the individual studies. Notably, none of the three-way interactions (Patient Gender × Symptom Context × Participant Attitude) approached significance, indicating the Patient Gender × Symptom Context interaction was not modified by participants' attitude toward women.

Finally, although statistical analyses are based on response means, to illustrate the clinical magnitude and seriousness of our results in a manner that corresponds more closely to clinical decision making, we report in Figures 3a–b the percentage of participants who agreed with a cardiac diagnosis and cardiologist referral. We calculated agreement by splitting the 7-point Likert scale into three response ranges: agreement (above 4), neutral (4), and disagreement (below 4). As the figures show, most participants agreed with a cardiac diagnosis and cardiologist referral for both male and female patients in the CHD/noSA conditions. However, in the CHD + SA conditions, 75% of participants agreed with a CHD diagnosis for male patients, whereas only 17% agreed for female patients; similarly, whereas 81% agreed with a cardiologist referral for male patients, only 30% agreed for female patients.

In summary, Study 2 results with CHD diagnosis and cardiologist referral paralleled results observed in Study 1. Study 2 also provided evidence that the presence of SA shifted the interpretation of women's cardiac symptoms, but not of men's. Results,

[1] Martin and Lemos (2002; Study 1) proposed that cardiac attribution differences between high-stress men and high-stress women are due to the prevalent stereotype that associates women with somatization, so that women are perceived as especially likely to manifest stress in terms of physical symptoms. We directly tested this hypothesis by asking participants about how much they attributed the patient's symptoms to stress (*stress attribution*). We observed a strong main effect of symptom context, with CHD + SA patients receiving significantly higher stress attribution scores than CHD/noSA patients. However, we observed no gender differences in stress attribution, nor did we observe an interaction between the two factors. Taken together with the symptom recall data, which showed that anxiety symptoms were recalled as frequently for men as for women (see Table 3), our results provide evidence that stressors and psychological symptoms were observed to be equally present in both men and women but had a different influence on the assessment of men's and women's accompanying cardiac symptoms.

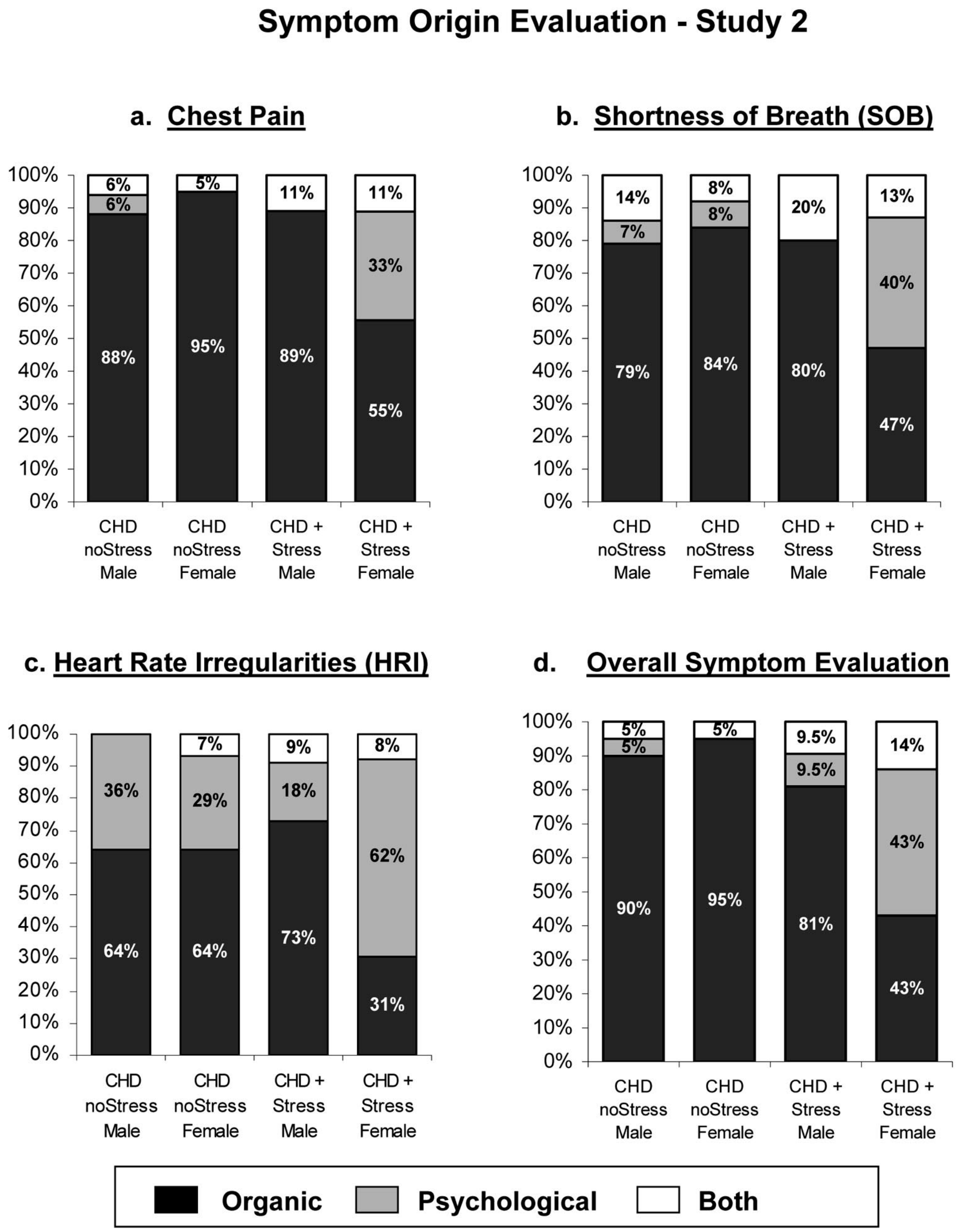

Figure 2. Number of participants (%) in each of the four conditions in Study 2 who indicated that the symptom had an organic origin, a psychogenic origin, or both. d: Overall evaluation of symptom origin. CHD = coronary heart disease.

therefore, supported the contextual hypothesis and not the simple association hypothesis. Three results from the analyses conducted on the combined sample emerged. The first showed that cardiac and psychological symptoms were recalled as frequently for male patients as for female patients, providing no support for a simple male/female stereotype argument. The second showed that participants' attitude toward women did not influence responses, providing evidence that gender bias is more likely due to situational factors (i.e., characteristics of the patient assessment situation) than participants' gender role ideology and stereotypes brought into the situation. Finally, examination of participants' agreement with a CHD diagnosis and a cardiologist referral showed a dramatic underdiagnosis and underreferral of women presenting CHD symptoms in the context of stressful life events.

General Discussion

Research on the role of gender has turned from simply asking whether there are differences between men and women to asking under what conditions or context do gender differences emerge

Table 3
Frequency of Symptoms Recalled by Participants

		Frequency by condition			
		CHD (no stress/anxiety)		CHD (plus stress/anxiety)	
Symptom	Overall frequency	Male patients	Female patients	Male patients	Female patients
Chest pain	145	37	49	31	28
Shortness of breath	125	28	29	33	35
Heart rate irregularities	180	48	58	39	35
Chest tightness/pressure	95	32	21	20	22
Fatigue	46	9	15	10	12
Insomnia	52	9	11	17	15
Sweating	60	17	12	17	14
Anxiety	45	1	2	22	20
Dry mouth	40	9	10	11	10
Headache	40	1	0	19	20
Radiating pain	58	16	16	10	16
Dizzy	39	0	1	13	25
Cough	31	9	13	6	3
Cold	4	3	0	0	1

Note. Immediately after reading the patient vignette, participants were instructed to list as many symptoms from the vignette as they could recall. The raw data for the combined Study 1 and Study 2 are reported above. The frequency of some symptoms is higher than the sample size ($N = 138$) because participants listed more than one variation of a symptom (e.g., heart rate irregularities included heart flutter, rapid heart, and palpitations). CHD = coronary heart disease.

and what are the mediating or moderating variables (Shields, 2000). Consistent with this perspective, the present studies showed a strong and consistent gender bias in the diagnosis and treatment of patients presenting CHD symptoms in the context of stressful life events; in these conditions, women were less likely to be given a CHD diagnosis and less likely to be referred to a cardiologist than were men. No gender bias was observed when typical CHD symptoms were presented without stressors; in these conditions, men and women were equally diagnosed with CHD and equally referred to a cardiologist. Gender bias may therefore not be a blatant process of stereotyping in which women's CHD symptoms are simply misinterpreted or discounted. Supporting this claim are two findings: Neither men as compared with women, nor those holding a more traditional as compared with egalitarian gender role ideology were less likely to make cardiac diagnoses and referrals for female patients. The presence of clear and unequivocal cardiac symptoms in the absence of stressors or psychological symptoms was sufficiently strong to counter any possible personal bias that might have existed on the part of participants (cf. Friend, Rafferty, & Bramel, 1990). The lack of gender differences when CHD symptoms were presented without stressors, along with the lack of influence participants' characteristics had on results, places considerable doubt on the commonly held view that gender bias in CHD assessment is due to a stereotype response that associates CHD with men but not women. The consistent statistical interactions between patient gender and symptom context seem to con-

Table 4
Analyses of Variance Examining the Effects of Participants' Attitude Toward Women on CHD Diagnosis and Cardiologist Referral

	CHD diagnosis			Cardiologist referral		
Source	*MS*	*F*	η_p^2	*MS*	*F*	η_p^2
Patient gender[a] (A)	33.78	22.17***	0.15	27.73	15.90***	0.11
Symptom context[a] (B)	20.91	13.72***	0.10	24.24	13.90***	0.10
Participant attitude[a] (C)	0.27	0.18	0.01	2.35	1.35	0.01
A × B[a]	18.92	12.42***	0.09	22.67	13.00***	0.09
A × C[a]	2.08	1.36	0.01	1.55	0.89	0.01
B × C[a]	5.13	3.36	0.03	1.78	1.02	0.01
A × B × C[a]	0.58	0.38	0.00	0.60	0.34	0.00

Note. The analyses reported above were conducted on the combined Study 1 and Study 2 data ($N = 138$; 49% female). CHD = coronary heart disease; *MS* = mean square; η_p^2 = effect size (partial eta squared).
[a] $df = 1, 127$.
*** $p < .001$.

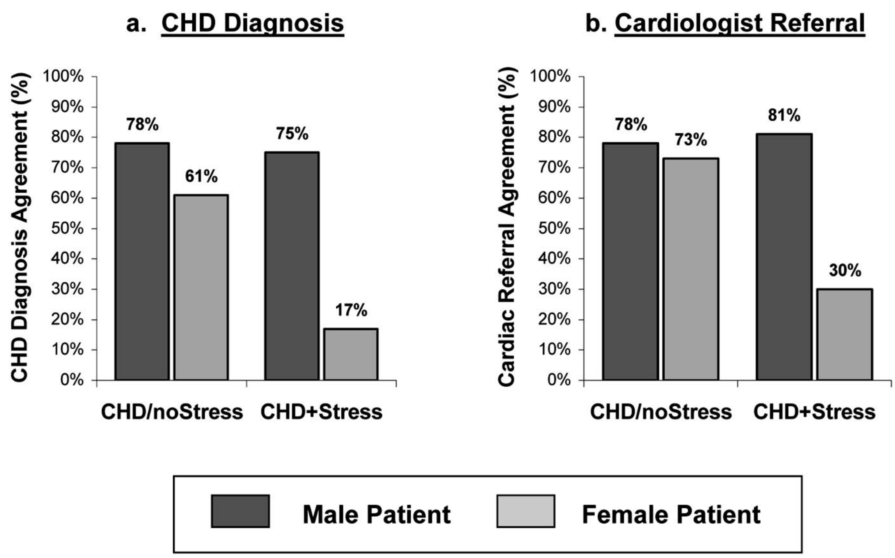

Figure 3. Number of participants (%) in each of the four conditions who agreed with a coronary heart disease (CHD) diagnosis and cardiologist referral. Studies 1 and 2 combined, $N = 138$.

firm that it is the unified impression or gestalt of a *stressed or anxious woman with CHD-like symptoms* that underlies the gender bias.

A reasonable question is why gender alone was not sufficiently strong to produce a bias. The CHD/noSA conditions clearly and unequivocally described a patient with heart disease with many cardiac symptoms and risk factors. But the case study also made clear that "this patient appears calm and composed." The picture was of the CHD patient in the foreground and gender as secondary. Thus, in the female CHD/noSA conditions, the CHD symptoms were central to patient assessment and *femaleness* was peripheral. It appears that a more complex stimulus configuration, which encompasses stressful life events, symptoms of anxiety, CHD symptoms, and femaleness, was necessary to trigger a gender bias. The addition of a stressor and the description of the patient as "anxious and agitated" strikingly changed the impression; female gender and psychological symptoms became central to patient assessment and drove the interpretation of cardiac symptoms. Unfortunately, this took away from the correct patient evaluation.

Considering gender differences in symptom presentation and in the prevalence of psychological disorders, the likelihood that women with CHD will also discuss life stressors and report symptoms of anxiety is high. As our results show, the likelihood that health care providers will be influenced by the interaction of psychological symptoms and the patient's female gender is also high. Study 2 provided evidence that this interaction produced a shift in the interpretation of CHD symptoms so that they were no longer viewed as having a cardiac or organic origin. Rather, they were viewed as a manifestation of stress and interpreted as having a psychogenic origin. For symptoms such as chest pain, the clinical implications of these results are serious. Cardiac chest pain requires urgent medical care and may be life threatening, whereas psychogenic chest pain may benefit from psychological care and may simply produce discomfort. The incorrect assessment of symptom origin could therefore delay medical care in women with CHD.

Martin et al. (1998) proposed that two classic judgment heuristics, *availability* and *representativeness* (Tversky & Kahneman, 1973), influence the evaluation of cardiac-related symptoms and increase the likelihood that women's cardiac symptoms will be misinterpreted or discounted. They also argued that the prevalent stereotype associating men, but not women, with heart disease leads laypersons and health care providers to use gender as a heuristic or decision rule so that cardiac-related symptoms are attributed to angina or possible MI when presented by men but not when presented by women. As the heuristic or stereotype argument is based solely on the perceived lack of heart disease in women as compared with men, it predicts a gender bias in cardiac assessment, whether or not stressors or psychological symptoms are present. But this is not what results showed. Neither our results with CHD diagnosis and cardiologist referral in the CHD/noSA conditions, nor Martin et al.'s own results with cardiac attributions in their low-stress conditions, showed any evidence of a gender bias. In these conditions, men and women received a similar cardiac assessment. Our results, and Martin et al.'s own results, therefore, place serious doubt on the heuristic or stereotype explanation for gender bias. The stereotype explanation is also countered by the symptom recall data we reported in Study 2: Our results showed no indication that participants were less likely to recall cardiac symptoms in female as compared with male patients, although such schemas would predict this. According to Tversky and Kahneman (1974), heuristics are highly economical and can be useful for making judgments under uncertainty. It is understandable therefore how heuristics and stereotypes might influence laypeople who may not have the knowledge to recognize symptoms of heart disease, or how heuristics and stereotypes might come into play in situations of uncertainty, for example, when the gender of the patient is not specified (viz., Martin et al., 1998; Study 6). It is less clear, however, how they would influence health care providers who are trained to recognize CHD symptoms, who know the prevalence of CHD, and who have access to extensive patient information, including information about the gender of the patient.

Our hypothesis, which is based on an Aschian shift-in-meaning interpretation, may also explain why neither our results in the CHD + SA conditions, nor Martin et al.'s (1998) results in the high-stress conditions, showed any evidence that stress produced cardiac symptom discounting in men. We hypothesized that the presence of a stressor or psychological symptoms such as anxiety might be perceived as contributing to CHD in men (e.g., risk factor) and may thus augment or strengthen, rather than diminish, the cardiac assessment. Analyses examining participants' diagnosis and referral confidence supported this hypothesis (Chiaramonte & Friend, 2004). When asked how confident they were with their patient diagnoses and treatment recommendations, medical students in the CHD + SA conditions showed significant decreased confidence with female patients but significant increased confidence with male patients, suggesting that the presence of stress weakened women's cardiac assessment but augmented men's cardiac assessment.

Study Limitations and Future Research

There are several limitations to the present studies. First and foremost, our participants were primarily medical students and not physicians; future research will need to examine how patients' gender and stress influence physicians' patient assessments and interpretation of cardiac symptoms. Second, although we were able to dispense with several explanations for gender bias and found support for a shift-in-meaning hypothesis, the latter interpretation itself can also be questioned. The symptom interpretation assessment in Study 2 occurred after the diagnosis and referral data were collected. Possibly, the diagnosis and referral drove the symptom origin interpretation and were not a cause of symptom interpretation. A future study should assess symptom interpretation prior to the collection of diagnosis and referral data. Additional limitations are related to the information included in the vignettes. The vignettes included mostly typical CHD symptoms such as chest pain, chest tightness, sweating, fatigue, and shortness of breath. In medical texts, these are presented clearly as symptoms indicative of CHD. However, recent research suggests that women often present with atypical symptoms such as nausea and back pain. Chest pain, a hallmark CHD symptom in men, also seems to be less common in women (McSweeney et al., 2003). Although we included a few atypical symptoms (e.g., back pain, sleeplessness), we chose to include mostly textbook-typical symptoms in order to examine how the presence of a stressor and its accompanying psychological symptoms would influence the assessment of patients presenting symptoms that would be identified as CHD by most health care professionals. We believe that finding a gender bias in such an unequivocal presentation of CHD symptoms provides strong evidence of the centrality of stressors and psychological symptoms in the assessment of women. However, the inclusion of textbook-typical symptoms probably *minimized* gender bias. It is possible that atypical symptoms might contribute even further to a bias in women as anecdotal evidence suggests (e.g., Latz & Baird, 1994; LeCharity, 1999). Future research examining how medical personnel respond to men and women presenting atypical CHD symptoms, or how the presence of stress and anxiety in addition to atypical symptoms might influence patient assessment, seems particularly relevant and worthwhile.

In an actual patient encounter, the assessment of women may also be complicated by factors related to age. As women present CHD symptoms on average 10 years later than men, the presence of comorbid conditions such as diabetes and hypertension is common and may complicate assessment; stress and anxiety may also be perceived differently in older women as compared with younger men. Future research should therefore examine the effects of age and variables related to age on cardiac assessment. Another important area for future research is the investigation of how symptoms of psychological disorders other than anxiety may influence medical care in general, and cardiac care specifically. Depression, for example, has been found to influence patient assessment. In a study that examined the effects of patient's gender and symptom presentation (with depression vs. without depression), Wilcox (1992) found that depressed women were rated as less seriously ill and less likely to require laboratory tests than depressed men. Given the ubiquity of stress and anxiety in medical situations, at least three additional areas are important for future study. First, although we included both stress and anxiety in our patient vignettes, a future study might examine the effects of stress and anxiety on patient assessment separately. Second, given the overlap of psychological and CHD symptoms, it is vital to assess how patients in medical situations express stress and anxiety and how medical practitioners perceive patients who present these symptoms. For instance, an attribution analysis could determine whether anxiety and stress are attributed to different sources in men and women. Possibly, in the present studies, anxiety and stress may have been viewed as dispositional in women and as situational in men. Finally, given the results observed with heart disease assessment, it will be important to examine how stressors and psychological symptoms influence the interpretation of symptoms of diseases other than heart disease.

Conclusion

In conclusion, the present studies showed a consistent gender bias in the assessment of women presenting CHD symptoms in the context of stressful life events. No evidence of a gender bias was found when CHD symptoms were presented clearly and without stress. Neither participants' gender nor their attitude toward women influenced results, providing evidence that gender bias is influenced more by situational factors than by personal ideologies or stereotypes brought into the situation. Future research needs to identify additional conditions that might be responsible for gender bias in heart disease diagnosis and treatment and further refine the processes that underlie them. Such a practical and theoretical approach might offer the best hope for the development of educationally based interventions to change medical professionals' perceptions and understanding and thus reduce factors that delay the medical care of women with heart disease.

References

American Heart Association (2002). *2002 Heart and stroke statistical update.* Dallas, TX: American Heart Association.

Asch, S. E. (1946). Forming impressions of personality. *Journal of Abnormal Social Psychology, 41,* 258–290.

Asch, S. E. (1987). *Social psychology.* Oxford, England: Oxford University Press. (Original work published 1952)

Ayanian, J. Z., & Epstein, A. M. (1991). Differences in the use of procedures between women and men hospitalized for coronary heart disease. *The New England Journal of Medicine, 325*(4), 221–225.

Barron, H. V., Bowlby, L. J., Breen, T., Rogers, W. J., Canto, J. G., Zhang, Y., et al. (1998). Use of reperfusion therapy for acute myocardial infarction in the United States: Data from the National Registry of Myocardial Infarction 2. *Circulation, 97,* 1150–1156.

Baumann, L., Cameron, L. D., Zimmerman, R., & Leventhal, H. (1989). Illness representations and matching labels with symptoms. *Health Psychology, 8,* 449–469.

Bransford, J. D., & Franks, J. J. (1971). The abstraction of linguistic ideas. *Cognitive Psychology, 2,* 331–350.

Bransford, J. D., & Johnson, M. D. (1972). Contextual prerequisites for understanding and recall. *Journal of Verbal Learning and Learning Behavior, 11,* 717–726.

Chiaramonte, G. R., & Friend, R. (1996, March). *Medical students' diagnostic and treatment biases of women presenting CHD symptoms.* Poster session presented at the Society of Behavioral Medicine Annual Meeting and Scientific Sessions, Washington, DC.

Chiaramonte, G. R., & Friend, R. (1999, April). *Factors influencing gender bias in the diagnosis and treatment of coronary heart disease.* Paper presented at the Society of Behavioral Medicine Annual Meeting and Scientific Sessions, San Diego, CA.

Chiaramonte, G. R., & Friend, R. (2004, April). *Influence of patient's gender and stress symptoms on medical students' and residents' confidence in assessing CHD patients.* Poster session presented at the Society of Behavioral Medicine Annual Meeting and Scientific Sessions, Baltimore, MD.

Eaton, W. W., Kessler, R. C., Wittchen, H. U., & Magee, W. J. (1994). Panic and panic disorder in the United States. *American Journal of Psychiatry, 151,* 413–420.

Friedman, M., & Rosenman, R. H. (1974). *Type A behavior and your heart.* New York: Knopf.

Friend, R., Rafferty, Y., & Bramel, D. (1990). A puzzling misinterpretation of the Asch "conformity" study. *European Journal of Social Psychology, 20,* 29–44.

Ghali, W. A., Faris, P. D., Galbraith, P. D., Norris, C. M., Curtis, M. J., Saunders, L. D., et al. (2002). Sex differences in access to coronary revascularization after cardiac catherization: Importance of detailed clinical data. *Annals of Internal Medicine, 136,* 723–732.

Heston, T. F., & Lewis, L. M. (1992). Gender bias in the evaluation and management of acute nontraumatic chest pain. The St. Louis Emergency Physicians' Association Research Group. *Family Practice Research Journal, 12*(4), 383–389.

Jaglal, S. B., Slaughter, P. M., Baigrie, R. S., Morgan, C. D., & Naylor, C. D. (1995). Good judgment or sex bias in the referral of patients for the diagnosis of coronary artery disease? An exploratory study. *Canadian Medical Association Journal, 152,* 873–880.

Kroenke, K., & Spitzer, R. L. (1998). Gender differences in the reporting of physical and somatoform symptoms. *Psychosomatic Medicine, 60*(2), 150–155.

Latz, M., & Baird, M. (1994). At the heart of the matter: One woman's bypass experience. *Family Systems Medicine, 12*(2), 205–211.

Lauer, M. S., Pashkow, F. J., Snader, C. E., Harvey, S. A., Thomas, J. D., & Marwick, T. H. (1997). Sex and diagnostic evaluation of possible coronary artery disease after exercise treadmill testing at one academic teaching center. *American Heart Journal, 134*(5, Pt.1), 807–813.

Leape, L. L., Hilborne, L. H., Bell, R., Kamberg, C., & Brook, R. H. (1999). Underuse of cardiac procedures: Do women, ethnic minorities, and the uninsured fail to receive needed revascularization? *Annals of Internal Medicine, 130,* 183–192.

LeCharity, L. A. (1999). The experiences of younger women with coronary artery disease. *Journal of Women's Health & Gender-Based Medicine, 8,* 773–785.

Martin, R., Gordon, E. E. I., & Lounsbury, P. (1998). Gender disparities in the attribution of cardiac-related symptoms: Contribution of common sense models of illness. *Health Psychology, 17,* 346–357.

Martin, R., & Lemos, K. (2002). From heart attacks to melanoma: Do common sense models of somatization influence symptom interpretation for female victims? *Health Psychology, 21,* 25–32.

Massie, B. M., & Sokolow, M. (1993). Cardiovascular disease: Symptoms, signs and procedures. In L. M. Tierney, Jr., S. J. McPhee, M. A. Papadakis, & S. A. Schroeder (Eds.), *Current medical diagnosis and treatment* (pp. 263–267). New York: McGraw-Hill.

Maynard, C., Beshansky, J. R., Griffith, J. L., & Selker, H. P. (1996). Influence of sex on the use of cardiac procedures in patients presenting to the emergency department. A prospective multicenter study. *Circulation, 94*(9, Suppl.), 1193–1198.

McSweeney, J. C., Cody, M., O'Sullivan, P., Elberson, K., Moser, D. K., & Garvin, B. J. (2003). Women's early warning symptoms of acute myocardial infarction. *Circulation, 108,* 2619–2623.

Mehilli, J., Kastrati, A., Dirschinger, J., Pache, J., Seyfarth, M., Blasini, R., et al. (2002). Sex-based analysis of outcome in patients with acute myocardial infarction treated predominantly with percutaneous coronary intervention. *Journal of the American Medical Association, 287*(2), 210–215.

Pigott, T. (2003). Anxiety disorders in women. *Psychiatric Clinics of North America, 26,* 621–672.

Robbins, A. S., Spence, J. T., & Clark, H. (1991). Psychological determinants of health and performance: The tangled web of desirable and undesirable characteristics. *Journal of Personality and Social Psychology, 61,* 755–765.

Roger, V., Farkouh, M. E., Weston, S. A., Reeder, G. S., Jacobsen, S. J., Zinsmeister, A. R., et al. (2000). Sex differences in evaluation and outcome of unstable angina. *Journal of the American Medical Association, 283,* 646–652.

Schag, C. A., & Heinrich, R. L. (1989). Anxiety in medical situations: Adult cancer patients. *Journal of Clinical Psychology, 45,* 20–27.

Shaw, L. J., Miller, D. D., Romeis, J. C., Kargl, D., Younis, L. T., & Chaitman, B. R. (1994). Gender differences in the noninvasive evaluation and management of patients with suspected coronary artery disease. *Annals of Internal Medicine, 120,* 559–566.

Sheikh, J. I., Leskin, G. A., & Klein, D. F. (2002). Gender difference in panic disorder: Findings from the National Comorbidity Survey. *American Journal of Psychiatry, 159,* 55–58.

Shields, S. (2000). Thinking about gender, thinking about theory: Gender and emotional experience. In A. H. Fischer (Ed.), *Gender and emotion: Social psychological perspectives* (pp. 3–23). New York: Cambridge University Press.

Spence, J. T., Helmrich, R., & Stapp, J. (1973). A short version of the Attitudes Toward Women Scale (AWS). *Bulletin of Psychological Sociology, 2,* 219–220.

Steingart, R. M., Packer, M., Hamm, P., Coglianese, M. E., Gersh, B., Geltman, E. M., et al. (1991). Sex differences in the management of coronary artery disease. *New England Journal of Medicine, 325,* 226–230.

Tobin, J. N., Wassertheil-Smoller, S., Wexler, J. P., Steingart, R. M., Budner, N., Lense, L., & Wachspress, J. (1987). Sex bias in considering coronary bypass surgery. *Annals of Internal Medicine, 107,* 19–25.

Travin, M. I., Duca, M. D., Kline, G. M., Herman, S. D., Demus, D. D., & Heller, G. V. (1997). Relation of gender to physician use of test results and to the prognostic value of stress technetium 99m sestamibi myocardial single-photon emission computer tomography scintigraphy. *American Heart Journal, 134*(1), 73–82.

Tversky, A., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology, 5,* 207–232.

Tversky, A., & Kahneman, D. (1974, September 27). Judgment under uncertainty: Heuristics and biases. *Science, 185,* 1124–1131.

Wilcox, V. L. (1992). Effects of patients' age, gender, and depression on medical students' beliefs, attitudes, intentions, and behavior. *Journal of Applied Social Psychology, 22,* 1093–1110.

Wool, C. A., & Barsky, A. J. (1994). Do women somatize more than men? Gender differences in somatization. *Psychosomatics: Journal of Consultation Liaison Psychiatry, 35,* 445–452.