

Introduction

The cost of health care, in terms of real dollars and in terms of lost productivity, has skyrocketed in recent years. For up to 60% of all visits to primary care physicians a medical cause for the visit is not found (Barsky, Wyshak, & Klerman, 1986). People who chronically report symptoms in excess of actual physiological distress burden the health care system by seeking medical care about nine times greater than the average U.S. citizen (Smith, Monson, & Ray, 1986). Medical practitioners often go through extensive clinical exams and use expensive diagnostic testing on individuals with strong complaints of physical symptoms (Koller et al, 1999). Although this extensive use may not be entirely unjustified, perhaps other therapeutic avenues may help in managing these patients and thus lower the health care cost (Barsky, Wyshak, & Klerman, 1986). Health care providers are often confronted with physical complaints that do not exhibit biological underpinnings (Salovey & Birnbaum, 1989). Overall, physical symptoms have been found to be strong predictive indicators of the use of medical services (Barsky, Wyshak, & Klerman, 1986), and because health care providers rely on patients' reports of physical symptoms to develop a diagnosis. Factors that may influence symptom perception, and, consequently, symptom reporting, may be social and psychological in nature (Leventhal & Leventhal, 1993). Psycho social factors can and do influence physical symptom reporting (Leventhal, Hansell, Diefenbach, Leventhal, & Glass, 1996). Researchers also use physical symptom reports as measures of physical health (Cameron, Leventhal, & Love, 1998).

Stress and Health

Selye (1993) states that stress is "not merely nervous tension". It is an event that evokes emotional and biological arousal. The response to this event is complex in nature and

depends on cognitive and physiological factors, which in turn produce overt behavioral changes in an individual. The response to stress depends on individual variations in coping styles. Thus, the same event may evoke different responses based on the individual's coping ability.

Psychological stress has also been reported to contribute to the overall decision to seek medical care (Pilisuk, Boylan, Acredolo, 1987). However, an increase in physician visit rate was unaccounted for by increased morbidity (Tessler, Mechanic, & Dimond, 1976). A possible explanation for this may be related to the measurement of health status through self-report. Koller et al. (1998) found that symptom reports do not give a concise picture of health status. However, symptom reporting was highly correlated with negative affect. Rognmann & Haggerty (1973) proposed that the interpretations of somatic sensations as disease symptoms might be due to the combination of stressors and negative affect (NA). Negative affect is the tendency to experience negative emotions, such as anxiety, anger, and depression. Negative affect is conceived of as a stable personality trait because it is experienced across situations, from stressful situations to situations that would not normally provoke a negative reaction. As a dimension assessed by self-report measures, NA relates to the self-perception which people hold of their general emotional state. Watson and Clark (1984) advocated using the term NA, since measures of anxiety, anger, and depressed mood usually are correlated, and thus are different dimensions of the same underlying state. High NA is viewed as a common factor to such dysphoric states as anxiety and depression (Watson, Clark, & Carey, 1988). Anxiety is used as a marker of NA. In terms of impact ratings of physical symptoms, it has been reported that trait anxiety, a marker of NA, mediated the relation between depressed mood and physical symptom reporting (Jorgensen & Richards, 1989). The combination of stress and negative affect is hypothesized to lead to an increased probability of seeking medical services. For instance, individuals reporting with depressed mood rate their health as poorer than individuals who are relatively happy

(Tessler & Mechanic, 1978; Salovey & Birnbaum, 1989). The correlation between NA and report of somatic symptoms has been moderate in size (.10 to .35) but reliable (Diefenbach, Leventhal, Leventhal, & Patrick-Miller, 1996). This association of emotional distress with physical symptoms is thought to exist for both clinical (e.g. persons diagnosed with depression) and non-clinical samples (Leventhal & Nerenz, 1983).

Generally, people under stress have been found to rate their physical health as poorer and to have a diminished sense of health status (Mechanic, Cleary & Greenley, 1982). Additionally, it is possible that the ability to manage stress may actually be necessary for health maintenance (Schwartz, 1990). Researchers studying stress and health often use physical symptom reports as measures of physical health (Cameron, Leventhal, & Love, 1998). An advantage of a specific symptom list is that it helps in identifying antecedents of health complaints. However, a critique of self-report measures of health has been that they may not be related to objective organic tests (Skelton, 1991). Nonetheless, separation of physical symptoms into organic versus psychological factors has not been successfully accomplished (Kirmayer, 1986). This psychological component reflects a person's subjective perception of health status (Costa & McCrae, 1985). Therefore, correlations of stress and symptom reporting are likely to contain a combination of actual health and psychological distress (Watson & Pennebaker, 1989). Tessler & Mechanic (1978) proposed that the link between distress and health status may be reciprocal in nature and, thus, it would be a mistake to assume only a unidirectional relationship (Tessler & Mechanic, 1978). Consequently, a better understanding of the role of the psychological factors connected to health seeking behavior is of importance in the development of programs designed to manage the stress in relation to perceptions of health status (Cameron, Leventhal, & Leventhal, 1995).

Theories about the link between negative affect and disease symptoms There are three hypotheses about the link between negative affect and disease symptoms. They are not mutually exclusive (Watson & Pennebaker, 1989). The *psychosomatic model* hypothesizes that experiencing a high incidence of negative emotions (such as anger, anxiety, depression, etc.) over a long period of time may cause physical health problems. Therefore, symptom reporting increases. The *disability model* hypothesizes the opposite: chronic physical symptoms lead to increased incidence of negative emotions. These models assume that actual symptoms exist and that physical health is correlated with symptom reporting and negative affect. However, the correlation between actual health and self reports of symptoms is weak. Watson & Pennebaker (1989) reported that although disease can be a stressful state to some individuals, empirical evidence did not support the notion that actual disease leads to higher trait NA levels, in both healthy and unhealthy samples. A common underlying assumption in both the Disability and Psychosomatic hypotheses is the notion that high NA individuals have more health problems. Although NA is strongly associated with physical symptom complaints, NA has not been shown to consistently correlate with poorer long-term health (Watson & Pennebaker, 1989). Due to the deficiencies of the above models, another explanatory model emerged (Watson, 1988). The *symptom perception model* explains this: people high in negative affect are more introspective; therefore they feel bodily sensations in greater detail and interpret them as symptoms of a disease. High NA individuals may be prone to have a greater sensitivity to detect symptoms as well as misinterpret or exaggerate somatic changes (Watson, 1988). Watson and Clark (1984) reported that persons who received high ratings on the NA trait tended to negatively interpret ambiguous symptoms, and are more introspective and self-focused, which enables them to be more sensitive to physiological sensations. Indeed, it was found that NA is related to self-focus (Wood, Saltzberg, & Goldsamt, 1990), and self-focus was found to be associated with PSR (Pennebaker & Skelton, 1978). Overall, Watson and Pennebaker

(1989) stated that at least in healthy samples, the Symptom Perception Hypothesis seems to be the most fitting explanation of the association of affect and symptom reporting.

The interaction of social defensiveness and negative affect: forms of defensive coping

Weinberger et al (1979) first proposed an interaction between social defensiveness and negative affect. Both social defensiveness and negative affect are thought of as stable and measurable personality tendencies. Weinberger suggested that individuals who are high in social defensiveness and low in self reported anxiety are utilizing a 'repressive coping style'. These people present themselves as non anxious but put great physiological efforts into maintaining this collected demeanor. In actuality, these people show heightened physiological arousal and they attempt to avoid negative stimuli. There is an ongoing debate as to whether or not repression is pathogenic (Erdelyi, 1990). Cognitive avoidance of information can minimize or remove a person's appraisal of the severity of physical symptoms (Schwartz, 1990). However, excessive withholding of emotional information has been linked with adverse psychological and health consequences (Pennebaker, 1989). This avoidant coping has been linked to such health problems as asthma, cancer, suppressed immune functioning, and cardiovascular illnesses such as hypertension (Schwartz, 1990). Freud (1893) suggested that these repressed emotions continue to exist and they may manifest themselves as 'somatic inervations'. This is not the only inconsistency in the research on repressive coping.

A problem in research on repressive coping is that repressive copers are defined as low anxiety, high MCSDS- and researchers often omit a group of high anxiety, high MCSDS (Barger, Kircher, & Croyle, 1997). Thus, there is a question whether repressors heightened ANS reactivity is due to high defensiveness or an interaction of high defensiveness and low anxiety MCSDS (Barger, Kircher, & Croyle, 1997). When Barger, Kircher & Croyle included both groups in their research, they found that high defensiveness by itself did not count for increased reactivity, and that exaggerated physiological responses can be more confidently attributed to low anxiety and high

defensiveness (Barger, Kircher, & Croyle, 1997). Warrenburg et al. (1989) cautioned us to distinguish between repressive coping and other defensive coping styles. Another defensive coping style, denial of illness, was also shown to correlate negatively with anxiety but had no relationship to MC or the interaction of MC and anxiety (Warrenburg et al., 1989).

Heart Rate Response Discrepancy

_____ An interesting phenomena in psychophysiology is that some individuals claim they do not experience stress induced negative affect despite stress induced elevations in physiological reactivity. In an effort to explain this physiological discrepancy, Weinberger (1990) hypothesized that these people try to create a self-image designed to not integrate the components of stress reactivity (e.g., negative affect and physiological) as a means of safeguarding a stoical self-image.

Research on the discrepancy between stress induced negative affect and the physiological response is consistent with the notion of some people compartmentalizing and not integrating affective, cognitive, and physiological stress responses.

Weinstein, Averill, Opton, & Lazarus (1968) investigated the discrepancy between stress induced autonomic levels and the report of stress and anxiety. Autonomic reactivity was assessed by HR and skin conductance. It was reported that participants who were classified as defensive showed stressor evoked autonomic reactivity that exceeded the self-report of stressor related negative affect. Participants on the other end of the spectrum, (i.e., high anxiety), displayed the reverse pattern. High anxiety participants showed greater self-report than autonomic reactions to stress, and low anxiety participants showed lesser self-report than autonomic reaction to stress. In regards to the measurement of autonomic reactivity measurement, other than in one study out of six, skin conductance in excess of reported affect was not associated with defensiveness. In sum, others have reported that socially-defensive people who also reported low subjective

distress, compared to nondefensive individuals who also reported low subjective distress, showed greater HR reactivity (Weinberger, Schwartz, & Davidson, 1979).

Jamner and Schwartz (1986) reported that defensive persons scored the lowest on self reported anxiety and anger, and had the highest cardiovascular responses to laboratory stressors. The authors commented on the remarkable physiological differences between defensive people scoring low on trait anxiety, and true low anxious participants (i.e., people scoring low on defensiveness and trait anxiety). Weinstein et al. (1968) suggested that the discrepancy between HR responses and stress might be a marker of defense. That is, perhaps a defensive avoidance of integrating the negative affective and physiological aspects of stress might account for the discrepancy between physiological and affective stress responses (Jorgensen, Schreer, Baskin, & Kolodziej, 1992).

Regarding HR response discrepancy in a group of college males, Jorgensen et al. (1992) reported that HR in excess of state reported negative affect correlated negatively with trait anger, a correlate of negative affectivity, and positively with the Marlowe-Crowne Social Desirability Scale (MCSDS, Crowne & Marlowe, 1964), a measure of social defensiveness. Neither trait anxiety nor the positive affect of trait curiosity correlated with response discrepancy.

Previous Research warrants further investigation

_____Koller et al (1999) researched the link between social defensiveness and negative affect and the impact they have on self reports of symptoms. Koller found repressors reported fewer symptoms than non repressors. Koller used a clinical sample of cancer patients. Also, neither the Marlowe Crowne Social Defensiveness Scale nor a physiological measure was utilized to measure social defensiveness. Koller created his own scale. When Paulhus (1984,1986) reviewed the MCSDS, he found it had two dimensions, impression management and self deception. Koller's scale only contained items related to impression management. There is a controversy as to weather the

impression management or the self deception dimension causes the heightened physiological arousal among high MCSDS scorers (Warrenburg et al., 1989). Repressors were defined as the 40 patients above the median in the social desirability scale and below the median in the negative affect scale. This present research will be the first to examine the relationship between negative affect, social defensiveness, and self reports of symptoms in a young, non clinical sample using both physiological measures and MCSDS. For the purposes of this study, we will examine the impact of all forms of defensive coping on self reports of disease symptoms.

Given links between response discrepancy, social defensiveness, and low levels of some aspects of NA, it is possible that, due to its apparent link to NA, PSR also may be inversely related to persons with elevated HR response discrepancy. In other words, defensiveness, as marked by the two markers of defense (viz., response discrepancy and MCSDS), is expected to be a better predictor of PSR, due to the usage of two markers of social defensiveness for purposes of categorization. Such a finding would be consistent with the notion of socially defensive persons safeguarding a sense of well being, both from the appraisal of emotional and physical health. Therefore, this study intended to expand on existing data by inquiring whether physical symptom reporting correlates negatively with stress induced HR in excess of stress induced negative affect. Such an association would suggest that socially defensive persons prone to a non-integration of the affective and physiological components of stress also may avoid recognition of a correlate of distress (i.e., physical symptom reporting). Conversely, persons prone to an augmentation of psychological distress (i.e., elevated stressor induced negative affect in excess of HR response and low MCSDS) should show high levels of distress related to physical symptoms.

Hypothesis

In terms of this study of a group of males, it is hypothesized that:

H1. Physical symptom reporting will negatively correlate with participants who will demonstrate greater response discrepancy.

H2. Social defensiveness will correlate positively with HR discrepancy.

H3. Defensiveness will negatively correlate with negative affect.

H4. Negative affect will negatively correlate with discrepancy scores.

H5. The individuals showing the lowest symptom reporting will be highest in response discrepancy.

METHODS

Participants

Participants were 73 undergraduate male students from a northeastern university who signed up for a study, in exchange for a credit requirement of an introductory psychology course in which they were enrolled. Female participants were excluded because women show smaller increases in blood pressure and neuroendocrine responses in response to stress than men do (K. Matthews, Davis, Stoney, Owens and Caggiula, 1991). Due to equipment failure, data from 69 participants is presented. Mean age was 18.8 (SD = 1.2). Demographic data was not collected in this sample. Participants were asked to abstain from, a) eating within an hour of their appointment, b) drinking alcohol for 24 hours prior to their appointment or more than 2 cups of coffee within 2 hours prior to their appointment, c) physical exercise 4 hours prior to their appointment, and, d) smoking less than 2 hours prior to their appointment. Participants who showed normal BP (Resting BP: SBP \leq 140 mm Hg and/or DBP \leq 90 mm Hg) were studied.

Self Report Measures

Physical Health Symptoms Questionnaire

General physical health symptoms was assessed by a self-report inventory (Boaz, 1982). (Appendix A). The Physical Health Symptoms Questionnaire consists of 77 questions regarding the participant's general health during the past six months, and the severity of any ailments. Respondents were asked to indicate the frequency which they have experienced each physical complaint. Each participant rated himself on a three-point likert type scale (0 = did not experience this problem, 1 = experienced this problem a little, and 2 = experienced this problem quite a bit). The sum of these ratings was used as the total score for self-reported health problems. We have found the previous computations of the PHQ in Professor Jorgensen's laboratory to have good internal consistency (alpha coefficient of .89 in a sample of college males).

Trait Anxiety and Trait Anger

Trait negative affect (anxiety and anger) and trait curiosity were assessed via the State Trait Personality Inventory (STPI) (Spielberger, Jacobs, Crane, Russell, Westberry, Barker, Johnson, Knight, & Marks, 1979). (Appendix B). Given the focus on trait negative affect in relation to HR response discrepancy, state scales were not used. The trait portion of the STPI is comprised of three subscales which measure trait anxiety, curiosity, and anger. Each subscale consists of 10 questions. Examples of trait anxiety statements are: "I am a steady person," and "I am quick tempered." Each participant rated himself on a four-point likert type scale ranging from (1) "not at all" to (4) "very much so." The STPI trait Anxiety and the STPI trait Anger scales have demonstrated internal reliabilities for a college male sample of .82 and .85, respectively (Spielberger et al., 1979).

Baseline and Task State Affect Measure

Measure of anxiety, hostility, and stress was based on items typically used in state affective measures (e.g., Multiple Affective Adjective Checklist – Revised; MAACL – R; Zuckerman & Lubin, 1985; Appendix C). Two questionnaires were constructed in order to measure affective responses at time of rest and during the mental arithmetic task (MAT). Four adjectives were selected from items commonly linked to feelings of anxiety, hostility, and positive affect. This affect questionnaire has been previously found to be sensitive to reported changes of negative affect. Adequate internal consistencies for rest and stress periods have been found (alpha's ranging from .73 - .93). Additionally, the affect questionnaire contained items such as "stressed," "pressured," and "frustrated," to create a composite index of the participant's stress level while performing the MAT. Participants indicated their affective level during each period on a four-point likert type scale. Answers ranged from "not at all" to "very much." For each laboratory period, the order of these items was randomly assigned.

Marlowe Crowne Social Desirability Scale

Because of our interest in enhancing the precision of prediction from two markers of defensiveness, we used the Marlowe-Crowne Social Desirability Scale (MCSDS, Crowne & Marlowe, 1964), due to its long history of assessing the defensive need to avoid disapproval. (Appendix D). The MCSDS consists of 33 true and false questions. Examples of statements are "I am always willing to admit it when I make a mistake" and "I have almost never felt the urge to tell someone off." The MCSDS has an internal consistency of $\alpha = .88$ and a one month test-retest reliability of .89 (Crowne & Marlowe, 1964).

Cardiovascular Measures

Heart Rate

Heart rate was measured due to its demonstrated ability to operationalize response discrepancy (Newton & Contrada, 19--). To measure heart rate, Interbeat intervals (IBIs) were continuously measured by means of custom-built solid-state

circuitry. The IBIs were stored on the PC and transformed to HR offline. HR was derived for 1-minute periods from the interbeat intervals collected within each session. Single scores for HR were derived for the baseline and the MAT periods described above by calculating the arithmetic mean of the estimates of cardiovascular activity obtained for each minute. Baseline scores were estimated from the mean of the last five minutes of this period.

Procedure

During a group session, a description of the study was conducted. The study was described as an investigation of the association between individual differences and cardiovascular activity at rest and during behavioral challenge. The participant then signed an informed consent form that explained his rights as an experimental participant. After completing, understanding, and signing the consent form, the participant was asked to complete several questionnaires used for a larger study, and the Personal Health Questionnaire. Upon completion of the forms, an individual laboratory session was scheduled.

At the individual laboratory session, the participant was escorted to a waiting room, where he was given the State Trait Personality Inventory. Upon completion of this scale, the participant was led to a temperature-controlled room and two Ag/AgCl ECG bio-potential electrodes were attached to both sides of the chest at about the sixth intercostal space; a ground Ag/AgCl electrode was attached to the abdomen. The participant was then asked to relax in a padded armchair while resting measures of HR were collected. Afterwards, the participant was asked to sit alone for a period of 20 minutes. After this pre-task period, the participant filled out the state affect measure for this period.

Next, the participant undertook a mental arithmetic task (MAT). HR was monitored continuously within the baseline and MAT periods. The MAT was of a

4-minute duration. The task required the participant to serially subtract 7s, beginning with the number 2,194. While the participant engaged in the mental arithmetic, the experimenter recorded and corrected his responses. The participant was instructed to make a subtraction every 2-seconds by using a metronome that ticked once a second as a guide. The participant was asked to be as accurate as possible. Standardized challenging comments were made in regards to the participant's accuracy and speed. Specifically, after the first mistake, the experimenter said, "You have been making mistakes, try to do better." After the second mistake, the experimenter said, "You have not been keeping up with the metronome, please try to go faster." After the third mistake, the experimenter said, "Please try to go faster and yet not make so many mistakes." Upon completion of the MAT, the participant completed a second state affect measure. The participant was then thoroughly debriefed and thanked for his participation.

Results

data currently under analysis

IBI's were averaged across contiguous one-minute epochs and then transformed to a mean HR beats per minute. Baseline HR related to the last five minutes of this 20-minute period. All four HR 1-min measures were used for the MAT.

For state measures of anxiety, hostility, and stress, a change scores was computed separately for each affect by subtracting the baseline measure from their respective raw scores at MAT. HR change scores were computed by subtracting the baseline HR from the MAT HR. HR change scores and affect change scores were standardized to z scores (Mean of 0, SD of 1). Computation of the response discrepancy score involved subtracting a standardized affect change score from the standardized HR change score. Thus, there were three response discrepancy scores for anxiety, hostility, and stress.

A statistically significant correlation was found among the individual HR discrepancy scores: Anxiety response discrepancy highly correlated ($r=0.81$, $p < .0001$) with hostility, and ($r=0.76$, $p < .0001$) with stress. Stress correlated significantly ($r=0.81$,

$p < .0001$) with hostility. Therefore, computing a composite score of the three individual HR discrepancy scores was supported by the statistically significant correlations among the individual affect discrepancy scores. Computation of the composite score was made by using the same method, only using the total scores instead of individual scores. Subsequent reported results are of the composite score.

Data Analytic Plan

In order to check the efficacy of the MAT HR and state affect reactivity, a series of t tests were computed to test whether the HR and state affect difference scores (viz., the baseline value subtracted from its respective MAT value) differed from zero; such a significant test shows a significant change from the baseline value. These t tests were conducted for the (a) self report difference scores for anxiety, hostility, and stress, and (b) HR difference scores. After examining possible non-linear relationships, Pearson product-moment correlations were calculated to examine the hypotheses.

Discussion

I hope that this research will add to the body of knowledge that exists about how people interpret and report physical disease symptoms. Hopefully, it will have an impact on how doctors diagnose and treat illness so that everyone will have better quality care. I hope to do a follow up study that assesses the relationship between social class and my variables. I am wondering if social classes effects negative affect, symptom reporting and social defensiveness and if so, how? This is a new and exciting field I hope to continue with in the future.