Physicians' Gender Bias in the Diagnosis, Treatment, and Interpretation of Coronary Heart Disease Symptoms

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Abstract of the Dissertation

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Research shows that women presenting coronary heart disease (CHD) symptoms are underdiagnosed and undereferred for diagnostic testing and treatment. The two main goals of the present research were to (1) identify and reconstitute experimentally conditions responsible for a gender bias and (2) understand the processes responsible for the bias. We hypothesized that in patients presenting CHD symptoms, the concurrent presentation of stress and anxiety symptoms are more likely to produce a gender bias than the presentation of CHD symptom alone. We propose that when presented with stress, women's – but not men's – cardiac symptoms undergo a "a shift in meaning" and are perceived to have a psychogenic and not an organic/cardiac etiology. For women, the presence of stress deters a CHD diagnosis while for men stress/anxiety may be viewed as a risk factor that augments a CHD diagnosis.

Three experimental studies were conducted. Participants in Study 1 (N=87 internists) and Study 2 (N=143 family physicians) were randomly assigned to read one of four versions of a vignette of a patient with textbook-typical CHD symptoms. Patient gender (male vs. female) and symptom context (with stress vs. without stress) were varied. The same design was used in Study 3 (N=142 family physicians); however, *atypical* CHD symptoms were substituted for typical ones. After reading the vignettes, participants indicated their patient diagnoses, treatment recommendations, and symptom interpretation.

Study 1 showed that when typical CHD symptoms were presented concurrently with stress/anxiety, women received significantly lower CHD diagnoses and cardiologist referrals than men. No evidence of a bias was observed when CHD symptoms were presented without stressors. Study 2 replicated Study 1 and showed that cardiac symptoms such as chest pain were evaluated similarly (organic) in men and women when presented without stressors and that the addition of stressors shifted the meaning of these symptoms from organic to psychogenic for women, but not for men. Finally, gender differences were not observed in Study 3. Men and women presenting atypical CHD symptoms received similar cardiac and psychological diagnoses. Overall, results show that women presenting typical CHD symptoms in the context of stress are underdiagnosed and underreferred for cardiac care by physicians and suggest the need for educational initiatives to increase physicians’ awareness of gender differences in symptom presentation.

Dedicated

to my Mom, Teresa

without whose encouragement,

love, and support I could never have

completed this undertaking.

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Background and Significance

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, while 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 (AHA, 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 have 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.

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 the recognition and diagnosis of women's heart disease symptoms and that delay their care.

Despite the many studies that have reported a gender bias in cardiac care, 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 and colleagues (Martin, Gordon, & Lounsbury, 1998; Martin & Lemos, 2001) and our own research (Chiaramonte & Friend, 1997, 1999, 2002, 2004, 2006) 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 main focus was on laypersons, they generalized their findings to healthcare 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

In their first paper, Martin et al. (1998) proposed that symptom interpretation and medical referral are organized and guided by cognitive representations or commonsense models of illness. According to this model, certain rules or heuristics operate on the interpretation and conceptualization of symptoms. The authors proposed that two classic judgment heuristics, *availability* and *representativeness* (Tversky & Kahneman, 1973) influence the evaluation of cardiac symptoms and increase the likelihood women's cardiac symptoms will be discounted. The authors argue that people are likely to conceptualize the typical heart disease patient as male and therefore be slower to entertain the possibility that a woman might be experiencing an MI (*representativeness heuristic).* They also argue that people are likely to recall more male than female acquaintances who have suffered from heart disease; as a consequence, they may assume that they will continue to encounter more male than female cardiac patients in the future and will be less likely to attribute women's symptoms to heart disease (*availability heuristic*). Martin et al. (1998) point out that commonsense models of illness are susceptible to stereotypes and propose that the prevalent stereotype associating men - but not women - with heart disease may lead to using <u>gender</u> 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. The authors contend that in laypeople, the influence of this stereotype may lead to a delay in the recognition of women's cardiac symptoms and to a delay in seeking treatment, while in healthcare providers it may lead to the systematic discounting or misinterpretation of women's cardiac symptoms.

Martin et al.'s (1998) first set of studies examined how information about gender and concurrent life stressors influence the attribution of cardiac symptoms. They developed a vignette of a patient with symptoms indicative of MI and varied patient gender (male vs. female) and stress level (low- vs. high-stress). Each participant read one of the four vignette variants and indicated how likely it was that the patient was experiencing cardiac problems (*cardiac attribution*). The study was replicated with four separate samples, including one sample of physicians, two samples of undergraduates, and one sample of community-dwelling adults. The authors' primary hypothesis was that participants would be more likely to attribute symptoms to cardiac causes when the patient was male rather than female. Based on research by Leventhal and associates (Baumann, Cameron, Zimmerman, & Leventhal, 1989) who demonstrated that symptoms occurring during challenging circumstances tend to be attributed to stress rather than disease (i.e., *the stress-illness rule*), they also hypothesized that male and female patients' cardiac symptoms would be discounted when presented along with high-stress.

Martin et al.'s (1998) results regarding the effect of gender on cardiac attributions were not consistent. In only one study with undergraduates did they find that cardiac attributions were lower for females when compared to males (i.e., gender main effect). However, this study not only manipulated patient gender (male vs female) and stressful life events (high- vs low- stress), it also manipulated patient age (45 vs 75 years old) in order to examine whether the tendency to discount symptoms in females might be attenuated if the patient was described as older than 70 years old. A problem with their design is that although a 75 year-old male has essentially the same risk of developing heart disease as a 75 year-old female, a 45 year-old female has a significantly lower risk of developing heart disease than a 45 year-old male. The observed gender effect may therefore have been influenced by the heart disease risk inequality of the conditions.

Notably, <u>none</u> of the studies showed any evidence of gender bias in the low-stress conditions. In fact, in two of the four studies, cardiac attributions were somewhat higher for low-stress females than low-stress males. The heuristic argument for gender bias is based solely on the perceived lack of heart disease in women as compared to 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. The authors also found no evidence that high-stress led to cardiac-symptom discounting in men. The only consistent result observed in post-hoc analyses was that high-stress females received lower cardiac attributions than the mean of the other three cells (i.e., high-stress males, low-stress females, and low stress males). Surprisingly, Martin et al. (1998) did not address why women did not receive lower cardiac attributions in the low-stress conditions. They also did not explain why high-stress was necessary to produce an effect and why high-stress did not lead to cardiac symptom discounting in males as well as females, as the stress-illness rule predicted.

In the second set of studies, Martin et al. (1998) addressed the psychological mechanism underlying the bias by testing the existence of the male-CHD-stereotype. They made use of theories from the social cognition literature, which posit that memory is typically more accurate for stereotype-consistent information (Bransford & Franks 1971, Bransford & Johnson 1972) and examined whether the male-CHD-stereotype would influence participants' recall. Undergraduate students were presented with a vignette describing a patient who had recently experienced a series of stressful life events and who went to the emergency room (ER) because of chest pain, shortness of breath, and sweating. The ER diagnosis was manipulated; half the participants read that the ER physician diagnosed an MI and admitted the patient to the hospital; the other half read that the physician diagnosed anxiety and sent the patient home. The gender of the patient was not revealed and participants were later asked to recall the gender of the patient. Most (90% vs. 10%) of the participants in the MI condition recalled that the patient was male. Interestingly, a greater number of participants in the anxiety condition also recalled that the patient was male (60% vs. 40%). Martin et al. (1998) argued that their results showed superior stereotype-consistent memory, thus supporting the male-CHD-stereotype. Although these studies suggest the presence of a male-CHD-stereotype, they do not explain why in their earlier studies the male-CHD-stereotype was not elicited in the low-stress conditions. They also do not explain why high-stress was necessary to produce lower cardiac attributions in women and they do not provide evidence that the male-CHD-stereotype is elicited in situations when the essential information, including the patient's gender, is available.

In a follow-up paper, Martin and Lemos (2001) conducted an additional study with undergraduates and proposed an alternate hypothesis. Although our interest is in how CHD is assessed by healthcare providers, we briefly discuss their research because of its theoretical implications. The follow-up study focused on common sense models of somatization (i.e., the tendency to manifest stress in terms of physical symptoms) and the stress-illness rule to explain why in their earlier studies high-stress women received lower cardiac attributions than high-stress men and why high-stress did not reduce cardiac attributions in men. Martin et al. argued that because laypeople hold stereotypes that associate somatization with female gender, the stress-illness rule might not work equally in male and female patients; high-stress females are given lower cardiac attributions because they are perceived as especially likely to manifest stress in terms of physical symptoms. As in the earlier paper, the authors examined the effect of patient's gender and high-stress on cardiac attributions; however, they altered the study design and dropped the low-stress conditions. Consistent with the earlier study, results showed that high-stress females received lower cardiac attributions than high-stress males. The authors argued that this provided evidence that women were perceived as especially likely to manifest stress in terms of physical symptoms. One problem with Martin & Lemos' (2001) study is that the elimination of the low-stress conditions made it impossible to distinguish a gender main effect from a gender X stress interaction. A second problem is that although the authors proposed a psychogenic hypothesis, they did not include measures to assess the psychological evaluation of patients or the attribution of symptoms to stress and they did not include measures that directly tested the presence of a somatic-female-stereotype. Despite the methodological and theoretical inconsistencies, Martin et al.'s (1998, 2002) research does provide valuable information. First, it provides evidence that high-stress has a different – and more central - effect on the evaluation of females than it does on the evaluation of males. Second, it provides evidences that high-stress females are evaluated differently from low-stress females and from high-stress males in cardiac situations. Finally, their results suggest that in uncertain situations gender may be used as decision rule or heuristic to evaluate cardiac patients.

The Contextual or Shift-In-Meaning Model

Our research (Chiaramonte & Friend, 1997, 1999, 2002, 2004, 2006), which has focused on healthcare 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, healthcare providers use processes similar to those involved in forming impressions of persons, as first developed by Solomon Asch (1946, 1984, 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, while 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 subsequently, 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., Coscarelli-Shag & Heinrich, 1989), and that they are more likely than men to discuss stressors and emotional issues with their physicians (Kroene & 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 (Sheikh, Leskin, & Klein, 2004; Eaton, Kessler, Wittchen, & Magee, 1994). Panic attacks are also relatively common in post-menopausal women (Smoller, Pollack, Waasertheil-Smoller, Barton, Hendrix, et al., 2003); the time in a woman's life when the risk of heart disease increases. 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 over-represented among cardiology patients. Second, until recently, data collected and information available about heart disease was 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 victim influenced by Friedman and Rosenman's (1974) characterization of the aggressive, competitive, Type-A man. Finally, healthcare 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 by health care providers is not the perceived incidence or prevalence of CHD as in the heuristic/stereotype model, but the centrality given to women's stress and psychological symptoms.

Previous Research

Over the past several years we have conducted four studies to understand why women with heart disease are under-diagnosed and under-referred for medical care. The general objectives of our research have been 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 hypotheses. The first hypothesis, which concurs with the heuristic/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. According to this hypothesis, when patients present CHD symptoms (without stressors or psychological symptoms), these are interpreted as having an organic origin in both men and women, while the addition of stressors produces a shift in the interpretation of women's symptoms (from organic to psychogenic in origin), but not men's symptoms. We propose that this shift in meaning decreases women's cardiac assessment.

With the assistance of several physicians and the medical literature (Massie & Sokolow, 1993) we developed a vignette of a fictional patient with a multitude of symptoms and risk factors that would be identified as CHD by most medical professionals. We manipulated patient gender (male vs. female) and symptom context (CHD symptoms only vs. CHD symptoms + stress) to examine how information about patient gender and concurrent stress symptoms would influence the assessment of patients with CHD symptoms. Participants in each study were randomly assigned to read one of the four variants of the vignette, followed by questionnaires assessing their recall of symptoms and patient assessment.

Participants in Study 1 (N=56; 46% female) were residents and advanced medical students (i.e., in their 3rd or 4th year of medical school who had completed a minimum of 1 clinical rotation). Participants in Study 2 (N=99; 56% female) were beginning medical students in their first week of medical school while participants in Study 3 (N=82; 48% female) were advanced medical students. Finally, participants in Study 4 (N=122; 67% female) were advanced physician assistant students who had completed an average of 300 clinical hours. In all four studies, after reading the vignettes, participants were given a memory test asking them to recall as many symptoms as they could; they also indicated whether they agreed/disagreed with a *CHD diagnosis* and a *cardiologist referral*. The pattern of means for CHD diagnosis and cardiologist referral for all four studies is presented in Figures 1a-d and 2a-d. As the figures show, results of all four studies consistently demonstrated that the addition of stress produced a gender bias, with women receiving significantly lower CHD diagnoses and cardiologist referrals than men. No evidence of a gender bias was observed in any of the studies when CHD symptoms were presented clearly and without stress and anxiety. Our results therefore disconfirmed the heuristic/male-CHD stereotype hypothesis and provided support for the contextual hypothesis. The stereotype explanation was also countered by the symptom recall results; our results showed no indication that participants were less likely to recall cardiac symptoms in female as compared to male patients, although such schemas would predict this.

To examine whether a shift-in-meaning of the cardiac symptoms had occurred, one sample of advanced medical students (N=82) received an additional questionnaire asking them to list the symptoms they had considered most important to their patient assessment and to indicate whether they believed the symptom's origin/etiology was organic or psychogenic. The most commonly listed symptoms were *chest pain, shortness of breath,* and *heart rate irregularities*. As Figures 3a-d show, both men's and women's symptoms were interpreted as having an organic origin when presented without stress while the addition of stress produced a shift in the interpretation of women's symptoms – but not men's – so that these were perceived as *less organic* and *more psychogenic.*

The clinical implications of our results are serious. Given the higher prevalence of anxiety disorders and psychological symptoms in women, the likelihood that a woman with CHD will also discuss stressors and present psychological symptoms is high. Our results suggest that this concurrent presentation may lead to the misinterpretation of women's cardiac symptoms so that they are perceived as a manifestation of stress/anxiety. This misinterpretation could delay women's medical care and lead to a worse prognosis. The results of our studies with medical students, residents, and physician assistant students prompted us to replicate and expand the research with physicians and to address several important limitations of the earlier studies.

Limitations of the Past Research Addressed in the Present Studies

The three studies that comprise the present research address four limitations of our earlier research. First and foremost participants in our earlier research were primarily medical students and not physicians. As it is physicians, and not medical students, who are the frontline decision-makers in patient care, it is necessary to show that the bias also occurs with physicians and it is imperative to identify the processes responsible for the bias in such a sample. The findings may then be sufficiently convincing to the medical community to prompt the development of educational initiatives to reduce the bias. To address this limitation, the present research was conducted with physicians specializing in internal medicine and with family physicians. The selection of internists and family physicians is particularly relevant as they are generally the first medical professionals to assess patients' symptoms; they are also generally responsible for giving patients referrals for specialized care. Greater understanding of the psychological processes underlying bias in these two groups would be especially meaningful, and practical.

Another limitation of the earlier research is that the patient vignettes included mostly typical CHD symptoms such as chest pain, chest tightness, sweating, and shortness of breath. In medical texts these are presented clearly as symptoms indicative of CHD. However, recent research suggests that women sometimes 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, Cody, O’Sullivan, Elberson, Moser et al., 2003). The earlier study included many textbook-typical symptoms and risk factors to examine whether the presence of stressors would produce a gender bias in the assessment of patients presenting symptoms that would be identified as CHD by most healthcare professionals. Certainly 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 such textbook-typical symptoms probably *minimized* gender bias in CHD assessment. It is possible that atypical symptoms might contribute even further to a bias as anecdotal evidence suggests (e.g., Latz & Baird, 1994; LeCharity, 1999). In order to examine how physicians respond to men and women presenting atypical CHD symptoms, and how the presence of stress and anxiety in addition to atypical symptoms might influence patient assessment, a modified patient vignette reflecting an atypical CHD symptom presentation was used in one of the three studies. A third limitation of our past research is that the questionnaire used to assess participants' interpretation of symptoms did not permit multidimensional answers. Origin was selected from four discrete choices: *mostly organic, somewhat organic, mostly psychogenic,* and *somewhat psychogenic,* thus a dimensional answer could not be given (e.g., somewhat psychogenic <u>and</u> mostly organic). Additionally, while the CHD+Stress conditions included both an external stressor and associated anxiety symptoms, we could not examine whether participants thought of stress and anxiety differently in male and female participants. To address this limitation, the symptom origin questionnaire in Studies 2 and 3 was modified to permit the assessment of symptom origin along three separate scales: an *organic scale*, a *psychogenic scale*, and a *stressor-related scale*. All three studies also included several measures to directly assess how stress and anxiety were perceived and treated in male and female patients. Finally, participants in our previous studies were all from the same University Medical Center so the observed effect may have been unique to that medical center. To address this limitation, participants in Study 1 were from a different University Medical Center while participants in Studies 2 and 3 were from diverse regions of New York State.

The Present Studies

A secure online survey instrument was used to conduct three separate studies. Participants in Study 1 (N=87) were physicians specialized in internal medicine. Participants in Study 2 (N=143) and Study 3 (N=142) were family physicians. As in the previous studies, patient gender (male vs. female) and symptom context (no stress vs. plus stress) were manipulated and participants read one of four vignette variants of a fictional patient with CHD symptoms. Participants in Studies 1 and 2 read vignettes of patients with *textbook-typical* CHD symptoms while participants in Study 3 read vignettes of patients with *atypical* CHD symptoms. After reading the vignettes, participants in all 3 studies completed a memory test where they listed as many symptoms as they could recall; they also indicated their agreement with several cardiac measures including *CHD diagnosis* and *cardiologist referral* and they indicated their agreement with several psychological measures including *anxiety diagnosis* and *psychologist referral.* Psychological measures were included to examine how the presence of stressors and anxiety translated into the psychological assessment of patients. Finally, all participants listed the 3 symptoms they considered most important to their patient assessment; participants in Studies 2 and 3 also indicated the symptom's origin to be on three separate scales: an *organic*, *a psychogenic*, and a *stressor-related origin scale.*

STUDY 1

Study 1 had four main objectives. The first was to replicate the earlier research with a sample of physicians specialized in internal medicine. The second was to test the simple association and contextual hypotheses by investigating how information about patient gender and concurrent stress symptoms would influence *CHD diagnosis*, *cardiologist referral*, and *cardiac medication prescription*. The third was to test the somatizing-female hypothesis by examining the influence of patient gender and concurrent stress symptoms on *anxiety diagnosis, stress diagnosis*, *psychologist referral*, and *anxiolytic medication prescription*. Finally, as research from the social cognition literature indicates that memory is typically more accurate for stereotype-consistent than stereotype-inconsistent information (e.g., Bransford & Franks, 1971; Bransford & Johnson, 1972), we examined the number and types of symptoms recalled by participants hypothesizing that better recall of male patients' cardiac 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's and women's symptoms would weaken the stereotype hypothesis.

METHOD

Participants

Four hundred seventeen physicians specializing in internal medicine and listed in the directory of a large university hospital in New York City received electronic mail (email) invitations to participate in a study ostensibly on memory and symptom recall. Forty-nine invitations were returned as undeliverable. Over the course of three weeks, the three hundred sixty-eight physicians with valid email addresses received the initial invitation letter and three follow-up reminders. In all, eighty-seven physicians completed the study (24% response rate). Thirty-three participants were female (38%) and 67 were male (62%). Additional physician characteristics are presented in Table 1.

Design and procedure.

The study was conducted using a secure online survey instrument. An algorithmically generated randomly assigned login code that provided access to the study website was included in the electronic mail invitation. Login codes were deactivated after first use ensuring that participants could not repeat the study. Once logged in, and after indicating their consent, participants were randomly assigned to read one of four versions of a fictional vignette of a patient with symptoms consistent with coronary heart disease (CHD). The four versions of the vignette are presented in Appendix A. The vignettes 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 with exertion, 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 (BMI=28), 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 and smoking 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 "textbook typical" 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 x 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 8-10 years later than men (AHA, 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 47 year-old man who was 6'1" tall and weighed 210 lbs. or a 56 year-old woman who was 5'5" tall and weighed 165 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 spoke clearly and calmly and that they were appropriately concerned about their symptoms. 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, that they were experiencing financial difficulties which might force them to move out of a house and into an apartment, and that that they were having difficulty falling and staying asleep. The CHD+SA vignette also indicated the patient appeared somewhat agitated and nervous and that they were extremely concerned about their symptoms. Our goal was to present a patient who had been exposed to objective stressors and who was experiencing associated psychological symptoms of stress. After reading the vignettes, participants completed three questionnaires (Appendix B). Participants could not refer back to the vignette after reading 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 (Appendix B).

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 set of questionnaires instructed participants to list as many symptoms as they could recall. Participants were also asked to recall the patient's age and gender; the information was used as a manipulation check and we excluded from analyses data from the one individual in Study 1, the two individuals in Study 2, and the one individual in Study 3 who incorrectly identified the patient's gender. Participants were then presented with a questionnaire asking them to indicate their level of agreement with thirty statements regarding the patient. Further minimizing demand characteristics, the three cardiac and four psychological dependent variables (DVs) were embedded within the these statements. The three cardiac DVs were *CHD diagnosis* (i.e., "This patient has coronary heart disease symptoms."), *cardiologist referral* (i.e., "This patient should be referred to a cardiologist."), and *cardiac medication prescription* (i.e., "This patient should be prescribed medication to relieve cardiac symptoms."). The four psychological DVs were *anxiety diagnosis* (i.e., "This patient has anxiety symptoms."), *stress diagnosis* (i.e., This patient's symptoms are caused by stress."), *psychologist referral* (i.e., "This patient should be referred to a psychologist."), and *anxiolytic medication prescription* (i.e., "This patient should be prescribed medication to relieve anxiety symptoms."). Ratings were made on 11-point Likert scales that ranged from 0 (*strongly disagree*) to 10 (*strongly agree*). The additional 24 statements are presented in Appendix B.

RESULTS

We examined responses to all 30 diagnosis and treatment recommendation statements to test the stress manipulation and to ensure that symptoms presented in the vignette were identified as CHD. Means for all diagnosis and treatment recommendation statements are presented in Figures 4 and 5. As the figures show, means for all psychological variables are below the midpoint on the 11-point scale in the CHD/noSA conditions and above the midpoint in the CHD+SA conditions, providing evidence that the manipulation was successful. CHD diagnosis and cardiologist referral were the only non-psychological illness variables with a mean above the mid-point of the 11-point scale, providing evidence that participants identified and treated the CHD symptoms and ruled-out other physical diagnoses.

Cardiac Dependent Variables

For all cardiac variables, 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*, *cardiologist referral*, and *cardiac medication prescription* statements were analyzed in a 2 (patient gender) x 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 3a, our focus is on a series of four planned contrasts conducted to test the two hypotheses. For ease of comparison across studies, means and standard deviations for cardiac variables are reported on Table 4 while planned contrast results are reported on Table 5.

Testing the two hypotheses. The pattern of means for the three cardiac variables is presented in Figures 6a, 6c, and 7a. 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; an absence of gender differences in the CHD/Only conditions will thus disconfirm the hypothesis. The contextual hypothesis, on the other hand, posits that cardiac symptoms presented clearly and without stress will be interpreted correctly in both men and women while the addition of stress will shift the meaning of women's – but not men's - cardiac symptoms so that these will be perceived as a manifestation of the stress. The contextual hypothesis thus predicts that (1) women presenting CHD + SA should receive lower cardiac scores than women presenting CHD/noSA (fCHD+SA< fCHD/noSA); (2) men presenting CHD + SA should <u>not</u> receive lower cardiac scores than men presenting CHD/noSA (mCHD+SA=mCHD/noSA); (3) significant gender differences should be observed in the CHD+SA conditions, with women receiving lower cardiac scores than men (fCHD+SA<mCHD+SA); and (4) in contrast to the simple association hypothesis prediction of a straightforward gender bias, the contextual hypothesis predicts that gender differences should <u>not</u> 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 X symptom context interaction. (See Table 3a for ANOVA results).

The simple association hypothesis was tested for all three 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 analysis of variance). None of the results were significant. That is, gender disparities were not observed when CHD symptoms were presented clearly and without SA. As Figure 6a shows, females (M=6.41, SD=2.38) and males (M=6.77, SD=1.77) received comparable CHD diagnosis scores, F<1. As Figure 6c shows, females (M=8.59, SD=1.99) and males (M=7.91, SD=2.01) also received comparable cardiologist referral scores F<1. Finally, as Figure 7a shows, females (M=6.91, SD=2.54) and males (M=6.18, SD=2.72) received comparable cardiac medication prescription scores F<1. 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=3.27, SD=2.23) received significantly lower scores than fCHD/noSA, $F(1, 83)=22.60$, $p<.0001$ while mCHD+SA (M=6.09, SD=2.32) and mCHD/noSA received comparable scores, $F<1$. Similar results were observed for cardiologist referral and cardiac medication prescription. That is, fCHD+SA (M=4.64, SD=3.61) received significantly lower cardiologist referral scores than fCHD/noSA, $F(1, 83)=22.57$, $p<.0001$, while mCHD+SA (M=7.29, SD=3.10) and mCHD/noSA received comparable scores, $F<1$. Similarly, fCHD+SA (M=2.05, SD=2.13) received significantly lower cardiac medication prescription scores than fCHD/noSA, $F(1, 83)=35.88$, $p<.0001$, while mCHD+SA (M=5.24, SD=3.29) and mCHD/noSA received comparable scores, $F<1$. Finally, results of the male versus female contrasts in the CHD+SA conditions showed that females received significantly lower CHD diagnosis, $F(1, 83)=17.88$, $p<.0001$, cardiologist referral, $F(1, 83)=9.90$, $p<.01$, and cardiac medication scores, $F(1, 83)=15.10$, $p<.001$.

Psychological Dependent Variables

For all psychological variables, 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 *anxiety diagnosis*, *stress diagnosis*, *psychologist referral*, and *anxiolytic medication prescription* statements were analyzed in a 2 (patient gender) x 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 5a, our focus is on a series of contrasts conducted to test the alternate (somatizing-female) and contextual hypotheses. Means and standard deviations for all psychological variables are reported on Table 7 while planned contrast results are reported on Table 8.

Testing the alternate (somatizing-female) hypothesis. The pattern of means for the four psychological variable is presented in Figures 7c, 8a, 8c, and 8e. The somatizing-female hypothesis posits that women's symptoms are more likely to be attributed to stress than men's symptoms. Results showing that women receive higher scores on psychological variables than men will thus support this hypothesis while results showing that men and women receive similar psychological scores will disconfirm the hypothesis. By contrast, the contextual hypothesis posits that both women's and men's symptoms may be attributed to stress. The difference is that for men, the attribution of symptoms to stress does *not diminish* the cardiac evaluation while for women the attribution of symptoms to stress *diminishes* the cardiac evaluation. However, because stressors are central to the assessment of women and peripheral to the assessment of men, the increase in psychological scores may be somewhat greater for women than men. Results showing that the addition of stress and anxiety (SA) increased the psychological assessment of men and women together with results reported above showing that the presence of SA reduced cardiac evaluations for women but not for men, would provide support for the contextual hypothesis.

As Table 5a shows, patient gender main effects or interactions were not observed in any analyses with psychological variables. We did, however, observe a strong and consistent symptom context main effect, showing that the experimental manipulation was successful. Results of contrasts showed that the addition of SA produced an equal and significant increase in anxiety diagnosis (Figure 8a), stress diagnosis (Figure 8c), psychologist referral (Figure 8e), and anxiolytic medication prescription (Figure 7c) for both men and women. We did observe one gender difference in the CHD/no SA condition, where men (M=3.82, SD=2.89) received somewhat higher anxiolytic medication scores than women (M=2.55, SD=2.30), $F(1, 83)=4.21$, $p<.04$. However, means for both men and women were below 5 on an 11-point scale, thus they do not suggest strong agreement with an anxiolytic prescription. On the other hand, if stress is perceived to be a CHD risk factor for men, internists may be more likely to prescribe an anxiolytic as a prophylactic to reduce the patient's stress/anxiety and thus decrease the risk of cardiac events.

Cardiac and Psychological Symptom Recall

We examined the number and types of symptoms recalled by participants in order to determine whether recall was more accurate for stereotype-consistent information. We hypothesized that better recall of male patients' cardiac symptoms or female patients' psychological symptoms would provide evidence of the male-CHD-stereotype or the female-somatizing stereotype. Participants were asked to recall the patient's symptoms two separate times, immediately after reading the patient vignette and at the end of the survey. The first time they were asked to list as many symptoms as they could recall while the second time they were asked to list the three symptoms they had considered most important in their patient assessment. Table 2a presents all symptoms and risk factors recalled by participants during the first recall test. As the Table 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 were listed as frequently for males as females while anxiety was listed *more* frequently for men providing evidence that stress and psychological symptoms were evaluated equally present in <u>both</u> males and females but that they had a different influence on the assessment and interpretation of males' and females' cardiac symptoms. Similar results were observed with the second symptom recall task and little difference was observed in the types of symptoms participants listed as having been important to their patient assessment (Table 7a).

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 9a and 9b, the percentage of participants who agreed with a CHD diagnosis and cardiologist referral. We calculated agreement by splitting the 11-point Likert scale into three response ranges: agreement (above 5), neutral (5), and disagreement (below 5). As the figures show, most participants agreed with a cardiac diagnosis and cardiologist referral for both male (73% and 91%) and female (82% and 91%) patients in the CHD/noSA conditions. Notice, however, how in the CHD+SA conditions 58% of participants agreed with a CHD diagnosis for male patients, while only 18% agreed for female patients; similarly, while 76% agreed with a cardiologist referral for male patients, 41% agreed for female patients.

In summary, for cardiac variables, results with experienced physicians mirrored results observed with medical students, residents, and physician assistant students and thus replicated our earlier research. Results consistently showed an absence of gender bias in the CHD/noSA conditions and a strong gender bias in the CHD+SA conditions, with women receiving significantly lower CHD diagnosis, cardiologist referral, and cardiac medication scores than men. Three additional results were observed. First, results with psychological variables showed no evidence of a gender bias; men's and women's stress and anxiety were equally diagnosed and equally attended to (i.e., with a psychological referral and anxiolytic medication), thus disconfirming the female-somatizing stereotype hypothesis. Second, the symptom recall data showed that cardiac and psychological symptoms were recalled as frequently for male and female patients, providing no support for a simple male/female stereotype argument. 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.

STUDY 2

Study 2 replicated the previous study with a large sample of family physicians and explored the psychological processes underlying gender bias by examining participants' interpretation of cardiac symptoms. Participants listed the symptoms they had considered most important to their patient assessment and indicated each symptom's origin along three separate scales: an *organic scale*, a *psychogenic scale*, and a *stressor-related scale*. We included a stressor-related origin category to examine whether stress and anxiety were perceived differently in men and women and hypothesized that anxiety and stress may be viewed as *dispositional* (psychogenic) in women and as *situational* (external stressor-related) in men. In line with the contextual hypothesis, we predicted that cardiac symptoms presented without stress/anxiety would be interpreted as equally organic in both men and women while the presentation of cardiac symptoms in the context of stress would shift the interpretation of women's symptoms so that these would be viewed as *less organic* and *more psychogenic* than men's.

METHOD

Participants

Two thousand two hundred sixty-two (2,262) family physician members of the New York State Academy of Family Physicians (NYSAFP) were sent postal mail invitations to participate in a study ostensibly on memory and symptom recall. Seventy-two letters were returned as undeliverable. One thousand eight hundred twenty-five were also sent an electronic mail (email) invitation; email addresses were not available for 437 members. Over the course of three weeks, physicians with valid email addresses were sent the initial invitation and three follow-up reminders. Eighteen physicians advised us that they could not complete the survey because of technical difficulties. In all, 285 completed the online survey (13-16% response rate). One hundred forty-three (N=143) were randomly assigned to Study 2 and N=142 were randomly assigned to Study 3. Of the 143 assigned to Study 2, 82 were female (57%) and 61 were male (43%). see Table 1 for additional physician characteristics.

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 three symptoms they considered most important to their patient assessment and to indicate next to each symptom what they believed its etiology to be. Symptom etiology was indicated along three separate scales: an *organic scale*, a *psychogenic scale*, and a *stressor-related scale*. Ratings were made on an 8-point Likert scales that ranged from 0 (*not at all*) to 7 (*very much so).* A sample of this questionnaire is reproduced in Appendix B.

RESULTS

Mean responses to all 30 diagnosis and treatment recommendation statements are reported in Figures 10 and 11. The pattern of means paralleled those in Study 1. CHD diagnosis and cardiologist referral were the only non-psychological illness variables with means above the mid-point on the 11-point scale. Means for all psychological variables were below the midpoint in the CHD/noSA conditions while they were above the midpoint in the CHD+SA conditions, providing evidence that the stress manipulation was successful and that participants identified CHD and ruled out other physical diagnoses.

Cardiac Dependent Variables

Responses to the *CHD diagnosis*, *cardiologist referral*, and *cardiac medication prescription* statements were analyzed in a 2 (patient gender) x 2 (symptom context) between-subjects analysis of variance (ANOVA); an alpha level of .05 was adopted. We report main effects and interaction terms on Table 3b, although, as in Study 1, our focus is on a series of four planned contrasts conducted to test the two hypotheses. Means and standard deviations for all cardiac variables are reported in Table 4 while planned contrast results are reported in Table 5.

The pattern of means for the three cardiac variables is shown in Figures 6b, 6d, and 7b. Five of the eight contrasts with CHD diagnosis and cardiologist referral paralleled Study 1 results. As in Study 1, fCHD+SA received lower CHD diagnosis and cardiologist referral scores than men, [$F(1, 139)=30.92$, $p<.0001$ and $F(1, 139)=13.88$, $p<.001$]. As in Study 1, fCHD+SA received significantly lower CHD diagnosis and cardiologist referral than fCHD/noSA, [$F(1, 139)=39.44$, $p<.0001$, and $F(1, 139)=20.97$, $p<.0001$]. Finally, as in Study 1, for cardiologist referral, gender differences were not observed when CHD symptoms were presented without SA, $F=(1, 139)=1.11$, $p=.29$. Two sets of analyses provided somewhat different results from Study 1 and from all previous studies. First, fCHD/noSA received marginally lower CHD diagnosis scores than mCHD/SA, $F(1, 139)=3.40$, $p=.07$. Second, SA influenced the cardiac assessment of female patients as well as male patients. That is, male patients presenting SA received significantly lower CHD diagnosis and cardiologist referral scores than male patient presenting CHD/noSA, [$F(1, 139)=7.50$, $p<.01$, and $F(1, 139)=4.11$, $p<.05$].

Three of four sets of results with cardiac medication were consistent with Study 1. First, as in all cardiac variables, a strong bias was observed in the CHD+SA conditions, with females receiving significantly lower scores than males, $F(1, 139)=18.41$, $p<.0001$. Second, fCHD+SA received significantly lower scores than fCHD/noSA, $F(1, 139)=11.13$, $p<.001$, and third, mCHD+SA and mCHD/noSA received comparable scores, $F(1, 139)=2.33$,$p=13$. As in CHD diagnosis, however, results showed a gender difference in the CHD/noSA conditions, with females receiving significantly lower scores, $F(1, 139)=5.56$, $p<.05$. Possibly family physicians were somewhat reluctant to diagnose CHD and to prescribe cardiac medication for women. However, given the similar cardiologist referral scores for men and women in the CHD/noSA conditions, results suggest that physicians did perceive the patient's symptoms as cardiac-related.

We explored these differences by examining the effect of participants' gender on cardiac scores. For cardiac diagnosis and cardiologist referral, analyses including participant gender as a factor revealed a significant main effect of participant gender, [$F(1,135)=5.34$, $p<.02$, and $F(1, 135)=3.88$, $p<.05$ respectively], and significant triple interactions [$F(1, 135)=9.35$, $p<.003$, and $F(1, 135)=4.68$, $p< .03$]. The interactions are presented in Figures 13a and 13b. As the Figures show, female family physicians' CHD diagnosis and cardiologist referral decreased with the presentation of SA symptoms irrespective of the patient's gender. By contrast, male family physician's CHD diagnosis and cardiologist referral of male patients remained unchanged with the addition of SA whereas their cardiac assessment of female patients dropped significantly with the addition of SA. Participant gender effects were not observed in Study 1 and they were not observed in any of our previous studies. Analyses of covariance (ANCOVA) examining CHD diagnosis and cardiologist referral responses were conducted controlling for participant gender; the 2x2 interaction remained significant for both CHD diagnosis, $F(1, 138)=8.19$, $p<,005$, and cardiologist referral, $F(1, 138)=4.38$, $p<.04$.

Psychological Dependent Variables

For all psychological variables, 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 *anxiety diagnosis, stress diagnosis, psychologist referral,* and *anxiolytic medication prescription* statements were analyzed in a 2 (patient gender) x 2 (symptom context) between-subjects analysis of variance (ANOVA); an alpha level of .05 was adopted. Main effects and interaction terms are presented on Table 5b. Means and standard deviations for all psychological variables are reported in Table 7 and contrast results are presented in Table 8.

The pattern of means for the four psychological variables is shown in Figures 7d, 8b, 8d, and 8f. Results with anxiety diagnosis, stress diagnosis, and anxiolytic medication were consistent with results observed in Study 1. As the figures show, gender differences were not observed in either the CHD/noSA conditions or the CHD+SA anxiety conditions. Our results showed that stress and anxiety symptoms were equally diagnosed in men and women and that men and women received equal anxiolytic medication prescription. However, as Figure 8f shows, although psychologist referral scores increased significantly for both male and female patients, the increase was greater for females and a gender difference was observed in the CHD+SA conditions, with females receiving significantly higher scores than males, $F(1, 139)=6.09$, $p<.05$. Possibly, participants gave psychologist referrals more readily to women because they may believe that women are more likely to accept and use such a referral.

Cardiac and Psychological Symptom Recall

All symptoms and risk factors recalled by participants in each of the four conditions are presented in Table 2b. As in Study 1, 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. With minor differences, cardiac and psychological symptoms were listed as frequently for males as females. With regard to symptoms participants regarded as important to patient assessment (Table 7b), anxiety was listed as frequently for males and females; however, chest pain and shortness of breath were less frequently listed as important to the assessment of fCHD+SA when compared to mCHD+SA, mCHD/noSA, and fCHD/noSA. Apparently, participants recalled the symptoms accurately (as Table 2a shows), however, they selected different symptoms as important in their medical assessment of male and female patients.

Perceived Origin of Symptoms

We examined the origin interpretation of the two symptoms most commonly listed as important to patient assessment as well as the overall symptom origin interpretation. These were heart rate irregularities (HRI, *n*=86) and chest pain (CP, *n*=82). The meaning shift that occurred in the interpretation of chest pain and heart rate irregularities, as well as the overall symptom interpretation, is best illustrated in Figures 12a-c. The figures present the number of participants (percentage) within each of the four conditions who indicated strong agreement (i.e., a score ≥ 5 on the 7-point Likert scale) with an organic, psychogenic, or stressor-related origin. As Figure 12a shows, for females, the addition of SA produced a striking decrease in the number of participants who agreed with an organic origin of chest pain (from 78% to 29%) and a significant increase in the number of participants who agreed with a psychogenic origin (from 22% to 50%). For males, the change in organic chest pain origin (from 92% to 75%) and psychogenic chest pain origin (from 4% to 8%) was negligible in comparison. With regard to stressor-related CP, a significant increase was observed in both males and females. Results suggest that stress is recalled accurately for women as well as men; however for men, it does not significantly take away from the organic interpretation of symptoms and thus does not take away from a CHD diagnosis and cardiologist referral.

In summary, Study 2 results examining the effects of patient gender and symptom context on cardiac and psychological assessment were consistent with results observed in Study 1, although minor differences emerged showing a participant gender effect on cardiac variables. As predicted by the contextual hypothesis, a patient gender x symptom context interaction was observed with CHD diagnosis and cardiologist referral, although it was marginally significant for cardiologist referral, showing that fCHD+SA received lower scores than fCHD/noSA, mCHD/noSA, and mCHD+SA. Five additional results were observed. First, we observed no evidence of a gender bias in the CHD/noSA conditions for cardiologist referral; it was only when SA were added that women received significantly lower scores than men. Second, in contrast to Study 1, for CHD diagnosis, a marginal gender difference was observed in the CHD/noSA conditions, although the difference was limited to female physicians. Third, results with anxiety diagnosis, stress diagnosis, and anxiolytic medication mirrored results observed in Study 1 and showed no evidence of a gender bias; the addition of SA increased scores on all psychological variables for women as well as men, although women's psychologist referral scores showed a somewhat greater increase than men's scores. Fourth, as in Study 1, symptom recall results showed that cardiac and psychological symptoms were recalled as frequently for male patients as female patients, providing no support for a simple male/female stereotype argument. Finally, results provided evidence that the presence of SA shifted the interpretation of women's – but not men's - cardiac symptoms from organic to psychogenic in origin.

STUDY 3

The patient vignettes in Studies 1 and 2 included many textbook-typical symptoms and risk factors to examine whether the presence of stressors would produce a gender bias in the assessment of patients presenting symptoms that would be identified as CHD by most healthcare professionals. Although 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 it may have *minimized* gender bias in CHD assessment. It is possible that atypical symptoms might contribute even further to a bias. The purpose of Study 3 was to examine how physicians respond to men and women presenting *atypical* CHD symptoms, and how the presence of stress and anxiety in addition to atypical symptoms might influence patient assessment.

METHOD

Participants

See Study 2 Method section. In all, 142 family physicians participated in Study 3 (N=142; 63% female, 37% male). Table 1 reports additional physician characteristics.

Design and Procedure

See Study 1 and Study 2 Method sections for design and procedure. As mentioned above, Study 3 was identical to Study 2 with one exception: the patient vignette was modified to reflect an atypical presentation of CHD symptoms (see Appendix A).

RESULTS

Mean responses to all 30 diagnosis and treatment recommendation statements are reported in Figures 14 and 15. In contrast to Studies 1 and 2, CHD diagnosis and cardiologist referral were not the only non-psychological illness variables with a mean above the mid-point on the 11-point scale. Gastrointestinal (GI) diagnosis scores were in fact higher than CHD diagnosis scores while cardiologist referral and medication to reduce GI symptoms both approached the midpoint. Additionally, anxiety and stress diagnosis means were at or above the midpoint in the CHD/noSA conditions. The less specific nature of the atypical symptoms may have produced a wider diagnosis differential than did the typical CHD symptoms making symptoms consistent with a number of diagnoses, including GI problems.

Cardiac Dependent Variables

Responses to the *CHD diagnosis*, *cardiologist referral*, and *cardiac medication prescription* statements were analyzed in a 2 (patient gender) x 2 (symptom context) between-subjects analysis of variance (ANOVA); an alpha level of .05 was adopted. We report main effects and interaction terms on Table 3b. As in the previous studies, our focus is on a series of four planned contrasts. For ease of comparison across studies, means and standard deviations for all cardiac variables are reported in Table 4 and contrast results are reported on Table 5.

The pattern of means for the three cardiac variables is show in Figures 16a-c. Only of the six contrasts examining gender differences was significant (CHD diagnosis, male vs. females in the CHD+SA conditions) and one was marginally significant (cardiac meds, male vs. females in the CHD/noSA conditions). A gender difference in CHD diagnosis in the CHD+SA conditions was observed, with women receiving lower scores (M=2.67, SD=2.03) than men (M=3.70, SD=2.15), F(1, 138)=4.18, p<.05, however, means for both men and women were on the low end of the 11-point scale. The low means suggest a lack of certainty with the diagnosis and indicate a difference in *disagreement* rather than a difference in *agreement* with a CHD diagnosis. As in Study 2, cardiac meds results showed that participants were marginally less likely to prescribe medication for fCHD/noSA than mCHD/noSA, F(1, 138)=3.45, p=.07. None of the other contrasts examining gender differences were significant. Male and female patients in the CHD/noSA conditions received comparable CHD diagnosis and cardiologist referral scores, [F(1, 138)=1.79, p=.18, and F(1, 138)=2.04, p=.16], and male and female patients in the CHD+SA conditions received comparable cardiologist referral and cardiac medication scores, [F(1, 138)=2.34, p=.13, and F(1, 138)=2.80, p=10]. The atypical CHD presentation did not produce the predicted increase in gender differences in cardiac and psychological assessment. The less specific nature of atypical CHD symptoms is consistent with a *number* of diagnoses, including GI disorders, making diagnosis more difficult. Adding stress and anxiety further complicates the patient assessment. Wilk's Lambda ANOVA

including both CHD and GI diagnosis revealed that participants in the CHD/noSA atypical conditions were unsure whether the atypical symptoms were indicative of GI or CHD; however, in the CHD+SA conditions participants believed the patient was suffering with GI problems and not CHD.

Psychological Dependent Variables

For all psychological variables, 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 *anxiety diagnosis*, *stress diagnosis*, *psychologist referral*, and *anxiolytic medication prescription* statements were analyzed in a 2 (patient gender) x 2 (symptom context) between-subjects analysis of variance (ANOVA); an alpha level of .05 was adopted. Main effects and interaction terms are presented on Table 5c. Means and standard deviations are reported on Table 6 while contrast results are reported on 8.

The pattern of means for anxiolytic meds, anxiety diagnosis, and psychologist referral are presented in Figures 15d-f. We hypothesized that the greater ambiguity in the atypical CHD presentation might produce gender differences in psychological diagnosis and treatment, with females receiving higher scores on all psychological variables. Results did not support this hypothesis, as none of the eight contrasts examining gender differences were significant. In both the CHD/noSA and the CHD+SA conditions, males and females received equal anxiety diagnosis, stress diagnosis, anxiolytic meds, and psychologist referral scores. The addition of SA *equally* increased psychological scores for males and females on all psychological variables. As no evidence was found that physicians were more likely to attribute women's symptoms to stress, the female-somatization stereotype hypothesis was rejected.

Cardiac and Psychological Symptom Recall

All symptoms and risk factors recalled by participants in each of the four conditions are presented in Table 2c. As with the previous studies, 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, as in the previous studies, anxiety and stress were listed as frequently for men as they were for women. With regard to symptoms participants regarded as important to patient assessment (Table 7c), we observed only minor differences in recall and, again, anxiety was listed as frequently for males and females. None of our results showed any evidence that recall was more accurate for stereotype-consistent information; that is, participants did not show better recall for male patient's cardiac symptoms or female patient's psychological symptoms, placing serious doubt on the male-CHD and female-somatizing stereotype hypothesis.

Perceived Origin of Symptoms

We examined the origin interpretation of the two symptoms most commonly listed as important to patient assessment as well as the overall symptom origin interpretation. The two symptoms most commonly listed as important were heart rate irregularities (HRI, n=116) and fatigue (n=71). For illustrative purposes, we report in Figures 16a-c, the number of participants (percentage) within each of the four conditions who indicated strong agreement (i.e., a score ≥ 5 on a 7-point Likert scale) with an organic, psychogenic, or stressor-related origin. As the figures show, the organic interpretation of symptoms decreased for both men and women, however the decrease was greater for women. For HRI, in the CHD/noSA conditions, 57% of participants indicated strong organic origin agreement for male patients and 70% indicated strong agreement for female patients. In the CHD+SA conditions, agreement dropped to 19% for males and to 8% for females. As the figures show, a similar pattern was observed with fatigue and with overall origin of symptoms. In summary, despite receiving similar scores on all psychological measures and comparable scores on cardiac variables, the addition of SA produced a somewhat different shift in the interpretation of men and women's cardiac symptoms. That is, although the addition of SA produced a similar increase in psychogenic and stressor-related origin scores for both men and women, it produced a greater drop in the organic origin of women than men.

GENERAL DISCUSSION

The main purpose of the present research was to replicate our previous research with medical students with two samples of physicians. As all our previous research had been conducted with medical students and residents it was important to demonstrate that the gender bias occurs with actual physicians who make medical decisions rather than merely with medical students or residents in training. Additionally, all our previous research was conducted at one institution, so the results could have been unique to that institution. We therefore wanted to extend the research to healthcare providers from different locations. The physicians who participated in the present studies were from multiple schools, of different ages, and varied in their training, medical experience, and specialties. The fact that nearly identical results were observed between beginning medical students in their first week in medical school and internists at a major university center (and family physicians) with over 14 years experience is striking and suggests that the result are indeed robust. Our confidence is further elevated by finding nearly identical results using two quite different methodologies (written questionnaires handed out to groups of medical students and anonymous questionnaires individually accessed by physicians on the internet).

Results of Study 1, conducted with a sample of physicians specialized in internal medicine, mirrored the pattern of results observed in our earlier research with medical students and residents. Results 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, less likely to be given a prescription for cardiac medication, and less likely to be given a cardiologist referral than 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, equally prescribed cardiac medication, and equally referred to a cardiologist. The lack of gender differences when CHD symptoms were presented without stressors places considerable doubt on the commonly held view that gender bias in CHD assessment is due to a stereotype response which associates CHD with men but not women. The consistent statistical interactions between patient gender and symptom context seem to confirm that it is the gestalt of "a stressed or anxious female with CHD-like symptoms" that underlies the gender bias (Table 3).

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 the patient appeared "calm" and s/he was "appropriately concerned" about her/his symptoms. 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, as well as 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 stress/anxiety 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 physicians will be influenced by the interaction of stress/anxiety 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 viewed as a manifestation of stress and interpreted as having a *less organic* and *more psychogenic* origin (Figure 12). For symptoms such as chest pain the clinical implications of these results are serious. Cardiac/organic chest pain requires urgent medical care and may be life threatening, while 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. It is possible that in the present studies, anxiety and stress may have been viewed as *dispositional* in women and as *situational* in men (Chiaramonte & Friend, 2006). Evidence for this is that, for women, stress decreased the organic interpretation of symptoms and increased the psychogenic and stressor-related interpretation. For men, although stress was recalled accurately and never dismissed, and although it increased the stressor-related interpretation, it did not diminish or obscure the organic interpretation of CHD symptoms.

Martin and colleagues (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 to using gender as a heuristic or decision rule so that cardiac-related symptoms are attributed to angina or possible MI when presented by a man but not when presented by a woman. As the heuristic/stereotype argument is based solely on the perceived lack of heart disease in women as compared to men, it predicts a gender bias in cardiac assessment, whether or not stress/anxiety 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, males and females received a similar cardiac assessment. Our results, and Martin et al.'s own results, therefore, place serious doubt on the heuristic/stereotype explanation for gender bias.

Tversky and Kahneman (1974) stated, "heuristics are highly economical and usually effective 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 healthcare 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.

The stereotype explanation is also countered by the symptom recall data we report (Table 2); our results showed no indication that participants were less likely to recall cardiac symptoms in female as compared to male patients, although such schemas would predict this. The fact that the CHD diagnosis was made after participants (1) had been requested to explicitly recall symptoms and (2) that they had done so accurately and without bias makes the results even more significant. It suggests that the individual symptoms are being combined differently for male and female stress patient rather than an error/bias/distortion in selectivity of recall. One would think that accurate recall showing no gender differences prior to diagnosis would mitigate a gender bias in diagnosis.

In their follow-up paper, Martin and Lemos (2002) proposed an alternate hypothesis to explain the effect of high-stress on women's cardiac attributions. They argued that because laypeople hold stereotypes that associate somatization with female gender, the stress-illness rule might not work equally in male and female patients; high-stress females are given lower cardiac attributions because they are perceived as especially likely to manifest stress in terms of physical symptoms. Although Martin & Lemos (2002) explained the psychogenic evaluation of female patient's CHD symptoms according to the stress-illness rule, they were unable to explain why the stress-illness rule should not also apply to males. In none of their studies, it should be noted, did Martin et al. (1998; Martin & Lemos, 2002) provide any direct evidence for either a heuristic or stress-illness rule explanation for a gender bias. For instance, they did not ask participants to recall CHD symptoms, and they did not evaluate symptom interpretation or assess attribution to stress, as the current studies have done, and which might have provided more direct evidence of the explanatory processes. We included several psychological variables and specifically asked participants about how much they attributed the patient's symptoms to stress and anxiety. There was a strong main effect between the CHD/Only and the CHD/Stress conditions, as one would expect if the stress symptom presentation was manipulated successfully (Table 6). However, we observed no gender differences in the attribution of symptoms to stress nor was there an interaction of gender with symptoms presented. Stress attribution increased for both male and female patients in the CHD/Stress conditions, which, according to the stress-illness rule, should have led to symptom discounting in both male and female patients. Thus, though our symptom interpretation data (attribution to organic or psychogenic origin) supports a psychogenic explanation as did Martin and Lemos' (2002, Study 1), they do not support the stress-illness rule explanation for psychogenic attribution.

As recent research suggests that women may present *atypical* CHD symptoms such as nausea and back pain and that chest pain, a hallmark CHD symptom in men, may be less common in women (McSweeney et al., 2003), we modified the patient vignette in Study 3 to reflect an atypical presentation of CHD symptoms to examine how physicians respond to patients presenting atypical CHD symptoms and how they evaluate atypical symptoms presented concurrently with stress. We predicted a greater gender/stress effect in the atypical conditions; however, results did not support this hypothesis. Only one of the six analyses examining gender differences in cardiac assessment showed a minor gender difference in CHD diagnosis and not one of the eight analyses examining gender differences in psychological assessment showed a bias. Men and women presenting atypical CHD without stress received equal cardiac and psychological assessments, as did men and women presenting atypical CHD in the context of stress. Because the atypical symptoms are less illness-specific, they have a "wider diagnosis differential" than do "typical" symptoms and are therefore consistent with a number of diagnoses, including GI problems, which made diagnosis less clear and more difficult. As Figures 4, 10, and 14 show, participants in Study 1 and 2 clearly saw the vignette as CHD but this was not the case in Study 3. In Study 3, physicians in the no/SA conditions were unsure whether to diagnose CHD or GI problems while physicians in the +SA conditions had greater certainty in a GI diagnosis than CHD. In any case, physicians clearly wanted additional information and referred the patient for lab work (See Figure 11).

With regard to atypical symptom interpretation, the addition of stress substantially increased the psychogenic and stressor-related interpretation of symptoms for both men and women. The most frequently recalled symptoms in both the atypical and typical vignettes were heart rate irregularities (HRI), for example palpitations and arrhythmias. A comparison across studies revealed that in Study 3, even in the no/SA conditions, palpitations and other HRI were interpreted as psychogenic or as a result of stress and not as an organic manifestation of cardiac symptoms (Figure 17). In the typical CHD/noStress conditions, HRI were interpreted in light of chest pain and exertional dyspena, which are specific to CHD, and were thought to have an organic origin. Our results suggest that men and women have the same probability of being diagnosed with CHD when they present with atypical symptoms. However, because women present with atypical symptom more frequently than men, and because atypical symptoms are less likely than typical symptoms to be diagnosed as CHD, more women will be underdiagnosed than men. Similarly, because women present with anxiety symptoms more often then men, and because the concurrent presentation of anxiety and atypical cardiac symptoms decreases CHD assessment, more women will be underdiagnosed with CHD than men. Thus gender and anxiety directly influence the psychogenic interpretation of typical symptoms and indirectly (because of the greater prevalence/presence), the psychogenic interpretation of atypical symptoms.

Study Strengths, Limitations, and Future Research

Because of recruitment difficulties, there are few studies of physicians. One major strength of the present studies, therefore, is that it included three separate, relatively large, samples of experienced physicians. Additionally, as the strongest evidence of a gender bias in cardiac care is with early diagnosis and referral for cardiac care, and since internists and family physicians are generally the first medical professionals to assess patients' symptoms, a second major strength of the present research is that participants were physicians specialized in internal and family medicine. Finally, the consistent results observed across different samples of participants, with varying levels of experience, and located in various parts of New York State, provide evidence of the strong external validity of the research.

One limitation of the present studies is that, 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 Studies 2 and 3 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 collection of diagnosis and referral data. At least three limitations are related to use of a written case vignette. First, a written vignette may not be similar to actual clinical practice; it may be that physicians would respond differently to a patient who visits their office. A more realistic – but significantly more costly – method would be to train actors as patients or to develop videotaped presentations. However, as research shows that assessments of patients using written case studies are highly correlated with assessments made in person (e.g., Kirwan, Chaput de Saintonge, Joyce, & Currey 1983; Kirwan, Bellamy, Condon, Buchanan & Barnes, 1983), the additional cost may not be justified. Second, physicians would generally not make "real diagnoses" without getting results of tests that might be needed. Physicians in all three studies indicated that they strongly believed the patient should be referred for lab work and other diagnostic tests. A future study might examine physicians' decision-making in a step-wise manner; that is, the types of diagnostic tests requested would be examined first followed by the diagnoses made and follow-up care prescribed following test results.

In an actual patient encounter, the assessment of women may also be complicated by factors related to age. As women present CHD symptoms on the 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 to 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, while 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. 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, Studies 1 and 2 showed a consistent gender bias in the assessment of women presenting *typical* 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. Study 3 results, on the other hand, showed no evidence of a gender bias in the cardiac or psychological assessment of patients presenting *atypical* CHD symptoms. Contrary to popular view, our results showed that the addition of stress produced a gender bias with typical but not atypical symptoms. 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.

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Figure 1: Previous Research: Cardiac Diagnosis

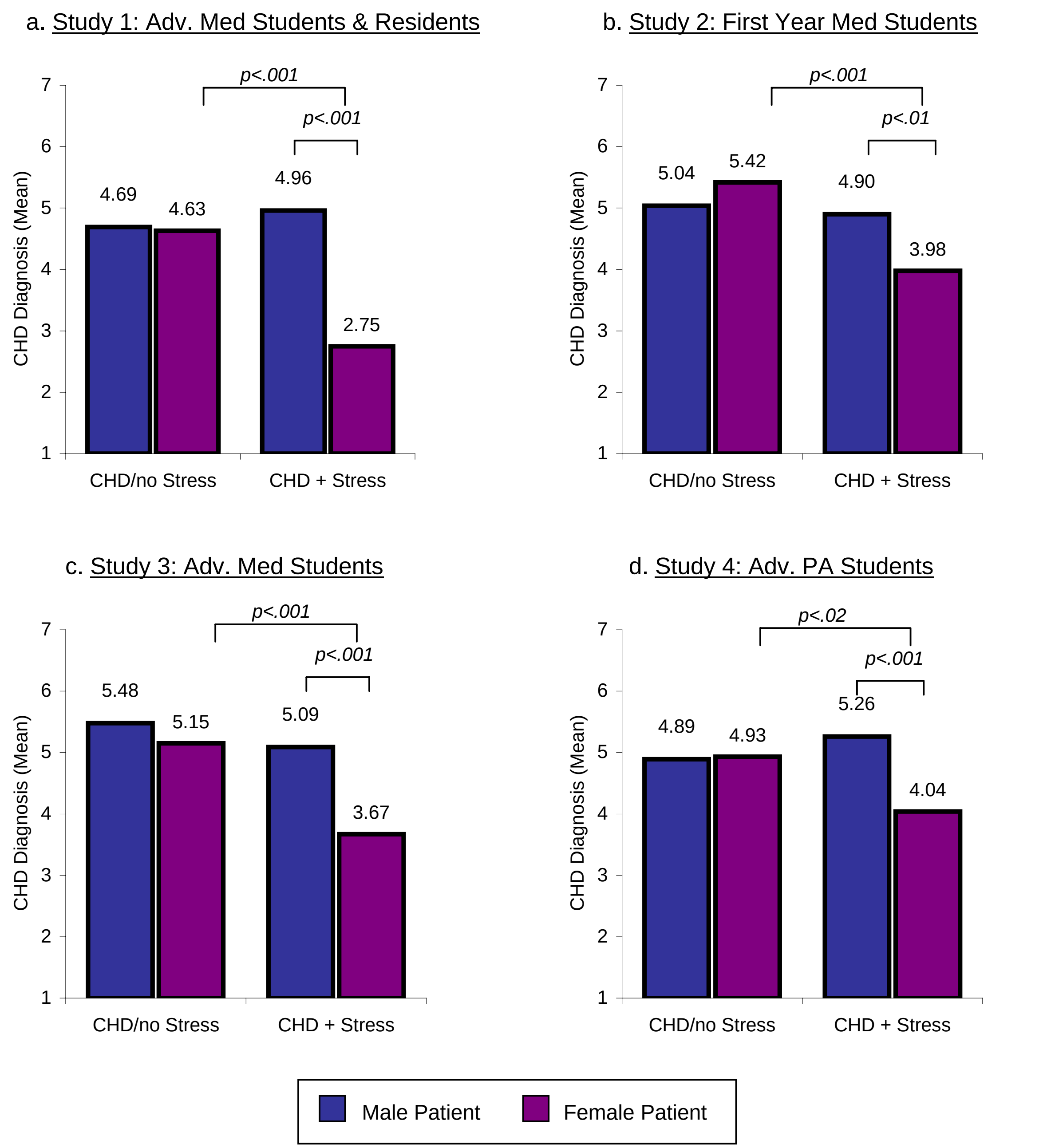


Figure 1: Effects of patient gender and symptom context on coronary heart disease (CHD) diagnosis. Means that differ significantly are indicated by brackets connecting shaded bars.

Study 1: Advanced Medical Students and Residents (N=56)
Study 2: Beginning Medical Students (N=99)
Study 3: Advanced Medical Students (N=82)
Study 4: Advanced Physician Assistant (PA) Students (N=122)

Figure 2: Previous Research: Cardiologist Referral

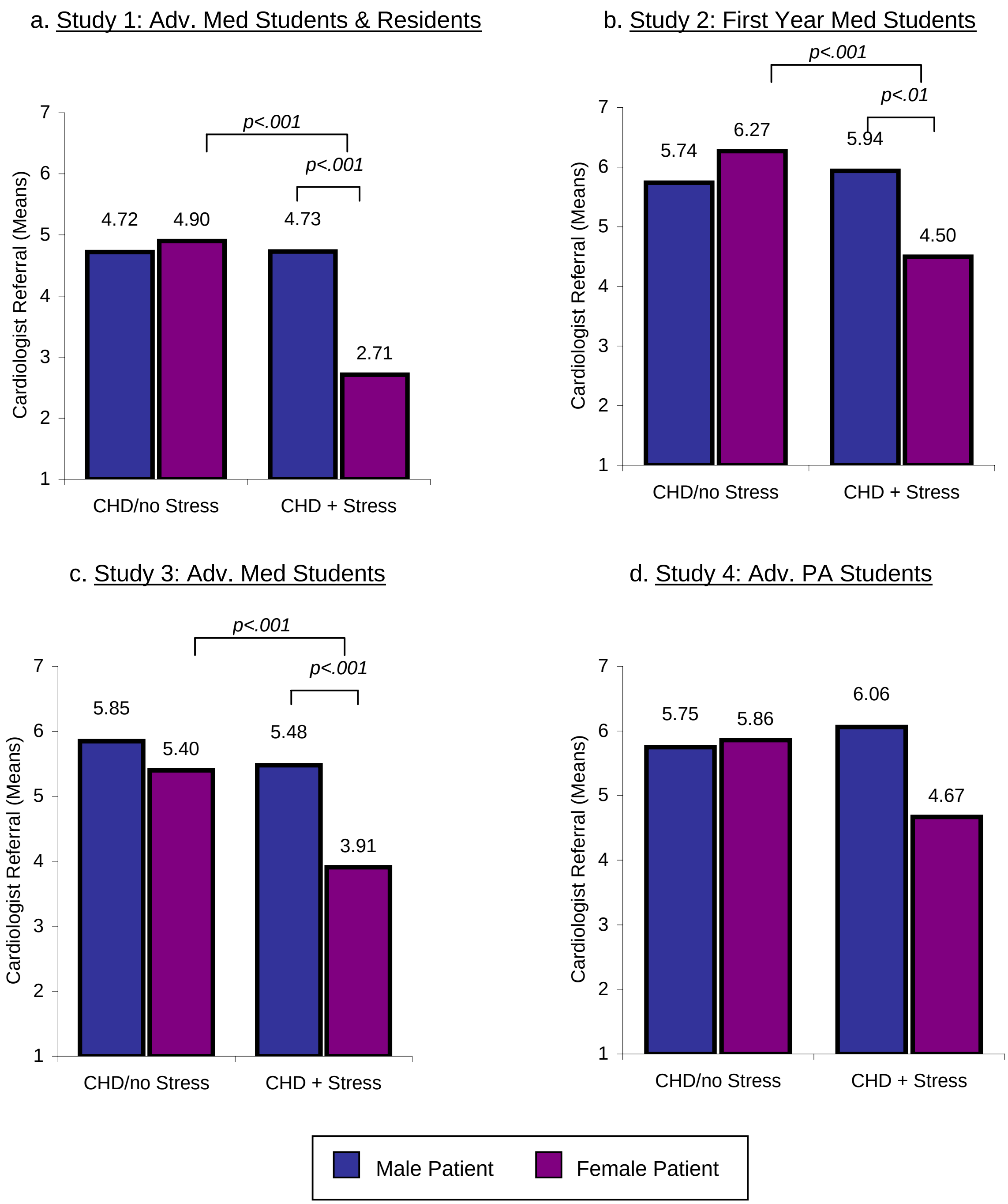


Figure 2: Effects of patient gender and symptom context on cardiologist referral. Means that differ significantly are indicated by brackets connecting shaded bars.

Study 1: Advanced Medical Students and Residents (N=56)
Study 2: Beginning Medical Students (N=99)
Study 3: Advanced Medical Students (N=82)
Study 4: Advanced Physician Assistant (PA) Students (N=122)

Figure 3: Previous Research: Perceived Origin/Etiology of Symptoms Most Frequently Listed as Important to Patient Assessment

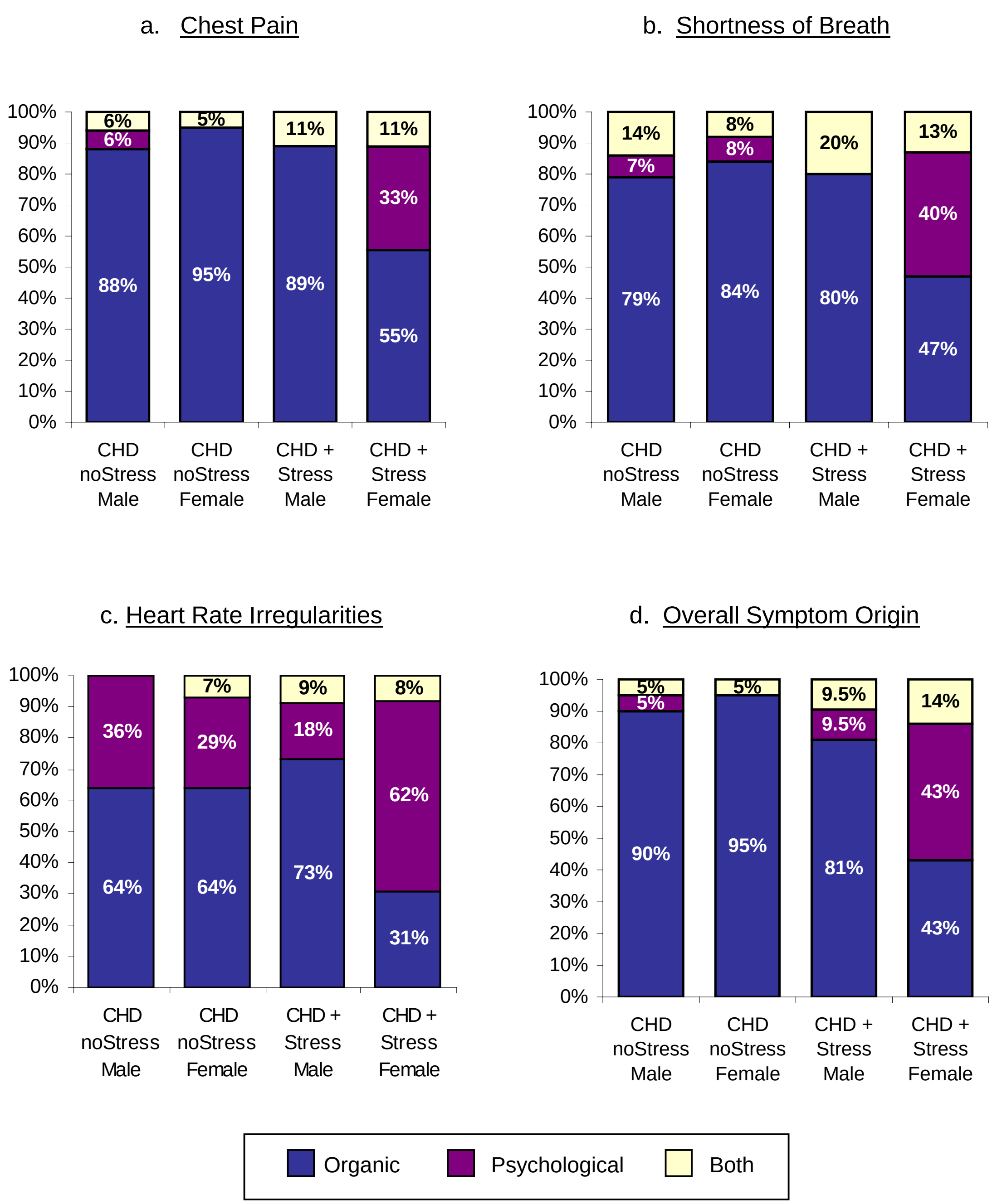


Figure 3. Number of participants (%) in each of the four conditions who indicated that the symptom had an organic origin, a psychogenic origin, or both. d: Overall evaluation of symptom origin. CHD=coronary heart disease. Participants: Advanced medical students (N=82)

Figure 4: All Diagnoses - Study 1

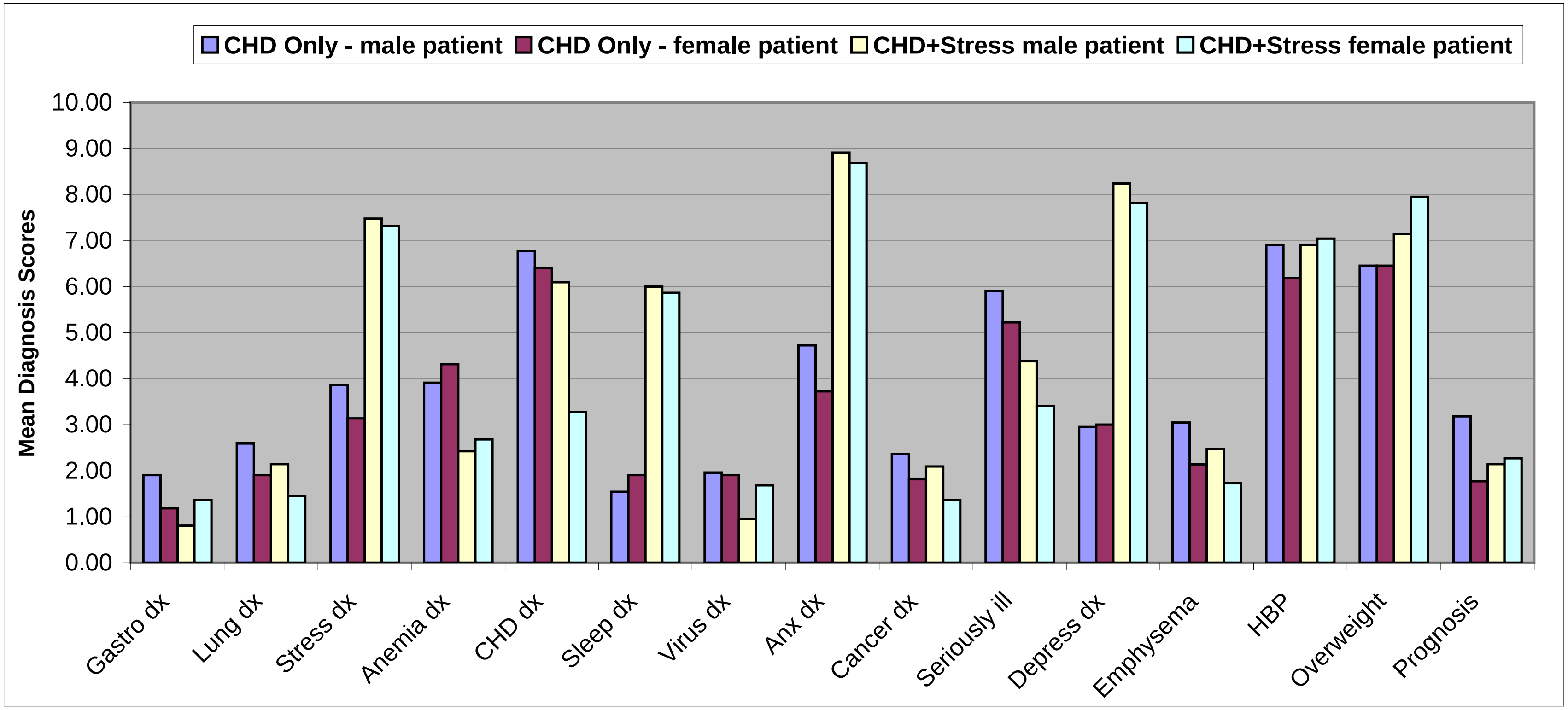


Figure 4: CHD=coronary heart disease. Participants indicated their agreement/disagreement with 15 diagnosis statements. Ratings were made on an 11-point Likert scale ranging from 0 (*strongly disagree)* to 10 (*strongly agree).* Means for Study 1 (N=87 Internists) are reported above

Statements (see Appendix B for full statements):

Gastro: Pt. has gastrointestinal symptoms.
Lung: Pt.'s lung function is impaired
Stress: Symptoms caused by stress.
Anemia: Pt. is anemic.
CHD: Pt. has CHD symptoms.

Sleep: Patient has sleep disorder.
Virus: Patient has virus.
Anxiety: Patient has symptoms of anxiety
Cancer: Patient has cancer.
Seriously ill: Patient is seriously ill.

Depress: Patient is depressed.
Emphysema: Patient has emphysema.
HBP: Patient has high blood pressure.
Overweight: Patient is overweight.
Prognosis: Patient's prognosis is poor.

Figure 5: All Treatment Recommendations - Study 1

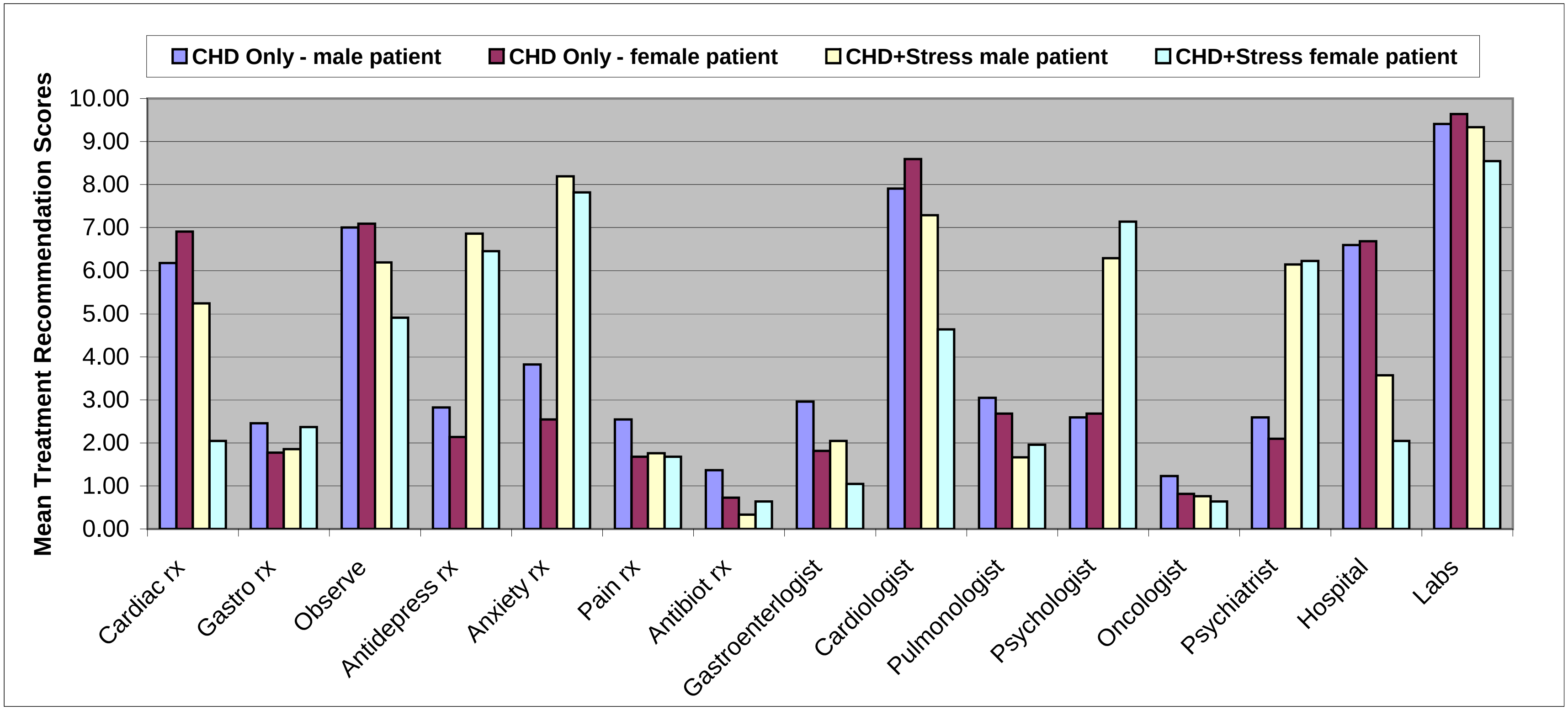


Figure 5: CHD=coronary heart disease. Participants indicated their agreement/disagreement with 15 treatment recommendations. Ratings were made on an 11-point Likert scale ranging from 0 (*strongly disagree)* to 10 (*strongly agree).* Means for Study 1 (N=87 Internists) are reported above.

Statements (see Appendix B for full statements):

Cardiac rx: Prescribe cardiac meds.
Gastro rx: Prescribe meds to↓ gastrointestinal sxs
Observe: Medical observation needed.
Antidepress: Prescribe antidepressant.
Anxiety: Prescribe anxiolytic meds

Pain rx: Prescribe pain-relieving meds
Antibiot rx: Prescribe antibiotic.
Gastro…: Refer to gastroenterologist.
Cardio,,,: Refer to cardiologist.
Pulmo….: Refer to pulmonologist.

Psychologist: Refer to psychologist.
Onco….: Refer to oncologist.
Psychiatrist: Refer to psychiatrist.
Hospital: Pt. needs to be hospitalized.
Labs: Request lab/other diagnostic tests.

Figure 6: CHD Diagnosis and Cardiologist Referral

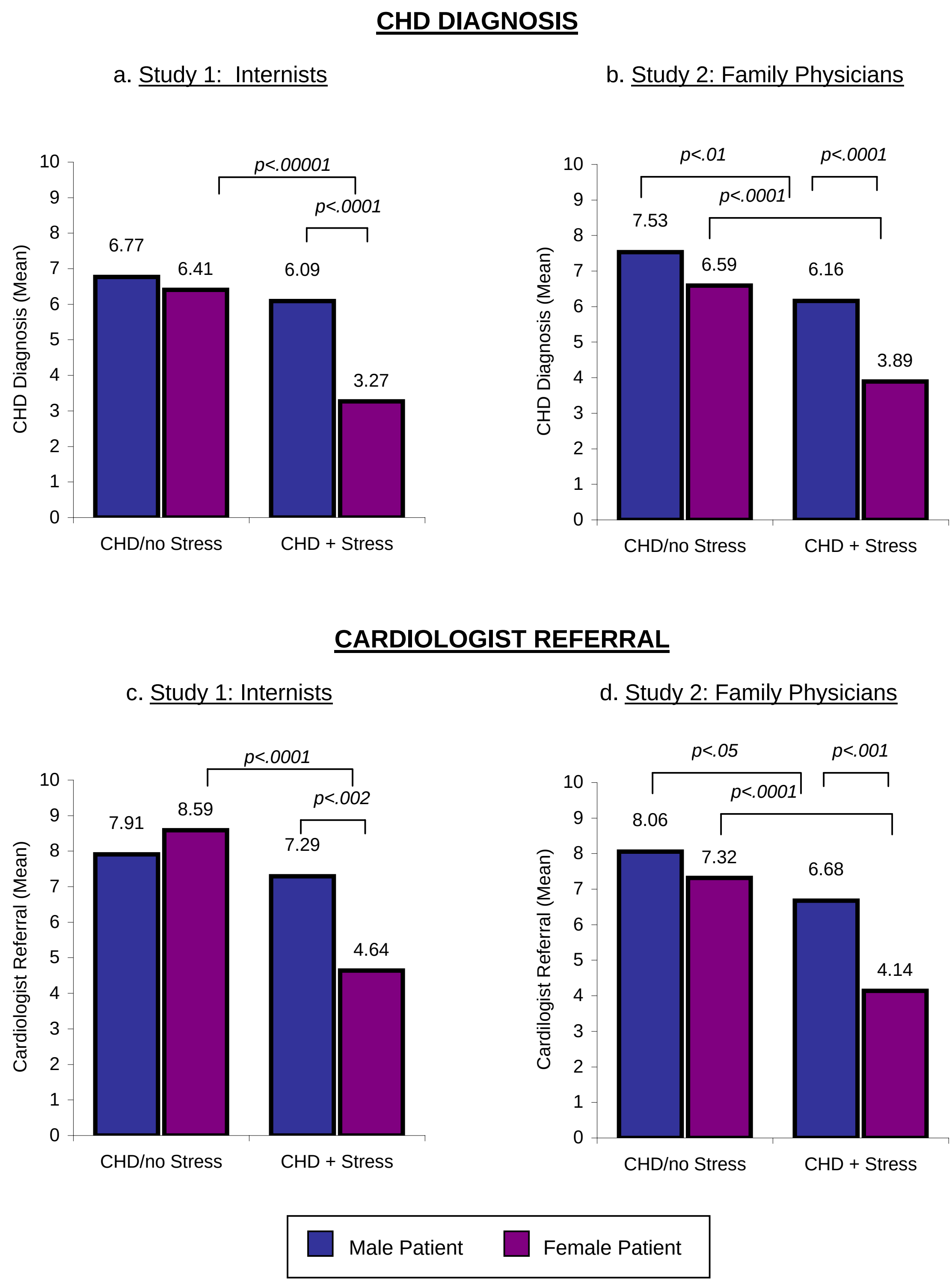


Figure 6: Effects of patient gender and symptom context on CHD diagnosis and cardiologist referral. Means that differ significantly are indicated by brackets connecting shaded bars.
Study 1, N=87 Internists; Study 2, N=143 Family Physicians.

Figure 7: Cardiac and Anxiolytic Medication Prescriptions

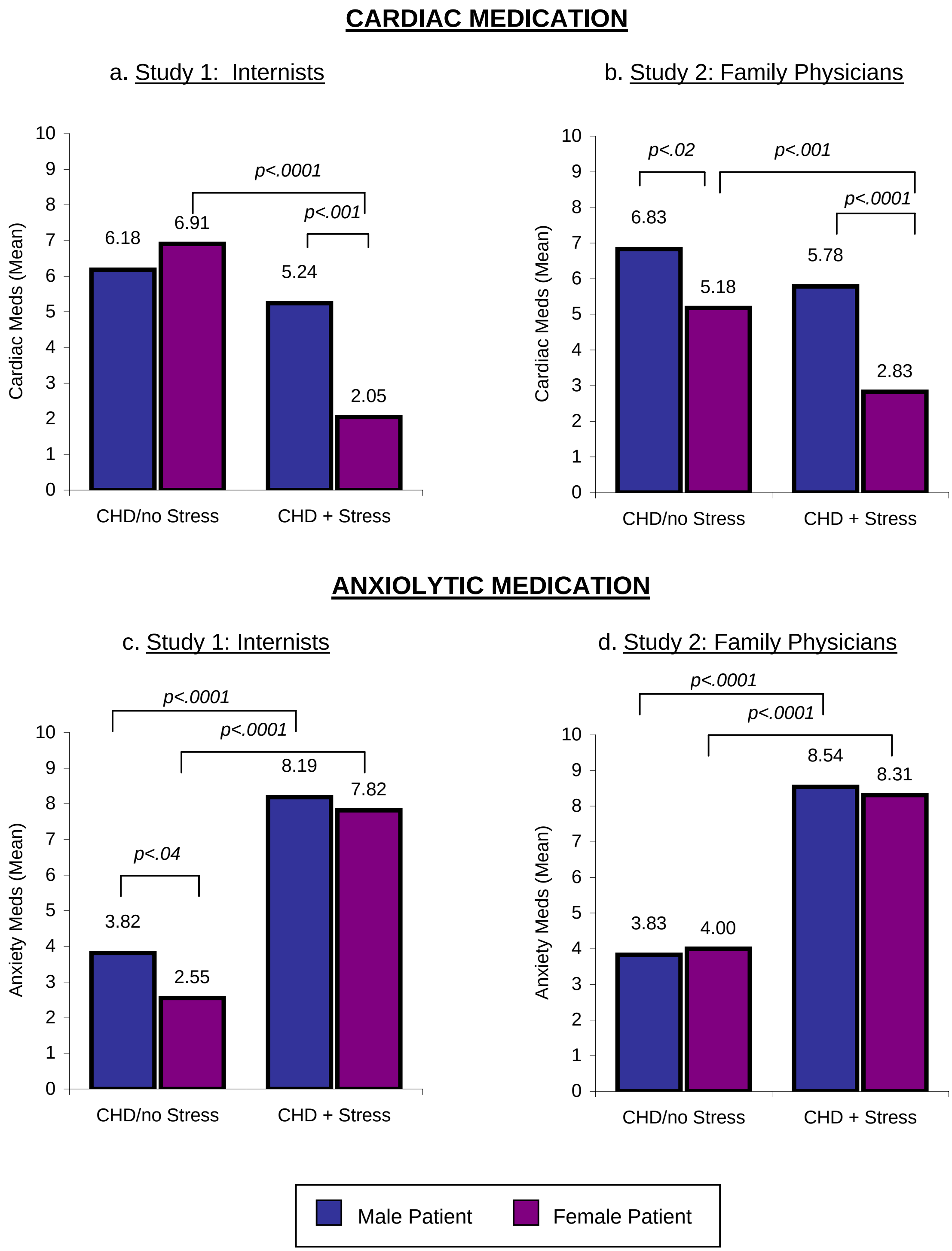


Figure 7: Effects of patient gender and symptom context on cardiac and anxiolytic medication prescriptions. Means that differ significantly are indicated by brackets connecting shaded bars. Study 1, N=87 Internists; Study 2, N=143 Family Physicians.

Figure 8: Anxiety Diagnosis, Stress Diagnosis, and Psychologist Referral

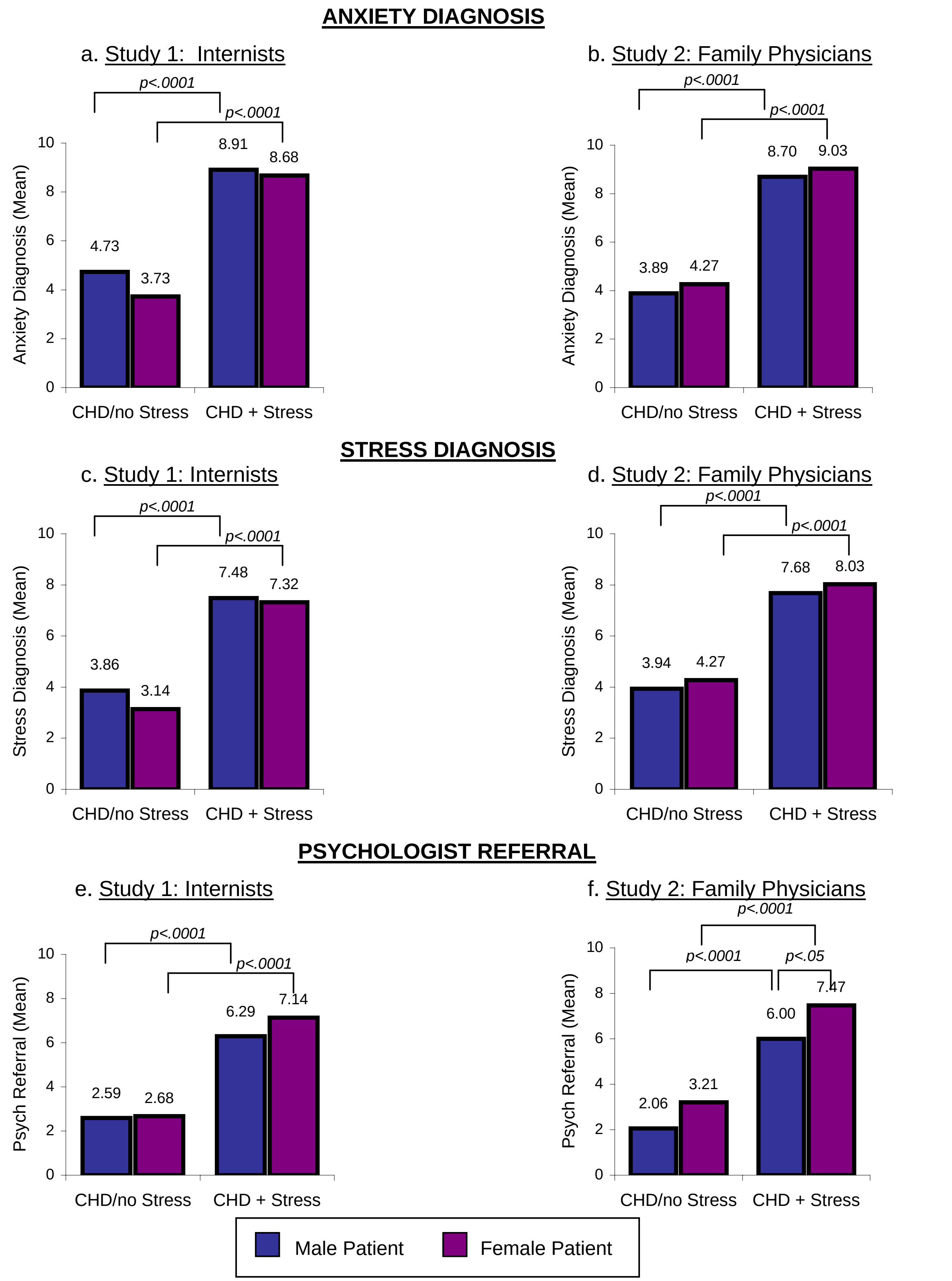


Figure 8: Effects of patient gender and symptom context on anxiety diagnosis, stress diagnosis, and psychologist referral. Means that differ significantly are indicated by brackets connecting shaded bars. Study 1, N=87 Internists; Study 2, N=143 Family Physicians. Typical CHD Symptoms.

Figure 9: Number (%) of Participants Indicating Agreement with a CHD Diagnosis and Cardiologist Referral

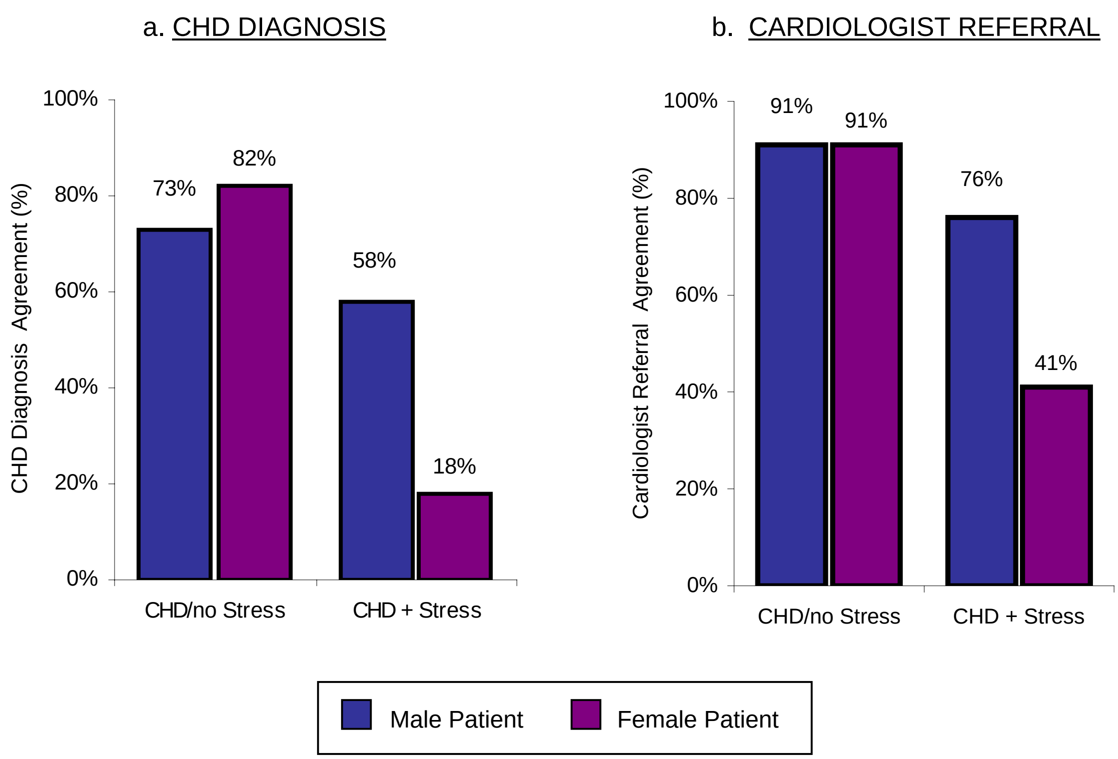


Figure 9: Number of participants (%) in each of the four conditions who agreed with a coronary heart disease diagnosis (CHD) and cardiologist referral. Study 1, N=87. Typical CHD symptoms.

Figure 10: All Diagnoses - Study 2

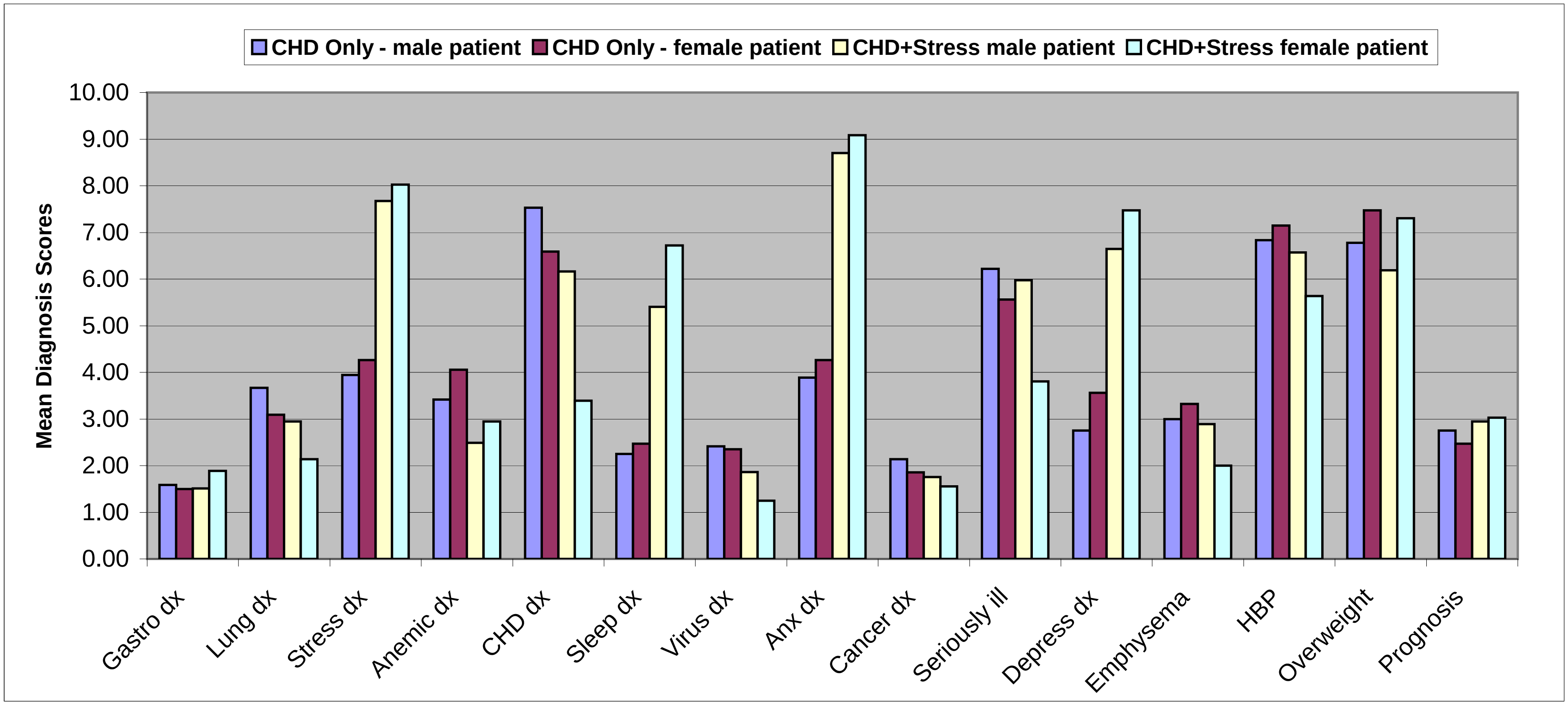


Figure 10: CHD=coronary heart disease. Participants indicated their agreement/disagreement with 15 diagnosis statements. Ratings were made on an 11-point Likert scale ranging from 0 (*strongly disagree)* to 10 (*strongly agree).* Means for Study 2 (N=143 Family physicians) are reported above

Statements (see Appendix B for full statements):

Gastro: Pt. has gastrointestinal symptoms.
Lung: Pt.'s lung function is impaired
Stress: Symptoms caused by stress.
Anemia: Pt. is anemic.
CHD: Pt. has CHD symptoms.

Sleep: Patient has sleep disorder.
Virus: Patient has virus.
Anxiety: Patient has symptoms of anxiety
Cancer: Patient has cancer.
Seriously ill: Patient is seriously ill.

Depress: Patient is depressed.
Emphysema: Patient has emphysema.
HBP: Patient has high blood pressure.
Overweight: Patient is overweight.
Prognosis: Patient's prognosis is poor.

Figure 11: All Treatment Recommendations - Study 2

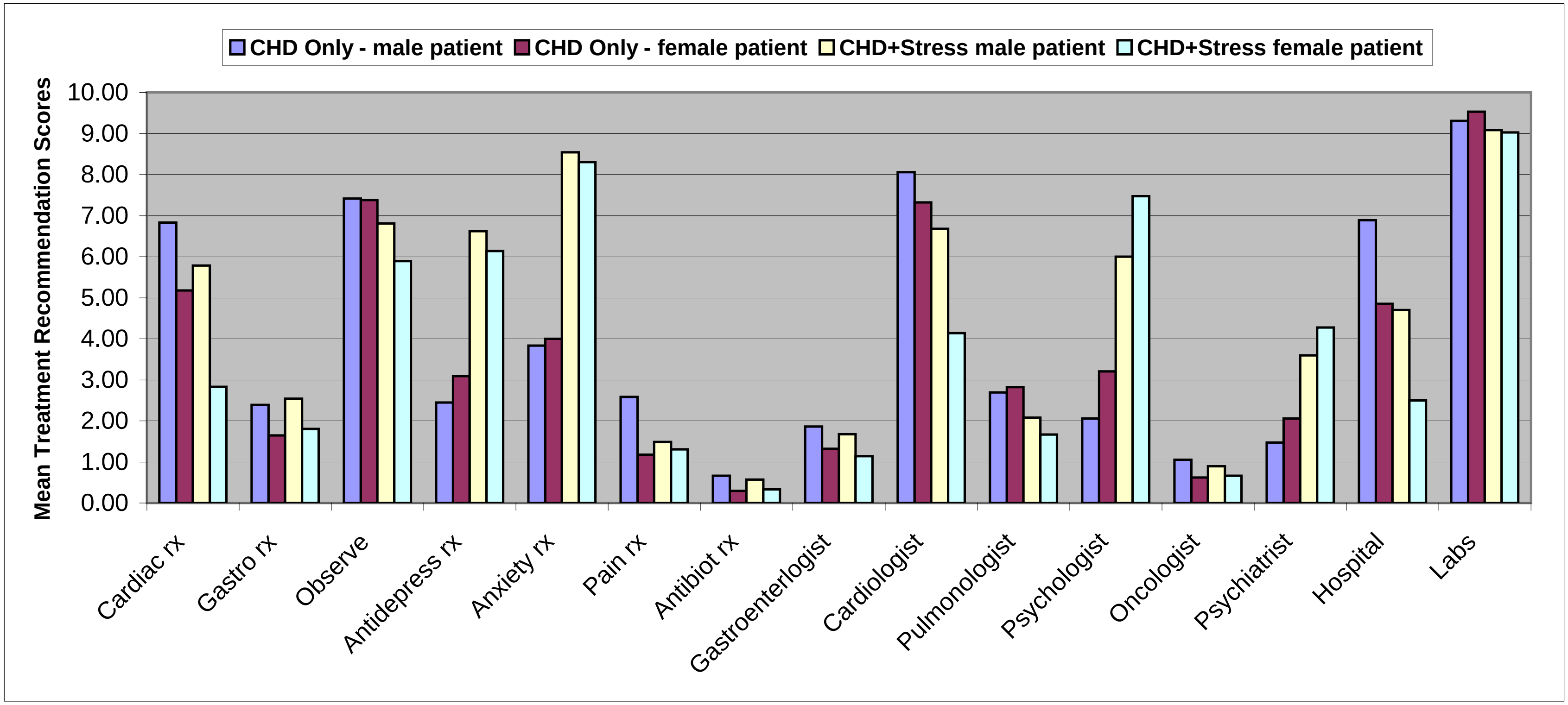


Figure 11: CHD=coronary heart disease. Participants indicated their agreement/disagreement with 15 treatment recommendations. Ratings were made on an 11-point Likert scale ranging from 0 (*strongly disagree)* to 10 (*strongly agree).* Means for Study 2 (N=143 Family physicians) are reported above.

Statements (see Appendix B for full statements):

Cardiac rx: Prescribe cardiac meds.
Gastro rx: Prescribe meds to↓ gastrointestinal sxs
Observe: Close medical observation needed.
Antidepress: Prescribe antidepressant.
Anxiety: Prescribe anxiolytic meds

Pain rx: Prescribe pain-relieving meds
Antibiot rx: Prescribe antibiotic.
Gastro…: Refer to gastroenterologist.
Cardio,,,: Refer to cardiologist.
Pulmo….: Refer to pulmonologist.

Psychologist: Refer to psychologist.
Onco….: Refer to oncologist.
Psychiatrist: Refer to psychiatrist.
Hospital: Pt. needs to be hospitalized.
Labs: Request lab/other diagnostic tests.

Figure 12. Perceived Origin of Symptoms Most Frequently Considered Important to Patient Assessment (Study 2)

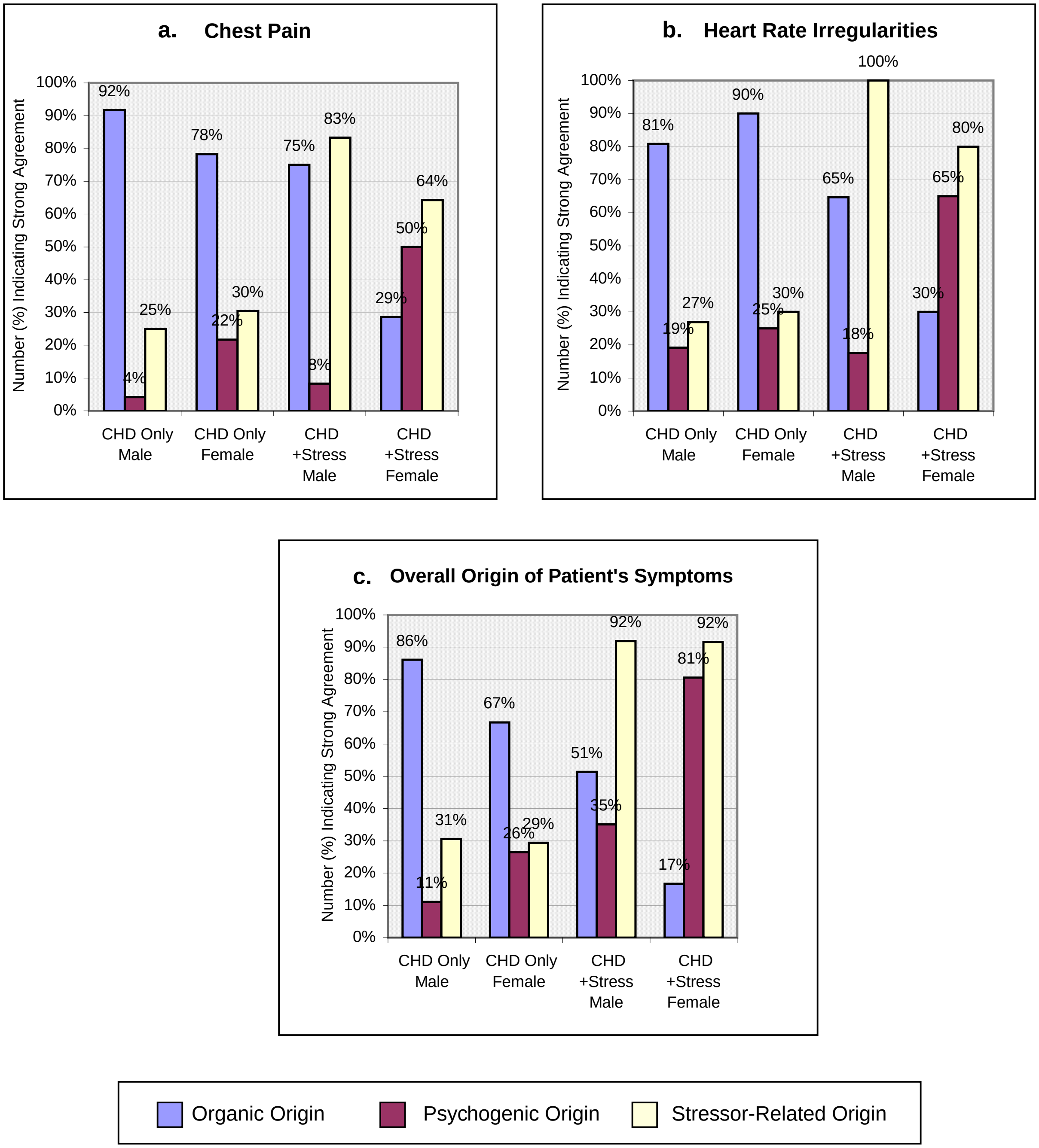


Figure 12. Participants listed symptoms they considered most important to their patient assessment and indicated the symptom's origin along *an organic, a psychogenic*, and *a stressor-related* scale. (see Appendix B). The above figures report the number (%) of participants who indicated *strong agreement (*i.e., a rating ≥ 5) with each of the 3 origin choices. Study 2, N=143 Family Physicians. Typical CHD symptoms.

Figure 13. Analyses of Variance Examining the Effects of Participants' Gender on CHD Diagnosis and Cardiologist Referral

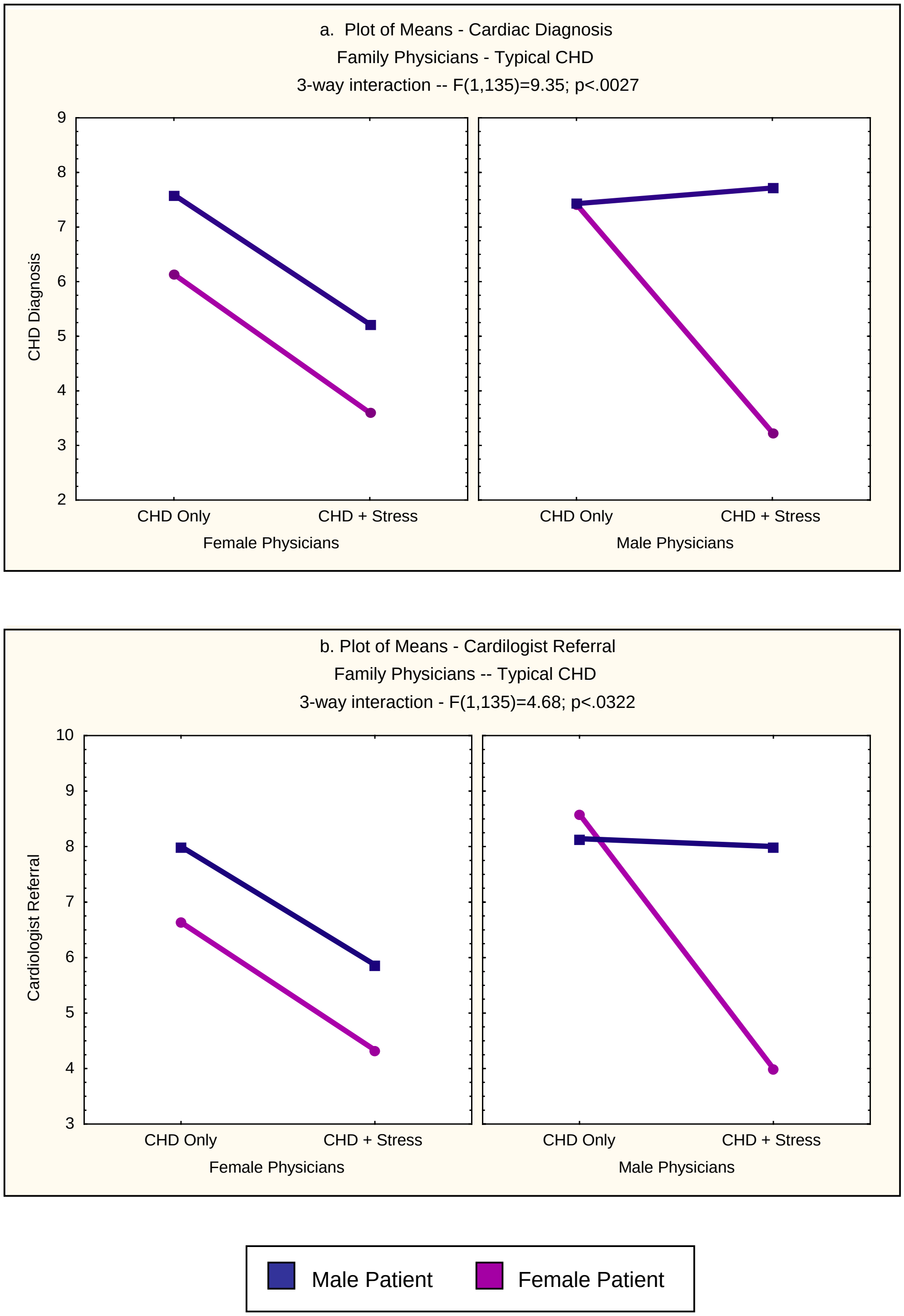


Figure 13. Results of Analyses of Variance examining the effects of participants' gender on CHD diagnosis and cardiologist referral. Study 2; Family Physicians, N=143. Typical CHD Symptoms.

Figure 14: All Diagnoses - Study 3

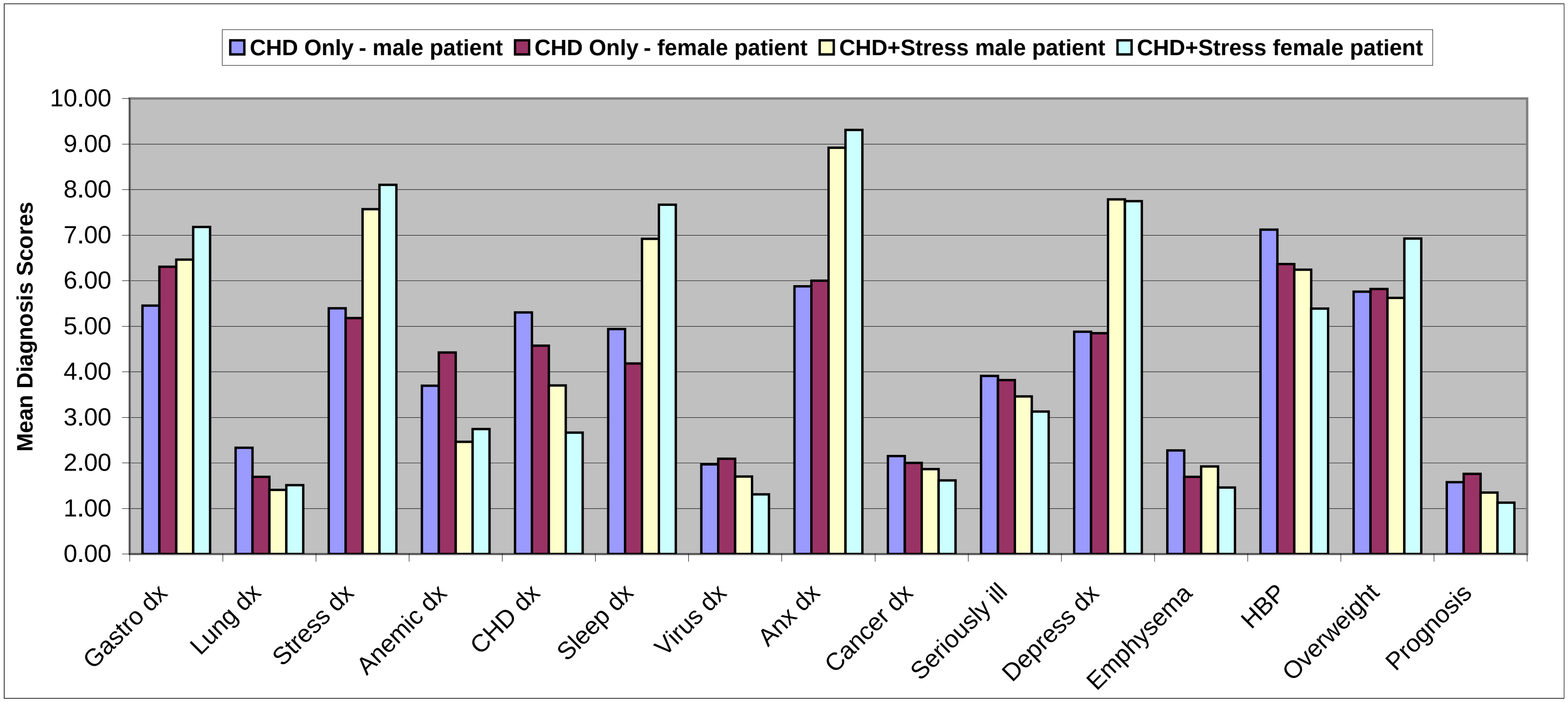


Figure 14: CHD=coronary heart disease. Participants indicated their agreement/disagreement with 15 diagnosis statements. Ratings were made on an 11-point Likert scale ranging from 0 (*strongly disagree)* to 10 (*strongly agree).* Means for Study 3 (N=142 Family physicians) are reported above

Statements (see Appendix B for full statements):

Gastro: Pt. has gastrointestinal symptoms.
Lung: Pt.'s lung function is impaired
Stress: Symptoms caused by stress.
Anemia: Pt. is anemic.
CHD: Pt. has CHD symptoms.

Sleep: Patient has sleep disorder.
Virus: Patient has virus.
Anxiety: Patient has symptoms of anxiety
Cancer: Patient has cancer.
Seriously ill: Patient is seriously ill.

Depress: Patient is depressed.
Emphysema: Patient has emphysema.
HBP: Patient has high blood pressure.
Overweight: Patient is overweight.
Prognosis: Patient's prognosis is poor.

Figure 15: All Treatment Recommendations - Study 3

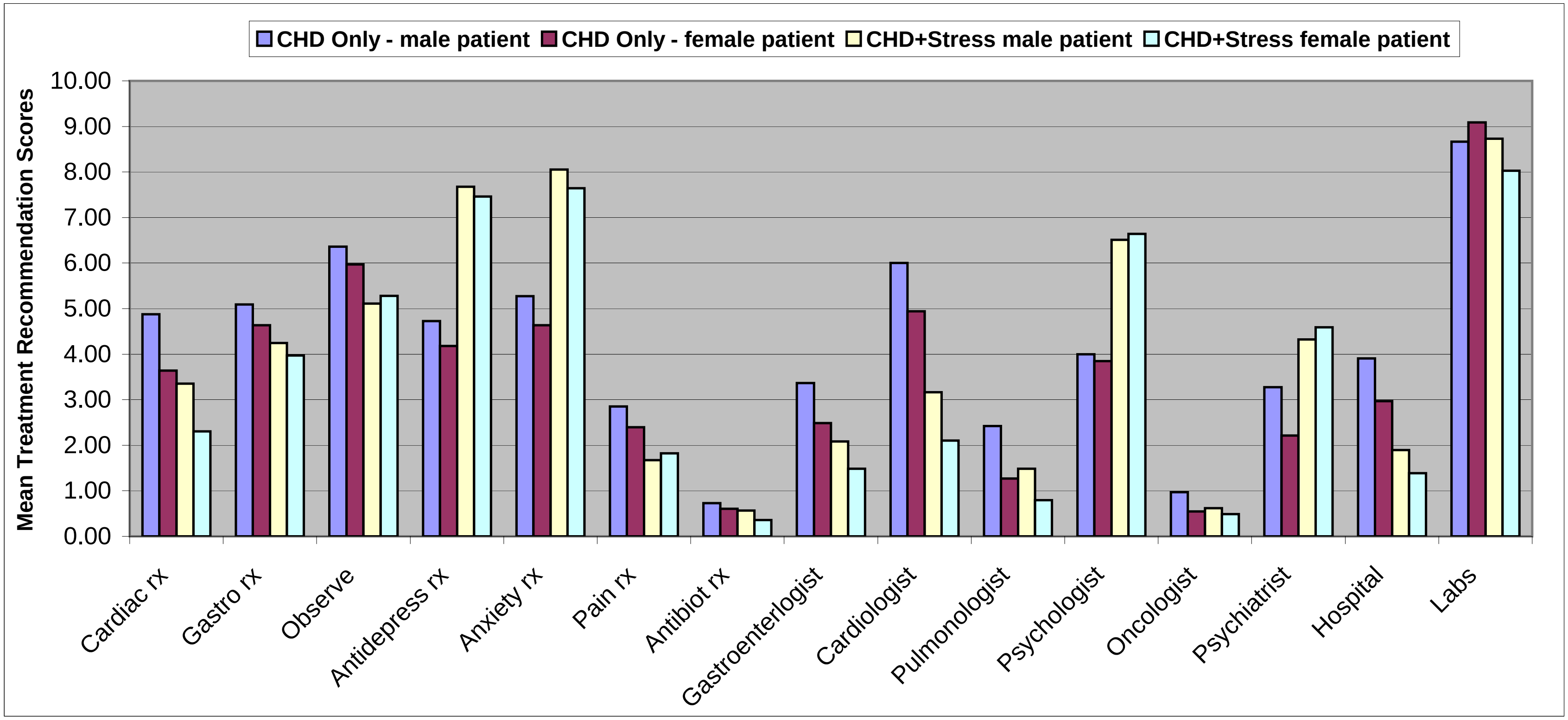


Figure 15: CHD=coronary heart disease.Participants indicated their agreement/disagreement with 15 treatment recommendations. Ratings were made on an 11-point Likert scale ranging from 0 (*strongly disagree)* to 10 (*strongly agree).* Means for Study 1 (N=142 Family physicians) are reported above.

Statements (see Appendix B for full statements):

Cardiac rx: Prescribe cardiac meds.
Gastro rx: Prescribe meds to↓ gastrointestinal sxs
Observe: Close medical observation needed.
Antidepress: Prescribe antidepressant.
Anxiety: Prescribe anxiolytic meds

Pain rx: Prescribe pain-relieving meds
Antibiot rx: Prescribe antibiotic.
Gastro…: Refer to gastroenterologist.
Cardio,,,: Refer to cardiologist.
Pulmo….: Refer to pulmonologist.

Psychologist: Refer to psychologist.
Onco….: Refer to oncologist.
Psychiatrist: Refer to psychiatrist.
Hospital: Pt. needs to be hospitalized.
Labs: Request lab/other diagnostic tests.

Figure 16. Mean Scores on Cardiac and Psychological Measures (Study 3)

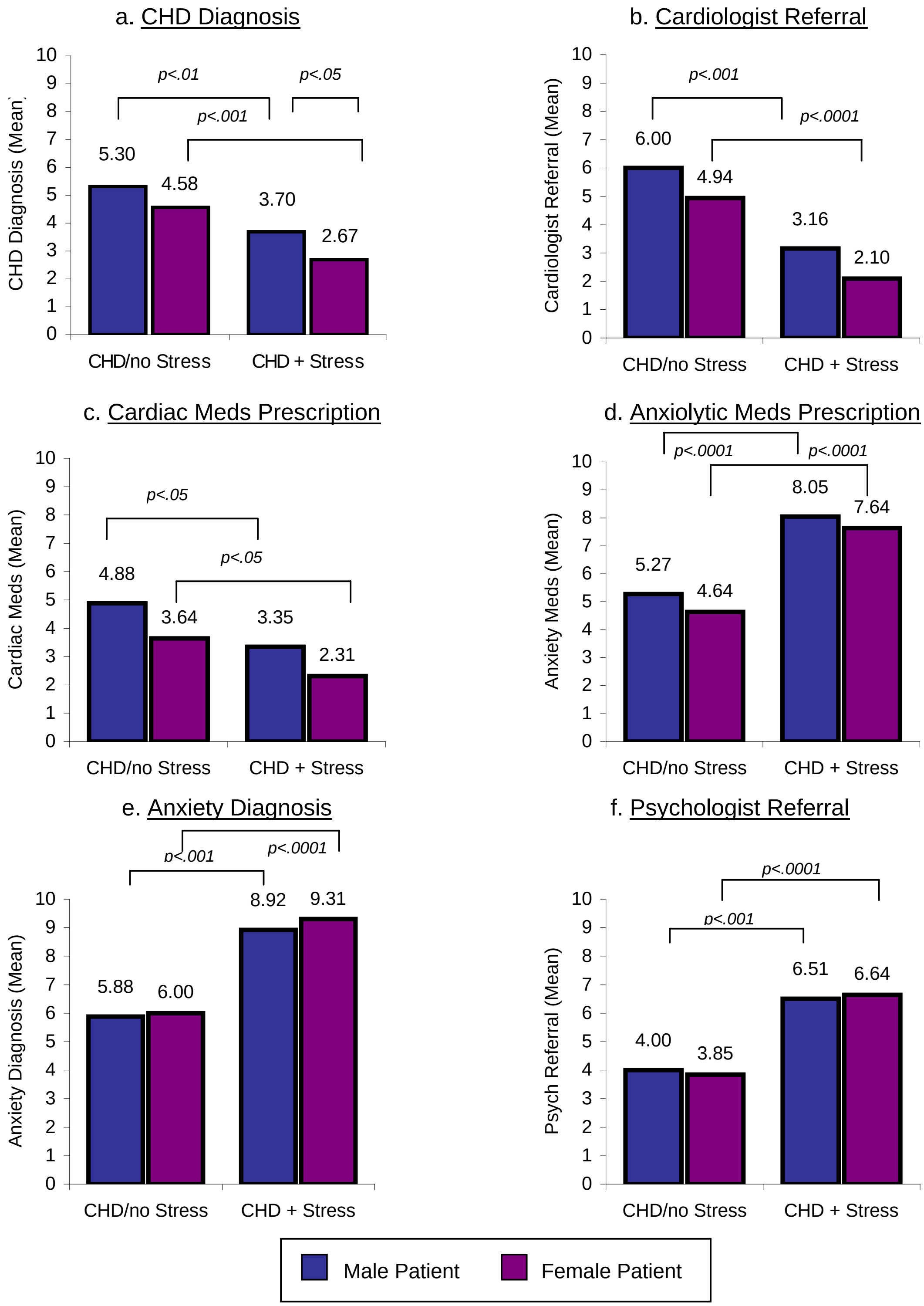


Figure16: Effects of patient gender and symptom context on cardiac and psychological measures. Means that differ significantly are indicated by brackets connecting shaded bars. Study 3, N=142 Family Physicians. Atypical CHD symptoms.

Figure 17. Perceived Origin of Symptoms Most Frequently Considered Important to Patient Assessment (Study 3)

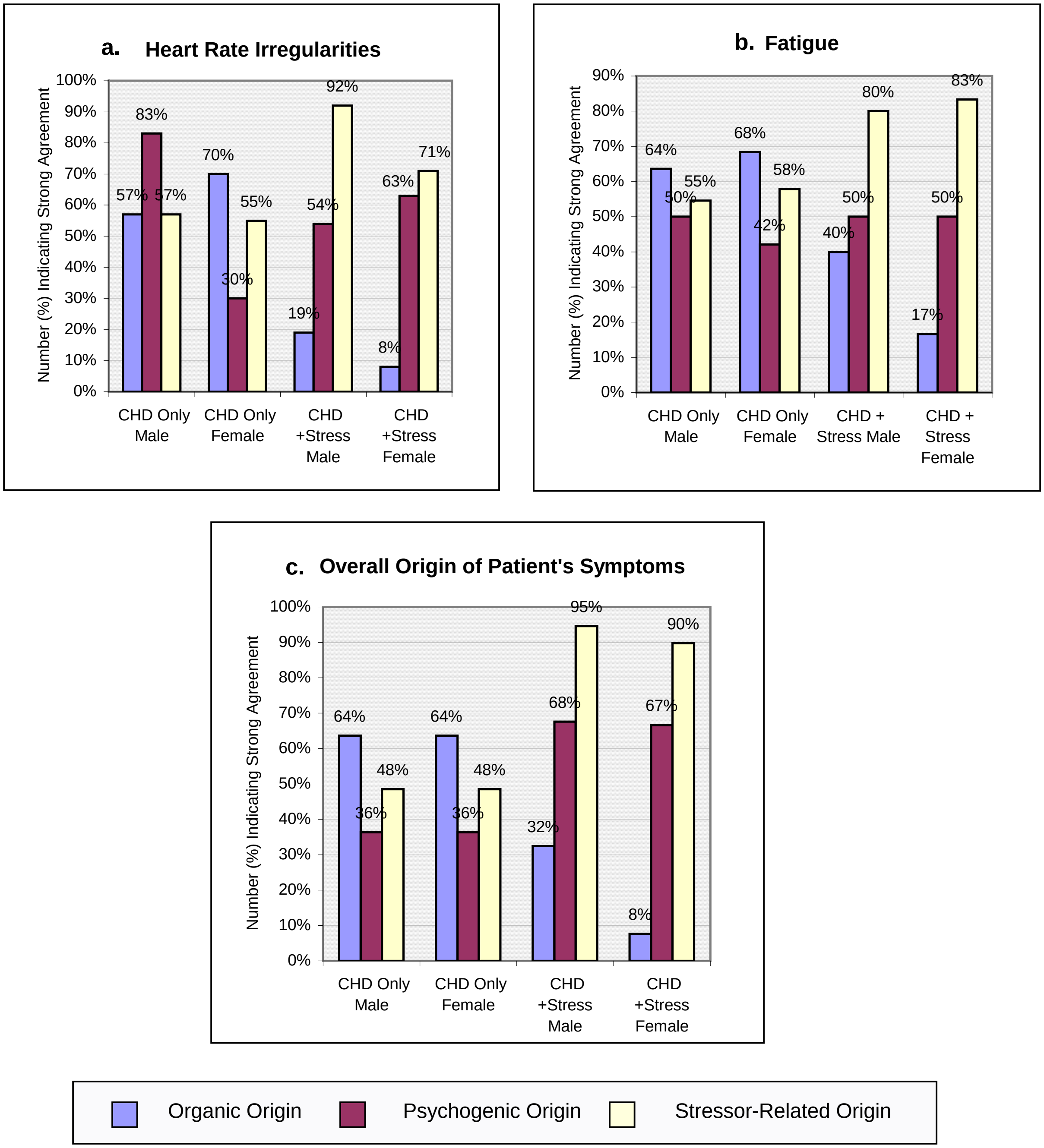


Figure 17. Participants listed the three symptoms they considered most important to their patient assessment and indicated the symptom's origin along an organic, a psychogenic, and a stressor-related scale. (see Appendix B). The figures above report the number (%) of participants who indicated *strong agreement* (i.e., a rating ≥ 5) with the origin choices. Study 3, N=142 Family Physicians. AtypicalCHD symptoms

Table 1. Physician Characteristics and Demographics

Characteristics	Study 1	Study 2	Study 3
Total Sample	N=87	N=143	N=142
Gender			
Male	54 (62%)	61 (43%)	52 (37%)
Female	33 (38%)	82 (57%)	90 (63%)
Race or Ethnicity			
Caucasian	73	119	112
Black or African-American	3	5	5
Hispanic or Latino	3	3	4
American Indian or Alaskan	--	--	1
Asian	8	15	17
Pacific Islander	--	--	--
Mixed Race	--	1	2
Unknown	--	--	1
Age			
Range	29-71	32-67	30-65
Mean (SD)	47.66 (10.79)	47 (8.56)	42.23 (8.94)
Years in Practice			
Range	1-41 years	1-40 years	2-40 years
Mean (SD)	16.04 (10.71)	16.17 (9.05)	13.89 (9.18)
Type of Practice			
Attending/Faculty	57	21	27
Solo Practice	13	30	21
Group Practice	16	64	68
Clinic/Public Service	1	24	17
Hospital Admin.	--	2	2
Hospice Care	--	1	--
Research	--	1	--
Urgent Care	--	--	7
Clinical Specialization			
Family Practice	--	134	136
Internal Medicine	35	2	--
Cardiology	11	--	--
Geriatrics	3	--	--
Endocrinology	4	--	--
Infectious Diseases	6	--	--
Rheumatology	6	--	--
Gastroenterology	6	--	--
Hematology	8	--	1
Pulmonology	1	--	--
Nephrology	4	--	--
Critical Care	2		
Hypertension	1		
OB/Gyn	--	2	--
Pediatrics	--	1	--
Radiology	--	1	--
Occupational Medicine	--	1	2
Addiction Medicine	--	2	--
Emergency Medicine	--	--	2
Adolescent Medicine	--	--	1

Table 2. Frequency of Symptoms Recalled by Participants for Male and Female Patients Presenting CHD Symptoms Without Stress/Anxiety or CHD Symptoms Plus Stress/Anxiety

Symptoms and Risk Factors	a. STUDY 1 Frequency by Condition[1]				b. STUDY 2 Frequency by Condition[1]				c. STUDY 3 Frequency by Condition[1]			
	A n=22	B n=22	C n=21	D n=22	A n=36	B n=34	C n=37	D n=36	A n=33	B n=33	C n=37	D n=39
Chest Pain	18	22	18	16	24	28	25	26	13	8	8	9
Chest Discomfort	--	--	--	--	--	--	--	--	6	9	8	7
Non-exertional chest pain	--	--	--	--	--	--	--	--	--	--	5	--
Chest tightness/pressure	16	17	19	17	35	30	18	17	2	1	--	--
Shortness of breath (SOB)	12	17	12	11	23	24	27	20	3	2	--	2
SOB with exertion	8	6	3	2	13	12	11	5	--	--	--	1
Heart Rate Irregularities (HRI)	31	26	27	21	56	56	38	48	44	45	47	61
Dizziness/lightheaded	13	18	7	9	24	26	11	20	21	15	12	24
Fatigue	13	5	9	7	23	21	19	17	34	40	26	26
Low energy; feels "worn out"	--	--	--	--	--	--	--	--	8	7	10	8
Dry Mouth	6	6	4	1	5	5	6	10	5	3	4	8
Sweatiness/clamminess	5	3	1	6	16	14	12	13	12	11	11	10
Cold / Cold Hands	1	3	2	4	14	17	14	8	11	17	7	9
Cough	1	1	--	--	--	--	--	1	--	--	--	--
Headache	--	--	2	--	2	2	1	1	--	2	1	1
Nausea/upset stomach	--	--	--	--	--	--	--	--	27	25	20	31
Abdominal pain	--	--	--	--	--	--	--	--	21	22	12	16
Shoulder/back/neck pain	--	--	--	--	--	--	--	--	27	37	33	28
Sleeping Problems	--	--	19	25	--	--	36	36	11	4	40	49
Anxiety	3	--	22	14	--	1	30	25	1	1	25	29
Worried/preoccupied	--	--	3	4	--	--	7	7	0	0	3	1
Nervousness/agitated	--	--	5	1	2	1	13	13	1	--	3	6
Stress (General)	--	--	3	1	--	--	1	--	--	--	--	1
Job Stress	--	--	--	--	--	--	5	1	--	--	3	1
Family Stress	--	--	--	--	--	--	4	2	--	--	2	1
Financial Stress	--	--	--	--	--	--	4	3	--	--	4	4
Depressed	--	--	2	--	--	--	1	1	--	1	1	--
Poor Concentration	--	--	--	1	--	--	--	2	--	--	2	2
Hypertensive (High BP)	2	1	3	1	1	4	4	1	1	--	--	--
Sedentary Lifestyle	--	1	1	1	2	2	1	1	--	--	--	--
Smoker	--	--	3	--	--	5	3	1	2	--	--	--
Overweight	--	--	1	1	--	2	1	1	1	1	1	--

Note: Immediately after reading the patient vignette, participants listed as many symptoms from the vignette as they could recall. The raw data is reported above. The frequency of some symptoms is higher than the sample sizes because participants listed more than one variation of a symptom (e.g, HRI variations included heart flutter, rapid heart, and palpitations).

[1]Four Conditions: A= Male patient, CHD symptoms no stress ; B=Female patient, CHD symptoms no stress
C= Male patient, CHD symptoms + stress; D=Female patient, CHD symptoms + stress

Table 3. Analyses of Variance (ANOVAs) Examining the Effects of Patient Gender and Symptom Context on CHD Diagnosis, Cardiologist Referral, and Cardiac Medication Prescription

Source	CHD Diagnosis			Cardiologist Referral			Cardiac Medication Prescription		
	df	MS	F	df	MS	F	df	MS	F
				a. Study 1[1] -- Typical CHD Symptoms (N=87)					
A. Patient Gender	1	55.18	11.53***	1	21.04	2.76	1	33.04	4.54*
B. Symptom Context	1	7.06	16.51***	1	113.91	14.95***	1	183.31	25.28****
A x B	1	32.86	6.86**	1	60.31	7.92**	1	83.52	11.52**
Error	83	4.79		83	7.62		83	7.25	
				b. Study 2[2] -- Typical CHD Symptoms (N=143)					
A. Patient Gender	1	123.09	27.12***	1	95.41	11.28**	1	189.54	21.97****
B. Symptom Context	1	186.07	41.00****	1	186.03	21.99****	1	102.78	11.91**
A x B	1	30.02	6.62**	1	29.08	3.44#	1	14.94	1.73
Error	139	4.54		139	8.46		139	8.63	
				c. Study 3[2] -- Atypical CHD Symptoms (N=142)					
A. Patient Gender	1	27.45	5.63*	1	39.68	4.36*	1	46.14	6.26**
B. Symptom Context	1	108.73	22.28****	1	284.28	31.22****	1	72.01	9.76**
A x B	1	0.84	0.17	1	0.00	0.00	1	0.35	0.05
Error	138	4.88		138	9.11		138	7.38	

Note. CHD = Coronary Heart Disease. *MS*= mean square. Means and Standard Deviations are presented on Table 4.

Study 1=Internists; Study 2 and Study 3=Family Physicians.

*p < .05; **p < .01; ***p < .001; ****p<.0001 #=marginal (p=.07)

Table 4. Mean Scores and Standard Deviations for Cardiac Diagnosis, Cardiologist Referral, and Cardiac Medication Prescription as a Function of Patient's Gender and Symptom Context.

	Conditions							
	CHD no Stress/Anxiety				CHD + Stress/Anxiety			
	Male Patient		Female Patient		Male Patient		Female Patient	
Symptoms	M	SD	M	SD	M	SD	M	SD
a. Study 1[1] -- Typical CHD Symptoms (N=87)								
Cardiac Diagnosis	6.77_b	1.77	6.41_b	2.38	6.10_b	2.32	3.27_a	2.23
Cardiologist Referral	7.91_b	2.01	8.59_b	1.99	7.29_b	3.10	4.64_a	3.61
Cardiac Meds Prescription	6.18_b	2.72	6.91_b	2.54	5.24_b	3.29	2.05_a	2.13
b. Study 2[2] -- Typical CHD Symptoms (N=143)								
Cardiac Diagnosis	7.53_c	1.59	$6.59_{c,\,b}$	2.11	6.16_b	2.48	3.39_a	2.23
Cardiologist Referral	8.06_c	2.19	$7.32_{c,\,b}$	2.82	6.68_b	3.10	4.14_a	3.38
Cardiac Meds Prescription	6.83_d	2.68	$5.18_{b,\,c}$	3.32	5.78_b	3.05	2.83_a	2.68
c. Study 3[3] -- Atypical CHD Symptoms (N=142)								
Cardiac Diagnosis	5.30_c	2.51	4.58_c	2.17	3.70_b	2.15	2.67_a	2.03
Cardiologist Referral	6.00_b	3.05	4.94_b	3.53	3.16_a	2.80	2.10_a	2.70
Cardiac Meds Prescription	4.88_b	2.92	3.64_b	2.79	3.35_a	2.89	2.31_a	2.26

Note: CHD = coronary heart disease. Means in a row sharing subscripts are not significantly different. For all measures, higher means indicate stronger agreement.

[1] Study 1: df = 1, 83; Internists [2] Study 2: df = 1, 139; Family physicians [3] Study 3: df = 1, 138; Family Physicians

Table 5. Results of Planned Contrasts Examining the Effect of Patient Gender and Symptom Context on Cardiac Diagnosis, Cardiologist Referral, and Cardiac Medication Prescription

Contrasts	a. Study 1[1] N=87	b. Study 2[2] N=143	c. Study 3[3] N=142
Cardiac Diagnosis			
a.CHD/noSA: male vs. female	F<1	F= 3.40#	F= 1.79
b.CHD+Stress: male vs female	F =17.88****	F= 30.92****	F= 4.18*
c.Females: CHD/noSA vs. CHD+Stress	F =22.60****	F= 39.44****	F= 13.35***
d.Males: CHD/noSA vs. CHD+Stress	F = 1.03	F= 7.50**	F= 9.15**
Cardiologist Referral			
a.CHD/noSA: male vs. female	F<1	F= 1.11	F= 2.04
b.CHD+Stress: male vs female	F = 9.90**	F= 13.88***	F= 2.34
c.Females: CHD/noSA vs. CHD+Stress	F= 22.57****	F= 20.97****	F= 15.80****
d.Males: CHD/noSA vs. CHD+Stress	F= 0.55	F= 4.11*	F= 15.43***
Cardiac Medication Prescription			
a.CHD/noSA: male vs. female	F<1	F= 5.56*	F= 3.45#
b.CHD+Stress: male vs female	F= 15.10***	F= 18.41****	F= 2.80
c.Females: CHD/noSA vs. CHD+Stress	F= 35.88****	F= 11.13***	F= 4.28*
d.Males: CHD/noSA vs. CHD+Stress	F= 1.32	F= 2.33	F= 5.52*

Note. CHD = coronary heart disease. Means and Standard Deviations are reported on Table 4.

[1] Study 1: df = 1, 83 Internists
[2] Study 2: df = 1, 139 Family physicians.
[3] Study 3: df = 1, 138 Family physicians.

*p < .05; **p < .01; ***p < .001; ****p<.0001 #=marginal (p=.07)

Table 6. Analyses of Variance (ANOVAs) Examining the Effects of Patient Gender and Symptom Context on Anxiety Diagnosis, Stress Diagnosis, Psychologist Referral, and Anxiolytic Medication Prescription

	Anxiety Diagnosis			Stress Diagnosis			Psychologist Referral			Anxiolytic Meds Prescription		
Source	df	MS	F	df	MS	F	df	MS	F	df	MS	F
a. Study 1[2] -- Typical CHD[1] Symptoms (N=87)												
A. Patient Gender	1	8.13	2.18	1	4.26	1.02	1	4.82	0.61	1	14.71	3.48#
B. Symptom Context	1	453.27	121.63****	1	330.21	79.40****	1	360.97	45.33****	1	505.63	119.48****
A x B	1	3.28	0.88	1	1.76	0.42	1	3.14	0.39	1	4.41	1.04
Error	83	3.73		83	4.16		83	7.96		83	4.23	
b. Study 2[2] -- Typical CHD[1] Symptoms (N=143)												
A. Patient Gender	1	5.11	1.24	1	4.04	0.95	1	61.41	9.46**	1	0.04	0.01
B. Symptom Context	1	828.47	201.80****	1	501.49	118.23****	1	601.97	92.72****	1	725.30	119.19****
A x B	1	0.00	0.00	1	0.01	0.00	1	0.93	0.14	1	1.44	0.24
Error	139	4.11		139	4.26		139	6.49		139	6.09	
c. Study 3[2] -- Atypical CHD[1] Symptoms (N=142)												
A. Patient Gender	1	2.30	0.74	1	0.92	0.20	1	0.01	0.00	1	9.72	1.71
B. Symptom Context	1	355.73	114.01****	1	229.4	50.55****	1	248.55	30.89****	1	295.55	52.09****
A x B	1	0.63	0.20	1	4.93	1.09	1	0.69	0.09	1	0.44	0.08
Error	138	3.12		138	4.53		138	8.05		138	5.67	

Note. CHD = Coronary Heart Disease. *MS*= mean square. Means and Standard Deviations are presented on Table 7.

Study 1=Internists; Study 2 and Study 3=Family Physicians.

*p < .05; **p < .01; ***p < .001; ****p<.0001 #=marginal (p=.07)

Table 7. Mean Scores for Anxiety Diagnosis, Stress Diagnosis, Psychologist Referral, and Anxiolytic Medication Prescription as a Function of Patient's Gender and Symptom Context.

	Conditions							
	CHD no Stress/Anxiety				CHD + Stress/Anxiety			
	Male Patient		Female Patient		Male Patient		Female Patient	
Symptoms	M	SD	M	SD	M	SD	M	SD
a. Study 1[1] -- Typical CHD Symptoms (N=87)								
Anxiety Diagnosis	4.73_b	2.10	3.73_b	2.47	8.91_a	1.14	8.68_a	1.73
Stress Diagnosis	3.86_b	1.98	3.14_b	1.94	7.48_a	2.04	7.32_a	1.92
Psychologist Referral	2.59_b	1.92	2.68_b	2.61	6.29_a	3.81	7.14_a	2.68
Anxiety Meds Prescription	3.82_c	2.04	2.55_b	2.30	8.19_a	1.94	7.82_a	1.92
b. Study 2[2] -- Typical CHD Symptoms (N=143)								
Anxiety Diagnosis	3.89_b	2.55	4.27_b	2.33	8.70_a	1.82	9.03_a	1.13
Stress Diagnosis	3.94_b	2.37	4.26_b	2.29	7.68_a	1.75	8.03_a	1.78
Psychologist Referral	2.06_c	2.27	3.21_c	2.79	6.00_b	2.77	7.47_a	2.32
Anxiety Meds Prescription	3.83_b	2.89	4.00_b	2.87	8.54_a	1.98	8.31_a	2.01
c. Study 3[3] -- Atypical CHD Symptoms (N=142)								
Anxiety Diagnosis	5.88_b	2.46	6.00_b	2.28	8.92_a	0.95	9.31_a	1.00
Stress Diagnosis	5.40_b	2.11	5.18_b	2.42	7.57_a	1.85	8.10_a	2.14
Psychologist Referral	4.00_b	2.57	3.85_b	3.23	6.51_a	2.76	6.64_a	2.77
Anxiety Meds Prescription	5.27_b	2.35	4.64_b	3.04	8.05_a	1.61	7.64_a	2.39

Note: CHD = coronary heart disease. Means in a row sharing subscripts are not significantly different. For all measures, higher means indicate stronger agreement. [1] Study 1: df = 1, 83 (Internists) [2] Study 2: df = 1, 139 (Family physicians) [3] Study 3: df = 1, 138 (Family physicians)

Table 8. Results of Planned Contrasts Examining the Effect of Patient Gender and Symptom Context on Anxiety Diagnosis, Stress Diagnosis, Psychologist Referral, and Anxiolytic Medication Prescription

Contrasts	Study 1[1] N=87	Study 2[2] N=143	Study 3[3] N=142
Anxiety Diagnosis			
a. CHD/noSA: male vs. female	F= 2.95	F<1	F<1
b. CHD+Stress: male vs female	F<1	F<1	F<1
c. Females: CHD/noSA vs. CHD+Stress	F= 72.46****	F= 98.89****	F=62.68****
d. Males: CHD/noSA vs. CHD+Stress	F= 50.31****	F= 102.99****	F=51.67****
Stress Diagnosis			
a. CHD/noSA: male vs. female	F= 1.40	F<1	F<1
b. CHD+Stress: male vs female	F<1	F<1	F= 1.20
c. Females: CHD/noSA vs. CHD+Stress	F= 46.25****	F= 58.38****	F= 33.65****
d. Males: CHD/noSA vs. CHD+Stress	F= 33.72****	F= 59.89****	F= 18.18***
Psychologist Referral			
a. CHD/noSA: male vs. female	F<1	F= 3.56#	F<1
b. CHD+Stress: male vs female	F= 1.00	F= 6.09*	F<1
c. Females: CHD/noSA vs. CHD+Stress	F= 27.41****	F= 49.02****	F= 17.32****
d. Males: CHD/noSA vs. CHD+Stress	F= 18.42****	F= 43.73****	F= 13.69***
Anxiolytic Medication Prescription			
a. CHD/noSA: male vs. female	F= 4.21*	F<1	F= 1.18
b. CHD+Stress: male vs female	F<1	F<1	F<1
c. Females: CHD/noSA vs. CHD+Stress	F= 72.27****	F=53.27****	F= 28.44****
d. Males: CHD/noSA vs. CHD+Stress	F= 48.54****	F=66.44****	F= 23.78****

Note. CHD = coronary heart disease. Means and Standard Deviations are reported on Table 6.

fCHD/no SA = female patient, CHD symptoms, no Stress/Anxiety
mCHD/no SA = male patient, CHD symptoms, no Stress/Anxiety
fCHD + SA = female patient, CHD symptoms + Stress/Anxiety
mCHD + SA = male patient, CHD symptoms + Stress/Anxiety

[1] Study 1: df = 1, 83 Internists (Typical CHD symptoms)
[2] Study 2: df = 1, 139 Family physicians (Typical CHD symptoms)
[3] Study 3: df = 1, 138 Family physicians (Atypical CHD symptoms)

*p < .05; **p < .01; ***p < .001; ****p<.0001 #=marginal (p=.07)

Table 9. Symptoms Participants Listed as Most Important to their Patient Assessment

	STUDY 1				STUDY 2				STUDY 3			
	Frequency by Condition[1]				Frequency by Condition[1]				Frequency by Condition[1]			
	A	B	C	D	A	B	C	D	A	B	C	D
n=	22	22	21	22	36	34	37	36	33	33	37	39
Chest Pain	13	19	13	11	22	24	22	11	11	5	6	5
Chest Discomfort	--	--	--	--	--	--	1	3	3	4	1	5
Non-exertional chest pain	--	--	--	--	--	--	--	--	1	1	2	--
Heart Rate Irregularities	14	15	9	15	28	21	17	20	21	28	27	25
Shortness of breath (SOB)	11	9	6	10	19	22	13	4	3	3	1	1
SOB with exertion	7	5	--	1	13	8	4	--	--	--	--	--
Chest tightness/pressure	8	10	7	7	16	11	13	13	1	--	1	--
Fatigue	4	1	1	1	5	5	5	8	23	26	9	6
Low energy-feels "worn out"	--	--	--	--	--	--	--	--	1	2	2	2
Dizzy/lightheaded	2	4	3	--	3	6	4	3	4	3	1	1
Sweatiness/clamminess	4	1	--	2	1	3	1	1	2	2	1	1
Dry mouth	1	--	--	--	1	--	1	1	--	--	--	--
Cold/cold hands	--	--	--	--	--	2	--	1	--	--	--	--
Hypertensive (High BP)	1	1	--	1	--	--	--	--	2	2	--	1
Cough	--	--	--	--	--	--	--	1	--	--	--	
Neck/back/shoulder pain	--	--	--	--	--	--	--	--	6	8	4	3
Upset stomach	--	--	--	--	--	--	--	--	3	1	6	6
Abdominal pain	--	--	--	--	--	--	--	--	9	5	2	4
Nausea	--	--	--	--	--	--	--	--	5	5	6	6
Stress	--	--	4	--	--	--	1	2	--	1	3	4
Anxiety	1	--	11	5	--	--	14	17	2	--	16	17
Worried/preoccupied	--	--	--	--	--	--	1	2	--	--	--	--
Nervous/agitated	--	--	--	--	--	--	--	4	--	--	--	--
Depressed	--	1	1	--	--	--	1	1	--	1	1	4
Sleeping Problems	--	--	8	13	--	--	13	16	2	2	22	26

Note: The last questionnaire participants received instructed them to list the 3 symptoms they considered most important to their patient assessment. The Table above reports all symptoms participants listed in each of the four experimental conditions.

Study 1: N=87 internists read vignette of patient with typical CHD symptoms
Study 2: N=143 family physicians read vignette of patient with typical CHD symptoms
Study 3: N=142 family physicians read vignette of patient with atypical CHD symptoms

[1]Four Conditions: A= Male patient, CHD symptoms no stress; B=Female patient, CHD symptoms no stress; C= Male patient, CHD symptoms + stress; D=Female patient, CHD symptoms + stress.

APPENDIX A: PATIENT VIGNETTES

Patient vignettes were created using the following symptom lists:

Typical CHD Symptoms Vignette	Atypical CHD Symptoms Vignette	Addition of Stress and Anxiety
out of breath		
exertional dyspnea		
sporadic chest pain		
constant chest tightness		
constant pressure		
fatigued	feels "worn out"	
Symptoms decrease with rest	Symptoms do not improve with rest	
	does not feel rested after waking	
	low energy	
	nausea	
	upper abdominal discomfort	
	back, shoulder, neck pain	
	mild chest discomfort	
heart flutter	heart flutter	
heart skips a beat	heart skips a beat	
lightheaded/dizzy with flutter	lightheaded/dizzy with flutter	
heart beats rapidly and hard	heart beats rapidly and hard	
heart feels like "pounding drum"	heart feels like "pounding drum"	
dry mouth	dry mouth	
sweating	sweating	
cold, clammy hands	cold, clammy hands	
rare alcohol use	rare alcohol use	
sometime smoker	sometime smoker	
does not exercise regularly	does not exercise regularly	
Overweight (BMI 28)	Overweight (BMI 28)	
BP 140/90	BP 140/90	
Heart rate 90 bpm	Heart rate 90 bpm	
Calm	Calm	agitated and nervous
appropriately concerned about sx	appropriately concerned about sx	excessively concerned about sx
		feels anxious
		difficulty falling asleep
		wakes frequently throughout night
		has a "lot on mind"
		was not given job promotion
		financial difficulties
		may have to sell home
		may have to move to apartment

APPENDIX B: QUESTIONNAIRES

I. Memory Test

This first questionnaire was given to participants immediately after they finished reading the patient vignette.

1. What is the patient's age? __________
2. What is the patient's gender? __________
3. What is the patient's occupation? __________

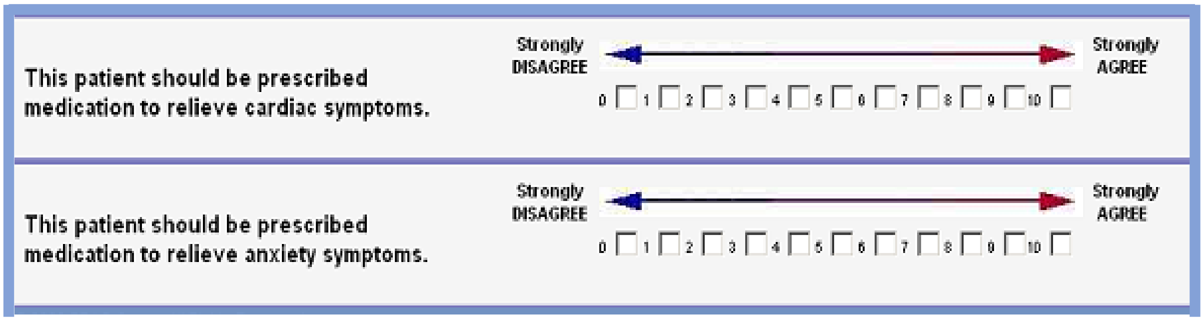
4. Please list as many symptoms as you can the recall from the patient case study you have just read.

______________	______________	______________
______________	______________	______________
______________	______________	______________
______________	______________	______________
______________	______________	______________
______________	______________	______________
______________	______________	______________
______________	______________	______________
______________	______________	______________
______________	______________	______________

II. <u>Diagnoses and Treatment Recommendations</u>

After the memory test, participants were presented with 15 diagnosis and 15 treatment recommendation statements and they were asked to indicate their level of agreement with each statement on an 11-point Likert scale. The image below is taken from the online questionnaire to illustrate how the statements were presented.

The seven dependent variables are marked with an asterisk.



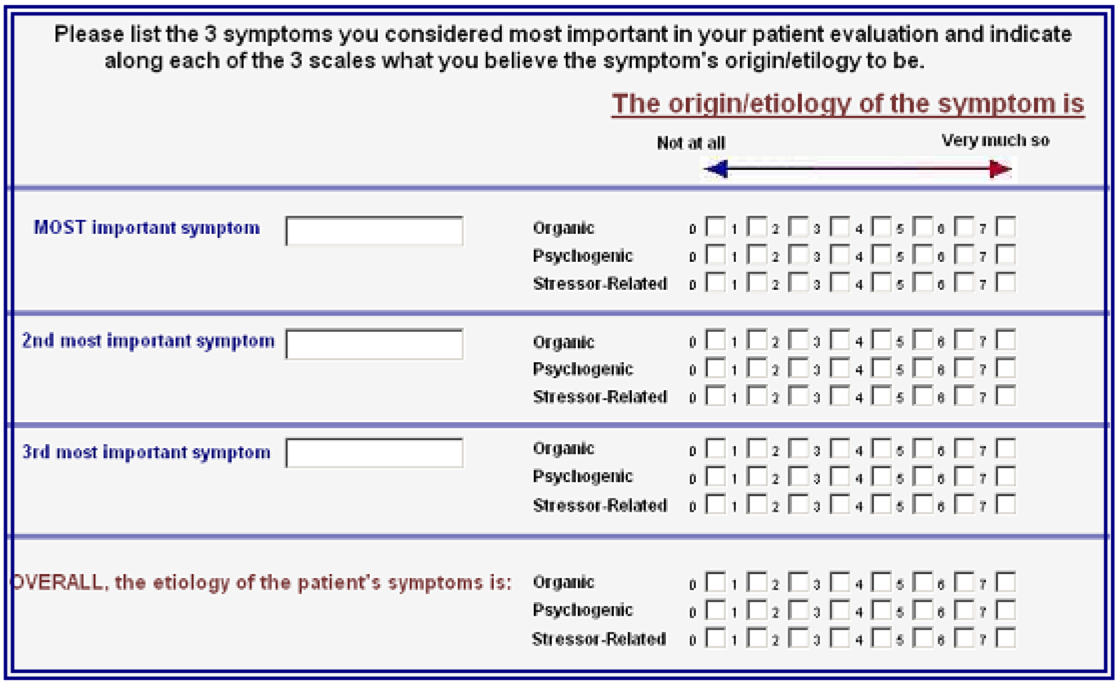
(1) This patient has gastrointestinal symptoms.
*(2) *This patient has anxiety symptoms.*
(3) This patient's lung function is impaired.
(4) This patient has cancer.
*(5) *This patient's symptoms are caused by stress.*
(6) This patient is seriously ill.
(7) This patient is anemic.
(8) This patient is depressed.
*(9) *This patient has coronary heart disease symptoms.*
(10) This patient has emphysema.
(11) This patient has a sleep disorder.
(12) This patient has high blood pressure.
(13) This patient has a viral infection.
(14) This patient is overweight.
(15) This patient's prognosis is poor.

*(1) *This patient should be prescribed medication to relieve cardiac symptoms.*
(2) This patient should be prescribed medication to decrease gastric symptoms. .
(3) This patient should be kept under close medical observation.
(4) This patient should be prescribed an antidepressant.
*(5) *This patient should be given prescription to relieve anxiety symptoms.*
(6) This patient should be given prescription to decrease pain.
(7) This patient should be given prescription for an antiobiotic.
(8) This patient should be referred to a gastroenterologist.
*(9) *This patient should be referred to a cardiologist.*
(10) This patient should be referred to a pulmonologist.
*(11) *This patient should be referred to a psychologist.*
(12) This patient should be referred to an oncologist.
(13) This patient should be referred to a psychiatrist.
(14) This patient will need to be hospitalized.
(15) This patient should be referred for labs/diagnostic tests.
If you agree, please specify tests ______________________________

III. Most Important Symptoms and Symptom Origin

Below is the last questionnaire participants received. The image is taken from the online questionnaire to illustrate how the statements were presented.

Please note that participants in Study 1 were only asked to list symptoms, they were not asked to indicate the symptom's origin. The Questionnaire was modified for Studies 2 and 3 so that participants could also indicate the symptom's origin.



Please list the 3 symptoms you considered most important in your patient evaluation and indicate along each of the 3 scales what you believe the symptom's origin/etilogy to be.

The origin/etiology of the symptom is

Not at all — Very much so

MOST important symptom	Organic	0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐
	Psychogenic	0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐
	Stressor-Related	0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐
2nd most important symptom	Organic	0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐
	Psychogenic	0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐
	Stressor-Related	0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐
3rd most important symptom	Organic	0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐
	Psychogenic	0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐
	Stressor-Related	0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐
OVERALL, the etiology of the patient's symptoms is:	Organic	0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐
	Psychogenic	0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐
	Stressor-Related	0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐