LIFE EVENTS AND ILLNESS LABELS MODERATE THE EFFECTS OF TRAIT NEGATIVE AFFECT ON SYMPTOM PERCEPTION

by

LISA M. DUNBAR

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ABSTRACT OF THE DISSERTATION

Life Events and Illness Labels Moderate the Effects of Trait Negative Affect on Symptom Perception

By: LISA M. DUNBAR

Dissertation Director: Howard Leventhal, Ph.D.

Objective: The relationship of trait negative affect (NA) to symptom reporting is well established in the literature. Recent evidence suggests that this relationship may be moderated by illness representations, suggesting that trait NA leads to a "chronic accessibility of illness representations." **Method:** This paper examined the process through which trait NA may influence symptoms and illness behavior by examining the effect of life events, trait NA, and illness labels on illness specific symptom reporting, psychosomatic symptom reporting, health anxiety and functional limitations among 554 elderly community dwelling adults. **Results**: The results showed a significant triple interaction of life events, trait NA and illness labels on psychosomatic symptom reporting, and functional limitations due to symptoms. Follow up analyses showed that individuals who were high in trait NA and had an illness label, reported greater psychosomatic symptom severity and functional limitations due to these symptoms after non-illness related life events. **Conclusions:** As opposed to a universal relationship of trait NA to symptoms, these findings provide evidence for the hypothesis that trait NA activates illness representations directing attention to perception of symptoms.

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Life Events and Illness Labels Moderate the Effects of Trait Negative Affect on Symptom Perception

It is well documented that the perception and reporting of somatic symptoms is influenced by psychological, physiological, societal, and affective variables (Cioffi, 1991; Leventhal et al., 1997). Understanding the processes involved in symptom experience is important both theoretically and practically as symptom perception plays a critical role in the behavioral management of illness and health, including quality of life and the way individuals go about their daily lives (Leventhal, Musumeci & Leventhal, 2008; Leventhal, Weinmen, Leventhal & Phillips, 2008). Self reports of trait negative affect (NA) have been implicated in this process because of their apparently ubiquitous association with symptom reporting (Watson & Pennebaker, 1989; Costa & McCrae, 1985). The symptom perception hypothesis, developed in response to these findings, focuses on individual differences and personality traits, including neuroticism and self-focused attention to account for the association of trait NA to somatic symptoms. More recent theoretical arguments have suggested that trait NA impacts symptom reporting by activating illness representations. These representations serve as an underlying framework that directs attention to somatic cues and shapes the attribution of these cues to a specific illness representation. This study extended previous literature by examining the process through which illness representations and trait negative affect may interact to influence symptom detection, in addition to examining behavioral consequences.

Symptoms as the Basis for Self-Regulation

Symptom detection is a subjective experience influenced by biological, psychological and cultural processes. It is also one of the primary mechanisms through which individuals assess and regulate their health (Leventhal & Diefenbach, 1991). Consistent with the Common Sense Model of Self-Regulation, patient's self-regulatory processes are modulated based on symptoms and other subjective experiences of illness (Bauman & Leventhal, 1985; Leventhal, Diefenbach, & Leventhal, 1992; Meyer, Leventhal, & Gutmann, 1985; Dunbar, Leventhal, & Leventhal, 2006). Symptoms are used by both patients and clinicians in diagnosing, initiating, and managing treatment. Symptoms also serve as one of the primary means by which physicians diagnose and treat physical illness and have been shown to influence health behaviors, such as self-monitoring of blood glucose for individuals with diabetes (Wagner, 1996) and physical activity (Cameron & Leventhal, 1995).

Patients' symptom perceptions have regularly been found to either accelerate or impede treatment seeking depending on the degree to which symptoms "match" representations of a feared illness. Individuals construct illness representations based on a combination of their understanding of illness, information from medical providers and the media, and cultural and family norms. These illness representations provide a framework through which subjective illness experiences are understood. Symptoms are integrated into these illness representations, which influence patients' interpretation of the somatic

experience as a signal of illness, or a threat, as compared to a nuisance or meaningless somatic event. Martin and Lemos's (2002) groundbreaking work on gender stereotypes clearly demonstrates the importance of symptom interpretation on treatment. Erroneous expectations that only men experience cardiac events, in addition to expectations that women are more likely to experience symptoms in response to stress, leads to treatment seeking delays by women after a myocardial infraction (MI). Further, women are less likely to interpret chest pain and associated symptoms as a cardiac event, and less likely to be advised by their peers to seek treatment in response to these symptoms (Martin et al., 2004; Martin & Lemos, 2002).

The absence of symptoms also influences perceptions of illness severity and consequently treatment decisions (McAndrew, in preparation). Having an illness carries expectations of a subjective experience of the illness. Patients associate a diagnosis of an illness or disease with symptoms. The reduction and eventual elimination of symptoms is a key criterion for successful treatment for most illnesses. This is problematic for patients with asymptotic illness, such as hypertension. In the absence of subjective cues to monitor the illness, and in the presence of what patients perceive as negative consequences (side effects) of taking medication, patients with hypertension are often not motivated to continue treatment (Meyer, Leventhal, & Gutmann, 1985). A parallel finding has been shown for patients with asthma. The belief that patients only have asthma when they have symptoms is directly linked to poor adherence to daily inhalers and an over-reliance on rescue medication (Halm, Mora, & Leventhal, 2006).

These phenomena highlight individuals' active search for correspondence between their perceptual experiences and abstract understanding of health. Individuals given an illness label search for the equivalent symptoms and when presented with an illness event, individuals create an identifiable meaning. A poor match between symptoms and disease processes (e.g. heart failure and diabetes) can lead to difficulties in self-regulation and has lead researchers to call for interventions which improve upon symptom awareness (Jurgens, 2006; Schachinger et al., 2005). Clearly symptoms, and expectations for symptoms, are integral in individuals' self-regulation of health.

Symptoms are Biased

Although symptoms are directly related to self-regulation of health and illness, symptom perception and interpretation are biased. The experience of somatic perceptions is common among normal adult populations. For example, Egan and Beaton (1987) found that healthy adults who were infrequent users of health care reported an average of 20 "symptoms" or somatic experiences in the prior week (Egan & Beaton, 1987), and Eriksen, Svensrok, Ursin, and Ursin (1993) reported that more than 75% of an European population reported at least one somatic symptom in the prior month. Haug, Mykletun, and Dahl (2004) showed that among a population of individuals without an identified physical illness, 22.7% of males and 32% of females reported 5 or more unexplained symptoms in the past year. In the general population, these somatic experiences are typically attributed to benign causes, and consequently do not trigger the seeking of medical care (Verbrugge, 1985). If however, the symptoms, their

pattern, severity, duration, or response to self generated intervention, fail to meet expectations and match a prototype for a benign illness, or if they do not fit into any readily understood pattern, the symptom experiences will lead to seeking medical care (Cameron, Leventhal, & Leventhal, 1993). In fact, studies suggest that 60% of medical visits have no medical basis (de Lean, Saiz-Ruiz, Chinchilla, & Morales, 1987), with the strongest predictor of care seeking being the worry or anxiety associated with the symptom interpretation (Smith et al., 1990).

Psychological variables, particularly negative affect and psychological distress, have been shown to account for a moderate amount of the variance in explaining these somatic experiences, which are considered to be unrelated to a direct disease processes or a magnification of an underlying disease process. Unfortunately, the mechanism as to how psychological factors may influence somatic experiences across illness diagnoses is poorly understood.

Trait Negative Affect

Trait negative affect (NA), or neurotism, is one of the most frequently studied psychological traits (Diefenbach, Leventhal, Levethal, & Patrick-Miller, 1998; Watson & Pennebacker, 1989; Costa & McCrae, 1985). Numerous studies have identified trait NA as a strong correlate of somatic symptom experience (Watson & Pennebaker, 1989; Costa & McCrae, 1985). The association of trait NA to symptom reporting has two important consequences for behavioral health research. First, the effects of trait NA on symptom reporting must be controlled for in studies using symptom reports to examine the effects of personality and life stress on illness. Watson and Pennebaker (1989) examined the role of this

confound in their elaboration of the “symptom perception hypothesis” (See also, Costa & McCrae, 1985). Second, whether trait NA does or does not confound the relationship between life stress and illness, it can be a marker for a process through which individuals become aware of and interpret symptoms as signs of illness and act as though they are indeed physically ill.

It has been suggested that trait NA may be associated with symptom reporting through a physiological pathway (i.e., it may predict the likelihood of actual physiological reactions that are experienced as symptoms) (Gold, Zakowski, Valdimarsdottir, & Bovbjerb, 2004), and through a perceptual pathway (i.e., it is well documented that individuals with high trait NA are likely to focus attention on the self, thereby increasing their awareness of somatic stimuli). The symptom perception hypothesis was developed to explain the perceptual pathway through which trait NA may lead to increased somatic detection. It suggests that individuals with high trait NA are more sensitive to pain, more generally vigilant, and more internally focused (Watson & Pennebaker, 1989), leading to increases in symptom reporting. Individuals who are high in trait NA are thought to over- attend and complain about normal bodily sensations that are ignored by individuals who are low in trait NA. The symptom perception hypothesis has garnered much attention and numerous studies have reported associations between trait NA and symptoms. Personality styles, rather than situational variables are hypothesized to account for the relationship between trait NA and symptom perception. Recent adaptations of the symptom-perception model have continued to include a pathway from trait NA through

selective attention to increases in symptoms (Kolk, Hanewald, Schagen, & Gijsbers van Wijk, 2003; Gendolla, Abele, Andreai, Spurk, & Richter, 2005).

Past studies also show that the relationship of trait NA to symptom reporting can be disrupted by focusing participant's attention outward, i.e., away from the self (Pennebaker, 1982), indicating that the association of trait NA with symptom reporting is not inevitable. It appears, therefore, that a variety of factors may mediate and/or moderate this association. Reasoning from a more complex theoretical model, Cameron, Leventhal, and Love (1998) suggest that the association of trait NA to symptom reporting is often mediated by underlying illness prototypes. Thus, as opposed to a universal association of trait NA and symptom reporting based upon an increase in self-focused attention, trait NA is presumed to enhance the "chronic accessibility of illness representations" that allow for the linkage of situationally induced, somatic emotional activation to an underlying illness representation and their interpretation as indicators of illness. As individuals with high scores on trait NA are more likely to experience this situationally induced emotional arousal, they would also be more likely to interpret symptoms as signs of pathology if they also have an illness history that provides the underlying template for making this connection. This important contribution also provides an explanation for Watson and Pennebaker's (1989) conclusion, that psychological and psychosomatic distress are manifestations of the same underlying experience and provides an explanation for the process through which individuals high in trait NA may report greater somatic symptoms in addition to or as opposed to psychological symptoms.

Preliminary evidence for Cameron, Leventhal, and Leventhal's (1998) hypothesis may be found in Croyle and Uretsky's (1987) study, which demonstrates that trait NA increases the "accessibility of illness-related memories". In their experimental design, individuals were assigned to either a positive or negative induction of mood. After the mood induction, individuals were asked to think about either an illness related or non-illness related event, or given no direction as to what event to think about. Participants in the negative mood induction, who were asked to think about illness related events reported both a higher number of symptoms during the previous month and lower self-assessed ratings of their health. Croyle and Uretsky (1987) suggest that negative affect may cause illness related memories to become more available. These memories then influence the processing and reporting of health-related information.

Cameron, Leventhal, and Love (1998) also found support for the chronic accessibility of illness representation hypothesis. In a randomized drug trial of tamoxifen, individuals high on trait anxiety reported a greater number of somatic symptoms related to the study drug. Trait anxiety did not lead to an increase in symptoms unrelated to the drug, but did lead to an over-generalization of these somatic symptoms to tamoxifen. These findings were also found in a population of adolescents with type I diabetes (Wiebe, 1994). In this study, adolescents with type 1 diabetes who were high in trait anxiety misattributed their somatic symptoms of anxiety to their blood glucose levels.

The chronic accessibility of illness representation hypothesis fits with seemingly contradictory evidence that while individuals who are high in trait NA report a greater number of symptoms, they do not report a greater number of symptoms that are specific to a given illness (Rabin, Ward, Leventhal & Schmitz, 2001; Diefenbach et al., 1996). Petrie, Moss-Morris, Grey, and Shaw (2004) found that symptoms that are clearly related to a vaccination are not biased by trait NA. However, trait NA is associated both with increased reporting of general symptoms, and the misattribution of these general symptoms to the vaccination. In this case, the vaccination provided an attribution for potentially "normal" body sensations, which as a result became "symptoms." As individuals who are high in trait NA experience a greater number of somatic perceptions and are more likely to be worried about illness related concerns, they reported more general symptoms. On the other hand, specific symptoms, such as redness around the vaccination, are equally likely to be experienced by individuals with high trait NA and individuals with low trait NA (Diefenbach et al., 1996). Further, both individuals who are high and individuals who are low in trait NA are likely to attribute the redness to the vaccine.

Better understanding the mechanisms through which NA may influence symptom perception has implications for our ability to intervene in the process. Watson and Pennebaker's model and subsequent symptom perception models, rely heavily on individual differences in explaining how trait NA influences symptom perception. Recent available evidence, however, suggests that individual differences make individuals more susceptible to maladaptive

interpretation of symptoms, a process which may be amenable to intervention. To date, this process has only been examined twice: one study that utilized an experimental design with an undergraduate population and one study that examined this hypothesis among individuals with cancer. The present study will extend these findings by examining symptom reporting among a population of elderly individuals, some of whom have a history of chronic illness that can be activated by acute stress or a major life event, and further examine the impact of trait NA on these relationships. We will also explore the behavioral consequences of acute stress on individuals with a chronic illness, specifically daily physical functioning and health anxiety.

Chronic Illness Label and Somatic Reporting

As trait NA is believed to cause a greater availability of illness representations, it is important to review the literature supporting the association between illness representations and somatic complaints. While this association is intuitive, few studies have examined the hypothesis that having an illness label will increase somatic detection. Perhaps, this is a result of the expectation that illness related physiological mechanisms entirely explain the relationship of chronic illness to symptom reporting. However, patients with a diagnosis of a chronic illness may be more vigilant of somatic experiences. Consequently, they may be more likely to report general symptoms, not related to their chronic illness, and be more aware of symptoms related to their chronic illness (Cameron, Leventhal, & Love, 1998). This is similar to patients who are

diagnosed with somatization disorder and are more likely to attribute common symptoms to physical factors (Robbins & Kirmayer, 1991).

Preliminary studies have begun to demonstrate the impact of an illness diagnosis on symptom perception. In 1989, Bauman and colleagues first showed the impact of a simple illness diagnosis on the perception of symptoms. In an innovative laboratory design, Bauman and colleagues found that normotensive individuals who were told that their blood pressure was elevated reported more symptoms of hypertension. As individuals regularly experience somatic events which go unnoticed, this study provided evidence suggesting that being given a label led to greater attention and reporting of these somatic events. Further, the anxiety produced by the label may have led to an increase in somatic symptoms. Spruill and colleagues (2007) have further defined the association between perceptions of self as hypertensive and blood pressure. They found that individuals who believed they were hypertensive reported higher levels of anxiety and had higher levels of blood pressure whether they were or were not hypertensive (status as hypertensive was determined by ambulatory monitoring). Finally, when the effect of perceived diagnosis on symptom perception was examined in a diabetic population it was found that among individuals with diabetes, patients who perceived themselves as having diabetes reported an increase in symptoms as compared to individuals who were unaware of their diagnosis (Hiltunen, Keinanen-Kiukaanniemi, Laara, & Kivela, 1996).

The present study sought to add to the literature by examining the impact of perceiving oneself as having a chronic illness on symptom reporting after a

non-illness related life event (LE). While it is expected that individuals with a chronic condition will search for symptoms of that condition from time to time, it is more concerning if individuals mis-label psychosomatic symptoms of distress as signs of their chronic illness. There is one cross-sectional study among a population of patients with diabetes that provides some evidence that this may occur. In this study, diabetes symptoms were more highly correlated with depressive symptoms than glucose control (Ciechanowski, Katon, Russo & Hirsch, 2003), suggesting that the symptoms reported as "due to diabetes" may have been in part somatic symptoms of distress that were mis-labeled.

Acute Stress and Symptoms

Acute stress can directly lead to somatic experiences, and is the psychological variable that is best known to affect the experience of symptoms by both investigators and the lay public. In fact, when symptoms newly occur following a major life event, they are interpreted by patients as a sign of stress and generally discounted (Cameron, Leventhal, & Leventhal, 1993; Martin & Lemos, 2002). Symptoms that occur prior to a major life stressor, or in conjunction with a long lasting stressor, are likely to increase care seeking, the former because they are detached from the stressor, the latter because the stress exposure is thought to have lasted long enough to make one ill (Bauman, 1989).

Research supports lay perceptions that acute stress causes somatic sensations, with studies finding that stress leads to increases in general somatic symptoms (Brown & Moskowitz, 1997), symptoms of gastrointestinal distress

(Bennet, Tennant, Piesse, Badcock, & Kellow, 1998), heartburn (Naliboff et al., 2004), abdominal pain (Halder, McBeth, Silman, Thompson, & Macfarlane, 2002), pain (Janssen, 2002), rheumatoid arthritis (Affleck, Tennen, Urrows & Higgins, 1991), anticipatory nausea in chemotherapy (Zachariae et al., 2007), and upper respiratory infection (Cohen, Doyle & Skoner, 1999). Acute stressors also lead to increase in symptoms among "healthy" individuals, or individuals without a diagnosable illness (Salovey & Birnbaum, 1989). As acute stress leads to increases in somatic experiences, this study will examine individuals after a non-illness life event and compare them to individuals without major life stress, a naturalistic quasi-experimental manipulation of somatic experiences. Illness labels and trait NA will be examined as moderators of symptom reporting.

Current Study

Symptom Hypotheses

This study tested the hypothesis that trait NA leads to a "chronic accessibility of illness representation." This study of 554 elderly participants examined the impact of being significantly upset by one or more major non-illness related life events, as compared to individuals who did not report a significant amount of distress regarding recent LE or did not report any recent LE, on symptom reports. We hypothesized that for individuals with a chronic illness who were high on trait NA, the major LE would activate their illness representation thereby leading to greater symptom reporting. Thus, a triple interaction was expected such that individuals who report high trait NA, who have an illness, and who experience a major life event, would report the greatest

symptom severity. Individuals with a chronic illness and who were high in trait NA were expected to be more vigilant of somatic experiences and report them as symptoms, than individuals who are low in trait NA and/or individuals without a chronic illness. It was hypothesized that trait NA would increase the salience of an illness representation which would lead to more accurate perceptions of the "true" illness symptoms and to the over-generalization of "normal" somatic experiences of distress to the illness representation, causing an overall increase in symptom reporting. Our model hypothesized that when an illness representation is activated, individuals both become more aware of symptoms of their chronic illness and attribute symptoms of distress or psychosomatic symptoms to the illness representation. Because of this, analyses were run on the complete symptom measure, and on its two components: psychosomatic symptoms and illness specific symptoms.

Additionally, based on the literature, we expected a main effect on symptoms for each of the 3 independent variables in the triple interaction: reporting a chronic illness, high trait NA and non-illness related life events (LE). Specifically, we hypothesized a main effect of having a chronic illness on symptoms, such that individuals who reported having a chronic illness would report greater symptom severity, psychosomatic symptoms, and illness specific symptoms. Next, we expected a main effect of trait NA on symptom reporting such that individuals higher in trait NA would report greater symptom severity, psychosomatic symptoms and illness specific symptoms. Our final expected main effect was for non-illness related life events to predict symptoms. We

expected individuals who reported a greater perceived impact of non-illness related life events to report greater symptom severity, psychosomatic symptoms and illness specific symptoms.

We developed two additional two-way interaction hypotheses based on our theoretical model. First, an interaction of chronic illness with LE, such that individuals with a chronic illness were expected to experience greater general symptom severity after a LE, greater psychosomatic symptom severity after a LE and greater illness specific symptom severity after a LE. Having a chronic illness label was expected to moderate the impact of an acute stressor, a life event, on symptom perception. This would suggest that having a chronic illness leads to greater symptom detection. Second, it was expected, that there would be an interaction of trait NA with LE, such that individuals high in trait NA were expected to experience higher symptom severity after a LE, greater psychosomatic symptoms, and greater illness specific symptoms. This would provide supporting data for the hypothesis that trait NA leads to greater symptom reporting.

Additional Hypotheses

To further elucidate the impact of the chronic accessibility of illness representations on health behaviors, we have examined the impact of LE, trait NA, and chronic illness on health anxiety, and functional limitations. Few studies on symptom perception have examined if and how increases in symptoms may translate into changes in illness behaviors. The analyses of the main effects (Chronic illness, trait NA, and LE) and two-way interaction terms on these three

dependent variables (health anxiety, and functional limitations) were exploratory as there was not a clear expectation for how or if the independent variables would impact the dependent variables. We did expect a triple interaction of chronic illness, trait NA and LE for each: health anxiety, and functional limitations.

Health Anxiety. First, based on our model, we hypothesized that individuals with a chronic illness and high in trait NA would report greater health anxiety following life events. We hypothesized that attributing their symptoms to their illness representation would lead to greater health anxiety. Examining changes in health anxiety allowed for some estimation of attribution of symptoms. While attributions were not measured specifically, if individuals attributed their increase in somatic perception to acute stressors, we would not expect to see increases in health anxiety.

Functional Limitations. Finally, we examined the impact of the chronic accessibility of illness representations on functional limitations. Specifically, we expected that if individuals with high trait NA have chronic accessibility of illness representations, they would have greater functional limitations, or limit their activities of daily living in order to accommodate their symptoms. Specifically, we expected a triple interaction such that individuals with high trait NA and a chronic illness would experience greater functional limitations after a non-illness related life event.

Method

Participants

Participants were 554 community dwelling elderly individuals recruited for participation in a 10 year longitudinal study examining the effects of affective, somatic, and cognitive information on health and quality of life outcomes. Interviews were conducted in person annually during the late spring and summer months and by phone during the mid winter. The average age of the sample at baseline was 72.2 years and the majority of participants were female (61.9%). Their socio-economic status was high, with 79.6% having some college or technical school, and 97.3% having at least a high school education. Of the participants, 59% lived with a spouse or partner. The sample was ethnically homogeneous with 99.4% of the sample being Caucasian. Participants generally were considered to be in good health for their age and status.

Procedure

Recruitment was initiated by letters sent sequentially to a sample of 1,772 individuals whose names were selected at random from a list of the 2,955 residents of a retirement community. As the community list was not up-to date, 459 names were eliminated because they could not be reached by letter or phone. An additional 702 individuals declined to participate leaving a sample of 607 participants after the first recruitment wave. Subsequently 244 individuals not in the original sample requested to participate and were admitted to the study following the recommendation of the community advisory board who were concerned that turning away residents was unacceptable on ethical grounds and

would compromise cooperation with community residents. Retention was considered excellent for the duration of the study, with approximately a 10% loss of participants (3% death; 3% leaving the community; 3% refusal) each year.

Interviews were conducted by undergraduate and graduate students majoring in sociology, psychology, and pre-med. Interviewers were trained in assessment and taught techniques for non-directive probes when participants responses were unclear. The interviews took approximately 2.5 hours, and 95% were completed in the participant's home.

These analyses examine data from the Spring 1995 wave of the study. This time point was chosen as this was the first time participants were asked in detail about specific ongoing chronic illnesses. The choice to rely on patients who reported having a chronic illness rather a confirmed medical diagnosis was a conscious one. Prior experiences with data collection in this area have led us to conclude that some individuals who have been diagnosed with a chronic illness fail to accept the label for themselves (i.e. pre-diabetes vs. diabetes) (Halm, Mora & Leventhal, 2006). As the current hypotheses were based on individuals perceiving themselves as chronically ill (i.e., as having an illness representation) the respondents' report of having a chronic illness rather than a medical diagnosis was the appropriate measure of the presence of a chronic condition.

Measures

Symptoms. Participants responded (on a 4 point scale: none, to yes-severe) to the question "Have you had ___ in the past week?" for each item in a list of 44 symptoms. This measure has been used in previous literature on

symptom reporting and negative affect (Mora et al., 2002). The symptom scale was next broken down into 2 sub-scales, a psychosomatic symptom scale and illness specific symptoms. The psychosomatic symptom scale was comprised of 8 of the 44 symptoms and was designed by Dr. Stephen Hansell, while the illness specific symptoms were the remaining 36 symptoms.

Trait Negative Affect. Trait anxiety and depression were assessed by having participants rate (on 5 point scales) the degree to which they usually experienced each of 10 different moods. This measure has been used in previous studies of symptom reporting and negative affect (Mora et al., 2002) and is similar to other common measures of negative affect, such as the Profile of Mood States (POMS) (Usala & Hertzog, 1989). The internal reliability was strong (Cronbach's ά=.92).

Perceived Impact of Life Events. Participants were asked to rate (on a 5 point scale from "not at all /or did not experience event" to "very") the degree to which they were upset by 26 non illness related life events. Examples of life events included: death of a spouse, child, family member, pet or other, motor vehicle ticket, financial or legal trouble, home or vehicle repairs, helping others, transportation problems and retiring. All 26 items were added to make a cumulative variable of total impact of life events. The participants scoring in the top 25% of this scale were coded as a 1 and those in the bottom 75% as 0, creating a dichotomous variable that distinguished participants who were reporting the greatest distress from those at a lesser level. The procedure followed Baron and Kenny's (1986) recommendation to dichotomize continuous

variables in moderation analysis, if the variable is not expected to have a graded effect on the independent variable.

Chronic Illness. Individuals were asked if they had any of 5 chronic illnesses. Those who answered yes to having any of chronic illness were coded as 1 and those who denied having any of the chronic illness were coded as 0. The chronic illness queried included diabetes, cancer, heart disease, arthritis, and shingles.

Functional Limitations. Functional limitations were assessed with four items which asses the degree to which individuals perceived their health impacted their physical functioning. Items asked (rated on Likert scales from 1=not at all to 5=very much) (1) “How much your health limits vigorous activities you can do such as running, lifting heavy objects, or participating in strenuous sports or activities?” (2) “How much does your health limit moderate activities you can do such as moving a table, carrying groceries, bending or lifting?” (3) “Do you have any trouble walking one block, uphill, or a few flights of stairs?” (4) “Do you have any trouble eating, dressing, bathing, and using the toilet?” A mean was computed. This four item scale was found to be highly correlated (r=.92 with the 18-item activities and disability scale designed by Johnson and Wolinsky (1994). The internal reliability was also acceptable, Cronbach’s ά=.79.

In a separate scale, participants were asked how much their reported symptoms impacted what they “need” to do and what they “like” to do. These two items were scored on a 5 point scale from “not at all” to “very”. These two

questions when added together had an acceptable internal consistency, Cronbach's ά=.83.

Health Anxiety. Anxiety about health was collected using five items from a validated measure used to distinguish anxious cognitions (Beck, Brown, Steer, Eidelson, & Riskind, 1987). Examples of items include, "I am trapped in my body" and "I am not a healthy person" and were rated on a 5-point Likert scale (range 1=never to 5=always). The internal consistence was acceptable, the Cronbach's ά=.81.

Self-Assessed Health. Participants were asked "In general would you say your health is…poor, fair, good, very good, excellent?" Self-assessed health was included as a control variable. Extensive past research has demonstrated that self-assessed health is associated with objective health measures and is an excellent predictor of mortality controlling for other health indicators.

Demographics. Gender and age were used as control variables.

Data Analysis

All analyses were conducted on SPSS software, version 14.0. Hierarchical regression analyses were used to predict total symptom score and the other independent variables following Baron and Kenny's (1986) recommendations for moderation analysis.

Prior to running the analyses, the independent variables, life events, and chronic illness were dichotomized as they were not expected to have a continuous effect on the dependent variable in accordance with Baron and

Kenny's (1986) recommendations. In order to reduce multicollinearity, trait NA was centered at the mean.

Correlations were computed to examine the associations between the dependent (i.e., symptoms, psychosomatic symptoms, illness specific symptoms, functioning, and health anxiety), independent (i.e., LE, chronic illness, and trait NA) and control variables (i.e., gender, age and self-assessed health). Hierarchical regression analyses were conducted to predict symptoms with demographic variables (age, gender and self-assessed health) and the independent variables trait NA, LE and chronic illness. The second step included the interactions of LE and chronic illness, LE and NA, and NA and chronic illness. The third step included the triple interaction of LE, NA and chronic illness. Identical hierarchical regression analyses were used to predict psychosomatic symptoms, illness specific symptoms, functioning, and health anxiety.

Interactions were graphed allowing visualization of all interactions using recommended procedures by Aiken and West (1991) and Dawson and Richter (2006). Two separate follow up analyses were run for each of the significant triple interaction terms. Preacher, Curran, and Bauer's (2006) propose determining the simple slopes of the moderator variables. The simple slopes are the regression slopes of symptoms on life events at specific or "conditional" values of trait NA and LE. While this simple effects analysis is the most commonly used follow up analysis (Holmbeck, 2002; Swann & Pelham, 2002), it does not allow for comparison between slopes. The second follow-up analyses were run following the recommendations of Dawson and Richter (2006) and

compared symptoms on life event's four regression slopes: high trait NA and no chronic illness, high trait NA and chronic illness, low trait NA and no chronic illness and low trait NA and chronic illness.

Results

Preliminary Analyses

The average age of the 554 participants at the 5th wave of data collection (1995) was 72 years. The majority of the participants were female (60%) and married (52%). The mean of self-assessed health was 3.24, where a 3 indicates a "good" self assessment of health and 4 equal to "very good" health. Participants reported an average of 5.5 symptoms on the 44 items symptom scale and 1 symptom on the 8 item psychosomatic scale.

Although the respondents were of advanced age, 21% reported not having any chronic illness. The percentage of individuals reporting specific chronic illnesses varied depending upon the condition; 59% of individuals reported arthritis, 20% heart disease, 5% cancer, 32% hypertension, 8% diabetes and 0.4% reported having shingles. Forty four percent of participants reported only 1 chronic illness, 24% reported 2 chronic illnesses, 9% reported 3 chronic illnesses, and only 2% reported 4 chronic illnesses. An analysis of variance was conducted to examine the impact of the number of chronic illnesses reported on symptoms. Symptom reporting varied depending upon number of chronic illnesses, $F(4, 546) = 9.87$, $p < .01$. Follow up analyses using Bonferroni alpha (.05), showed that individuals with no chronic illness reported significantly fewer symptoms than individuals with either 1, 2, 3, or 4 chronic illnesses ($p < .01$ for all).

There was not a significant difference between the number of symptoms reported from individuals with 1, 2, or 3 chronic illnesses. Individuals with 4 chronic illnesses did report significantly more symptoms than individuals with 1 chronic illness ($p=.04$). Because of our theoretical argument that having a chronic illness label would lead to greater symptom reporting, for the remaining analyses the individuals reporting any chronic illnesses were treated as a group, further analyses therefore compared participants without a chronic illness to individuals with 1 or more chronic conditions.

Individuals were asked how upset they were regarding life events. Life events relating to the individuals' illnesses, mental health, or disabilities were not included, which left 26 life events from the list of 30. Interestingly, 19% of individuals in the sample reported either no major life events, or felt that they were not currently upset by any life event. The mean number of events reported to be upsetting was two. The most commonly reported life event was the death of a non-family member (family members were asked about separately); 105 of the 554 respondents reported feeling upset about the death of a non-family member.

Correlation Analyses

As shown in table 1, correlations were computed to provide a detailed view of the relationships among the variables. As expected, total symptoms were highly correlated with reports of psychosomatic symptoms ($r=.76$, $p<.01$). Total symptoms were positively correlated with advanced age ($r=.17$, $p<.01$), female gender ($r=-.12$, $p<.01$), poor self-assessment of health ($r=-.49$, $p<.01$),

high levels of trait NA (r=-.40, p<.01), reporting a chronic illness (r=.21, p<.01) greater functional limitations (r=.58, p<.01), and greater health anxiety (r=.33, p<.01).

Regression Analyses

Total Symptoms. Our initial analysis examined the effect of chronic illness label, trait NA, and LE on symptom reporting. Each was expected to independently influence symptom reporting such that individuals with a chronic illness would report greater symptoms, individuals with high trait NA would report greater symptoms, and individuals with greater LE would report greater symptom severity. In our central hypothesis, we posited a triple interaction among these variables, that is, we expected individuals with high scores on trait NA who reported a chronic illness and who were under high levels of stress after a LE, would report the greatest number of symptoms.

Following Baron and Kenny's (1986) suggestions, hierarchical repressions were computed to test for moderation effects; the results of the analysis are shown in Table 2. As expected, there were main effects (step 1) for trait negative affect (β=.19, p<.01), life events (β=.16, p<.01), and chronic illness (β=.11, p<.01) after controlling for age, gender, and self-assessed health. None of the three potential two-way interaction terms examined in step two were significant. The interaction of chronic illness and LE showed a trend towards significance (β=.16, p<.08). The triple interaction of chronic illness, LE and trait NA (step 3) was significant (β=.24, p<.05). Overall our model accounted for 35% of the

variance of symptoms. The tolerance was acceptable for all independent and control variables.

Follow up analyses probed the direction of the interaction. First, the interaction terms were graphed (see figure1) (Dawson & Richter, 2006). The graph of the triple interaction showed the interaction terms had the expected form, with individuals with a chronic illness, high trait NA, and more life events reporting the greatest number of symptoms. Next, the simple slopes for the effects of life events on symptoms were computed at each of the conditional values (i.e. one standard deviation above the mean for trait NA with a chronic illness, one standard deviation above the mean for trait NA with no chronic illness, one standard deviation below the mean for trait NA with a chronic illness and one standard deviation below the mean for trait NA with not chronic illness) (Preacher, Curran, & Bauer, 2006). The slope for individuals high in trait NA and with a chronic illness was significant ($t=4.55$, $p<.01$) as was the slope for individuals low in trait NA with a chronic illness ($t=2.59$, $p<.01$). We next compared the slopes following Dawson and Richter's equation (Dawson & Richter, 2006). The slope for individuals high in trait NA with a chronic illness was significantly different from the slope for individuals high in trait NA without a chronic illness ($t= 2.6$, $p<0.01$). This was the only significant difference.

Psychosomatic Symptoms. The total symptom measure was next broken down into a measure of psychosomatic symptoms and illness specific symptoms. As our hypothesis proposed that symptoms not necessarily related to the chronic illness may be incorporated into the illness label, it was important to examine the

effect of the independent variables on psychosomatic symptoms, or symptoms conceptualized to be caused by psychological factors. The analysis conducted for psychosomatic symptoms was identical to the regression analysis conducted for illness specific symptoms (see Table 3). The analysis for psychosomatic symptoms did not produce a main effect for chronic illness, providing support for the hypothesis that the scale assessed symptoms unrelated to chronic conditions. There was a effect for trait NA (β=.21, $p<.01$) and LE (β=.13, $p<.01$). There was a significant interaction for chronic illness and LE (β=.23 $p<.03$) as well as between trait NA and LE (β=.13, $p=.01$). The interaction for trait NA and chronic illness was not significant. Finally the triple interaction term for trait NA and life events and chronic illness was significant (β=.391, $p<.01$). Overall our model accounted for 22% of the variance of psychosomatic symptoms. The tolerance was acceptable for all independent and control variables.

Additional follow-up analyses were conducted to better define the nature of the interaction. The graph of the triple interaction showed the interaction terms were in the expected form, with individuals with a chronic illness, high trait NA and more life events reporting the greatest number of psychosomatic symptoms (see Figure 2). Analyses conducted to determine the simple slopes for the effect of life events on symptoms at each derivation of trait NA and chronic illness, found that only the slope for symptoms and life events at high trait NA with a chronic illness was significant ($t=4.59$, $p<.01$). Analyses conducted to compare the simple slopes, found that the slope for the effect of life events on symptoms at high trait NA with a chronic illness was significantly different than high trait NA

without a chronic illness (t= 3.5, p<.01), low trait NA with a chronic illness (t= 3.30, p=.01), and low trait NA without a chronic illness (t=2.37, p<.02). None of the other slopes were significantly different from each other.

Illness Specific Symptoms. Analyses next examined the total symptom measure minus psychosomatic symptoms. This remaining 36 symptom measure, contained symptoms that are general more specific to a given illness, and not as correlated to psychological factors (i.e. cough, vision problems, hearing problems, throat problems). The regression analysis was the same as the first two. In the first step, there was a main effect for each of the independent variables: trait NA (β=.17, p<.01) and LE (β=.16, p<.01) and chronic illness (β=.12, p<.01). The two-way interaction terms were entered in the second step, and the triple interaction was entered in the third. None of the two-way or triple interaction terms were significant.

Functional Limitations. The fourth analysis examined the impact of the three independent variables on functional limitations, and to our knowledge is the first to extend the theory that trait NA may lead to a chronic accessibility of illness representation to examine the effect on behaviors impacted by adverse health. The regression analysis for functional limitations was identical to the first two regression analyses. In the first step the control variables: gender, age, and self-assessed health, were added as were the independent variables: chronic illness, trait NA and LE. The first step showed a main effect for trait NA (β=.144, p<.01) and chronic illness (β=.09, p<.02). The second step added the two-way

interaction terms and the third added the triple interaction. None of two-way interaction or three-way interaction terms were significant.

The functional limitation questions asked participants their perceived impact of health on their functioning. In order to assess individual's perceived impact of their symptoms on their functioning we also ran the analyses with a composite of these two questions. The results of this analysis are shown in table 4 and in graph 3. There was a main effect for trait NA (β=.11, $p<.02$). None of the two-way interaction terms were significant. The triple interaction of trait NA and chronic illness and LE was significant (β=.33, $p<.01$). This model accounted for 23% of the variance of symptoms impact on perceived functioning. The tolerance was acceptable for all independent and control variables.

Follow up analyses were conducted on the significant triple interaction. A graph of the interaction terms indicated that individuals with high trait NA and a chronic illness reported the greatest functional limitations due to their symptoms after LE. Analyses of the simple slopes showed a significant slope for the effect of life events on symptoms, for the conditional variables high trait NA and chronic illness ($t=2.5$, $p=0.01$). The simple slope of high trait NA and no chronic illness was also significant ($t=-2.09$, $p<0.04$). This slope was negative indicating that individuals high in trait NA without a chronic illness report fewer symptoms after a major life event. Separate analyses were conducted to determine any significant differences between the simple slopes. There was a significant difference between the slopes for high trait NA with a chronic illness and high trait NA without a chronic illness ($t=2.85$, $p<.01$). There was also a trend towards

significance for the difference between the slopes for high trait NA with a chronic illness and low trait NA with a chronic illness (t=1.92, p<.06).

Health Anxiety. The final analysis examined the impact of the independent variables on health anxiety, or worry about the individual's health. Analysis was consistent with the other regression models and is shown in Table 5. There was a main effect for chronic illness (β=.10, p<.01) and negative affect (β=.44, p<.01). The three two-way interaction terms were added into the next step. Only the relationship between trait NA and chronic illness was significant (β=.19, p<.04). Finally, the triple interaction of trait NA. LE, and chronic illness was not significant, although it showed a trend towards significance (β=.23, p=.07). Our model accounted for 32% of the variance.

We graphed the non-significant triple interaction. Interestingly, the interaction was not in the expected form. While individuals high in trait NA with a chronic illness after a life event did report the highest health anxiety, the greatest difference in health anxiety was between those who did not experience a life event and those who experienced a significant life event among individuals with low NA and without any chronic illness.

Discussion

These results provide support for the hypothesis that trait NA enhances accessibility to representations of chronic illness during periods of life stress. Specifically, follow up analyses of the significant triple interaction demonstrated that individuals who were high in trait NA and had an illness label reported the most symptoms after a non-illness related life event. When the symptom

measure was broken down into psychosomatic symptoms and illness specific symptoms, the same general pattern was found for psychosomatic symptoms, but not for illness specific symptoms. Individuals high in trait NA with a chronic illness reported greater psychosomatic symptoms after a non-illness related life event, than individuals who were low in trait NA, and/or did not report having a chronic illness, and/or did not experience being upset by major life events. For illness specific symptoms, the triple interaction was not significant, suggesting that there is not an increase in symptoms related to an illness. While this last finding is contrary to our original hypothesis, it is consistent with prior research that has demonstrated that trait NA leads to increased psychosomatic symptoms, but not specific symptoms that are readily identified as being caused by a given illness (Diefenbach et al., 1998).

In contrast to prior models that have focused on individual differences as sufficient explanations for increased reporting of somatic symptoms and considered trait NA to be a bias or confounding factor, the results of this study suggest a diathesis stress model. Individuals who are high in trait NA are at risk for greater symptom reporting but this relationship is dependent upon the presence of an underlying schema of a chronic illness. Individuals high in trait NA, with a history of chronic illness will experience physical symptoms of distress when these schemata are activated by life stressors. Trait NA increases the likelihood that stress will activate an illness representation, but it is not sufficient for increased symptom reporting.

Consistent with previous studies, the representations of illness in the "minds" of individuals high in trait NA are linked to a greater number and variety of symptoms; their representations incorporate symptoms that can be characterized as psychosomatic. This symptom set includes a range of general somatic complaints that are commonly reported in association with both a wide range of illnesses and with psychological factors. Importantly, these psychosomatic symptoms, which can be caused by acute stress, are not reported more frequently after the experience of a life stressor by individuals high in trait NA who do not have a chronic illness history. They are also not reported after life events by individuals who are low in trait NA who have a chronic illness history. Only individuals who are high in trait NA and who have a chronic illness attend to and report greater somatic symptoms. These individuals expand their illness representations to include these general psychosomatic symptoms.

The expansion of illness representations, by individuals high in trait NA, to include psychosomatic symptoms leads to diagnostic difficulties for clinicians, who have to differentiate somatic symptoms caused by illness from somatic symptoms caused by psychological factors and attributed to the chronic illness. Practitioners are faced with the difficulty of diagnosing or managing the chronic illness and in diagnosing or managing any potential psychological disorders. If individuals with a chronic illness experience and report greater somatic symptoms of psychological distress than individuals without a chronic illness, it has implications for the diagnosis of mental disorders within a medical population. Many psychosomatic symptoms used to diagnose depression and/or

anxiety may also be symptoms of a chronic illness (e.g. fatigue, weight loss, chest pain). Because of this, many clinicians erroneously conclude that including psychosomatic symptoms in a screen for mental disorders will lead to an overestimation of depression and anxiety in a medical population. In order to account for this, researchers have developed psychological scales for depression and anxiety which do not assess somatic symptoms (Zigmond & Snaith, 1983). This study suggests that individuals with chronic illness detect and experience greater psychosomatic symptoms in response to psychological distress than individuals without a chronic illness. Consequently, psychological instruments that do not include somatic symptoms may underestimate depression and anxiety among populations with chronic illness (Drayer et al., 2005).

Consistent with prior studies showing reduced functional capacity among depressed and/or anxious individuals, our data also showed reduced function among participants high in trait NA who reported large numbers of chronic illness associated symptoms when experiencing distressing LE. These results should be interpreted cautiously, as the original measure of functional limitations as a result of illnesses was non-significant. It is important to note that although the participants in our study are relatively healthy community dwelling elderly adults and are not clinically distressed, those participants who were high in trait NA for whom life events were sufficiently intense to activate the representation of a condition consistent with their history of chronic illness, reported reductions in their ability to complete their activities of daily living. This decrease was perceived to be a function of the increase in symptoms associated with the

activation of their chronic schemata and not due to a perceived decrease in their overall health.

The perception of functional limitations resulting from symptoms as opposed to a reduction in health is consistent with the finding that the activation of illness representations for individuals with a chronic illness did not lead to an increase in health anxiety. Although the findings for the interaction for health anxiety are uninterpretable and not statistically significant, the trend was not in the expected direction. Individuals without a chronic illness and with low trait NA reported greater health anxiety after a non-illness life event than individuals with a chronic illness and with high trait NA. Future studies should examine if the increase in symptoms for individuals high in trait NA with a chronic illness after a LE is expected and therefore does not lead to increased concern regarding health.

Theoretical Considerations

Persons familiar with cognitive behavior theory (CBT) for psychological disorders, particularly panic disorder and somatization, may recognize the parallels between these CBT models and the hypotheses set forth in this paper. While this paper examined increased psychosomatic symptom reporting among a non-psychiatric population, many of the underlying assumptions are the same. Specifically, that having an illness schema of an illness leads to increased reporting of psychosomatic symptoms and the interpretation of these symptoms as resulting from a chronic illness. Clark's cognitive model of panic disorder, proposes that cognitive maladaptive ("catastrophic") attributions of physical

symptoms of anxiety as symptoms of an underlying physical disorder maintains the panic disorder (Clark, 1997). Physical symptoms of panic attacks include chest pain, shortness of breath, dizziness, sweating and disorientation. The properties or these symptoms, their location (chest), sensory properties (shortness of breath; sweating) and rapid onset and duration (abrupt onset and rapid rise), are identical to the events reported by patients experiencing a myocardial infarction. Given these "check processes" it is not surprising that individuals with panic disorder interpret these anxiety related symptoms as signs of a physical disorder. Their cognitive (e.g. I'm going to die) and behavioral (e.g. avoiding environments that have no escape routes), responses to the panic attacks not only impair their quality of life, but they also maintain the panic attacks.

Bouton, Mineka & Barlow's (2001) model of panic disorder proposes the conditioning of somatic symptoms to the immediately preceding anxiety, and conditions the individual to experience the somatic symptoms of a panic attack. This conditioning of the somatic symptoms thus maintains the panic attacks. As opposed to a disparate argument, we consider the behavioral conditioning of symptoms to be consistent with our theoretical argument. In addition to both becoming more aware of symptoms of the illness and generalizing psychosomatic symptoms to the illness, individuals in our sample who have an illness schema may actually experience more somatic symptoms, if the symptoms become conditioned to the experience of anxiety linked to the illness label. The presence of anxiety creates stress/distress symptoms which become

part of the illness representation and are activated when the representation is activated. As trait NA predisposes someone to experience greater anxiety, this conditioning of anxiety symptoms to an illness schema will differ depending upon the individual's level of trait NA. The question then develops as to both the type of symptoms integrated into the illness representation and the timing of the integration. While not examined specifically in this study, it is probable that psychosomatic symptoms were integrated into the illness representation both at the time of diagnosis (the creation of the illness label) and throughout the management of the disease. Both represent times of high "anxiety" for the individuals with a diagnosed chronic illness. The diagnosis of a chronic illness presents many implications for quality of life, or a limit to the life span.

Future Directions

While this study adds to the literature by expanding upon the symptom perception hypothesis there were limitations. Primarily, although this study examined individuals who were upset by major life events as opposed to individuals who were not upset by major life events, all of the measures were collected at the same time. Future studies should examine these variables using a longitudinal or experimental design to strengthen the results. Second, the broad definition of chronic illness served as both a strength and limitation of the study . Rather than limiting the study to examine individuals with a specific chronic illness, this study examined individuals with any chronic illness, thus limiting the ability to match specific symptoms to a specific illness. Future studies should examine increases in symptoms specific to a given illness and control for

indices of disease severity. We addressed this issue through the use of interaction analyses. Individuals with a chronic illness and low trait NA did not show an increase in psychosomatic symptom reporting after a major life event, suggesting that it was not an increase in disease severity accounting for the increase in symptom reporting. Finally, this study examined a homogeneous sample of elderly community dwelling adults. Future studies will need to broaden the examination of these hypotheses to more diverse samples.

Conclusions

This study expanded upon the symptom perception hypothesis by examining the process through which trait NA increases somatic symptoms. Consistent with our theoretical model (McAndrew et al, 2008) this study suggested that individuals high in trait NA, with a chronic illness, experienced an activation of their illness representation after acute stress (non-illness related life event). This activation of the illness representation lead to a greater reporting of psychosomatic symptoms, but not illness specific symptoms, in addition to increases in perceived impact of symptoms on functioning. Clinically, there are implications for how individuals and practitioners distinguish between somatic and psychosomatic symptoms. These findings belie clinical expectations that somatic symptoms of distress should be ignored among physically ill populations. Theoretically, these findings echo cognitive behavioral models for clinical disorders, such as panic disorder. Finally, these findings highlight the importance of examining the process through which psychological phenomena

occur and expand upon the complex relationship between psychological and somatic occurrences.

References

Affleck, G., Tennen, H., Urrows, S., & Higgins, P. (1991). Individual differences in the day-to-day experience of chronic pain: A prospective daily study of rheumatoid arthritis patients. *Health Psychology, 10*. 419-426.

Baumann, L.J., Zimmerman, R.S., & Leventhal, H. (1989). An experiment in common sense; education at blood pressure screening. *Patient Education and Counseling, 14*, 53-67.

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

Bouton, M. E., Mineka, S. & Barlow, D.H. (2001). A Modern Learning Theory Perspective on the Etiology of Panic Disorder. *Psychological Review, 108*, 4-32.

Brown, K.W. & Moskowitz, D.S., (1997). Does unhappiness make you sick? The role of affect and neuroticism in the experience of common physical symptoms. *Journal of Personality and Social Psychology, 4*, 907-917.

Cameron, L.D., & Leventhal, H. (1995). Vulnerability beliefs, symptom experiences, and the processing of health threat information: A self-regulatory perspective. *Journal of Applied Social Psychology, 25*, 1859-1883.

Cameron, L.D., Leventhal, H., & Love, R.R. (1998). Trait anxiety, symptom perceptions, and illness-related responses among women with breast cancer in remission during a tamoxifen clinical trial. *Health Psychology, 17*, 459-469.

Cioffi, D. (1991). Beyond attentional strategies: A cognitive-perceptual model of somatic interpretation. *Psychological Bulletin, 109,* 25-41.

Clark, D.M. (1997). Panic disorder and social phobia. In D.M. Clark & C. G. Fairburn (Eds), The science and practice of cognitive behaviour therapy (pp.121-153). New York: Oxford University Press.

Cohen, S., Doyle, W., & Skoner, D.P. (1999) Psychological stress, cytokine production, and severity of upper respiratory illness. *Psychosom Med, 61I,* 175-180.

Costa, P. T., Jr., & McCrae, R. R. (1985). Hypochondriasis, neuroticism, and aging: When are somatic complaints unfounded? American Psychologist, 40, 19–28.

Croyle, R.T. & Uretsky, M. B. (1987) Effects of mood on self-appraisal of health status. *Health Psychology, 3*, 239-253.

Dawson, J. F., & Richter, A. W. (2006). Probing three-way interactions in moderated multiple regression: Development and application of a slope difference test. *Journal of Applied Psychology, 91,* 917-926.

Diefenbach, M.A., Leventhal, E.A., Leventhal, H., Patrick-Miller, L. (1998). affect relates to cros-sectional but not longitudinal symptom reporting: Data from elderly adults. *Health Psychology, 15*, 282—288.

Drayer, R.A., Mulsant, B. H., Lenze, E.J., Rollman, B.L., Dew, M.A., Kelleher, K.,

Karp, J.F., Begley, A., Schulberg, H.C., Reynolds, C.F. (2005). Somatic symptoms of depression in elderly patients with medical comorbidities. *International Journal of Geriatric Psychiatry. 20, 973-982.*

Egan, K.J., & Beaton, R. (1987). Response to symptoms in healthy, low utilizers of the health care system. *J Psychosom Res, 31*, 11-21.

Ellington, L., & Wiebe, D. J. (1999). Neuroticism, symptom presentation, and medical decision making. *Health Psychology, 18*, 634-643.

Gendolla, G.H.E., Abel, A.E., Andrei, A., Spurk, D., & Richter, M. (2005) Negative mood, self-focused attention and the experience of physical symptoms: The joint impact hypothesis. *Emotion, 5*, 131-144.

Gold, S.M., Zakowski, S.G., Valdimarsdottir, H.B., Bovbjerb,D.H. (2004). Higher Beck Depression Scores predict delayed epinephrine recovery after acute physiological stress independent of baseline levels of stress and mood. *Biological Psychiatry*, 67, 261-273.

Halm, E., Mora, P., & Leventhal, H. (2006). No symptom, no asthma: The acute episodic disease belief is associated with poor self-management amont inner-city adults with persistent asthma. *Chest, 129,* 573-580*.*

Halder, McBeth, Silman, Thompson & Macfarlane. (2002). Psychosocial risk factors for the onset of abdominal pain. Results from a large prospective population-based study. *International Journal of Epidemiology, 31*, 1219-1225.

Haug, T.T., Mykletun, A., & Dahl, A.A. (2004). The association between anxiety, depression, and somatic symptoms in a large population: The hunt-II study. *Psychosomatic Medicine,* 6,: 845-851.

Holmbeck, G.N (2002). Post-hoc probing of significant moderational and mediational effects in studies of pediatric populations. *Journal of Pediatric Psychology, 27,* 87-96.

Janssen, S.A. (2002). Negative affect and sensitization to pain. *Scandinavian Journal of Psychology, 43*, 131-137.

Hiltunen, L., Keinanen-Kiukaanniemi, S., Laara, E. & Kivela, S. (1996). Self-perceived health and symptoms of elderly persons with diabetes and impaired glucose tolerance. *Age and Aging, 25*, 59-66.

Jurgens, C. (2006). Somatic awareness, uncertainty, and delay in care-seeking in acute heart failure. *Research in Nursing and Health,* 29, 74-96.

Katon, W. (1984). Depression: Relationship to somatization and chronic medical illness. *Journal of Clinical Psychiatry, 45*, 4-11.

Leventhal, H., & Diefenbach, (1991). The active side of illness cognition. In J.A. Skelton & R.T. Croyle (Eds), Mental representations in health and illness (pp.247-272). New York: Springer-Veriag.

Leventhal, H., Benyamini, Y., Brownlee, S., Diefenbach, M., Leventhal, E.A., Patrick-Miller, L., & Robitaille, C. (1997). Illness representations: Theoretical foundations. In J. Weinman & K. Petrie (Eds). Perceptions of Health and Illness (pp. 19-45). London: Harwood Publishers.

Leventhal, H., Musumeci, T., & Leventhal, E.A. (2008). To act or not to act: Using statistics or feelings to reduce disease risk, morbidity and mortality. In K.W. Schaie (Ed.), *Societal Impact on Aging Series.*

Leventhal, E. A., & Prohaska, T.R. (1986). Age, Symptom Interpretation and Health Behavior. *Journal of the American Geriatric Society, 34*:185-91.

Leventhal, H., Weinman, J., Leventhal, E.A., & Phillips, L.A. (2008). Health psychology: The search for pathways between behavior and health. *Annual Review of Psychology.*

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

Martin, R., Lemos, K., Rothrock, N., Bellman, B., Russell, D., Tripp-Reimer, T., Lounsbury, P., & Gordon, E. (2004). Gender disparities in common sense models of illness among myocardial infarction victims. *Health Psychology, 23*, 345-353.

Petrie, K.J., Moss-Morris, R., Grey, C., & Shaw, M. (2004). The relationship of negative affect and perceived sensitivity to symptoms reporting following vaccination. *British Journal of Health Psychology, 9,* 101-111.

Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational tools for probing interaction effects in multiple linear regression, multilevel modeling, and latent curve analysis. *Journal of Educational and Behavioral Statistics*, *31*, 437-448.

Rabin, C., Ward, S., Leventhal, H., & Schmitz, M. (2001). Explaining retrospective reports of symptoms in patients undergoing chemotherapy anxity, initial symptom experience and posttreatment symptoms. *Health Psychology, 20*, 91-98.

Salovey, P., & Birnbaum, D., (1989), Influence of mood on health-relevant cognitions. *Journal of Personality and Social Psychology, 57* (3) 539-551.

Schachinger, H., Hegar, K., Hermanns, N., Straumann, M., Keller, U., Fehm-Wolfsdorf, G., Berger, W. & Cox, D., (2005). Randomized Controlled Clinical Trial of Blood Glucose Awareness Training (BGAT III) in Switzerland and Germany. *Journal of Behavioral Medicine, 28 (6) 587-594.*

Spruill, T.M., Pickering, T.G., Schwartz, J.E., Mostofsky, E., Ogedegbe, G., Clemow, L., & Gerin, W., (2007). The impact of perceived hypertension status on anxiety and the white coat effect. *Annals of Behavioral Medicine*, 34, 1-9.

Skevington, S.M. (2004). Pain and symptom perception. In A. Katein & J. Weinman (Eds.) Health Psychology. Malden, MA: Blackwell Publishing.

Swann, W.B. & Pelham, B. (2002). Who wants out when the going gets good? Psychological investment and preferences for self-verifying college roommates. *Self & Identity*, 219-233.

Watson, D., Clark, L.A. & Tellegren, A. (1988). Development and validation of a brief measure of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*, 1063-1070.

Watson, D. & Pennebaker, J.W. (1989). Health complaints, stress, and distress: Exploring the central role of negative affectivity. *Psychological Review, 96,* 234-254.

Wiebe, D.,J., Alderfer, M.A., Palmer, S.C., Lindsay, R., Jarrett, L. (1994).

Behavioral self-regulation in adolescents with type 1 diabetes negative affectivity and blood glucose symptom perception. *Journal of Consulting and Clinical Psychology, 62*, 1204-1212.

Zachariae, R., Paulsen, K., Mehlsen, M. (2007). Anticipatory nausea: The role of individual differences related to sensory perception and autonomic reactivity. *Annals of Behavioral Medicine, 33*, 69-79.

Zigmond, A.S. & Snaith, R.P., The hospital anxiety and depression scale. *Acta Psychiatr Scand,* 67, 361-370.

Tables

Table 1

Correlation Matrix of all variables

	1	2	3	4	5	6	7	8	9
1. Symptoms	1								
2. Psychosom. Symptoms	.756*	1							
3. Age	.171*	.091*	1						
4. Gender	-.116*	-.053	.117*	1					
5. Self-Assessed Health	-.492*	-.358*	-.196*	-.010	1				
6. Trait Negative Affect	-.398*	.344*	.091*	-.049	-.402*	1			
7. Life Events	.284*	.229*	-.013	-.005	-.152*	.271*	1		
8. Chronic Illness (Illness Label)	.205*	.115*	.069	.006	-.186*	.071	.082	1	
9. Functional Limits due to Symptoms	.576*	.400*	.279*	-.078	-.511*	.336*	.128*	.184*	1
10. Health Anxiety	.330*	.246*	.041	-.116*	-.359*	.513*	.151*	.159*	.361*

Note. $*p < 0.01$.

Table 2

Regression Analysis Predicting Total Symptoms

	B	Std. Error	Beta	Sig
Step 1				
Age	.079	.032	.087	.015
Gender	-1.854	.469	-.138	.000
Self Assessed Health (SAH)	-2.383	.270	-.347	.000
Trait NA (NA)	.224	.046	.190	.000
Life Events (LE)	2.450	.541	.164	.000
Chronic Ill	1.810	.57	.113	.002
Step 2				
Age	.077	.033	.085	.019
Gender	-1.799	.472	-.134	.000
SAH	-2.361	.270	-.344	.000
NA	.292	.106	.248	.006
LE	.312	1.322	.021	.814
Chronic Ill	1.243	.653	.077	.057
Interaction of Chronic Ill and NA	-.081	.112	-.062	.468
Interaction of Chronic Ill and LE	2.564	1.447	.162	.077
Interaction of NA and LE	.005	.090	.003	.956
Step 3				
Age	.077	.032	.085	.018
Gender	-1.825	.471	-.136	.000
SAH	-2.350	.269	-.342	.000
NA	.403	.119	.342	.001
LE	.821	1.342	.055	.541
Chronic Ill	1.066	.657	.066	.105
Interaction of Chronic Ill and NA	-.219	.131	-.169	.095
Interaction of Chronic Ill and LE	1.954	1.474	.123	.186
Interaction of Trait NA and LE	-.419	.229	-.214	.068
Triple Interaction of NA, LE and Chronic Ill	.501	.249	.239	.045

Note. Chronic Ill=Chronic Illness Label; NA=Trait Negative Affect; LE=Life Events; SAH=Self-Assessed Health

Table 3

Regression Analysis Predicting Psychosomatic Symptoms

	B	Std. Error	Beta	Sig
Step 1				
Age	.005	.009	.024	.548
Gender	-.187	.131	-.055	.156
Self Assessed Health (SAH)	-.404	.075	-.233	.000
Trait NA (NA)	.061	.013	.209	.000
Life Events (LE)	.473	.151	.126	.002
Chronic Ill	.183	.160	.045	.253
Step 2				
Age	.006	.009	.027	.500
Gender	-.195	.131	-.058	.138
SAH	-.400	.075	-.231	.000
NA	.052	.029	.176	.080
LE	-.361	.367	-.096	.326
Chronic Ill	-.003	.181	.000	-.019
Interaction of Chronic Ill and NA	-.015	.031	-.046	.629
Interaction of Chronic Ill and LE	.903	.402	.227	.025
Interaction of NA and LE	.063	.025	.130	.011
Step 3				
Age	.006	.009	.026	.501
Gender	-.204	.130	-.060	.118
SAH	-.397	.074	-.229	.000
NA	.096	.033	.327	.004
LE	-.156	.372	-.042	.674
Chronic Ill	-.075	.182	-.019	.679
Interaction of Chronic Ill and NA	-.071	.036	-.218	.052
Interaction of Chronic Ill and LE	.658	.408	.165	.107
Interaction of Trait NA and LE	-.108	.064	-.225	.089
Triple Interaction of NA, LE and Chronic Ill	.200	.069	.391	.004

Note. Chronic Ill=Chronic Illness Label; NA=Trait Negative Affect; LE=Life Events; SAH=Self-Assessed Health

Table 4

Regression Analysis Predicting Functional Limitations due to Symptoms

	B	Std. Error	Beta	Sig
Step 1				
Age	.008	.012	.028	.483
Gender	-.221	.168	-.052	.189
Self Assessed Health (SAH)	-.876	.097	-.392	.000
Trait NA (NA)	.039	.016	.106	.016
Life Events (LE)	.269	.189	.058	.154
Chronic Ill	.381	.213	.071	.075
Step 2				
Age	.008	.012	.027	.495
Gender	-.209	.169	-.049	.216
SAH	-.865	.098	-.387	.000
NA	.023	.040	.062	.566
LE	-.506	.468	-.109	.280
Chronic Ill	.164	.248	.030	.509
Interaction of Chronic Ill and NA	.017	.042	.041	.688
Interaction of Chronic Ill and LE	.915	.511	.187	.074
Interaction of NA and LE	.008	.031	.014	.800
Step 3				
Age	.008	.012	.028	.477
Gender	-.221	.168	-.052	.189
SAH	-.860	.097	-.385	.000
NA	.079	.046	.211	.090
LE	-.309	.473	-.067	.514
Chronic Ill	.094	.249	.017	.705
Interaction of Chronic Ill and NA	-.051	.050	-.125	.313
Interaction of Chronic Ill and LE	.677	.519	.138	.192
Interaction of Trait NA and LE	-.170	.082	-.290	.038
Triple Interaction of NA, LE and Chronic Ill	.208	.088	.333	.019

Note. Chronic Ill=Chronic Illness Label; NA=Trait Negative Affect; LE=Life Events; SAH=Self-Assessed Health

Table 5

Regression Analysis Predicting Health Anxiety

	B	Std. Error	Beta	Sig
Step 1				
Age	-.016	.015	-.038	.304
Gender	-.632	.224	-.101	.005
Self Assessed Health (SAH)	-.533	.128	-.167	.000
Trait NA (NA)	.238	.022	.438	.000
Life Events (LE)	-.034	.259	-.005	.897
Chronic Ill	.740	.273	.099	.007
Step 2				
Age	-.015	.016	-.035	.345
Gender	-.623	.225	-.100	.006
SAH	-.535	.128	-.167	.000
NA	.165	.051	.305	.001
LE	.452	.631	.065	.475
Chronic Ill	.899	.311	.120	.004
Interaction of Chronic Ill and NA	.111	.053	.186	.038
Interaction of Chronic Ill and LE	-.494	.691	-.067	.475
Interaction of NA and LE	-.054	.042	-.060	.203
Step 3				
Age	-.015	.015	-.035	.342
Gender	-.633	.225	-.101	.005
SAH	-.532	.128	-.166	.000
NA	.213	.057	.392	.000
LE	.671	.641	.096	.296
Chronic Ill	.822	.314	.110	.009
Interaction of Chronic Ill and NA	.052	.063	.086	.409
Interaction of Chronic Ill and LE	-.757	.704	-.103	.283
Interaction of Trait NA and LE	-.237	.110	-.266	.031
Triple Interaction of NA, LE and Chronic Ill	.215	.119	.226	.071

Note. Chronic Ill=Chronic Illness Label; NA=Trait Negative Affect; LE=Life Events; SAH=Self-Assessed Health

Figure 1

Triple Interaction of Total Symptoms

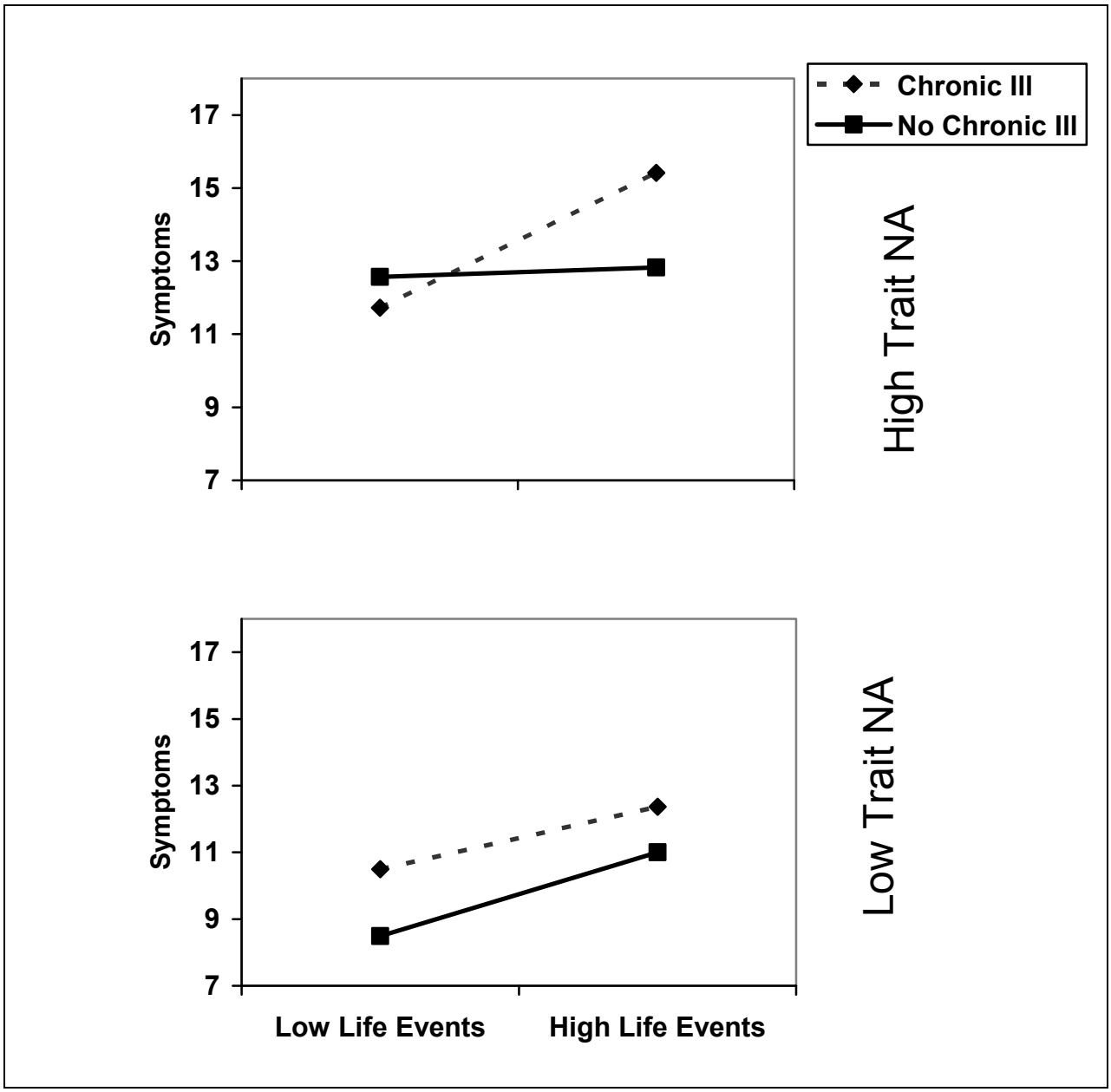


Figure 2

Triple Interaction of Psychosomatic Symptoms

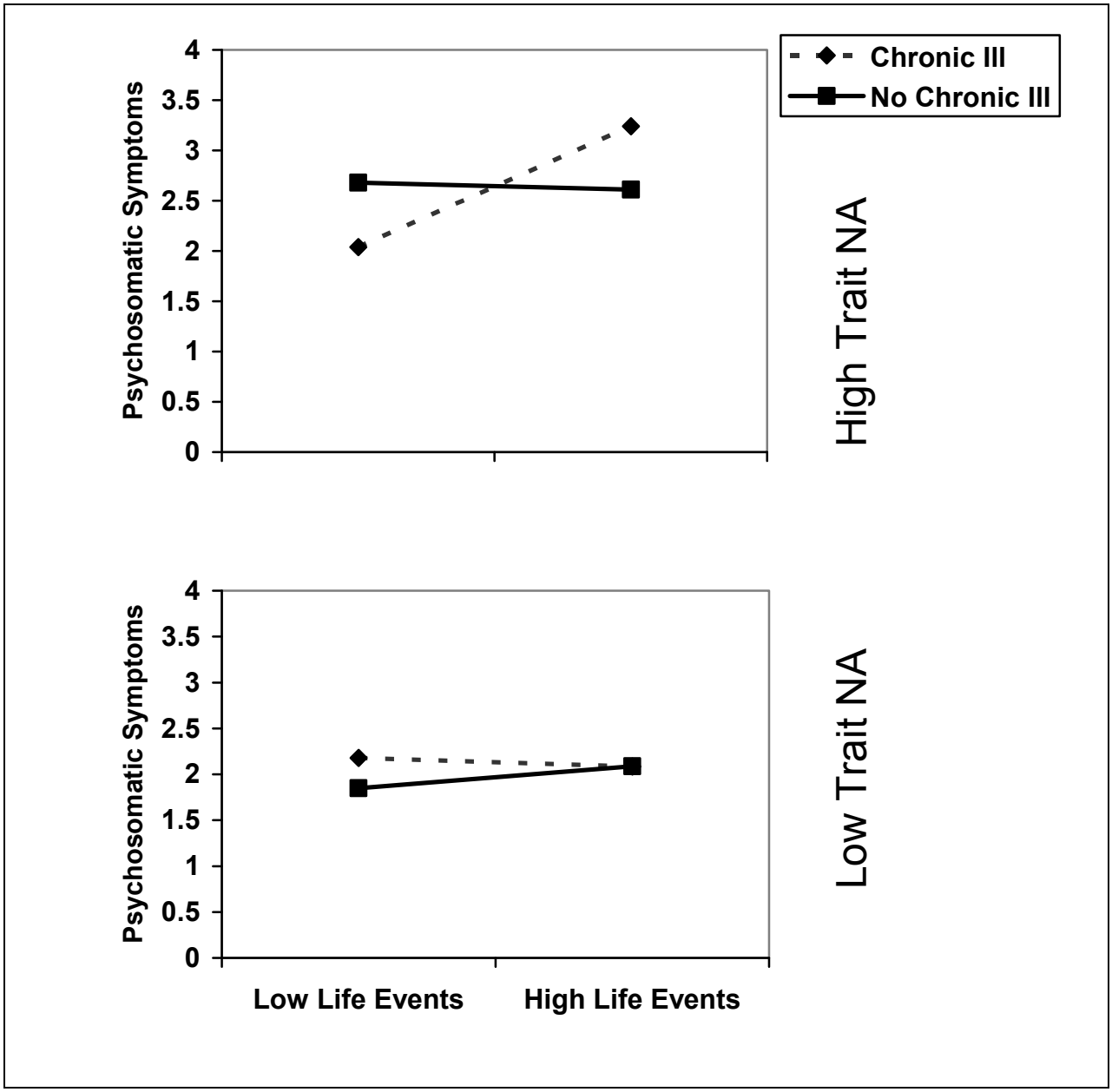


Figure 3

Triple Interaction of Functional Limitations Due to Symptoms

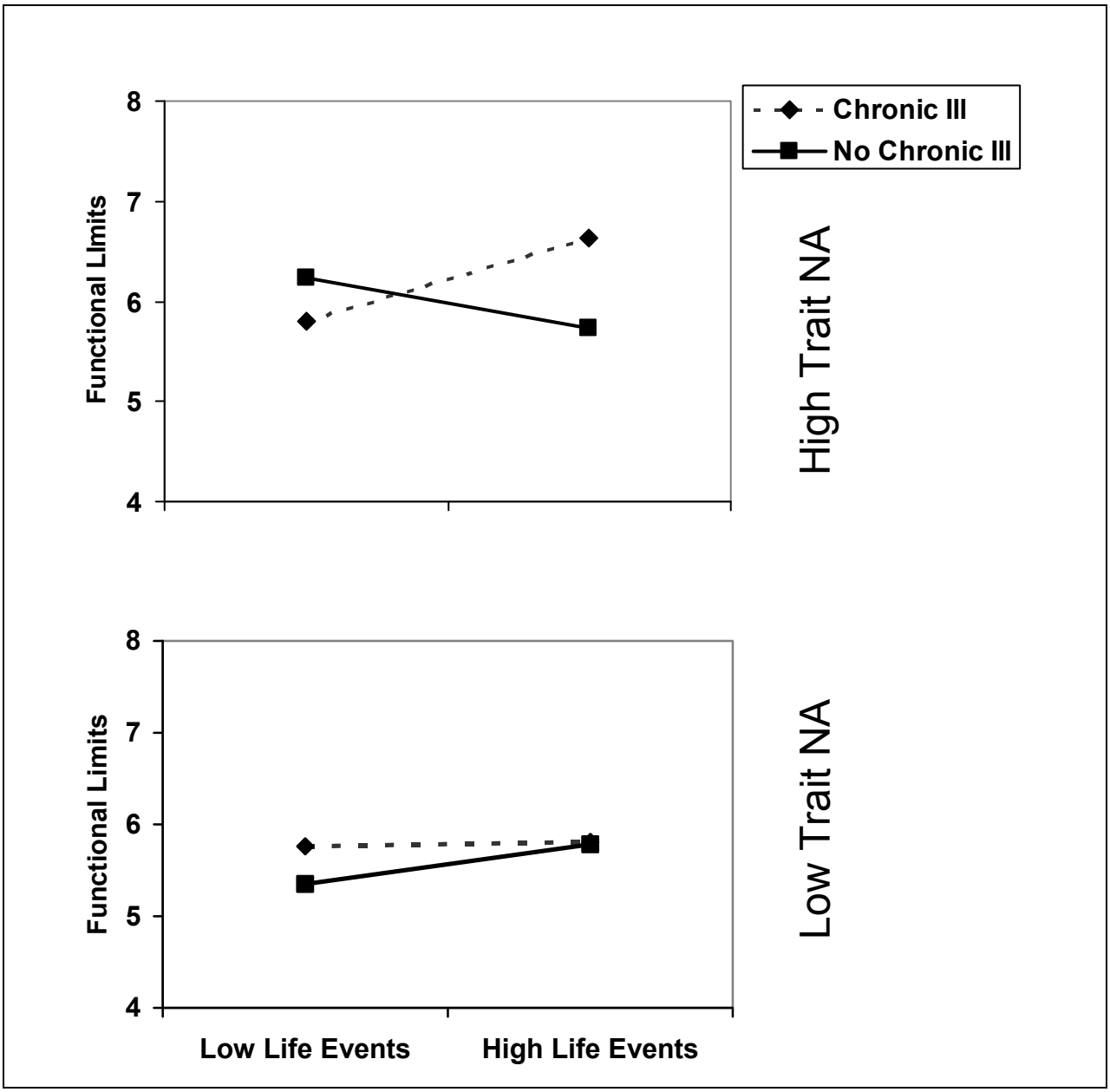
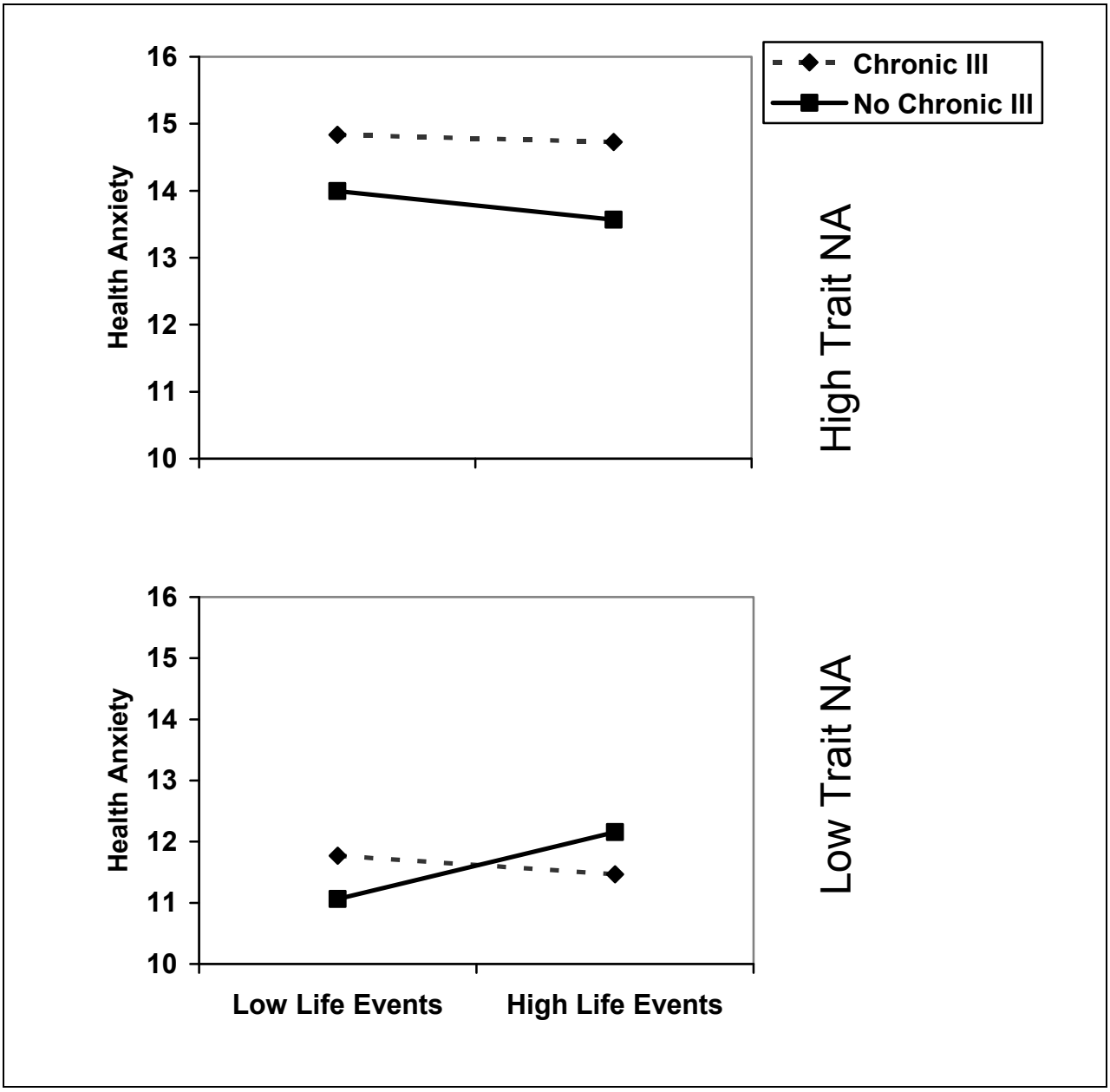


Figure 4

Non-significant Graph of Health Anxiety



Curriculum Vita

Lisa Dunbar

Education

Ph.D. Psychology, 2008
Rutgers University

M.S. Psychology, 2006
Rutgers University

B.S. Major: Psychology, Minor: Business and History, 2001
Plattsburgh State University

Research Experience

Center for Obesity Research and Education, Temple University, Philadelphia, PA
Psychology Intern, July 2007 to July 2008

Center for the Study of Health Beliefs and Behaviors, Rutgers University, Piscataway, NJ
Graduate Assistant, September 2004 to July, 2008

Psychology Department, Rutgers University, Piscataway, NJ
Graduate Assistant, September 2004 to November 2005

Commonwealth Research Center at Harvard Medical School, Boston, MA
Research Assistant, October 2001 to February 2003

Publications

Dunbar, L., Leventhal, E., & Leventhal, H. (2006). Self-regulation, health and behavior. In J. Birren (Ed.), *The Encyclopedia of Gerontology, 2nd Edition.* New York: Academic Press.

McAndrew, L., Schneider, S., Burns, E., & Leventhal, H. (2007). Does patient blood sugar monitoring improve diabetes control: A systematic review of the literature. *Diabetes Educator, 33(6),* 991-1010.

McAndrew, L., Burns, E., Musumeci-Sbazo, T., Mora, P., Halm, E., Vileikyte, L., Leventhal, E., & Leventhal, H. (2008). Using the common sense model to design interventions for the prevention and management of chronic illness threats: From description to process. *British Journal of Health Psychology, 13,* 195-204.

Clinical Experience

APA-Approved Clinical Psychology Internship, Temple, Philadelphia, PA
Psychology Intern, July 2007 to July 2008

NIMH funded Somatization Program, RWJMS, Piscataway, NJ
Extern, May 2005 to February 2007

Geriatric Psychiatry, Robert Wood Johnson Medical School (RWJMS), Piscataway, NJ
Extern, Sept. 2006 to January 2007

Psychological Clinic, Graduate School of Applied and Professional Psychology (GSAPP) Rutgers University, Piscataway, NJ
Student Clinician, October 2004 to May 2007