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Using the Common Sense Model of Self-Regulation to Understand the Relationship Between Symptom Reporting and Trait Negative Affect

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Abstract
Background/Purpose Based on the Common Sense Model of Self-Regulation, we examined if the relationship of trait NA to physical symptom reporting was moderated by life events and illness representations.
Methods This relationship was examined using a cross-sectional dataset of 554 elderly adults.
Results A significant three-way interaction demonstrated that individuals who reported the greatest severity of physical symptoms were higher in trait NA, and reported more life events and a chronic illness history.
Conclusions The results of this study are consistent with the hypothesis that individual high on trait NA who have a history of a chronic illness have illness representations with both disease specific physical symptoms and symptoms from other causes, such as emotional distress. This may complicate the care of medical conditions for these patients.

Keywords Symptom · Illness representation · Common sense model · Negative affect

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Introduction

Numerous studies show consistent and moderate to strong association between trait negative affect (NA) and physical symptom reporting [1]. The symptom perception hypothesis, a widely accepted explanation for this relationship, proposes that individuals high in trait NA report symptoms because they are vigilant, internally focused, and pain-sensitive [1]. Individuals with high trait NA are thought to attend to normal body sensations which individuals with low trait NA ignore. Studies have shown that situational factors can moderate this relationship (e.g., social support [2]). A better understanding of situational factors that moderate the relationship of trait NA and physical symptom reporting would allow us to develop more effective interventions to help individuals manage their symptoms.

In contrast to prior research that has primarily focused on personality factors, the Common Sense Model of Self-Regulation (CSM) suggests a diathesis stress relationship. The CSM proposes that individuals are active problem solvers who use their experience with symptoms and medical information to develop illness representations, or lay beliefs about their illness [3, 4]. These illness representations act as a framework to direct attention to physical symptoms and shape the attribution of these symptoms to an illness. The CSM predicts that individuals high in trait NA with an illness

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representation will attend to normal body sensations and label them as symptoms because they will connect these symptoms to their illness representation [5, 6].

The CSM also predicts that individuals high in trait NA have illness representations with a greater range of physical symptoms. This is, in part, because chronic conditions increase emotional distress, particularly among individuals high in trait NA. The co-occurrence of the illness and emotional distress generates illness representations that include both disease specific and physical symptoms of emotional distress. This classically conditioned representation can be reactivated by life events that are emotionally distressing, even if not health related [7]. For example, an individual high in trait NA with hypertension will be likely to attribute general symptoms, such as a headache, as a sign of high blood pressure, particularly during times of high stress (e.g., divorce) when they will be more worried about their blood pressure rising. Therefore, individuals high on trait NA who have a history of a chronic illness are thought to have illness representations with both disease-specific symptoms and physical symptoms of emotional distress. When life stresses activates illness representations, individuals high in trait NA who have a history of chronic illness are thought to experience and report a wider array of physical symptoms.

Cameron, Leventhal, and Love [8] found partial support for this model in a randomized controlled trial comparing tamoxifen to placebo in women with a history of breast cancer. They found that women high in trait NA who were placed on tamoxifen reported more tamoxifen symptoms and also were more likely to attribute non-tamoxifen symptoms to the treatment. The authors concluded that trait NA was related to a "heightened sensitivity to symptoms (and) tendencies to attribute symptoms to health threats." Petrie, Moss-Morris, Grey, and Shaw (2004) reported a similar effect in a study examining symptom reports after a vaccination. They found that participants high in trait NA reported a greater variety and severity of physical symptoms. The investigators concluded that the vaccination encouraged participants high in trait NA to search for and report symptoms [9]. Finally, adolescents with type I diabetes who are high in trait NA have been found to misattribute physical symptoms of anxiety to their blood glucose levels [10]. These studies suggest that trait NA leads to increased symptom reporting and symptoms being attributed to an illness representation.

Croyle and Uretsky (1987) found evidence that acute changes in affect, such as those seen after a life stressor, activates illness representations [11]. Participants were assigned to either a positive or negative mood induction condition, and for each mood condition, some were asked to think about an illness-related event or a non-illness-related event. Participants in the negative mood induction who were asked to think about illness-related event reported a greater severity of symptoms during the previous month. Croyle and Uretsky (1987) suggested that situational changes to negative affect caused illness representations to become more available leading to increased symptom reporting.

Based on the literature reviewed above, we hypothesized that distress associated with a life event would activate the illness representation of individuals with a chronic illness who are high on trait NA, and thereby lead to greater physical symptom reporting. Thus, we predicted a three-way interaction such that following major life events, individuals high on trait NA would report a greater severity of symptoms if they also had an ongoing chronic illness in comparison to the severity reported by high trait NA individuals without a chronic illness or by low trait NA individuals, whether they did or did not have an ongoing chronic illness. We also examined if activation of the illness representation would be related to increased functional limitations.

Method

Participants

Our analysis used data from a 9-year longitudinal (1991–1999) study examining the effects of affective, somatic, and cognitive factors on health and quality of life at 6-month intervals. Participants were 554 community-dwelling elderly individuals living in a retirement community (a detailed description of the study methods can be found in [12]). All participants provided informed consent. These analyses examined data from the 1995 spring/summer wave of interviews in this longitudinal study, the first detailed questioning about ongoing, chronic illnesses. We did not impute missing data because there was less than 0.5 % missing data for each variable.

Measures

Symptoms The primary dependent variable was a 44-item scale for reporting symptoms such as fever, arm pain, and headaches. Participants responded on four-point scales (from No to Yes–severe) to the question "Have you had ___ in the past week?" The symptom scale was based on the standard review of systems used in internal medical [13]. The dependent measure was a sum of the severity of these symptoms.

Functional Limitations Due to Symptoms Participants who reported physical symptoms were asked in the past week when your symptoms were at their worst, "how much did they prevent you from doing things that you "liked to do" and "needed to do?" These two items were scored on a five-point scale ("not at all" to "very"). These two questions were summed and had a Cronbach's α=.83.

Trait Negative Affect Trait negative affect was assessed with ten items. The questions asked: How _____ are you usually?

Each of the items was rated on a five-point scale ("not at all" to "very much"). The adjectives used had the highest loadings in a factor analysis [14] and included nervous, gloomy, worried, depressed, uneasy, tense, blue, glum, on edge, and sad. The internal reliability was very good (Cronbach's α=.92).

Life Events Participants were asked about 30 different life events they could have experienced in the past year. We excluded 4 items from the list of 30 that were related to personal, physical, or mental illness. For this analysis, we counted the number of life events experienced by participants (maximum 26). Examples of the events included were death of a spouse, motor vehicle ticket, and retiring.

Illness Representation Individuals self-identified if they had hypertension, diabetes, cancer, heart disease, arthritis, and shingles. Prior studies indicated that participant self report of a chronic illness rather than medical diagnosis per se is the critical factor for presence of an illness representation [15]. Individuals were coded as having one or more illness representations as compared to none of the six.

Demographics Self-reported sex (1 = man, 0 = woman) and age served as controls.

Statistical Analyses

Hierarchical regression analyses examined predictors of symptoms and symptom-related functional limitations. The analyses followed Baron and Kenny's [16] recommendations for moderation analysis. Trait NA and life events were centered prior to conducting analyses. In all analyses, sex, age, and the independent variables were entered at step one, the two-way interactions in step two, and the three-way interaction in step three. Variables were standardized and interactions were graphed [17]. The follow-up analyses were run following the recommendations of Dawson and Richter (2006) and compared the slopes of the regression line for the relationship between the dependent variable with life events for individuals: (1) high in trait NA without one of the five chronic illnesses, (2) high in trait NA with one or more of the five, (3) low in trait NA without, and (4) low in trait NA with one or more of the five chronic illnesses [17].

Results

Preliminary Analyses

Participant's average age was 72 (±7.2), 60 % were female, 97 % had a high school education or greater, and 99 % were Caucasian. A slight majority of the respondents, 57 %, reported having arthritis, 20 % heart disease, 5 % cancer, 32 % hypertension, 8 % diabetes, 0.4 % had shingles, and 21 % did not report one of these chronic illnesses. Participants reported an average of 2.1 (±1.7) life events.

Physical Symptoms

The results of the analysis are presented in Table 1. Trait NA, life events, and chronic illness all were related to the overall severity of physical symptoms. None of the two-way interactions were significant. However, there was a significant three-way interaction with trait NA, life events, and having one or more chronic illnesses related to the overall severity of symptoms (see Table 1).

Follow up analyses probed the direction of the interaction. First, the three-way interaction was plotted [17] to confirm that it took the predicted form, with individuals with chronic illness, high trait NA, and more life events reporting the greatest severity of symptoms (see Fig. 1). The slope of the effect of life events on reporting symptoms for individuals high on trait NA with a chronic illness was significantly different than the slope for participants high on trait NA without a chronic illness (t=2.8, p<.01). The slope for the effect of life events on reporting symptoms for individuals low in trait NA without a chronic illness was also significantly different than the slope for participants high in trait NA without an illness representation (t=−1.93, p<.01). None of the other slopes significantly differed from each other.

Functional Limitations Due to Symptoms

The results of this analysis are in Table 1. There was a main effect for trait NA and chronic illness. No two-way interaction terms were significant. The three-way interaction of trait NA, chronic illness, and life events was significant. The interaction was graphed and further analyses conducted. These analyses showed that participants with high trait NA and chronic illness reported the greatest functional limitations due to symptoms following a series of life events. The slope for the effect of life events on symptom-related functional impairments was significantly different than that for individuals high in trait NA without a chronic illness (t=2.50, p=.01). None of the other slopes significantly differed from each other.

Discussion

Based on the Common Sense Model of Self-Regulation, individuals who are high in trait NA were hypothesized to report greater severity of physical symptoms if they had an illness representation of an ongoing chronic illness and a recent life event. This expectation was based on the assumption that individuals high in trait NA with a chronic illness

Table 1 Regression analyses predicting symptoms and functional limitations

	Physical symptom				Functional limitations due to symptoms			
	B	Std. error	Sig	ΔR^2	B	Std. error	Sig	ΔR^2
Step 1				.256				.105
Age	.14	.03	.00		.03	.01	.04	
Gender	−1.97	.50	.00		−.25	.18	.18	
NA	.38	.05	.00		.10	.02	.00	
LE	.73	.15	.00		.03	.05	.62	
Ill Rep	2.71	.60	.00		.64	.23	.01	
Step 2				−.001				.005
NA × LE	−.01	.03	.61		−.00	.01	.73	
NA × Ill Rep	−.06	.12	.64		.20	.13	.12	
Ill Rep × LE	.50	.35	.15		.02	.04	.69	
Step 3				.007				.008
NA × LE × Ill Rep	.16	.06	.01		.05	.02	.04	

Ill Rep illness representation, *NA* trait negative affect, *LE* life events, *B* unstandardized regression coefficient

would have illness representations that included physical symptoms of emotional distress and other common physical symptoms. The analyses supported these predictions by showing that individuals high in trait NA, with a chronic illness, reported more symptoms after a non-illness-related life event than did those who were low in trait NA, those without chronic illness, or those not experiencing a major life event. In addition, our data showed reduced functioning due to symptoms among participants who recently experienced a severe life event if they were high in trait NA and reported having a chronic illness. Consistent with previous studies, we suggest that activated representations of illness for individuals high in trait NA may have been linked to a greater number and variety of symptoms [8, 9].

The expansion of illness representations by individuals high in trait NA to include additional physical symptoms will lead to difficulties managing chronic illness. Physical symptoms not specific to a chronic illness are common in medical settings; in fact, one study found that 38 % of individuals seen in an internal medicine clinic presented with a "common" symptom difficult to connect to a physical cause. As patients use physical symptoms to manage chronic illness, experiencing these additional symptoms will complicate management of existing chronic illness (e.g., patients with diabetes are known to use symptoms, such as dizziness as a sign of high glucose) [18]. Future studies should examine patients' attribution of these symptoms. Research suggests that individuals are likely to attribute physical symptoms to a physical illness or environmental cause and not to stress or psychological disorders. For example, individuals with PTSD have been found to attribute their symptoms to an environmental cause not to PTSD [19]. Teaching patients high in trait NA to distinguish

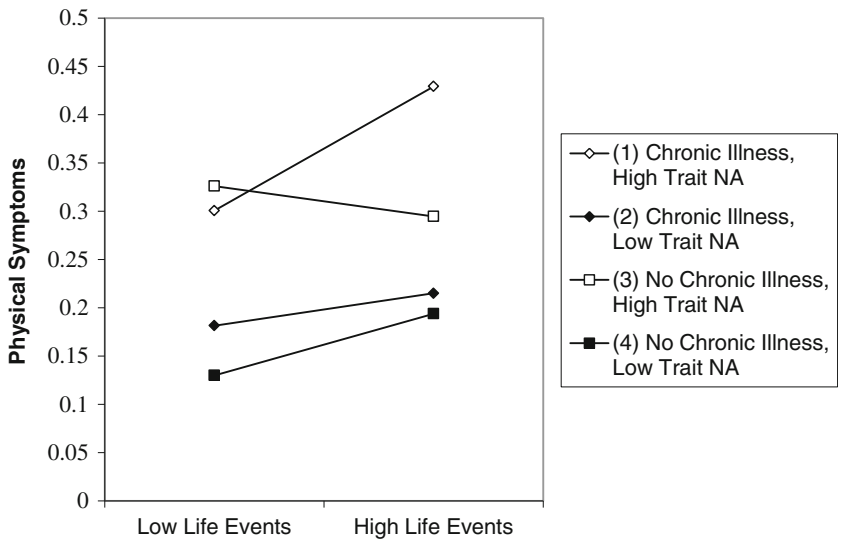

Fig. 1 Three-way interaction for physical symptoms

between illness-specific symptoms and other symptoms may improve their ability to appropriately seek care and reduce functional limitations. Work in this area has shown that individuals with type 1 diabetes can be taught to better identify internal cues of blood glucose changes [20].

A limitation of this study stemmed from how our constructs were measured, a common limitation of secondary analyses of existing datasets. Since only six chronic illnesses were captured, it is likely that some of the 21 % without a chronic illness actually had a chronic illness. It is impressive that even with this statistical noise, we were still able to find a significant three-way interaction. We were also not able to capture other dimensions of illness representations or patient's attributions of their symptoms. The participants were all elderly adults; future studies should examine the relationships in a heterogeneous sample. The largest limitation was this study's use of a cross-sectional design which prevents determining the direction of the associations. It could be argued that the three-way interaction simply represents a cumulative effect of added burden from each of the independent variables. However, two pieces of evidence argue against this. The first is that none of the two-way interactions were significant. The second is that an exploratory analysis (not reported here) found that although symptom burden was higher for individuals with a chronic illness compared to not having a chronic illness, there was not a further increase in symptom burden when having more than one chronic illness compared to having only one chronic illness. Thus, it does not appear that a simple burden of adversity hypothesis is accounting for the findings of this study.

Conclusions

In conclusion, this study provides support for the hypothesis that the coupling of trait NA and a chronic illness will lead individuals to further activate their illness representations in response to a life event. As a result, individuals in this study who were high in trait NA, had a chronic illness, and experienced a life event reported more physical symptoms and reported greater perceived impact of symptoms on their functioning. These findings highlight the importance of examining situational factors that moderate the relationship between high trait NA and symptom reporting.

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