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Laura J. Milliken

May 2015

**THE ILLNESS INTRUSIVENESS MODEL IN MALE VETERANS WITH CHRONIC  
HEART FAILURE**

**A Dissertation Presented to the  
Faculty of the College of Education  
University of Houston**

**In Partial Fulfillment  
of the Requirements for the Degree**

**Doctor of Philosophy**

**by**

**Laura J. Milliken**

**May 2015**

## Acknowledgment

This document not only illustrates the accumulation of my work as a doctoral student; these pages represent my incredible support system of mentors, colleagues, and loved ones who have served as a cornerstone for me throughout this journey. I could not have achieved my dream of becoming a psychologist without the constant support and guidance from each and every one of you.

To my advisor, Dr. Consuelo Arbona, for always believing in me, offering your professional and personal help and guidance, and for challenging me to think more abstractly.

To my committee members, Drs. Andrea Burrridge, Susan X. Day, and Lorraine Retzel, for helping me better understand difficult concepts, encouraging me to think outside the box, and always making room in your busy schedules to meet with me or talk with me on the phone. Thank you all (including Dr. Arbona) for serving as models for me to grow into a strong, independent female psychologist.

To my first advisor, Dr. Tam K. Dao, for taking me under your wing and serving as my mentor throughout the program even though your career took you elsewhere.

To my mentor, Dr. Wright Williams, for helping me grow and gain confidence as a clinician, researcher, and person, and challenging me to work beyond what I thought I was capable of.

To my cohort and friends, Jocelyn Abrams, Felicia Fisher, LaWanda Hill, Nausheen Noor, Akilah Reynolds, Rui Tang, Navneet Thind, Allison Verhaak, and

Jennie Wang-Hall, for your constant support and for always encouraging me to practice self-care and have balance in life.

To my best friend, Bethany Schaefer, for your continual love, encouragement, and thoughtfulness, and to all of my dearest friends who have brought laughter and balance to my life throughout this process, Laura Arneson, Jenny Bannister, Stephanie Banno, Candice Baron, Erin Berg, Mallory Brown, Suzanne Ceplina, Nathan Coolman, Laura Davis, Kitridge Bruton Garth, Corey Goddeyne, Katie Hernandez, Niko John Kalargyros, Kristen Kelley, Jillian Kulesh, David McMillian, Michael Retzer, Larissa Tavelli, and Nicole West.

To my sister, Dr. Ann Marie Milliken, for being a supportive friend and role model all of my life, inadvertently guiding me to strive for the best in all that I do.

And finally, to my parents, Larry and Rosemary Milliken, for your unconditional love and support; for always believing in me and encouraging me to follow my dreams, no matter what the cost. Words cannot express my appreciation for all that you both have done for me.

I truly do not know what I would have done without you all by my side.

Thank you!

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Milliken, Laura J. "The Illness Intrusiveness Model in Male Veterans with Chronic Heart Failure." Unpublished Doctor of Philosophy Dissertation, University of Houston, May 2015.

### Abstract

Background: Individuals suffering from chronic heart failure (CHF) experience adaptive and psychosocial challenges that originate from disease symptoms, and these symptoms often disrupt individuals' valued lifestyles and activities; this interference is called illness intrusiveness. The illness intrusiveness theoretical model proposes that the relation of disease factors to psychological wellbeing is mediated by illness intrusiveness. The model also proposes that illness intrusiveness produces negative psychological effects by reducing individuals' sense of personal (internal) control over valued life activities, with personal control serving as a mediator of the relation of illness intrusiveness to psychological wellbeing.

Researchers who have examined the illness intrusiveness model have operationalized personal control in two ways. Consistent with the illness intrusiveness model, personal control has been assessed in terms of the extent of control individuals believe they have over various domains of functioning or their valued life activities, which can be construed as a direct consequence of the illness itself (e.g., Poochikian-Sarkissan, Sidani, Wennberg, & Devins, 2008). However, other researchers have operationalized personal control as health locus of control (HLC), which refers to individuals' beliefs regarding to what extent with their actions they can make a difference in the progression of their disease (e.g., Talbot, Nouwen, Gingras, Belanger, & Audet, 1999). HLC can be construed as a personality predisposition consistent with Julian Rotter's (1966) Locus of Control theory.

A study that examined internal HLC control as a mediator of the relation of disease factors to psychological wellbeing operationalized the construct similar to Rotter's original definition. Their results indicated that internal HLC contributed little variance to depression and that the model including personal control as a mediator was not the best fit for the data (Talbot et al., 1999). The illness intrusiveness model also proposes that psychological factors may moderate the relationship between illness intrusiveness and wellbeing. Therefore, it is possible that internal HLC assessed as a personality predisposition (e.g., a psychological factor) will moderate, rather than mediate, the relationship between illness intrusiveness and anxiety symptom severity.

Purpose: No published studies were located that assessed whether patients' perceived level of internal HLC over the progression of their disease might moderate the relationship between illness intrusiveness and anxiety symptom severity in Veterans diagnosed with CHF. Thus, the purpose of this study was to examine among Veterans diagnosed with CHF illness intrusiveness as a mediator of the relation between disease severity and anxiety symptom severity, and internal HLC as a moderator of the relation between illness intrusiveness and anxiety symptom severity. The hypotheses were a) that illness intrusiveness would mediate the relation between HF severity and anxiety symptom severity, and b) the relationship between illness intrusiveness and anxiety symptom severity would be strengthened for Veterans with a lower endorsement of internal HLC, and that either a non-significant or less strong relationship would occur with a higher endorsement of internal HLC.

Methods: Archival data of approximately 116 adult male Veterans (ages 49-88; see demographic variables in Table A1) from two Veterans Affairs hospitals in the United States who participated in a baseline screening for an ongoing effectiveness/implementation trial of brief cognitive behavioral therapy (bCBT) were used for the study. Participants in the database were diagnosed with CHF, chronic obstructive pulmonary disease (COPD), or both, and comorbid symptoms of anxiety and/or depression; however, only data from Veterans diagnosed with comorbid CHF and anxiety were used in this study. The Kansas City Cardiomyopathy Questionnaire (KCCQ; Green, Porter, Bresnahan, & Spertus, 2000) was used to assess disease severity, the Beck Anxiety Inventory (BAI; Beck & Steer 1990) was used to assess anxiety symptom severity, the Heart Failure Illness Intrusiveness Rating Scale (HF IIRS; Devins et al., 1983; Devins, 2010) was used to assess illness intrusiveness, and the Internal Health Locus of Control subscale of the Multidimensional Health Locus of Control Scale, Form C (MHLC; Wallston, Stein, & Smith, 1994) was used to assess the internal HLC construct.

Preliminary analyses were conducted to examine the bivariate correlations of the variables included in the study. To examine the first hypothesis, a simple mediation model was tested using a non-parametric, bias-corrected bootstrapping procedure to examine the indirect effect of illness intrusiveness on the association between CHF severity and anxiety symptom severity using macros provided by Preacher and Hayes (2004; 2008). Age was used as a control variable because research indicates differences in distress levels from the effects of illness intrusiveness in younger versus older patients.



To examine the second hypothesis, hierarchical regression analysis was used to examine to what extent internal HLC moderates the relation of illness intrusiveness to anxiety symptom severity. Two steps were involved in this analysis to test for moderation. Step 1 included the control variable of age, as well as illness intrusiveness and internal HLC to test for the main effects of the predictor and moderator. In Step 2, the interaction term (e.g. illness intrusiveness by internal HLC) was included to examine to what extent it explains additional variance in anxiety over and above the variance explained by the others (Baron & Kenny, 1986).

Results: Bivariate correlations showed that age and internal HLC were not related to any of the variables of interest; however, the other variables of anxiety, illness intrusiveness, and CHF severity were related to each other as expected (see Table A2). Results of the first analysis indicated that illness intrusiveness significantly mediated the relation of CHF severity to anxiety symptom severity in this sample; this finding is consistent with existing research and supports the first hypothesis of the study. Results of the second analysis showed that although the overall model was significant and the combination of illness intrusiveness and internal HLC share approximately 14% of the variance with anxiety, the change in  $R^2$  from step one to step two was not statistically significant. This finding indicates that the relation of illness intrusiveness to anxiety is not moderated by internal HLC in this sample, thereby not supporting the second hypothesis of this study.

Conclusion: The results of this study are consistent with existing literature and suggest that illness intrusiveness mediates the relationship between CHF severity and anxiety symptom severity. These findings highlight the importance of examining and

treating CHF patients' level of illness intrusiveness in order to hopefully reduce their level of anxiety. Future research on the illness intrusiveness theoretical model using a larger sample size will allow clinicians and other health professionals to appropriately assess and treat patients diagnosed with CHF in an attempt to increase their quality of life.

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## **Chapter I**

### **Introduction**

Congestive Heart Failure (CHF) is a debilitating chronic health condition that affects approximately 5 million individuals in the United States, with more than 300,000 dying each year as a result of the disease (Curtis et al., 2008; Go et al., 2014). Prevalence of CHF among outpatients older than 65 years of age is estimated to range from 10-20% and the incidence is dramatically increasing with age (Curtis et al., 2008; Moser et al., 2010). According to Mayo Clinic, CHF occurs when one's heart muscle does not pump blood as well as it should, resulting in symptoms such as shortness of breath, fatigue, and swelling in legs, ankles, and feet, to name a few (Mayo Foundation for Medical Education and Research, 2013).

Because of the limitations in mobility and the chronic fatigue that these symptoms often produce, CHF can affect both physical and mental health by reducing the patient's quality of life and participation in daily life activities (Cully, Johnson, Moffett, Khan, & Deswal, 2009; MacMahon & Lip, 2002; Paukert, LeMaire, & Cully, 2009). For instance, the prevalence of anxiety and depression ranges from 30-50% in patients with CHF (Brenes, 2003; Cully, Jimenez, Ledoux, & Deswal, 2009; Jiang, Alexander, & Christopher, 2001; Katon, 2003; Kunik, et al., 2005; MacMahon & Lip, 2002; Yohannes, Willgoss, Baldwin, & Connelly, 2009). Although not much research exists regarding anxiety with CHF patients, some studies have suggested that the prevalence of anxiety may actually be as high as 63%, depending on the CHF subgroup studied (Konstam, Moser, & De Jong, 2005). In patients with CHF, anxiety disorders are associated with adverse outcomes such as hospital readmission, greater

health services use, and poorer health-related quality of life (Cully et al., 2009b; Volz et al., 2009).

Within the Veteran population, only two studies were located that examined the prevalence of anxiety and CHF (Cully et al., 2009a; Cully et al., 2009b). The first study found that the prevalence of anxiety in Veterans with CHF was 25.3% (n = 158), while the second reported that approximately 18% (n = 2,180) of patients were diagnosed with anxiety or depression within one year of their initial medical diagnosis (Cully et al., 2009a; Cully et al., 2009b). Since evidence has suggested that anxiety often follows a diagnosis such as CHF, it is important to consider what factor(s) might contribute to an increase in these anxiety symptoms.

Although limited, research has shown that disease severity, illness intrusiveness, and health locus of control each contribute to psychosocial wellbeing, particularly anxiety, in CHF patients (Bieling, Rowa, Antony, Summerfeldt, & Swinson, 2001; Cully et al., 2009a; Cully et al., 2009b; Dancey & Friend, 2008; Devins, Beznak, Mah, Loblaw, & Gotowiec, 2006; Devins, 1991; Paukert et al., 2009; Poochikian-Sarkissan, Sidani, Wennberg, & Devins, 2008; Talbot, Nouwen, Gingras, Belanger, & Audet, 1999). Thus, the purpose of the current study was to examine to what extent disease severity, perceived intrusiveness of disease symptoms, and internal health locus of control relate to anxiety symptoms in Veterans with CHF. It was hypothesized that illness intrusiveness would mediate the relation of disease severity to anxiety symptom severity, and that internal health locus of control would moderate the relation of illness intrusiveness to anxiety symptom severity.

### **The Illness Intrusiveness Model**

Individuals suffering from chronic medical conditions experience adaptive and psychosocial challenges that stem from disease symptoms and treatment effects, such as inflammation, pain, fatigue, lack of mobility, and cognitive/memory deficits (Devins & Shnek, 2000). In turn, disease symptoms and treatment effects often disrupt the individual's lifestyles and activities. Illness intrusiveness refers to the extent to which the person perceives that disease and treatment related factors interfere with engagement in daily life, including work and leisure activities. Research findings have shown that the intensity of illness symptoms and treatment effects is positively associated to negative psychological consequences, such as depression and low quality of life (Bieling et al., 2001; Dancey & Friend, 2008; Paukert et al., 2009).

The illness intrusiveness theoretical model proposes that the relation of disease factors to psychological wellbeing is mediated by illness intrusiveness: disease (e.g., pain, fatigue, disability, etc.) and treatment factors (e.g., time required, amelioration of symptoms) directly influence illness intrusiveness, which in turn, directly affects patients' psychosocial wellbeing and quality of life (Figure B1; Devins et al., 2009; Roessler, 2004). The model also proposes that illness intrusiveness produces negative psychological effects by reducing individuals' sense of personal control to carry out valued experiences and activities and to avoid negative ones; that is, a sense of personal control mediates the relation of illness intrusiveness to psychological wellbeing. In other words, what affects individuals' quality of life is not the disease per se, but the lack of positive reinforcement that stems from participating in meaningful activities and the perceived loss of personal control over their lives. In addition, the illness intrusiveness

framework suggests that psychological, social, and contextual factors play moderating roles in the relations between illness intrusiveness and subjective wellbeing (Devins et al., 2006; Synder, Foley, Farrell, Beier, & Zemon, 2013; See Figure B1).

Research findings have suggested that in individuals with several medical conditions (e.g., breast cancer, rheumatoid arthritis, multiple sclerosis, systemic lupus erythematosus, hyperhidrosis, end-stage renal disease, and sleep disorders), severity of physical illness symptoms (e.g., pain, disability, progression of disease) is positively correlated to illness intrusiveness perceptions (Bettazzoni, Zipursky, Friedland, & Devins, 2008). In addition, illness intrusiveness is inversely correlated with indices of subjective wellbeing (e.g., decreased life happiness and satisfaction, positive mood, self-esteem, increased emotional distress, etc.) across various medical and psychiatric conditions (Dancey & Friend, 2008; Paukert et al., 2009). For example, research on end-stage renal disease (ESRD) has suggested that patients who reported greater functional limitations, higher uremic levels, and more time required for treatment reported higher levels of illness intrusiveness, and that illness intrusiveness level directly affected psychosocial wellbeing (Devins, 1991). Further, research findings have provided support for the hypothesis that illness intrusiveness mediates the relation of disease factors to subjective wellbeing in patients with end-stage renal disease, laryngectomy, sleep disorders, multiple sclerosis, and rheumatoid arthritis (Devins, Stam, & Koopmans, 1994; Devins et al., 1993a; Devins et al., 1993b).

Only two studies were located that examined illness intrusiveness in cardiac and/or heart failure (HF) patient populations (LeMaire, Shahane, Dao, Kibler, & Cully, 2012; Paukert et al., 2009). Both studies examined predictors of depressive symptoms in

older Veterans diagnosed with HF. In the earlier study, perceived HF intrusiveness was a significant predictor of depressive symptoms after controlling for physical limitations (Paukert et al., 2009). In a follow-up study, LeMaire et al. (2012) found that illness intrusiveness fully mediated the relationship between HF severity and depression; they further concluded that perceived intrusiveness of HF symptoms may be a better indicator of depression than the severity of the HF illness and symptoms. The current study expanded on the extent to which illness intrusiveness mediates the relation of HF disease to psychosocial wellbeing among Veterans with CHF. The first objective of the current study was to examine to what extent illness intrusiveness mediates the relation between HF severity and anxiety symptom severity.

### **Internal Health Locus of Control**

The construct of locus of control (LOC) was originally developed and conceptualized in 1966 from the perspective of Julian Rotter's Social Learning Theory (Ryon & Gleason, 2014; Chung, Preveza, Papandreou, & Prevezas, 2004). Rotter believed that how one responds to an environmental stimulus depends on the meaning that one attaches to the event. In other words, environmental and personal factors interact to influence one's behavior. Rotter defined LOC as the degree to which individuals expect that there is a dependent relationship between their behaviors and outcomes across situations (Ryon & Gleason, 2014). Therefore, LOC captures a relatively stable predisposition of individuals to attribute events to either their own actions or to factors outside of their control (e.g. behavior of others or chance). Individuals with an internal LOC are more likely to believe that their own behaviors are responsible for outcomes in their lives while those with an external LOC are more likely to attribute outcomes to



outside forces (e.g., fate, luck, or other people). Although originally viewed as a one-dimensional construct (in which internal and external LOC were considered two ends of a continuum), LOC is now conceptualized as a multidimensional construct; individuals are either categorized as having one of the two orientations, internal and external LOC, or are placed on a continuum within each dimension (Ryon & Gleason, 2014).

Attempting to understand why individuals conduct, or fail to conduct, behaviors that promote or threaten their health status has increasingly been of interest to health psychologists (Rodin & Salovey, 1989). Thus, researchers in health psychology have studied individuals' perceptions of control over their health outcomes; they have applied the concept of LOC to examine the relation of patients' beliefs about the course of their illness to physical and psychological outcomes (Wallston, 1992). Herein, the construct of health locus of control (HLC) is defined as individuals' beliefs regarding to what extent the course of their illness depends on either their own behavior or on external forces, such as the behaviors of others or chance (Asadi-Pooya, Schilling, Glosser, Tracy, & Sperling, 2007; Baken & Stephens, 2005; Ryon & Gleason, 2014; Wallston, 2005; Wallston, Wallston, & DeVillis, 1978). The internal control dimension in the HLC construct is equivalent to the internal LOC in Rotter's model: it refers to individuals' predisposing beliefs regarding the extent to which they are able to perform health-related behaviors (e.g. identify and select treatment options, manage symptoms, etc.) that will influence the course of their illness and health outcomes (Asadi-Pooya et al., 2007).

### **Personal Control**

Researchers who examined personal control as a mediator of the relation of disease factors to psychological wellbeing within the illness intrusiveness theoretical

model have conceptualized and measured the construct in two different ways. This discrepancy is important because it may inform the interpretation of their findings. Consistent with Rotter's original LOC theory, many researchers define personal control as individuals' predispositions to believe that they have control over the progress or outcomes of the disease; they use the Multidimensional Health Locus of Control Scale (MHLC) to measure this construct (Hundt et al., 2013; Wallston, Stein, & Smith, 1994; Wallhagen, Strawbridge, Kaplan, & Cohen, 1994; Talbot et al., 1989). The second way researchers define personal control is consistent with the illness intrusiveness theoretical framework in terms of the extent of control individuals believe they have over various domains of functioning or over their valued life activities; in this way, personal control may be construed as a direct consequence of the disease (Devins et al., 1993a; Devins et al., 1993b; Devins et al., 2001; Devins et al., 2009; Devins, 2010; Devins et al., 2013; Poochikian-Sarkissan et al., 2008).

Only two studies were located that examined the extent to which personal control mediated the relation of illness intrusiveness to psychological outcomes according to the original illness intrusiveness model (Poochikian-Sarkissan et al., 2008; Talbot et al., 1999). In these studies, researchers operationalized personal control differently. The first study examined epilepsy patients and, consistent with the illness intrusiveness framework, measured personal control as it pertains to how much influence individuals believe they have over various domains of functioning (e.g., work, relationships, etc.) according to the same life domains assessed with the illness intrusiveness scale (Poochikian-Sarkissan et al., 2008). Results indicated that higher perceived illness intrusiveness correlated significantly with decreased psychological wellbeing, and that

patients who endorsed higher personal control over diverse life domains reported more positive psychosocial outcomes. Further, results of a path analysis showed that illness intrusiveness had a direct relation to psychological wellbeing and an indirect relation mediated by perceived personal control over daily activities, which is consistent with the theoretical model (Poochikian-Sarkissan et al., 2008).

In the second study, which examined the illness intrusiveness model with Type 2 Diabetes patients, the researchers operationalized personal control as health locus of control, or the extent to which individuals believe their behavior determines their health outcomes (Talbot et al., 1999). Results of this study showed a good fit between the complete model and the data; diabetes intrusiveness had both a direct effect on depressive symptoms and an indirect effect mediated by personal control (Talbot et al., 1999). However, compared to illness intrusiveness, personal control contributed very little variance to depression (4% versus 61%), and results suggested that the model excluding personal control as a mediator was a much better fit for the data (Talbot et al., 1999). This lack of fit may be explained by the fact that Talbot et al. (1999) operationalized personal control as internal HLC, which is inconsistent with the operationalization of personal control in the illness intrusiveness theoretical model (which refers to perceived control over valued life activities as a result of the illness). Consistent with Rotter's theory, it is possible that personal control assessed as internal HLC captures a personality predisposition (e.g., a psychological factor) rather than a change in patients' lifestyle that can be attributed directly to illness symptoms and treatment factors.

As indicated earlier, the illness intrusiveness theoretical model proposes that psychological factors may moderate the relation of illness intrusiveness to psychological

wellbeing; thus, it is possible that personal control conceptualized as a personality predisposition (a psychological factor) may moderate, rather than mediate, the relationship between illness intrusiveness and anxiety symptom severity. Research has demonstrated a negative relationship between illness intrusiveness and psychological wellbeing, and that a higher endorsement of internal HLC is positively associated with mental health and inversely related to negative affect (e.g., depression) (Asadi-Pooya et al., 2007; Bieling, et al., 2001; Dancey & Friend, 2008; Devins, 1991; LeMaire et al., 2012; Paukert et al., 2009). Thus, it was hypothesized that the endorsement of a lower level of internal HLC might strengthen the relationship between illness intrusiveness and anxiety, whereas the endorsement of a higher level of internal HLC might weaken or produce no effect on this relationship. Therefore, the second objective of the current study was to examine to what extent internal HLC would moderate the relation of illness intrusiveness to anxiety symptom severity in a sample of Veterans suffering from CHF.

### **The Present Study**

No published studies were located that examined the illness intrusiveness model in a sample of Veterans diagnosed with comorbid CHF and anxiety. Herein, the purpose of the current study was twofold; to examine a) illness intrusiveness as a mediator of the relation between CHF severity and anxiety symptom severity, and b) internal HLC as a moderator of the relation between illness intrusiveness and anxiety symptom severity.

### **Research Questions and Hypotheses**

The current study investigated the following research questions with corresponding hypotheses:

1. To what extent does illness intrusiveness serve as a mediator of the relation between HF severity and anxiety symptom severity? Consistent with previous research (described above), illness intrusiveness has been found to be a significant mediator of the relationship between disease severity and psychological wellbeing in many medical samples. Thus, it was hypothesized that illness intrusiveness would serve as a mediator of the relation between HF severity and anxiety symptom severity in this sample.
2. To what extent does internal HLC serve as a moderator of the relation between illness intrusiveness and anxiety symptom severity? Consistent with previous research (described above), a negative relationship exists between illness intrusiveness and psychological wellbeing, and a higher endorsement of internal HLC is positively associated with mental health and inversely related to negative affect. Thus, it was hypothesized that the endorsement of a lower level of internal HLC might strengthen the relationship between illness intrusiveness and anxiety, whereas the endorsement of a higher level of internal HLC might weaken or produce no effect on this relationship.

## Chapter II

### Method

#### Participants

The sample was composed of 116 adult male Veterans (ages 49-88) from two Veterans Affairs hospitals in the United States. Data for the current study were collected as a baseline screening for an ongoing effectiveness/implementation trial of brief cognitive behavioral therapy (bCBT) for Veterans with congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), or both, and a diagnosis of either depression or anxiety, or both (Cully et al., 2012). For the purposes of this study, only data from Veterans with comorbid CHF and anxiety was used.

#### Instrumentation

*Heart Failure Illness Intrusiveness Rating Scale (HF IIRS; Devins et al., 1983; Devins, 2010).* The HF IIRS was used to assess the illness intrusiveness construct. This instrument is a 13-item, self-report scale that measures patients' perceptions regarding the extent to which CHF currently intrudes upon meaningful life activities (Cully et al., 2012; Devins et al., 1983). Respondents rate intrusiveness along a 7-point scale from 1 (*not very much*) to 7 (*very much*), with higher scores indicating greater intrusiveness. Example items include, "How much does your HF and/or its treatment interfere with your relationship and social activities with your family?" and "How much does your HF and/or its treatment interfere with your religious or spiritual activities?" This measure includes the following domains: Physical Well-Being and Diet; Work and Finances; Marital, Sexual, and Family Relations; Recreation and Social Relationships; and Other Aspects of Life. This study examined only the total illness intrusiveness score. The IIRS

has demonstrated good to excellent internal consistency reliability, with Cronbach's alpha scores ranging from the .80's to the .90's, and acceptable test-retest reliability, with coefficients ranging from .80 to .85 across a variety of chronic illness populations (Devins et al., 1990; Devins et al., 2006). The IIRS has also demonstrated high construct and discriminant validity (Devins, 2010). In this study, the IIRS demonstrated good internal consistency (Cronbach's alpha = 0.87).

*The Kansas City Cardiomyopathy Questionnaire-Physical Limitation Subscale (KCCQ-PLS)*. Consistent with other studies examining HF severity, illness intrusiveness, and wellbeing, the PLS subscale of the KCCQ was used to assess the CHF disease severity construct. The KCCQ is a well-validated, self-administered disease-specific quality of life inventory for HF patients (Green, Porter, Bresnahan, & Spertus, 2000). Notably, the KCCQ-PLS and the HF IIRS represent different constructs. The KCCQ-PLS is a subjective measure of the actual physical health difficulties associated with HF symptoms, and closely resembles the NYHA classification system concepts, while the HF IIRS is a measure of the perceived global disruption of physical health difficulties on lifestyle factors (LeMaire et al., 2012).

The PLS captures the physical deficits associated with HF and its symptoms of fatigue and shortness of breath. It has convergent validity with the New York Heart Association (NYHA) classifications and the 6-min walk test (with patients reporting more physical limitation on the KCCQ expected to walk a shorter distance); the PLS correlates significantly with distance walked (0.48,  $p < 0.0001$ ), and has a high Spearman's correlation coefficient with NYHA classification (-0.65,  $p < 0.001$ ) and other measures of physical limitation (Green et al., 2000). Internal consistency reliability

(Cronbach's alpha) for the KCCQ-PLS has been reported to be 0.84 (Creber, Polomano, Farrar, & Riegel, 2012). In this study, the KCCQ-PLS demonstrated good internal consistency reliability, with a Cronbach's alpha of 0.79. The PLS includes six questions asking about activity limitations related to HF symptoms (e.g., dressing oneself) over the previous two weeks. Items are rated on a scale (the scale changes by question, but ranges from 1 to either 6 or 7) and are consistent with semistructured interviews used to determine NYHA classification. Scores are transformed to a range of 0 to 100 by subtracting the lowest possible scale score, dividing by the range of the scale, and multiplying by 100; higher scores reflect better health function.

*The Beck Anxiety Inventory (BAI; Beck & Steer, 1990).* The BAI was used to assess anxiety symptom severity. This instrument is a 21-item measure of the severity of self-reported anxiety symptoms (e.g., numbness or tingling, terrified, fear of losing control, etc.). Responses on each item assess the past week, and range from 0 (*not at all bothered*) to 3 (*severely bothered*), with total scores ranging from 0 to 63. Scores between 0-7 indicate minimal anxiety, scores between 8-15 indicate mild anxiety, scores between 16-25 indicate moderate anxiety, and scores  $\geq 26$  indicate severe anxiety. In the development of the BAI, Beck et al. (1988) found internal consistency and test-retest reliability estimates of .92 and .75, respectively (Ayala, Vonderharr-Carlson, & Kim, 2005). However, based on current studies, coefficient alphas range from .83 to .95 and test-retest reliability estimates range from .35 to .83 (Ayala, Vonderharr-Carlson, & Kim, 2005). In this study, the BAI had a Cronbach's alpha of 0.88, demonstrating good internal consistency reliability.



*Multidimensional Health Locus of Control, Form C (MHLC; Wallston et al., 1994)*. The Internal HLC subscale of the MHLC was used to assess the construct of internal HLC. This subscale consists of 6 items; on each item, patients are asked to rate the degree to which they agree or disagree with each statement based on a 6-point Likert scale ranging from *Strongly Agree* to *Strongly Disagree*. Scores can range from 6 to 36, with higher scores indicating a stronger internal control belief. Example items from the Internal HLC subscale include: “If my condition worsens, it is my own behavior which determines how soon I will feel better again” and “The main thing which affects my condition is what I myself do.” The MHLC demonstrates adequate internal consistency reliability, test-retest reliability, and construct validity (Wallston et al., 1994). Generally, the scales are moderately reliable, with Cronbach alphas ranging from .60-.75 and test-retest stability coefficients ranging from .60-.70 across studies (Wallston, 2005). The Internal HLC subscale of the MHLC demonstrated good internal consistency reliability in this study, with a Cronbach’s alpha of 0.78.

### **Procedures\***

Potential participants were selected from a regional Veterans Affairs (VA) database that includes two large VA Medical Centers in the south central United States. The initial data extraction identified patients with International Classification of Diseases-Ninth Revision (ICD-9) diagnoses of CHF and/or COPD within the previous two years. In addition, patients included endorsed at the pre-screening clinically significant symptoms of anxiety and/or depression as measured by the BAI and the Patient Health Questionnaire (PHQ-9), respectively. Exclusion criteria included a diagnosis of dementia or other cognitive impairment (e.g., three or more errors on an

established six-item screening exam), Bipolar Disorder, Schizophrenia, or Substance and Alcohol Abuse/Dependence (as measured by the Mini International Neuropsychiatric Inventory (MINI)) within the previous year. Research assistants (RAs) conducted chart reviews that confirmed diagnoses and identified if each Veteran met exclusion criteria. Once potential participants were identified, opt-out letters were mailed providing information about the study and instructions on how participants could decline study participation. All patients who did not opt-out were contacted by phone by a RA or the study coordinator for an initial screening.

The initial screening, which was conducted by trained RAs or study coordinator, assessed the severity of patients' COPD/CHF, using the Medical Research Council (MRC) dyspnea scale for COPD/NYHA, as well as symptoms of anxiety and/or depression. To ensure inter-rater agreement, the project coordinator met with each RA to explain the administration of the measures and how to distinguish between different levels of severity. The project coordinator supervised each RA during the first three to four administrations of the instruments and addressed discrepancies between their ratings until a high level of concordance was achieved.

To be included in the study, patients needed to be classified as a category III or higher on the MRC and as a category II or higher on the NYHA. Additionally, patients needed to endorse at least one symptom of anxiety or one symptom of depression according to the Primary Care Evaluation of Mental Disorders (PRIME-MD). Therefore, this sample is analogous to primary care patients with moderate to severe COPD or CHF and screening positive for depression or anxiety on the PRIME-MD.

If patients met inclusion criteria at the screening, a baseline appointment was scheduled. Baseline assessments were also conducted over the telephone by RAs and consisted of a more in-depth assessment of self-reported physical and mental health, illness intrusiveness, and health related locus of control were collected at this time point. All questionnaires were administered over the phone and the RA entered data into a database as the call was conducted. Data from patients that met criteria for a diagnosis of CHF and anxiety who completed baseline appointments were included in the current study.

The parent study was approved by the Baylor College of Medicine Institutional Review Board (H-27082) and a local VA Research and Development review committee. Therefore, the study is in compliance with the Helsinki Declaration and all study participants provided informed consent including permissions for publications. The current study was approved by the University of Houston Institutional Review Board. *\*Note:* This information was extracted from Pauker et al. (2009), LeMaire et al. (2012), Cully et al. (2012), and the H-27082.

### **Statistical Analyses**

The research design was correlational. Statistical analyses were performed using SPSS version 22.0. Recent research suggests that the mediation effect should be examined more formally than traditional methods by using bootstrapping techniques (Hayes, 2009; MacKinnon & Fairchild, 2009). Thus, to examine the first hypothesis, a simple mediation model was tested using a non-parametric, bias-corrected bootstrapping procedure to examine the indirect effect of illness intrusiveness on the association between CHF severity and anxiety symptom severity using macros provided by Preacher

and Hayes (2004; 2008). Using this method, the indirect effect is defined as the product of the coefficients of CHF severity in path *a* and the mediator of illness intrusiveness in path *b*. The bootstrapping procedure creates an empirical approximation of the sampling distribution of the product of the estimated coefficients in the indirect paths by using thousands of resamples from the data set (e.g., 1,000 in this analysis specifically) (Reitzel et al., 2009). This approach does not impose the assumption of the sampling distribution's normality, which is important because these assumptions are commonly violated. In addition, small samples present further threats to the normality assumption for any path in regular mediation models (Preacher & Hayes, 2005; Reitzel et al., 2009). Therefore, because of its increased power over other methods (e.g., Baron and Kenny's [1986]'s causal-step approach) and better control over Type I error rates, bootstrapping is a preferred approach (Preacher & Hayes, 2005; Reitzel et al., 2009). Last, in order to determine that a mediation effect is present, the 95% confidence intervals produced in the SPSS output for the direct and indirect effects cannot include zero.

A hierarchical multiple regression analysis was conducted to test the second hypothesis which stated that internal HLC moderates the relationship of illness intrusiveness to anxiety symptom severity. All variables were centered at the mean. Centering these variables reduces the likelihood of multicollinearity problems. In this regression, age was entered in the first step as a covariate, and illness intrusiveness and internal HLC were also entered in this step to test for main effects. In the second step, the interaction term between illness intrusiveness and internal HLC was entered to test the moderating effect of internal HLC in the relation of illness intrusiveness to anxiety.

## Chapter III

### Results

#### Preliminary Analyses

Statistical analyses were performed using SPSS version 22.0. Demographic variables for the sample are shown in Table A1. A preliminary analysis was conducted to examine the bivariate correlations of the variables included in the study (See Table A2). As shown in Table A2, age and internal health locus of control (HLC) were not related to any of the variables of interest. Anxiety symptom severity was positively correlated with total illness intrusiveness score and negatively correlated with chronic heart failure (CHF) severity (higher scores on the measure of CHF severity indicate better health function). CHF severity was negatively correlated with total illness intrusiveness score.

#### Primary Analyses

The first set of analyses tested the hypothesis that illness intrusiveness mediates the relation between CHF severity and anxiety symptom severity. Results of the mediation analysis showed significant indirect effects for illness intrusiveness on this association (indirect effect estimate for illness intrusiveness =  $-.038$ ,  $SE = .018$ ; 95% CI,  $-.082 - (-.01)$  [See Table A3 and Figure B2]). Specifically, greater CHF severity was negatively associated with greater illness intrusiveness scores (higher scores on the Kansas City Cardiomyopathy Questionnaire-Physical Limitation Subscale (KCCQ-PLS) equal greater health function) (a path;  $\beta = -.25$ ,  $SE = .07$ ,  $t = -3.52$ ,  $p < .0001$ ), and greater illness intrusiveness scores were positively associated with greater anxiety severity (b path;  $\beta = .15$ ,  $SE = .06$ ,  $t = 2.6$ ,  $p < .01$ ). In addition, results indicated a significant direct effect of CHF severity and anxiety symptom severity, while adjusting for age (direct

effect estimate (c' path;  $\beta = -.131$ ,  $SE = .044$ ,  $t = -2.95$ ,  $p < .01$ ; 95% CI,  $-.219 - [-.043]$ ), meaning that greater CHF severity was positively associated with greater anxiety symptom severity. Results of a regression indicated that the total effect of CHF severity on anxiety severity was significant as well (c path;  $\beta = -.349$ ,  $p < .001$ ). In sum, these findings support the first hypothesis that illness intrusiveness mediates the relation of CHF severity to anxiety symptom severity in this sample.

In the next set of analyses a hierarchical multiple regression was conducted to test the hypothesis that internal HLC moderates the relationship of illness intrusiveness to anxiety symptom severity. Table A4 contains the results of the regression analysis with anxiety symptom severity as the dependent variable. An examination of the second step of the regression analysis (See Table A4) shows that the overall model was significant,  $R^2 = .14$ ,  $F(4, 111) = 4.49$ ,  $p < .01$ , indicating that the combination of illness intrusiveness and internal HLC share approximately 14% of variance with anxiety. However, the change of  $R^2$  from step one to step two was not statistically significant ( $\Delta R^2 = .024$ ,  $p > .08$ ), which indicates that the relation of illness intrusiveness to anxiety is not moderated by internal HLC.

### **Exploratory Analyses**

To this writer's knowledge, not much research exists that examines each of the five illness intrusiveness domains (e.g., physical, work, marriage/family, social/recreational, and other) as they relate to medical illnesses within the illness intrusiveness literature. In the current study, since the total illness intrusiveness score served as a mediator in the relation between CHF severity and anxiety symptom severity, this writer was curious to examine whether there were certain sub-constructs that are

particularly important in this mediation effect. Thus, five separate mediation analyses were conducted as post-hoc exploratory analyses using each of the five illness intrusiveness subscales to examine if any of the subscales would mediate the relation of CHF severity to anxiety symptom severity. Results showed significant indirect effects for the physical, work, and other illness intrusiveness domains on the association between CHF severity and anxiety symptom severity; the domains that were not significant were social and marriage/family (see Table A3). In sum, these findings highlight that these three domains of the illness intrusiveness scale significantly mediate the relation of CHF severity to anxiety symptom severity in this sample.

In addition, because of the unexpected finding that internal HLC did not moderate the relation of illness intrusiveness to anxiety symptom severity, further post-hoc exploratory analyses were conducted assessing this moderation with each of the five illness intrusiveness domains. One could argue that internal HLC may moderate the relation of some illness intrusiveness-related domains of functioning but not others; thus, five separate moderation analyses were conducted using the five illness intrusiveness subscales to examine if internal HLC would significantly moderate the relation of any of the subscales to anxiety symptom severity. A significant moderation effect was found only for the social domain of the illness intrusiveness scale (See Table A5, and Figure B3). Tables A6 and Figure B3 indicate that the slopes for the lines that correspond to medium and low levels of internal HLC were different from zero, and that the slope for the low-level internal HLC line had a greater slope than the slope for the medium-level internal HLC line. These results suggest that for Veterans reporting both low and medium levels of internal HLC, the relation of illness intrusiveness-social to anxiety

symptom severity was statistically significant. The slope of the line corresponding to Veterans that reported high levels of internal HLC was not significantly different from zero. This last finding shows that for participants with high levels of internal HLC, the relation of illness intrusiveness-social to anxiety symptom severity was not statistically significant.



## Chapter IV

### Discussion

The purpose of the current study was to examine two components of the illness intrusiveness model (Devins et al., 2009) in a sample of Veterans diagnosed with comorbid chronic heart failure (CHF) and anxiety. The study examined the following two hypotheses: a) illness intrusiveness (total score) would mediate the relation of CHF severity to anxiety symptom severity, and b) internal health locus of control (HLC) would moderate the relation between illness intrusiveness to anxiety symptom severity. It was expected that the endorsement of a lower level of internal HLC might strengthen the relationship between illness intrusiveness and anxiety, whereas the endorsement of a higher level of internal HLC may weaken this relationship.

The finding that illness intrusiveness (total score) mediated the relationship between CHF severity and anxiety symptom severity supports the study's first hypothesis. In addition, this result is consistent with findings from studies that have examined the mediating role of illness intrusiveness in patients suffering from other medical conditions (e.g., end-stage renal disease, laryngectomy, sleep disorders, multiple sclerosis, and rheumatoid arthritis) (Devins, Stam, & Koopmans, 1994; Devins et al., 1993a; Devins et al., 1993b). Moreover, this finding indicates that the amount of CHF severity one experiences is directly related to illness intrusiveness, which in turn, is directly associated to the patient's anxiety symptom severity. Thus, the relation of CHF severity to anxiety symptom severity is associated with how much the person perceives CHF disease factors interfere with his or her engagement in daily life activities. As LeMaire et al. (2012) discussed when interpreting similar results on depressive symptoms

in Veterans diagnosed with CHF, the intrusiveness of CHF symptoms may be a better predictor of anxiety than the severity of the CHF symptoms.

Results did not provide support for the study's second hypothesis that predicted that internal HLC would moderate the relation of illness intrusiveness to anxiety symptom severity. As previously discussed, studies have been mixed regarding how internal HLC is operationally defined and measured. In this study, internal HLC was operationalized from Rotter's perspective as a personality predisposition to believe that one has control over the progress or outcomes of the disease. In the illness intrusiveness perspective, personal control refers to what extent illness and treatment related factors hamper patients' sense of control over various domains of functioning or valued life activities, which is expected to mediate the relation of illness intrusiveness to psychological wellbeing. The illness intrusiveness framework also proposes that psychological factors may moderate the relation of illness intrusiveness to psychological wellbeing (Poochikian-Sarkissan et al., 2008; Talbot et al., 1999). However, results did not provide support for the hypothesis that Rotter's internal HLC construct constitutes a psychological factor that moderates the relation of illness intrusiveness to anxiety. Furthermore, internal HLC was not related to illness intrusiveness nor to anxiety. Therefore, current findings suggest that Rotter's approach to assess patients' sense of control over illness and treatment symptoms is not consistent with the postulates of the illness intrusiveness model.

Previous research has shown that a higher endorsement of internal HLC is positively associated with better mental health functioning and inversely related to negative affect, such as anxiety (Asadi-Pooya et al., 2007; Bieling, et al., 2001; Dancy &

Friend, 2008; Devins, 1991; LeMaire et al., 2012; Paukert et al., 2009). However, internal HLC was not related to anxiety symptom severity or to illness intrusiveness in this sample. These findings suggest that in the context of chronic physical illnesses, specifically Veterans with CHF in this sample, internal HLC as a psychological predisposition may not be relevant to experiences of illness intrusiveness and anxiety.

The exploratory analyses showed significant mediation effects for the physical, work, and the other domains of the illness intrusiveness subscales in the relationship between CHF severity and anxiety symptom severity (See Figure B2). These findings suggest that these three domains may be most relevant in explaining the relation of CHF severity to anxiety severity. Future research with a larger sample may examine the relative importance of the various domains of illness intrusiveness in explaining the relation of illness severity to psychological well-being.

The exploratory hierarchical regression analysis showed that the illness intrusiveness-social domain was a significant predictor of anxiety symptom severity (See Table A5). However, since only one out of the five moderation analyses was statistically significant, this provides very little support for the idea that the moderation effect is present for one of the illness intrusiveness domains but not others.

### **Future Directions and Limitations**

Although the findings of the current study add to the existing illness intrusiveness medical literature, results need to be interpreted in light of the study's limitations. First, mediation models are best applied to examine causal relations in longitudinal designs; however, the design of this study is correlational and cross-sectional results should be interpreted with caution. Second, the sample consisted of mostly male Veterans from

two Veterans Affairs hospitals in the U.S. This serves as a threat to the external validity of the study since the results may not be generalizable to female Veterans or civilian populations, or even male Veterans in other hospitals.

In future investigations, attempts should be made to further this area of research by including a larger sample of Veterans with CHF. Researchers could also attempt to use more measures of anxiety, including physiological measures, to further increase the accuracy of the findings in regards to the construct. It may be beneficial to conduct more research on the five illness intrusiveness domains to see how each of them fit within the illness intrusiveness framework, specifically in regards to medical populations. Last, future research could focus on examining other psychological variables (e.g., self-efficacy, coping style, etc.) that may moderate the relation of illness intrusiveness to anxiety symptom severity.

### **Implications**

Clinically, these findings highlight the importance of illness intrusiveness in Veterans presenting with comorbid chronic heart failure (CHF) and anxiety symptoms. The results are consistent with existing literature and indicate that illness intrusiveness mediates the relationship between CHF severity and anxiety symptom severity.

Clinicians and other health professionals can attempt to increase the quality of life for Veterans with CHF by attempting to decrease the amount of interference their illness has on their valued life activities. By doing this, the hope is to decrease these Veterans' anxiety symptoms and, ultimately, contribute to a better quality of life.

In conclusion, the results of this study illustrate the importance of assessing and treating CHF patients' level of illness intrusiveness in order to hopefully reduce their

level of anxiety. For patients whose CHF interferes with their daily life activities, this intrusiveness might influence the relationship between their level of CHF severity and the amount of anxiety symptoms they experience. Further research on the illness intrusiveness theoretical model in Veterans with CHF will allow mental health and medical professionals to appropriately assess and treat patients diagnosed with CHF.

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## **Appendix A**

### **Tables**

Table A1

*Participants' Demographic Characteristics (n = 116)*


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	n (%)
<b>1. Race</b>	
Caucasian	76 (65.52)
African American	29 (25%)
Hispanic	4 (3.45%)
Other	7 (6.03%)
<b>2. Education</b>	
No high school	1 (0.86%)
Some high school	10 (8.62%)
GED	10 (8.62%)
High school grad	20 (17.24%)
Some college	57 (49.14%)
College grad.	18 (15.52%)
<b>3. Yearly Income</b>	
<10,000	3 (2.61%)
10,000-19,999	22 (19.13%)
20,000-29,000	35 (30.43%)
30,000-39,000	14 (12.17%)
40,000-49,000	16 (13.91%)
50,000-59,000	12 (10.43%)
>60,000	13 (11.30)
<b>4. Marital Status</b>	
Married	73 (62.93%)
Separated	2 (1.72%)
Divorced	26 (22.41%)
Never married	5 (4.31%)
Widowed	10 (8.62%)
<b>5. Smoking Status</b>	
Current	27 (31.76%)
Former	58 (68.24%)

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Table A2

*Means, Standard Deviations, and Intercorrelations for Predictor & Criterion Variables*

	M	SD	1	2	3	4	5
1. Age	66.18	8.70	--				
2. KCCQ-Phys	36.68	20.61	-.01	--			
3. IIRS	57.64	16.00	-.17	-.32***	--		
4. IHLC	19.59	4.29	-.05	.10	-.13	--	
5. BAI	21.89	9.92	-.03	-.35***	.32***	.08	--

*Note.* \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

KCCQ-Phys = Kansas City Cardiomyopathy Questionnaire-Physical Limitation Subscale; IIRS = Illness Intrusiveness Rating Scale; IHLC = Internal Health Locus of Control; BAI = Beck Anxiety Severity

Table A3

*Indirect Effects of CHF Severity on Anxiety Symptom Severity through Proposed Mediators.*

Proposed Mediators	Estimate of Indirect Effect		BCa 95% CI	
	Effect Estimate	SE	Lower	Upper
Illness Intrusiveness - Total	-.038	.018	-.082	-.01
Illness Intrusiveness - Physical	-.028	.016	-.071	-.01
Illness Intrusiveness - Work	-.033	.018	-.081	-.005
Illness Intrusiveness - Other	-.035	.018	-.086	-.008
Illness Intrusiveness - Social	-.01	.016	-.048	.016
Illness Intrusiveness - Marriage/ Family	-.01	.009	-.039	.002

Table A4

*Hierarchical Regression Analysis Summary for Age, Illness Intrusiveness, and Internal Health Locus of Control (IHLC), Predicting Anxiety Symptom Severity.*

Step/Predictor Measures	Anxiety Symptom Severity		
	$\beta$	$R^2$	$\Delta R^2$
Step 1		.115	.115**
Age	.029		
Illness Intrusiveness-C	.337***		
Internal HLC	.123		
Step 2		.139**	.024
Age	.024		
Illness Intrusiveness-C	.350***		
Internal HLC	.150		
Illness Intrusiveness-C X IHLC-C	-.157		

*Note.* \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

Table A5

*Hierarchical Regression Analysis Summary for Age, Illness Intrusiveness - Social, and Internal Health Locus of Control (IHLC), Predicting Anxiety Symptom Severity*

Step/Predictor Measures	Anxiety Symptom Severity		
	$\beta$	$R^2$	$\Delta R^2$
Step 1		.038	.038
Age	-.005		
Illness Intrusiveness-Social-C	.178		
Internal HLC	.099		
Step 2		.078	.04*
Age	.015		
Illness Intrusiveness-Social-C	.264**		
Internal HLC	.111		
Illness Intrusiveness-C X IHLC-C	-.218*		

*Note.* \*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Table A6

*Simple Slopes and Associated t- and p-values for Illness Intrusiveness-Social.*

	Simple Slope	t-value	p-value
Low	3.61	2.90	0.00***
Medium	2.07	2.64	0.01**
High	0.52	0.63	0.5

*Note.* \*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

## **Appendix B**

### **Figures**

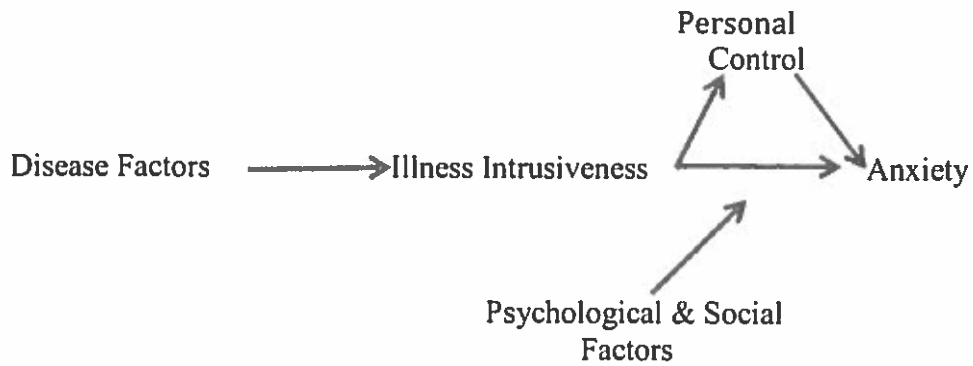


Figure B1. The illness intrusiveness theoretical framework.

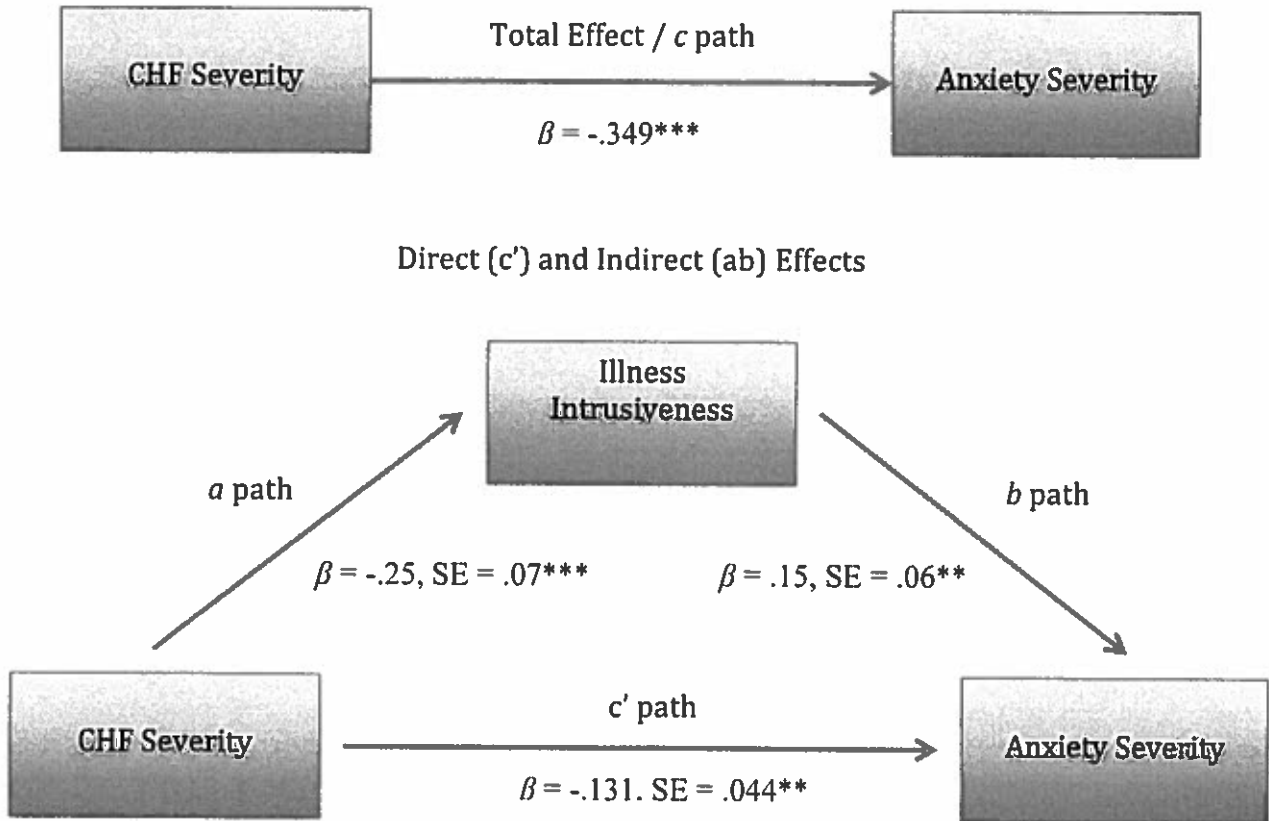
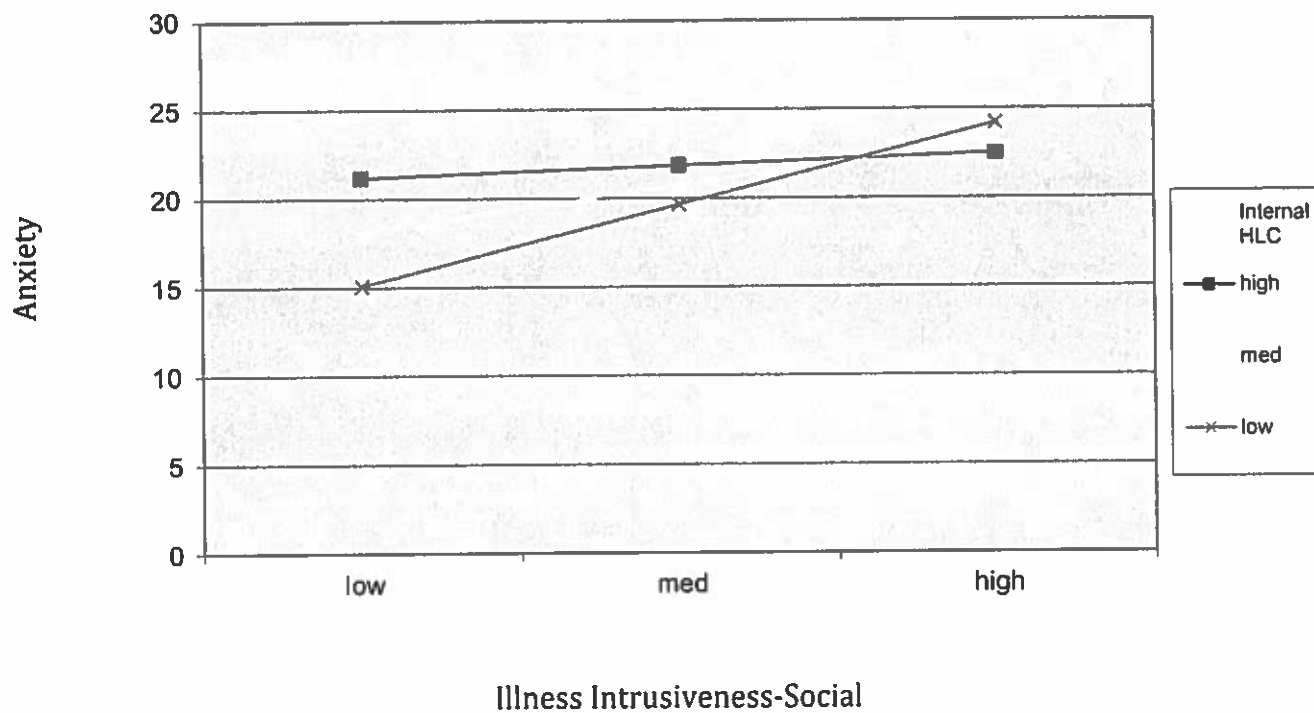


Figure B2. Total (c path) and Indirect Effect (ab paths) of CHF Severity on Anxiety Symptom Severity Through Illness Intrusiveness.

Note.  $*p < .05$ ,  $**p < .01$ ,  $***p < .001$



*Figure B3.* The Interaction of Internal Health Locus of Control and Illness Intrusiveness-Social on Anxiety Symptom Severity.