Risk Processes Implicated in the Development of Depression and Anxiety-Spectrum Disorders

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Abstract

Risk processes implicated in the development of depression and anxiety-spectrum disorders

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The purpose of this study was to examine risk processes linking individual differences in personal resources to symptoms of anxiety and depression. The construct of personal resources was defined as a higher order factor subsuming the traits of self-esteem, self-efficacy, optimism, locus of control, and anxiety. Hypotheses related to three models of psychiatric risk were assessed: (1) the direct-link model, which posits that deficiencies in personal resources are directly associated with elevated risk for clinical anxiety and depression; (2) the stress-moderation model, which places emphasis on the interaction of personal resources with responses to stressors in ways that either increase or decrease the risk for anxiety disorders and depression; and (3) the stress-generation model, which links the risk for anxiety disorders and depression with a propensity to *generate* stress related to deficiencies in personal resources.

One-hundred-thirty-one university students took part in two testing sessions. The first session included a mock job interview whereby participants were challenged by the stress-inducing task of preparing and delivering a speech before a panel of two 'staff members' acting as personnel managers. Three indices of stress reactivity were used: affective state, heart rate variability (HRV), and selective attention to threat words.

Participants also completed a stress questionnaire designed to assess the degree of stress they experienced in situations of normative challenge (e.g., having a paper to write), self-generated or dependent stress (e.g., time management issues), and in response to independent events (e.g., death of a family member). Approximately six months after the first testing session participants completed measures of clinical anxiety and depression. Results of Structural Equation Modeling (SEM) and Hierarchical Regression analyses pointed to risk processes common to depression and anxiety, and others specific to each. Low personal resources and stress generation were associated with a vulnerability to both types of disorder. However, these mechanisms of risk were more closely linked to depression than anxiety. Low-resource individuals appear to magnify relatively minor life stresses, thereby increasing their vulnerability to depression. Independent stress, however, was a stronger predictor of vulnerability to anxiety than was level of personal resources, dependent stress, or normative challenge. In addition, independent stress was the primary feature of an interaction with dependent stress that placed low-resource individuals at risk for anxiety-spectrum disorders. Thus, it appears that the risk for depression is more closely associated with the negative perceptions that are characteristic of those low in personal resources, whereas the risk of an anxiety-spectrum disorder is more closely associated with exposure to negative independent life events.

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Risk processes implicated in the development of depression and anxiety-spectrum disorders

Considerable evidence indicates that individual differences in certain traits represent risk factors for the development of anxiety disorders and major depression – referred to collectively as distress disorders (Clark, Watson, & Mineka, 1994; Ingram, Miranda, & Segal, 1998; Zinbarg & Barlow, 1996). Among the personality traits shown to influence distress disorders those most cited are locus of control, self-esteem, self-efficacy, optimism, and trait anxiety (Calvo & Cano-Vindel, 1997; Cohen & Edwards, 1989; Fortin, 1992). Despite sizeable correlations among them (Fortin, 1992; Scheier & Carver, 1992; Walsh, Wilding, & Eysenck, 1994), researchers have generally examined the separate influence of each individual trait on mental health. Given their significant interrelations however, the aforementioned traits may actually represent a coherent way of thinking that is related to both stress appraisal and psychological adjustment. This type of hypothetical mindset can be understood as a filter for life experiences or a collection of relatively stable "personal resources" which help to provide meaning for one's environment. Such a construct and its relations to stress and distress disorders has yet to be tested. Accordingly, the aim of the present study was twofold: (1) to create a unified construct labeled "personal resources" representing a higher order factor which will include the correlated traits of self-esteem, self-efficacy, optimism, locus of control and trait anxiety; and (2) to further elucidate the processes of risk for anxiety disorders and depression by examining the relationships among personal resources, stress, and distress symptoms.

Stress

Although many models of stress have been proposed, the transactional model is widely accepted as the most comprehensive perspective of the origin of stress (Lazarus & Folkman, 1984). The basic premise of the transactional model is that stress occurs when perceived challenges exceed the perceived resources that can be allocated to meet these challenges. Within the transactional framework, the *appraisals* of a given challenge and of available resources are key determinants of whether stress will be experienced by the individual.

Personal Resources

The construct of personal resources represents a set of traits acting as an interpretive lens through which life experiences are assessed and understood. An individual's degree of personal resources is based on five traits: (1) self-esteem, defined as an individual's evaluation of his self-worth (Rosenberg, 1965); (2) self-efficacy, defined as the ability to plan and perform behaviors that will lead to desired results (Bandura, 1986); (3) optimism, described as generalized positive expectancies (Scheier & Carver, 1992); (4) locus of control, or an individual's general belief regarding his or her ability to exert control over life events (Rotter, 1966); and (5) trait anxiety, described as the tendency to experience feelings of tension and apprehension (Calvo & Cano-Vindel, 1997). A high level of personal resources consists of high self-esteem, high self-efficacy, high optimism, an internal locus of control, and low trait anxiety. On the other hand, a low level of personal resources comprises low self-esteem, low self-efficacy, low optimism, an external locus of control, and high trait anxiety.

Pilot research in our laboratory has shown that self-esteem, self-efficacy, optimism, locus of control and trait anxiety are intercorrelated in ways which suggest that they represent a coherent mindset. In an initial pilot study, a factor analysis of the five traits revealed that they formed a single factor (Salerno, 2000); a second study later replicated this finding (Lamarché, Schwartzman, & Salerno, 2003). The present study was designed to examine the interplay among the construct of personal resources, stress and symptoms of distress disorders.

Modeling the association between personal resources and mental health

Several models explaining how personality is related to distress disorders have been proposed. The models can be grouped into three broad conceptual frameworks: (1) the direct-link model wherein personality characteristics predispose an individual to, result from, or modify distress disorders directly; (2) the stress-moderation model wherein personality dimensions interact with responses to objective stressors in ways that either increase or decrease the likelihood of disorder; and (3) the stress-generation model which has personality factors implicated in the creation of stressful environments associated with distress disorders (Clark et al., 1994).

In general, results support the direct-link and stress-moderation models. Fewer studies, however, have examined the validity of the stress-generation model. In the ensuing pages, a comprehensive overview of studies testing the validity of each of the above models will be provided. Accordingly, the literature review is divided into three main sections each guided by a separate model or conceptualization of how personality is related to symptoms of distress disorders. A section of the literature review describes

studies examining the validity of the stress-moderation model. In this segment, the focus will be on investigations which have examined the interplay between each of the trait components included in the construct of "personal resources" and stress reactions known to be associated with anxiety and depressive symptoms, namely, mood state change, cardiac reactivity, and selective attention to threat. In a separate section of the literature review the focus will be on findings related to the stress-generation model. These studies have examined how depressed individuals generate a significant portion of the stress which they experience. First however, studies evaluating the direct-link model are reviewed.

The direct-link model: Personal resources and psychological distress

There is considerable evidence of a strong relationship between each trait element contained in the concept of personal resources and distress. Numerous studies have shown that low self-esteem, low self-efficacy, pessimism, external locus of control, and high trait anxiety are all associated with high levels of anxiety and depressive symptoms. However, the great majority of these studies used cross-sectional designs that could not establish the direction of significant correlations between traits and symptoms. The presumption is that traits cause distress, however, in studies of this kind the opposite possibility cannot be ruled out. Given the aim of the present study to identify risk processes for distress disorders, investigations that used a prospective design to show that trait elements of "personal resources" predict psychological distress are highlighted.

This segment of the literature review is divided into five sub-sections. Each sub-section focuses on one of the trait components of "personal resources" and its association

with psychological distress. In addition, wherever possible, each sub-section includes reviews on the nature of the relationship between a single trait and distress symptoms in both sub-clinical and clinical samples. Studies have shown that high rates of sub-clinical anxiety and depression constitute risk for distress disorders (Fergusson, Horwood, Ridder, & Beautrais, 2005; Kessler, Zhao, Blazer, & Swartz, 1997). Consequently, demonstrating an association between each trait element representing deficits in personal resources and sub-clinical symptoms would indicate that low levels of personal resources are associated with risk for distress disorders. Moreover, demonstrating that the association between traits and symptoms in sub-clinical samples parallels the relationship observed between traits and distress disorders would also suggest that certain personality features represent risk for distress disorders. In general, this segment of the literature review reveals robust relationships between each trait element of "personal resources" and psychological distress. These associations indicate that traits representing low levels of personal resources are (a) associated with increased distress in sub-clinical populations; and (b) characteristic of individuals with distress disorders.

Trait anxiety and psychological distress

High trait anxiety has been linked with elevated distress in non-clinical populations. A recent study by Bhar and Kyrios (2005) examined whether non-clinical obsessions in college students were related to a set of cognitive and mood factors including trait anxiety. Results showed that high trait anxiety was closely associated with intense obsessions. This relationship was interpreted as reflecting an overdeveloped vigilance for threat, a characteristic typical of anxiety disorders. In a study exploring

mechanisms involved in the development of distress disorders, investigators asked medical students and graduate students to complete measures of trait anxiety, perceived stress, panic symptoms, and depression (Isyanov & Calamari, 2004). High trait anxiety was associated with increased panic symptoms and depression. Interestingly, perceived stress was not a relevant factor in these associations. Several other studies have also reported an association between trait anxiety and sub-clinical depressive symptoms (Endler & Parker, 1990; Famer, 1998; Muris, 2002). Collectively, these findings support the direct-link model of distress disorders.

Although there is much convergent evidence consistent with the hypothesis that high trait anxiety is associated with non-clinical levels of distress, these studies used cross-sectional designs that cannot establish the direction of the association between trait anxiety and adjustment. Bromberger and Matthews (1996), however, used a prospective design to investigate the relative contributions of trait anxiety and other variables on increases in depressive symptoms over a three-year period in a sample of pre-menopausal middle-aged women. After controlling for depressive symptoms at baseline, they found that women who were characterized by high trait anxiety reported more depressive symptoms than low trait-anxious women. This study suggests that trait anxiety predicts depressive symptoms in middle-aged women. That is, the longitudinal design of this study enabled researcher to show that high trait anxiety predisposes women to increases in depressive symptoms over time.

The association between trait anxiety and psychological distress in sub-clinical samples has been replicated in patients suffering from a variety of distress disorders. For

example, Chambers, Power and Durham (2004) examined trait vulnerability measures, including trait anxiety, and long-term outcome of 83 patients diagnosed and treated for Generalized Anxiety Disorder (GAD) eight to 14 years earlier. Current diagnostic status was assessed and it was found that many patients still suffered from GAD and/or other distress disorders. Results indicated that high trait anxiety was correlated with diagnoses of GAD, social phobia, panic, and depression. Trait anxiety at pre-treatment was also associated with distress disorders at long-term follow-up. Lastly, co-morbid diagnoses were strongly related to high levels of trait anxiety. These findings suggest that patients reporting high trait anxiety suffer from distress disorders characterized by a chronic course and high levels of co-morbidity. Similarly, other studies have also found that trait anxiety is related to GAD (Gomez & Francis, 2003; Kopp, 1989), and is a predictor of poor outcome in depression (Parker, Wilhelm, Mitchell, & Gladstone, 2000; Szadoczky, Rozsa, Zambori, & Furedi, 2004). In general, investigators have found that patients suffering from distress disorders are characterized by high trait anxiety (Clark et al., 1994; Zinbarg & Barlow, 1996).

Much like the majority of studies examining the association between trait anxiety and distress in non-psychiatric samples, most investigations exploring the link between trait anxiety and distress disorders have used cross-sectional designs. To date, very few studies have used a prospective longitudinal design to test whether pre-morbid anxiety represents a trait diathesis for distress disorders. In fact, there are no known published prospective longitudinal studies that have examined trait anxiety as a vulnerability factor for anxiety disorders. However, a small number of studies have assessed whether pre-

morbid personality characteristics predict the onset of depression. Hirschfield and colleagues (1989) had a large sample of individuals at risk for depression complete measures of several personality dimensions. Participants were followed for a period of one to six years. Pre-morbid personality scores of individuals who developed depression were compared with those who did not. Among the personality traits assessed, pre-morbid neuroticism scores predicted subsequent depression. This finding is particularly relevant because a number of investigators have posited that neuroticism is very closely associated to, if not synonymous with, trait anxiety (Clark et al., 1994). Similar findings have been reported by others (see Gunderson, Triebwasser, Phillips, & Sullivan, 1999). Thus, it would appear that trait anxiety/neuroticism predicts the onset of depression.

To summarize, numerous studies have reported a link between trait anxiety and psychological distress in sub-clinical samples and in patients suffering from distress disorders. The majority of these studies used cross-sectional designs that preclude causal inferences from being made. Prospective studies, although few in number, indicate that trait anxiety predisposes the individual to depression.

Self-efficacy and psychological distress

In addition to trait anxiety, self-efficacy has also been linked to psychological distress. As stated previously, self-efficacy has been defined as an individual's perceived capacity to organize and execute behaviors necessary to obtain desired results (Bandura, 1986). The appraisal of oneself as a problem-solver may therefore be regarded as a sub-type of self-efficacy. From a theoretical standpoint, the manner in which individuals appraise their problem-solving competence should be linked to their emotional well-

being. If this is the case, a strong negative relationship would be expected between self-appraised problem-solving competency and emotional distress. Indeed, researchers have consistently found an association between low self-appraised problem-solving efficacy and poor psychological adjustment in both normal and clinical populations.

In one of the first studies examining the relation between problem solving and distress, Nezu (1985) examined a sample of college students and reported differences in psychological distress between self-perceived effective and ineffective problem-solvers. That is, college students who appraised themselves as ineffective problem-solvers reported more depression and more state and trait anxiety than students who appraised themselves as effective problem-solvers. Similar results have been reported in several other published investigations (Cheng, 2001; Davey, 1994; Davey & Levy, 1999; D'Zurilla, Chang, Nottingham, & Faccini, 1998; Heppner & Anderson, 1985; Pretorius & Diedricks, 1994). Taken together, these findings suggest a robust inverse association between self-perceived problem-solving effectiveness and emotional distress in sub-clinical populations.

The relationship between self-appraised problem-solving efficacy and symptom of distress in sub-clinical samples extends to individuals suffering from major depression and anxiety disorders. Nezu (1986a) compared clinically depressed individuals to controls matched on several demographic variables and found that depressed subjects reported less problem-solving confidence than non-depressed subjects. This association between clinical depression and self-appraised problem-solving has since been replicated in studies with both adult and adolescent psychiatric patients (D'Zurilla et al., 1998;

Marx, Williams, & Claridge, 1992; Reinecke, Dubois, & Schultz, 2001). Similarly, a significant relationship has been found between self-perceived ineffective problem solving and anxiety disorders such as Post Traumatic Stress Disorder (PTSD) and GAD (Dugas, Gagnon, Ladouceur, & Freeston, 1998; Ladouceur, Blais, Freeston, & Dugas, 1998; Nezu & Carnevale, 1987).

In sum, research to date provides evidence of a strong link between self-appraised problem-solving ineffectiveness and emotional distress. This association has been reported and replicated in samples with sub-clinical levels of anxiety and depression and in individuals suffering from distress disorders.

Optimism and psychological distress

Optimism is yet another trait that has been linked to psychological adjustment. Researchers have generally omitted the relationship between optimism and distress in psychiatric populations. The majority of studies in this area of research have used sub-clinical samples to investigate the link between optimism and symptoms in the context of a stressful event. This method has enabled researchers to report on the stress-buffering effects of optimism as well as on the question of a direct link between optimism and distress. The stress-buffering effects of optimism are discussed in the portion of the literature review dealing with the stress-moderation model of distress disorders. The focus here is on studies examining the direct association between optimism and distress.

A number of studies point to a direct link between optimism and psychological adjustment (Chang, 2002; Scheier, Carver, & Bridges, 2001). Chang (2002) asked a group of college students and a group of older adults to complete a measure of optimism,

an inventory of perceived stress and a measure of general distress. Results indicated a direct negative relationship between optimism and general distress in both younger and older adults. Similarly, other studies have identified direct associations between optimism and general psychological adjustment (Blankstein, Flett, & Koledin, 1991), fewer depressive symptoms (Chang, 1998; Marshall & Lang, 1990), lower trait anxiety (Schuller, 1995), and lower state anxiety (Sumi, Horie, & Hayakawa, 1997). Of note is the prospective three-year study by Bromberger and Matthews (1996) described earlier which indicated that pessimism as well as high trait anxiety predicted increases in depressive symptoms in pre-menopausal women. In general, studies in this area of inquiry have shown that optimists report less psychological distress than pessimists.

Locus of control and psychological distress

A fourth personality trait that has been cited as a factor associated with psychological distress is locus of control. An individual's locus of control or general belief regarding control over life circumstances is usually characterized as either being internal or external. Those with a predominantly internal locus of control believe that the outcomes of events are dependent on one's own behavior. In contrast, those with a predominantly external locus of control believe that life events are beyond one's control (Rotter, 1966). In general, findings in this area of research suggest that high external locus of control is associated with greater psychological distress.

Benassi and colleagues (1988) conducted a meta-analysis of 97 studies that examined the nature and strength of the relationship between locus of control and depression in psychiatric patients, students, and the general population. Results were

consistent with the hypothesis that higher levels of externality are associated with more depression. Interestingly, the association between locus of control and depression was evident in both the clinical and normal samples. Almost a decade later, Presson and Benassi (1996) conducted another meta-analysis of studies using non-clinical samples and more stringent inclusion criteria and found similar results. Thus, research findings provide support for the hypothesis that an external locus of control is linked with depression in both psychiatric and non-clinical samples.

Although there are relatively few studies examining the link between locus of control and anxiety, results from these investigation are consistent with those exploring the locus of control-depression relationship. Kennedy, Lynch and Schwab (1998) examined differences on locus of control scores between a control group and six groups of patients characterized by separate diagnoses, namely, Major Depression, Panic Disorder, GAD, Social phobia, Obsessive-Compulsive Disorder (OCD), and Mixed Anxiety-Depressive Disorder. This study used the Levenson (1973) multi-dimensional scale to assess locus of control. An advantage of this scale is that it can distinguish between two dimensions of external locus of control, powerful others and luck or fate. Thus, this instrument contains three separate sub-scales which can provide scores indicating attributions of control for the outcomes of events as being internal (I scale), provoked by powerful other (P scale), or due to chance (C scale). Results indicated that patients with depression, social phobia and a mixed diagnosis attributed control of events in their lives to powerful others more so than the control group. In addition, patients with depression, panic disorder, social phobia, and a mixed diagnosis believed that the

outcomes of events were due to chance more so than the control group. The psychiatric groups did not differ from each other and the control group on the I scale, and OCD patients had P and C scale scores that were similar to the control group.

Most studies examining the link between locus of control and anxiety have used non-clinical samples. Researchers who used the Levenson scale reported an inverse relationship between internality and anxiety (Holder and Levi, 1988; Molinari & Khann, 1981; Presson and Benassi, 1996), and a positive association between anxiety and both scales denoting externality (i.e., attributions of control to powerful others and belief in chance or fate; (Burger, 1984; Dyal, 1984; Strickland, 1977). These finding are consistent with the association observed between high externality and poor adjustment in patients suffering from distress disorders.

In summary, a review of the available research reveals a significant relationship between locus of control and psychological distress. Findings provide good support for the hypothesis that psychological distress is associated with high external locus of control in clinical populations. In addition, both low internality and high externality are associated with high distress in non-clinical populations.

Self-esteem and psychological distress

Self-esteem, the fifth trait included in the construct of personal resources, has also been associated with emotional distress. In fact, the inverse association between self-esteem and distress is well-documented and exists in both non-clinical populations and in patients diagnosed with distress disorders.

There is a good deal of cross-sectional evidence of an inverse relationship between self-esteem and depression in both psychiatric and sub-clinical samples (Abramson, Seligman, & Teasdale, 1980; Andrews, 1998; Feather, 1985; Lewisohn, Roberts, Seeley, Rohde, Gotlib, & Hops, 1994). Much less consistent has been evidence of low self-esteem as a marker of vulnerability to depression. To date, findings are inconclusive in establishing a causal role for self-esteem in the onset of depression (Andrews, 1993; Coyne & Gotlib, 1986; Roberts & Monroe, 1994).

The association between self-esteem and anxiety has been studied less extensively than the relationship between self-esteem and depression. Several investigators have noted however, that patients suffering from anxiety disorders report lower self-esteem than non-clinical controls (Ehntholt, Salkovskis, & Rimes, 1999; Jacobi, Paul, de Zwaan, Nutzinger, & Dahme, 2004; Silverstone, 1991). In non-clinical samples, low self-esteem has also been associated with increased anxiety symptoms and more general distress (Christensen, Cohan, & Stein, 2004; Crocker & Luhtanen, 2003; Jong, 2002; Yao & Cottraux, 2002). As a whole, these results confirm that low self-esteem is a characteristic of patients with anxiety disorders and suggest that low self-esteem in non-clinical individuals may represent a risk for the development of anxiety disorders.

Conclusions

Studies have shown that traits characteristic of deficits in personal resources are linked to symptoms of depression and anxiety in sub-clinical samples. In addition, many studies have shown that patients suffering from distress disorders report low self-esteem, low problem-solving self-efficacy, pessimism, an external locus of control and high trait

anxiety. Moreover, some prospective studies provide support for the notion that high trait anxiety/neuroticism and pessimism in sub-clinical samples predict increases in depressive symptoms. Collectively, the evidence to date provides strong support for the direct-link model of psychiatric vulnerability. That is, individuals low in personal resources appear to be at risk for distress disorders based on the direct association between deficiencies in personal resources and symptoms of distress.

The stress-moderation model: Personal resources, stress reactivity and distress

In this section, I review studies which examined whether the trait components of personal resources are related to stress responses in ways that modulate risk for distress disorders. Each response system involved in stress reactivity, namely, the subjective, the physiological, and the behavioral systems are considered in three separate sub-sections. The high volume of studies in these areas of research dictates that the focus be on a single stress reaction per response system known to be associated with distress disorders. The initial sub-section focuses on an overview of studies which investigated whether each trait element in personal resources is associated with the individual's subjective or perceived stress in ways that impact distress symptoms. A second sub-section focuses on studies which investigated the interplay among each of the traits comprising personal resources, parasympathetic cardiac reactivity, and distress symptoms. Lastly, a third sub-section focuses on studies that examined whether personality resources and stress-related selective attention to negative information combine to moderate risk for clinical anxiety and/or major depression. In general, there is good evidence in support of the stress

moderation model with the most consistent and comprehensive data coming from studies of the subjective response system.

Personal resources, subjective stress, and distress

There is a substantial research literature strongly suggesting that interactions between each personality dimension included in the concept of personal resources and subjective stress effect distress symptoms. Specifically, numerous studies have shown that pessimism, low self-efficacy, high trait anxiety, low self-esteem, and an external locus of control all increase the likelihood of poor psychological adjustment by intensifying the feeling of being stressed. Although findings are mixed in the areas of self-esteem and locus of control, the great majority of studies have reported results that are consistent with the notion that the trait components of personal resources interact with subjective stress in ways that either increase or decrease the likelihood of distress disorders.

Numerous prospective studies have examined the link among optimism, stress and distress. This area of study has focused on examining the association between optimism and stress-related distress in non-psychiatric populations. The interrelation between optimism and stress and its subsequent effect on distress has been investigated in groups of people facing a variety of difficulties including health-related stressors such as pregnancy and illness, and non-health-related stressors such as college entry. Research has consistently shown that optimism is inversely related to feelings of stress thus diminishing the likelihood of distress symptoms.

One of the first studies exploring the association between optimism and distress in the context of a health-related stressor examined the development of depressed feelings following childbirth (Carver & Gains, 1987). Women completed measures of optimism and depression during the final trimester of their pregnancy and then completed the same depression measure again three weeks postpartum. Results showed that, even when initial depressive levels were controlled, optimism predicted levels of depressive symptoms postpartum. This result has since been replicated (Fontaine & Jones, 1997). Other researchers have reported that pessimism predicts poorer psychological adjustment during pregnancy (Park, Moore, Turner, & Adler, 1997), following an unsuccessful fertility treatment, and after an abortion (Cozzarelli, 1993; Major, Richards, Cooper, Cozzarelli, & Zubek, 1998).

Optimism has also been studied in the context of adjustment to the traumas of serious illness and war. For example, one study examined the effect of optimism on psychological adjustment following the diagnosis and treatment of early-stage breast cancer (Carver, Pozo, Harris, Noriega, Scheier, Robinson, et al. 1993). Controlling for the effects of medical factors and prior distress, an inverse relationship was found between optimism and distress in the year following surgery. Similar stress-buffering effects of optimism have been reported in men being treated for prostate cancer (Johnson, 1996), in a heterogeneous group of cancer patients receiving radiotherapy (Christman, 1990), and in patients undergoing joint replacement surgery (Chamberlain, Petrie, & Azaria, 1992). In the same way that it protects individuals from the trauma of serious illness, optimism has also been shown to be inversely related to symptoms of Post

Traumatic Stress Disorder (PTSD) in civilians experiencing war (Ai, Evans-Campbell, Santangelo, Cascio, 2006; Durakovic-Belko, Kulenovic, & Dapic, 2003).

Although much of the evidence for the inverse relationship between optimism and distress comes from studies of individuals facing health threats, researchers have also examined the interplay between optimism and stress in individuals who experienced less extreme or more normative stressors. A spinwall and Taylor (1992) examined the relationship between optimism and adjustment in the context of the stressful challenge of commencing college studies. Several personality factors were assessed at the time of college entry including optimism, self-esteem, and locus of control. Results showed that higher levels of optimism at college entry were associated with lower levels of psychological distress via stress-related coping responses three months later. These associations were significant despite controlling for levels of mood, self-esteem, and locus of control at college entry. Several other studies have since reported similar results (Scheier & Carver, 1992; Segerstrom, Taylor, Kemeny, & Fahey, 1998; Stewart, Betson, Lam, Marshall, Lee, & Wong, 1997). Moreover, investigations using community samples have found that optimism interacts with stressful life events to predict poor psychological adjustment (Bromberger & Matthews, 1996; Chang, 2002; Raikkonen, Matthews, Flory, Owens, & Gump, 1999).

Problem-solving self-efficacy has also been examined as a possible influence on stress and subsequent emotional difficulties. Several studies have shown that problem-solving self-efficacy is a moderator of stress-related depression and anxiety symptoms. Nezu and Ronan (1988) conducted a study on the relation between self-appraised

problem-solving ability and depressive symptoms in college students as a function of stressful life events. Results showed that independent of initial levels of depressive symptoms, self-appraised ineffective problem-solvers under high stress reported more depressive symptoms than self-appraised effective problem-solvers under equivalent levels of stress. Similar results have been reported by D'Zurilla and Sheedy (1991), and by other investigators in studies of adult and adolescent psychiatric patients (Dixon, Heppner, Burnett, Anderson, & Wood, 1993; D'Zurilla, Chamg, Nottingham, & Faccini, 1998; Otto, Fava, Penava, Bless, Muller, & Rosenbaum, 1997; Reinecke, Dubois, & Schultz, 2001). Taken together, the results indicate that under stressful conditions individuals who appraise themselves as ineffective problem-solvers are at risk for depression.

Research findings also indicate that individuals who describe themselves as poor problem-solvers experience significantly more stress-related anxiety than those who describe themselves as good problem-solvers. Nezu (1986b) found that problem-solving efficacy moderated the link between negative life stress and anxiety in college students. Similar results have also been reported in studies of graduate students (Miner & Dowd, 1996), combat veterans suffering from PTSD (Nezu & Carnevale, 1987), and adolescent inpatients (Reinecke et al., 2001). To summarize, there is consistent support across normal and psychiatric populations for the hypothesis that self-appraised ineffective problem-solvers experience more stress-related anxiety than self-appraised effective problem-solvers.

Another dispositional factor that has been examined as a potential source of influence on stress and related distress is trait anxiety. Calvo and Cano-Vindel (1997) examined the relationship between trait anxiety and stress using the challenge of preparing and delivering a speech before a panel of judges as the stressor. Results showed that trait anxiety was associated with elevated levels of self-reported performance anxiety and somatic anxiety (i.e., moistness of hands). Other studies have provided evidence of a link between trait anxiety and stress in students and in male white-collar workers (Constans, 2001; Spangler, Pekrun, Kramer, & Hofmann, 2002; van Eck, Nicolson, & Berkhof, 1998; Xiaoning, Xiaohong, Yan, & Chuanyun, 2005). In addition, a number of studies have shown that the increased stress incurred by high trait anxious individuals is associated with an increase in distress symptoms. Medical students characterized by high trait anxiety reported more stress and more panic and depressive symptoms than students characterized by low trait anxiety (Isyanov & Calamari, 2004). Similarly, Israeli adolescents who reported being high in trait anxiety experienced increases in state anxiety and PTSD symptoms following terrorist attacks (Ronen, Rahav, & Appel, 2003). In sum, the foregoing research findings indicate that high trait-anxious individuals respond to stressful challenges in ways that place them at risk for distress disorders.

A fourth personality trait cited as a factor influencing the impact of stress on mental health is self-esteem. Bovier, Chamot and Perneger (2004) examined stress and internal resources as determinants of mental health among university students. Results showed that high self-esteem buffered the negative effect of stress on psychological

distress. This finding was replicated in a community sample of Chinese Americans (Mak, Chen, Wong, & Zane, 2005). Self-esteem has also been shown to moderate the influence of stress on suicide ideation among college students (Wiburn & Smith, 2005) and soldiers (Lieberman, Solomon, & Ginzburg, 2005). That is, the relation between stress and suicide ideation was more pronounced in individuals with low self-esteem compared to those with high self-esteem. In addition to the aforementioned studies, several prospective studies have been able to demonstrate that life stresses in individuals characterized by low self-esteem render them particularly vulnerable to subsequent symptoms of distress disorders. For example, it has been reported that adolescents and college students with low self-esteem display depressive mood reactions following stress (Abela, 2002; Southall & Roberts, 2002), and heart transplant patients with low self-esteem are at risk for depression and PTSD (Dew, Roth, Schulberg & Simmons, 1996).

Despite the many studies that have shown that high self-esteem can buffer the negative impact of stress on psychological distress, there exist several counter indicative findings. For example, studies have shown that self-esteem does not always buffer the subjective reporting of stress (Hobfoll & Walfisch, 1984; Westcott, 1989). Interestingly, Westcott found that a composite variable that included self-esteem and social support moderated the effects of stress. Those who were low in self-esteem and had low levels of social support presented significantly more psychiatric symptoms than individuals who scored high on both variables. Likewise, Ormel, Sanderman and Stewart (1988) reported that desirable events reduced symptoms of distress *only* for participants who had very high levels of self-esteem and an internal locus of control. In sum, the findings of studies

investigating the impact of self-esteem on stress-related symptoms are mixed. There is evidence however, that high self-esteem in combination with other resources, namely, an internal locus of control and high social support, buffers the negative effects of stress.

A number of studies have examined the influence of locus of control on stress reactivity and related distress symptoms. Several investigations have shown that external locus of control in university students is associated with more academic stress and heightened stress reactions when confronted with the challenge of a laboratory task (Abouserie, 1994; Bollini, Walker, Hamann, & Kestler, 2004; Gadzella, 1994; Lu, 1994). Other studies have shown that an internal locus of control is associated with fewer hassles (Farne, Sebellico, Gnugnoli, & Corallo, 1992) and lower stress following a laboratory task (Weinstein & Quigley, 2006). Additional studies have shown that, compared to individuals with an internal locus of control, those with an external locus of control report more distress symptoms when confronted with a wide variety of stressors (e.g., sexual assault, bereavement, sleep deprivation, having a family member sustain a severe injury and negative life events in both samples of college students and in the general population; Frazier, Steward, & Mortensen, 2004; Hill, Welch, & Godfrey, 1996; Johnson & Sarason, 1978; Pelletier, Alfano, & Fink, 1994; Wheaton, 1982).

Results from the above cross sectional studies suggest that external control beliefs constitute a risk factor for the onset of stress-related anxiety disorders and depression. However, relatively few prospective studies have actually examined whether an external locus of control increases the probability of distress symptoms as a function of increased stress. Sandler and Lakey (1982) used a prospective design to examine whether control

beliefs predicted the development of dysphoria via their moderating effects on negative life events in a sample of college students. Results indicated that, after controlling initial symptom level, Externals reported more life stress and subsequent dysphoria than Internals. Comparable results have been found in samples of middle-aged men (Krause & Stryker, 1984) and adolescents (Herman-Stahl & Petersen, 1999).

Although the above studies suggest that external locus of control is associated with increased subjective stress and more distress symptoms in response to stress, the findings of other studies are counter indicative (McFarlane, Norman, Streiner, & Roy, 1983; Nelson & Cohen, 1983; Walsh, Wilding, & Eysenck, 1994). For example, Walsh and colleagues (1994) reported that the mood states of Internals and Externals did not differ following a laboratory stressor. Fortin (1992) observed that the disparity of findings may due in part to methodological differences among studies in this research area (e.g., the use of different measures of locus of control). Overall, research to date provides tentative support for the premise that individuals prone to an external locus of control are at risk for stress-related distress disorders (Fortin, 1992).

To summarize, numerous studies have shown that the negative impact of stress on psychological adjustment is influenced by trait components which together comprise the higher order construct of personal resources. Despite some mixed findings reported in studies of self-esteem and locus of control, cross-sectional and prospective data across a wide range of participants indicate that traits characteristic of low levels of personal resources intensify subjective stress thus increasing the risk of developing distress disorders.

Personal resources, heart rate variability reactivity, and distress

In comparison to the extensive research literature on the associations among personal resources, subjective stress, and distress, few studies have examined the physiological concomitants of the trait resources-stress-distress relationship. Most studies in this area of research have used indices of stress denoting arousal. Such markers of stress include heart rate and galvanic skin responses associated with Autonomic Nervous System (ANS) function or the release of the hormone cortisol related to actions from the Hypothalamus-Pituitary-Adrenal axis (HPA axis). However, an unhealthy physiology may be more accurately expressed by low levels of adaptive variability than by hyperarousal. For example, an adaptive response to a highly stressful situation should produce a very high degree of arousal. Moreover, high levels of arousal may not be a process characteristic of depression (Clark et. al., 1994).

In recent years, heart rate variability (HRV) has emerged as a marker of cardiac flexibility reflecting an individual's ability to regulate emotions in the face of life challenges. From a psychophysiological perspective, the main sources of influence on HRV are the impact of the ANS on cardiac activity and ANS regulation by the brain. The ANS is subdivided into two interrelated systems, namely, the sympathetic nervous system (SNS) and the parasympathetic nervous system (PNS). The SNS and PNS exert influence on heart rate by impacting the activity of the sinoatrial node, the tissue in the heart sometimes referred to as the "pacemaker" which initiates the heart beat. The influences of the sympathetic and parasympathetic systems on the heart generally oppose one another. During periods of real or perceived stress sympathetic activity becomes

dominant producing increases in physiological arousal meant to aid individuals meet the demands of the stressor. The increases in heart rate characteristic of such states of arousal are associated with a reduction in the duration of time between consecutive heart beats or decreases in interbeat intervals. By contrast, during periods of relative safety parasympathetic activity becomes dominant acting to maintain relatively low levels of physiological arousal associated with decreases in heart rate and increases in interbeat intervals. The individual's capacity to shift between states of low and high arousal is dependent on the ability of the ANS to quickly vary heart rate. Thus, HRV is a measure of autonomic flexibility indicative of an individual's capacity to respond rapidly to stressors and to recover quickly post stress.

The autonomic influences on the heart are centrally controlled by the brain. The neuroanatomy generally responsible for integrating the physiological, emotional, and behavioral responses to environmental demands include regions of the cortex (e.g., medial prefrontal area), limbic system (e.g., hypothalamus), and brainstem (e.g., nucleus of the solitary tract). These areas of the brain process signals from the body's internal condition and input pertaining to external conditions and then proceed to adjust coordinated responses based on changes in the internal and external conditions. The output from this process is transmitted to the SNS and PNS which then influence heart rate. As a result, HRV is a measure of an individual's capacity to generate adaptive physiological responses related to emotional responses of appropriate timing and magnitude in the context of life challenges (for a more detailed description of the physiological underpinnings of HRV see Appelhans & Luecken, 2006).

More than a decade ago Porges proposed a theory linking autonomic flexibility represented by HRV with emotion regulation. Porges' Polyvagal Theory (1995, 2007) suggests that the most recent evolutionary shift in the ANS is the development of the ventral vagal complex, a PNS structure capable of rapidly withdrawing and reinstating its inhibitory influence on the heart. The purpose of this evolutionary shift is to facilitate adaptive coping by providing a "vagal brake" for the heart to be applied or released depending upon how environmental demands are perceived. Specifically, when the environment is perceived as safe, the vagal braking influence or vagal tone is high, slowing heart rate and inducing relatively relaxed states that facilitate social interactions. Conversely, in the face of an authentic threat an adaptive response calls for low vagal tone or the release of the "vagal brake" on the heart, allowing for an increase in sympathetic nervous system activity and the mobilization of defense reactions to counter the threat (i.e., fight/flight responses).

Vagal suppression can therefore be used as a marker of whether responses to life challenges are adaptive. The extent to which vagal suppression is either adaptive or maladaptive is dependent on an individual's assessment of the threat posed by a particular situation. For example, vagal suppression during an objective life-threatening situation is adaptive, whereas "excessive" vagal suppression during a normative life challenge indicates poor parasympathetic regulation of cardiac reactivity (Hastings, Nuselovici, Utendale, Coutya, McShane & Sullivan, 2008). Conversely, a low degree of vagal suppression in the face of an actual stressor would also constitute a maladaptive response indicative of poor parasympathetic regulation.

The rhythmic variation in heart rate produced by breathing is called respiratory sinus arrhythmia, a phenomenon known to be highly consistent with vagal activity (Appelhans & Luecken, 2006). In fact, though some have cast doubt on the relationship between respiratory sinus arrhythmia and vagal tone (Grossman & Taylor, 2007), the magnitude of HRV produced by breathing has often been used as an index of vagal tone. Research using HRV as a marker of vagal influence on the heart has consistently shown that vagal reactivity is dependent on both context and individual characteristics of those interpreting environmental demands. For example, laboratory stressors that elicit autonomic nervous system activation such as mental arithmetic tasks, worry, recall of negative events, and exposure to traumatic stimuli have all evoked decreases of vagal control as indicated by reduced HRV (Friedman, 2007). Moreover, behavioral treatments known to reduce stress such as relaxation, massage and exercise have all been shown to augment HRV (Beauchaine, 2001). In addition, there is evidence indicating that individuals suffering from certain distress disorders respond poorly to stress as indicated by abnormalities in HRV reactivity. Specifically, a number of studies have found that individuals with panic disorder and a sub-group of individuals with depression and high anxiety responded to stressors with greater reductions in HRV than controls (Santucci, Friedman, & Pumphrey, 2000; Yeragani, Pohl, Balon, Ramesh, Glitz, Jung, et al., 1991; Yeragani, Pohl, Berger, Balon, Ramesh, Glitz, et al., 1993). By contrast, PTSD patients have displayed a lack of HRV reactivity compared to controls (Cohen, Benjamin, Geva, Matar, Kaplan, & Kotler, 2000; Cohen, Kotler, Matar, Kaplan, Loewenthal, Miodownick,

et al., 1998). In the case of other distress disorders, such as phobias and GAD, mixed results have been reported (for a review see Friedman, 2007).

It should be noted, however, that certain aspects of the research findings in this field warrant attention. First, psychophysiological markers of psychopathology rarely, if ever, yield wholly consistent findings. Friedman (2007) points out that these inconsistencies are probably the result of two factors: (a) the heterogeneity of distress disorders; and (b) the possibility that other variables such as age or severity of distress may affect the association between HRV reactivity and a given disorder. In other words, context can interact with individual characteristics to produce either normal or abnormal physiological reactions. Second, the associations between HRV reactivity and distress disorders need to be considered in light of the general finding that individuals with distress disorders are usually characterized by lower basal HRV than controls (Beauchaine, 2001). For example, studies that reported a lack of HRV reactivity in patients with PSTD also reported lower overall HRV in PTSD patients compared to controls (Cohen et al., 1998, 2000). Thus, irrespective of stress reactivity, distress disorders are often characterized by low HRV. In the case of PTSD, extremely low basal HRV is reflective of a chronically hyperactive cardiac system that leads to a ceiling effect in response to a stressor. In individuals with other distress disorders, especially panic patients and anxious depressives, lower basal HRV is compounded by excessive vagal withdrawal in response to stress signifying a malfunctioning parasympathetic nervous system associated with emotional instability.

Only a handful of studies have examined whether irregularities in HRV reactivity in 'normals' characterized by traits consistent with low personal resources place them at risk for distress disorders. In one such study, moments of intense confidence/optimism and intense helplessness/hopelessness were identified during chess games while heart rate was being recorded (Schwarz, Schachinger, Adler, & Goetz, 2003). Results showed that hopelessness/ pessimism was associated with decreased HRV.

In another study, Fuller (1992) examined the effects of a naturally occurring stressor on parasympathetic reactivity as a function of trait anxiety. Results showed that HRV was lower in students with high trait anxiety compared to those with low trait anxiety two weeks before and the day prior to an important exam. In contrast, a study which investigated whether trait anxiety moderated HRV reactivity in individuals who perceived more recent stress in their lives found that a significant inverse relationship between HRV and perceived stress was independent of trait anxiety (Dishman, Nakamura, Garcia, Thompson, Dunn, & Blair, 2000).

Lastly, Weinstein and Quigley (2006) reported that Locus of Control (LOC) influenced vagal response to a novel laboratory stressor. That is, an external locus of control characterized by the belief that powerful others control life events was associated with a lack of HRV reactivity during a video-game task. Interestingly, the belief that the outcome of events is due to chance was unrelated to HRV reactivity, suggesting that the abnormality in parasympathetic reactivity pertained to a specific type of external LOC.

In sum, a lack of HRV reactivity in individuals endorsing a powerful-others LOC belief system mimics the parasympathetic aberrations found in PTSD patients, and differs

from the excessive vagal withdrawal observed in pessimists, panic patients and anxious depressives. These findings constitute preliminary evidence that, under certain circumstances, deficits in personal resources are associated with a poorly functioning cardiac system as indicated by abnormalities in HRV reactivity. Based on the evidence reviewed, any abnormality in HRV reactivity displayed by individuals low in personal resources would be dependent on context. The association between personal resources and HRV responses may therefore be a function of level of stress. Given a situation in which individuals face a low to moderate normative stressor, the expectation would be that low resources would be associated with large decreases in HRV. This decrease in HRV would point to excessive vagal suppression and risk for panic disorder, and depression co-morbid with anxiety. In the context of an intense stressor or a challenge perceived to be beyond one's control, the expectation would be that low personal resources would be linked with abnormally small decreases in HRV. Such blunted parasympathetic activity would be indicative of risk for PTSD and perhaps severe cases of other distress disorders. At this juncture, there is a need for studies to explore whether the moderating effect of HRV reactivity on the relationship between trait resources and distress is dependent on level of stress and type of distress symptoms.

Personal resources, stress-related selective attention, and distress

In addition to aberrations in stress-related HRV reactivity, individuals with low personal resources may also respond to stress with selection attention strategies that reflect high levels of distress. Attention can be understood as a gateway between the external environment and thought processes (Corbetta, Miezen, Dobmeyer, Shulman, and

Petersen, 1990). One of the basic functions of attention is to aid cognitive processing by intensifying the signal that is deemed most worthy of the individual's interest. In this sense, attention manages the onslaught of environmental information by prioritizing and selecting what warrants additional mental effort thus serving as an early influence on behavior. Personal resources may influence attention during stress through a mechanism that Laberge (1995) has termed preparatory attention. That is, a relatively stable set of traits may produce expectations regarding life challenges that serve to direct attention to spatial locations that are conducive to either adaptive or maladaptive behaviors. For example, early detection of threat can be adaptive if preparation for an appropriate defense response is needed. If the threshold for shifting into defense mode is too low however, frequent and non-adaptive anxiety episodes can occur rendering the individual vulnerable to clinical levels of anxiety (Williams, Watts, MacLeod, and Mathews, 1988). In essence, personal resources may elicit a type of attentional expectancy that is associated with the overly sensitive detection of threat.

There is considerable evidence suggesting that certain distress disorders are characterized by an oversensitive selective attention bias for negative information (for reviews see Mathews & MacLeod, 1994; Mogg & Bradley, 2004). However, there are no known studies that have examined whether stress generates a maladaptive attentional bias for negative information in clinical populations with distress disorders. In non-clinical populations, findings are mixed and indicate that the relationship between personal resources and stress-related enhanced vigilance for negative information may be dependent on the intensity and duration of the stressor. Findings from studies examining

the relations among adaptiveness, stress, and attentional bias are reviewed below. First, the methodological merits of the two tasks most frequently used to determine attentional bias are assessed.

The most commonly used attention paradigms have been the modified Stroop and the visual probe tasks. In the modified Stroop task, participants are shown words varying in emotional intensity printed in an assortment of colors and are required to name the color of the word as quickly as possible. Any delay in color naming is attributed to the meaning of the word interfering with the task. That is, delay in naming the color of the word is treated as an index of the attention-grabbing power of the word. In general, studies have shown that anxious individuals take longer to name the colors of threatening words than controls suggesting that individuals characterized by anxiety have an attentional bias to threat content (for a review see, Williams, Mathews, & MacLeod, 1996). A number of researchers, however, have pointed out that there are interpretative difficulties associated with the Stroop task. According to MacLeod (1991), for example, interference effects typically interpreted as attention to threat may simply be indicative of a delayed response. In other words, the interference effect may occur not at the input phase of information processing when initial attention to a stimuli takes place, but rather at a later phase of response selection. In addition, rather than vigilance for threat, interference effects may actually reflect cognitive avoidance whereby delayed color naming is the result of the effort required to direct attention away from negative information (de-Ruiter & Brosschot, 1994).

To overcome the methodological limitations of the Stroop task MacLeod, Tata, and Mathews (1986) developed the visual probe task. This task was based on research indicating that individuals respond more quickly to a cue shown in an attended rather than unattended area of a display (Posner, Snyder, & Davidson, 1980). In the standard procedure, a series of word pairs is briefly presented on a computer screen. On valid trials, one word of each pair is high in emotional valence (e.g., a threat word) and the other is neutral. The words then disappear and a probe (e.g., a dot) appears in the location previously occupied by one of the words. Participants are instructed to respond as quickly as possible to the probe. Faster latencies to probes replacing emotional words as compared to neutral words denote selective attention to emotionally charged information. A noteworthy deviation from the standard version of the "dot probe task" is the use of multiple types of threat stimuli. This strategy was originally employed to target selective attention to emotional stimuli that relate to the participant's most prominent concern. Although this manipulation has been used successfully in a clinical population (McNally, 1996), it has provided mixed results when used in non-clinical populations (MacLeod & Mathews, 1988; Mogg, Bradley, & Hallowell, 1994). More work is therefore required to determine under what circumstances selective attention in a non-clinical population is specific to a form of threat provoked by a particular stressor.

The dot probe paradigm has yielded evidence that certain distress disorders are associated with a selective attention bias to emotional information. Research has consistently demonstrated an attentional bias for threat cues in GAD patients (see Mogg & Bradley, 1998 for a review). One study also reported that OCD patients displayed

more vigilance for contamination content compared to mood-matched high trait anxious controls (Tata, Leibowitz, Prunty, Cameron, et al., 1996). Additionally, there are replicated findings suggesting that individuals with social phobia selectively attend to social threat stimuli, such as angry faces and social-threat words (Gilboa-Schechtman, Foa, & Amir, 1999; Heinrichs & Hofmann, 2001; Maidenberg, Chen, Craske, Bohn, & Bytrisky, 1996; Mogg, Philippot, & Bradley, 2004). Results are less consistent in the area of specific phobias. There is also no consensus on whether a mood-congruent attentional bias exists. Two studies revealed a selective attention bias for sad cues (Mathews, Ridgeway, & Williamson, 1996; Mogg, Bradley, & Williams, 1995), and another did not (MacLeod, Mathews, & Tata, 1986). In addition, a mixed diagnosis of depression and GAD does not appear to be associated with vigilance for threat cues (Mogg & Bradley, 2004). Thus, the evidence to date indicates a robust selective attention bias for threat cues in GAD and a likely enhanced vigilance for threat in OCD and social phobia. Findings pertaining to attentional bias in specific phobias and depression are inconclusive.

Based on data reviewed above, evidence of selective attention to threat in non-clinical populations may denote risk for certain anxiety disorders. Moreover, stress may generate anxiety states more likely to evoke selective attention to threat in at risk individuals. Indeed, there exists some preliminary evidence which indicates that, compared to individuals high in personal resources, those low in personal resources respond to stress by selectively attending to threat cues. Specifically, high trait anxious individuals have been shown to react to a naturally occurring stressor with an attentional

bias for threat information. For example, MacLeod and Mathews (1988) assessed selective attention in high and low trait-anxious students when state anxiety was low (at the outset of the school year) and again when state anxiety was high (one week prior to final exams). Results indicated that only high trait-anxious participants shifted attention to threat cues during both test occasions (i.e. had faster response latencies to threat words than neutral words). Also, results for examination-relevant words (e.g. test, failure) provided support for the interaction hypothesis. That is, at high stress, high trait-anxious participants shifted attention to exam-related words, whereas low trait-anxious participants shifted their attention away from such information (i.e. low trait-anxious participants had faster response latencies to neutral words than threat words). A subsequent investigation replicated these results (Mogg et al., 1994).

By contrast, a study which used a laboratory stressor generated results inconsistent with those reported above. Mogg, Mathews, Bird and Macgregor-Morris (1990) assessed attentional bias in high and low trait anxious students while randomly allocating participants to either a high stress condition (difficult anagram task with false negative feedback) or a low stress condition (easy anagram task with false positive feedback). Results showed that all participants shifted their attention to threat stimuli under the high stress condition. Similar results have also been reported elsewhere (Mogg, McNamara, Powys, Rawlinson, Sieffer, & Bradley, 2000; Wilson & MacLeod, 2003).

In summary, studies which have used the methodologically sound dot probe have provided mixed results. Short-lasting laboratory stressors characterized by high stress

provoke a similar selective attention bias for threat in both high and low trait-anxious individuals. On the other hand, naturally-occurring stressors characterized by both high or low stress and a relatively long period of anticipation trigger a greater attentional bias for threat stimuli in high trait-anxious individuals compared to low trait-anxious individuals. The latter finding is consistent with the pattern of attentional bias for threat stimuli observed in patients with GAD, OCD and social phobia. However, given the small number of studies characterized by complex findings conclusions about the risk of high trait-anxious individuals for distress disorders based on their attentional patterns await further inquiry. The available data points to the importance of context in determining whether a selective attention bias for threat information is adaptive or maladaptive. Specifically, the duration of the stressor and the degree of stress corresponding to selective attention patterns likely moderate the relationship between personal resources and psychological adjustment.

Conclusions

Numerous studies have shown that the trait components characteristic of deficits in personal resources are related to certain stress responses in ways that signal risk for distress disorders. Evidence pertaining to the subjective response system is comprehensive and relatively consistent. Although the data is less consistent, there is some evidence to suggest that deficiencies in personal resources are associated with abnormalities in HRV reactivity (i.e., either excessive or blunted vagal suppression) and overvigilance to negative information. Overall, the available research provides support for the stress-moderation model of distress disorders. The findings are generally

consistent with the hypothesis that personality dimensions related to the construct of personal resources interact with subjective, physiological, and behavioral stress responses in ways that increase the likelihood of distress disorders.

The stress-generation model: Personal resources, stress creation and distress

The stress-moderation model draws on an etiological perspective consistent with the diathesis-stress of distress disorders. In this model, low levels of personal resources signal vulnerability to distress disorders in the face of external life stressors that are perceived as overwhelming. On the other hand, the stress-generation model represents an elaboration of the transactional perspective described above. From the stress-generation viewpoint, the boundary between diathesis and stress is unclear. In this perspective, stress is not merely a reaction to a challenge but instead a state created by the individual. This an important theoretical shift from previous stress models in that individuals are seen as actively contributing to their stressful environments without the presence of an objective stressor triggering a stress response. A review of the research literature will provide evidence of an association between depression and stress generation. However, little is known about the association between stress generation and anxiety disorders. In addition, given that the stress-generation model is a relatively recent development, research on the relation between each trait component included in the construct of personal resources and the propensity to create stressful environments is sparse.

In her initial study, Hammen (1991) reported that a sample of women characterized by past recurrent episodes of depression were more likely to experience "dependent stress", stressful life events to which they had contributed, compared to

women with bipolar disorder, medical illness, or no disorder. Since then several other studies have replicated this finding in samples with histories of major depression, including community samples of adolescent women (Daley, Hammen, Burge, Davila, Paley, Lindberg, & Herzberg, 1997), adult men (Cui & Vaillant, 1997) and women (Hammen & Brennan, 2002), and clinical samples of adolescents (Rudolph, Hammen, Burge, Lindberg, Herzberg, & Daley, 2000) and adults (Harkness, Monroe, Simons, & Thase, 1999). In general, these studies have reported that the stress-depression link is not the result of objective stressors or "independent stress". Instead, depression has been found to be consistently associated with dependent stress likely to reflect interpersonal concerns (Hammen, 2005).

Although numerous studies have reported an association between depression and self-generated stress, only a few investigations have explored whether symptoms related to depression, such as anxiety, are also associated with dependent stress. Wingate and Joiner (2004) followed a group of black adolescents for one year and found that anxiety and conduct disorder symptoms were unrelated to life stress, whereas depressive symptoms predicted life difficulties including self-generated stress. In the only known study that assessed the relationship between anxiety and dependent stress, Rudolph and Hammen (1999) examined whether age and gender-related patterns of stress varied across type of stressors. Results showed that anxiety was unrelated to dependent interpersonal events (e.g., sibling conflict) in both boys and girls of preadolescent and adolescent ages. However, dependent non-interpersonal stress (e.g., academic failure) was significantly but *negatively* related to anxiety in boys and adolescents.

While the sparse findings to date suggest that self-generated stress is specific to depression, from a theoretical standpoint, one would expect a significant association between dependent stress and anxiety disorders given etiological factors consistent with the notion of self-generated stress. For example, a known cause of Panic Disorder is the catastrophic misinterpretation of normal bodily sensations. In other words, panic is self-generated given that it occurs without being triggered by an objective stressor. This conceptualization of panic attacks is consistent with patients reporting that attacks often come out of nowhere. Similar cases could be made for an association between self-generated stress and anxiety disorders such as OCD and social phobia. More studies are therefore needed to explore whether the dependent stress-anxiety link parallels the dependent stress-depression association.

Interestingly, the relationship between depression and dependent stress appears to be bidirectional. That is, depression predicts self-generated stress and conversely dependent stress may be a key predictor of depressive episodes (Kendler, Karkowski, & Prescott, 1999). Moreover, the tendency to create stress has been reported to be a characteristic of children of depressed mothers. Self-generated stress is therefore associated with a known risk factor for depression (Adrian & Hammen, 1993). Thus, research assessing the correlates and mechanisms of stress generation would serve to shed light on an aspect of vulnerability to depression that has particular relevance for programs aimed at preventing depression.

As noted earlier, identifying factors that contribute to stress generation is a relatively recent subject of inquiry. Personality dimensions are among the variables

hypothesized to be involved in the process of creating stress in one's life. Studies have examined whether poor social problem-solving efficacy and neuroticism/trait anxiety contribute to stress generation. For example, a longitudinal study by Davila and colleagues (1995) found that deficient social problem-solving skills based on responses to theoretical situations predicted interpersonal stress that was self-generated. Similarly, Herzberg and colleagues (1998) found that self-reported interpersonal incompetence predicted persistent interpersonal stress, controlling for psychiatric history.

Similarly, neuroticism, a personality dimension closely related to trait anxiety, has also been linked to stress generation (Fergusson & Horwood, 1987; Kendler, Gardner, & Prescott, 2003; Poulton & Andrews, 1992). Moreover, in a recent study Kendler and colleagues (2004) found that the positive association between neuroticism and interpersonal difficulties, understood to be self-generated stress, predicted increased depression.

To summarize, there is evidence that incompetence in social problem-solving and high neuroticism/trait anxiety are associated with stress generation. Despite these positive findings, a full understanding of whether personal resources are implicated in the generation of stress is limited for two reasons. First, research that points to an association between personal resources and stress generation equates interpersonal difficulties with dependent or self-generated stress. Although there are many interpersonal stressors that constitute self-inflicted difficulties, there are interpersonal stressors that occur with minimal contribution from the individual. The studies to date are characterized by methodological limitations that render their findings inconclusive in this regard. In

addition, there is a dearth of research on the association between personal resources and stress generation. There are no studies, for example, that test whether self-esteem, locus of control and optimism are related to dependent stress. Essentially, further work is needed to test the validity of the stress generation model. In particular, more studies are needed to determine whether low levels of personal resources contribute to the creation of stress, the effect of which would be to render the individual vulnerable to distress disorders.

Overview

Rationale, study design, and hypotheses

The present study was designed to examine models of psychiatric risk that center on the relationships between personal resources and symptoms of depression and anxiety. Personal resources was defined as a higher-order personality construct subsuming five interrelated traits – self-esteem, self-efficacy, optimism, locus of control, and trait anxiety. Three models of psychiatric vulnerability were the focus of the study. Their respective positions may be summarized as follows: (1) the direct-link model - deficiencies in personal resources predispose the individual to symptoms of depression and anxiety. In this formulation, the link between personality function and psychiatric risk is direct; (2) the stress-moderation model - deficiencies in personal resources in the face of stress render the individual vulnerable to symptoms of depression and anxiety. In this formulation, which may be viewed as a diathesis-stress perspective, deficits in personal resources represent a predisposition to distress disorders in two indirect ways: (a) via the association of personal resources with maladaptive responses to objective

stressors, which in turn are associated with high levels of depression and anxiety symptoms, and (b) by the interaction of personal resources with responses to stressors in ways that predict distress symptoms; and (3) the stress-generation model - deficiencies in personal resources generate stressful environments. This model represents an important theoretical shift from the above stress model in that it blurs the boundary between diathesis and stress. In this formulation, instead of risk being associated with reactions to an objective stressor, psychiatric vulnerability is linked with individuals actively contributing to their environment by creating stress.

The study used a laboratory stress paradigm in a 6-month prospective time frame to determine the predictive strength of the three perspectives of psychiatric vulnerability. Data on personality resources, response to a laboratory stressor, and stressful events experienced in the past 12 months were collected at Time 1. Measures of psychiatric symptoms were collected at Time 2, six months later. The stress paradigm involved the use of a modified version of the Trier Social Stress to evoke stress (Kirschbaum, Pirke, & Hellhammer, 1993). This social-evaluative stressor consists of an anticipation period in which participants prepare a speech, a test period in which participants deliver the speech, and a recovery period in which participants relax following speech delivery. The Trier procedure was used for two main reasons; (1) it is a well-validated tool both psychometrically and ecologically for investigating psychobiological stress in a laboratory setting with non-clinical populations (Bassett, Marshall, & Spillane, 1987; Tersman, Collings, & Eneroth, 1991); and (2) the sequence of tasks (e.g., speech

preparation, speech delivery) makes it feasible to collect data without disrupting the natural flow of the stressor procedure.

The predictive strength of the direct-link model of psychiatric risk was examined by assessing the association between personal resources and clinical symptoms. The predictive strength of the stress-moderation model was examined by measuring whether individual differences in personal resources increase or decrease the likelihood of disorder via their influence on the individual's reactivity to a laboratory stressor. Three indicators of stress response were used: (1) mood change as a marker of subjective response; (2) vagal suppression as a physiological marker of autonomic regulation; and (3) selective attention as a behavioral marker of vigilance in the face of threat. Lastly, the predictive strength of the stress-generation model was examined by assessing whether personal resources were implicated in the creation of stressful environments associated with distress disorders. To do so, three types of stressful events were measured, dependent or self-generated stress (e.g., not having someone to date), normative stress, or stress generated by common stressors (e.g., school examinations), and stress experienced as a result of fateful independent events (e.g., loss of a loved one).

The present study tested hypotheses based on the aforementioned models of psychiatric risk:

1. The direct-link model: Low personal resources are associated with risk for (a) major depression, and (b) anxiety-spectrum disorders.

2. The stress-moderation model: Low personal resources are associated with the risk of (a) depression and (b) anxiety-spectrum disorders as a function of mood lowering, vagal

suppression, and selective attentional bias to threat in response to a stressor In addition, the interactive effects of personal resources and each of the foregoing dimensions of stressor reactivity are predictive of symptoms of (c) depression and (d) anxiety-spectrum disorders.

3. The stress-generation model: Low personal resources are associated with high levels of self-generated stress, the effects of which render the individual vulnerable to (a) depression and (b) anxiety-spectrum disorders. In addition, the interactive effects of personal resources and self-generated stress are predictive of symptoms of (c) depression and (d) anxiety-spectrum disorders.

Method

Sample

The volunteer sample consisted of 198 undergraduate students who responded to recruitment procedures. Screening for psychiatric disturbance, current substance abuse, or insufficient fluency in English resulted in the exclusion of 31 volunteers. Thus, 167 participants [42 males and 125 females, averaging 22 years of age, (SD = 4.8)] completed the first testing session and were asked to partake in a second testing session. Thirty-six participants either declined further participation when re-contacted or could not be reached. As a result, 131 of a possible 167 participants completed the second testing session [26 males and 105 females, averaging 22 years of age, (SD = 4.5)]. The final sample of 131 participants and the sample recruited of 167 participants did not differ on all key variables used for statistical analyses.

Materials and Apparatus

Screening: An abbreviated semi-structured clinical interview (SSCI) was conducted to rule out the presence of substance abuse and psychiatric disorder (see Appendix A). Also, the Cloze English Fluency Test was administered to rule out those with inadequate comprehension of English (see Appendix B). The test requires that the participant provide a word for each of the 30 blank spaces appearing on a one-page text. A score of 15 or above out of 30 was considered acceptable (Aitken, 1977). Participants who reported not being fluent in English, or had difficulty completing the trait measures, were tested for English comprehension.

Trait Measures: The Life Orientation Test (LOT), Rosenberg's Self-Esteem Scale (RSES), the Problem Solving Inventory (PSI), Spielberger's Trait Anxiety Inventory (STAI), and the Adult Nowicki-Strickland Internal-External Locus of Control Scale (ANSIE) were the measures used in the study to assess for personal resources.

The LOT consists of eight items (plus four filler items) that assess for dispositional optimism defined as generalized outcome expectancies (Scheier and Carver, 1985; see Appendix C). For each item participants respond by circling one of five points on a likert scale ranging from "0" (strongly disagree) to "4" (strongly agree). Scheier and Carver (1985) assessed internal consistency and test-retest reliability at alpha = .76 and r = .79 respectively.

The Rosenberg Self-Esteem Scale is a 10-item questionnaire designed to appraise self-worth and self-acceptance (Rosenberg, 1965; see Appendix D). The score is obtained by summarizing the participant's ratings on a four-point likert scale. According to Rosenberg (1965), the scale has a Guttman scale reproducibility coefficient of .92 and a test-retest reliability over a two-week period of r = .85.

The PSI is a 32-item scale designed to measure self-appraised coping efficacy in the areas of problem-solving confidence, approach/avoidance style and personal control (Heppner & Peterson, 1982; see Appendix E). Participants respond on a six-point likert scale indicating their level of agreement with each particular item. According to Heppner and Peterson (1982), the PSI is excellent in terms of internal consistency (alpha = .90) and test retest reliability (r = .89).

The STAI is a 20-item scale measuring trait anxiety, that is, the tendency to experience feelings of tension and apprehension (Spielberger & Vagg, 1984; see Appendix F). The higher scores of neurotic subjects and depressed patients relative to 'normals' on the STAI provide evidence that this measure has good construct validity (Spielberger & Vagg, 1984). The Cronbach alpha has been assessed at .88 (Spielberger & Vagg, 1984).

The ANSIE was used to measure the extent to which one views life outcomes as dependent on one's own abilities, or as dependent on environmental factors beyond one's control (Duke and Norwicki, 1973; see Appendix G). The ANSIE is a 40-item yes-no scale that controls for social desirability. Duke and Norwicki reported that the ANSIE has excellent psychometric properties with a test-retest reliability of $r = .83$ and internal consistency ratings ranging from .66 to .73.

Personal Resources Factor: Personal resources refers to a higher order construct subsuming the above correlated trait measures (see results section for factor analysis, p.50). This factor can be understood as a mindset related to stress appraisal and adjustment.

Measures of Affective State: Self-reported mood and stress levels were assessed using the Bipolar Profile of Mood States questionnaire (POMS) and the Student Stress Questionnaire (SSQ). The POMS is a 72-item questionnaire that allows participants to evaluate themselves on six bipolar scales: composed-anxious, elated-depressed, confident-unsure, energetic-tired, clearheaded-confused, and agreeable-hostile (McNair, Lorr, and Droppleman, 1988; see Appendix H). Participants rate themselves from 0 to 3

in relation to an emotionally-valenced word (e.g. sad, nervous, etc...), where "0" indicates that they *feel much unlike* the word, and "3" indicates that they *feel much like* the word. Sub-scale scores were combined to produce a summary score indicative of overall mood state. The POMS is reported to be sensitive to changes in mood state and to have good psychometric properties (McNair et al., 1988).

The SSQ is a 21-item self-report questionnaire designed to measure responses to varying types of stressful live events (see Appendix I). The SSQ is divided into three subscales; four items assess reactivity to normative events (e.g., Having papers or essays to write), six items assess reactivity to dependent events (e.g., Having problems managing your time effectively), and 11 items assess reactivity to independent events (e.g., Death of a family member). Participants indicate the extent to which an event was stressful to them in the past 12 months by placing a vertical bar across a 100 mm line to register responses ranging from *not at all* to *extremely stressful.* The mean is calculated for each subscale providing a single score for dependent, normative, and independent stress respectively.

The 21 items in the SSQ were selected from existing life-stress questionnaires, namely, the College Chronic Life Stress Survey (Towbes & Cohen, 1996), the Peri Life Events Survey (Dohrenwend, Krasnoff, Askenasy, & Dohrenwend. 1978), and the Adolescent Perceived Events Scale (Compas, Davis, Forsythe, & Wagner, 1987). Six independent raters classified the items in the aforementioned questionnaires as normative, dependent, or independent. To be included in the SSQ, an item had to be rated in the same category by at least five of six raters.

Physiological measure: Respiratory sinus arrhythmia (RSA, or high frequency HRV), an index of cardiac vagal tone, was used as the physiological marker of stress reactivity. In order to generate RSA scores inter-beat-interval (IBI) was obtained using a wireless heart rate monitor (the Polar Vantage NV). Participants wore a dual-electrode band around their chest which transmitted the cardiac data to a watch placed on the participant's wrist where the data were temporarily stored. The IBI files were then transferred onto a desktop computer where editing of recording artifacts was followed by the computation of RSA using the method developed by Porges (1985). In this method, MXEDIT software (Delta Biometrics, Inc.) uses a moving 21-point polynomial algorithm that isolates heart rate variability at the amplitude and period of the oscillations associated with breathing. High amplitude frequencies ranging from .12 to .40 Hz were used to compute RSA - reported in units of $\ln(\text{msec})^2$.

Each participant's IBI datafile was divided into three segments: (a) the initial10-minute relaxation period was used to compute baseline RSA; (b) the10-minute period during which participants prepared their speech was used to calculate RSA suppression during anticipation of a stressful task; and (c) the five-minute period during which participants delivered their speech was used to compute RSA suppression during a challenge (see section entitled "Procedure" for a description of the stress-inducing task used in the experiment). Three mean RSA scores per participant were computed, one for each segment of a participant's IBI datafile. To do so, RSA scores were calculated for every successive 20-second interval and the mean of these values was then used as a measure of baseline RSA or RSA suppression for the participant in question.

Attention Paradigm: The probe detection paradigm (a reaction time task) was used to assess selective attention to threat words. Each trial began with a central fixation cross appearing for 500 milliseconds (msec). A word pair in upper-case letters then appeared for 500 msec, with one word above and the other below the central fixation point. Following the presentation of a word pair, a dot probe replaced one of the words. The probe remained on the screen until the subject responded. The participant was instructed to press "K" on the computer keyboard when the probe was above the central point, and "M" when the probe was below the central point. The inter-trial interval was either 500, 750, 1000, or 1500 msec in randomized sequence. In all, there were 11 practice trials followed by 48 experimental trials. The trials were presented in a newly randomized order for each subject, and the threat word and probe appeared in either the upper or lower position with equal probability. The trials of interest were those consisting of threat-neutral word pairs, while the remaining trials acted as filler items. Mean reaction times to probes replacing threat words relative to mean reaction times to probes replacing neutral words were compared to produce an index of selective attention. An attentional bias score for each participant was calculated using the following equation: Attentional bias score = ½[(UpLt – UpUt) + (LpUt – LpLt)], where U = upper position, L = lower position, p = probe, t = threat word (Mogg et al., 1994). Thus, LpUt is when the probe is in the lower position (replacing a neutral word) and the threat word in the upper position. Bias scores where values are positive reflect faster reaction times to probes replacing threat words relative to probes replacing neutral words and are interpreted to signify selective attention towards the spatial location of threat words.

Alternatively, negative values reflect faster reaction times to probes replacing neutral words relative to probes replacing threat words and are interpreted to indicate selective attention away from the spatial location of threat words.

The words used in the probe detection task were drawn from previous research on anxiety and selective attention (e.g. MacLeod & Mathews, 1988; Mogg et al., 1994; see list of words in Appendix J). There were 32 achievement threat words (e.g. humiliated, worthless) and 32 physical threat words (e.g. crippled, murder) that were matched for length, frequency, and emotional valence. The achievement and physical threat word lists were each divided in half to provide two sets of words (A and B) equal in length, frequency, and emotional valence. All threat words were paired with neutral words matched for frequency and length (e.g. murder-decade; worthless-grassland). An additional 32 neutral-neutral word pairs matched for length acted as filler items. Half the neutral-neutral word pairs were allocated to set A and the other half allocated to set B. Thus, two word sets (A and B) consisted of 16 achievement threat-neutral-word pairs, 16 physical threat-neutral word pairs, and 16 neutral-neutral word pairs respectively. The sequence of administration for versions A and B of the probe detection task was counterbalanced across subjects.

Apparatus: A Power Macintosh 4400/200 with a 14-inch display monitor was used for the attention paradigm.

Measures of Symptom Severity

The revised version of the Beck Depression Inventory (BDI-II) was the instrument used to assess severity of depression. The BDI-II is a well-known 21-item

self-report questionnaire with excellent psychometric properties (Beck & Steer, 1996). It has been used extensively in research with both clinical and student samples.

The Beck Anxiety Inventory (BAI) was used to assess level of anxiety. The BAI is similar in structure to the BDI-II in that it consists of 21 items with each item being rated on a four-point scale ranging from 0 to 3. Several studies using a variety of clinical and non-clinical populations have found that the BAI has high internal consistency (Cronbach coefficient alphas > .90) and moderate to high convergent validity with other self-report and clinical ratings scales of anxiety (*rs* > .50). The BAI was included in this study because it was constructed with the goal that it would have a low correlation with self-reported depression as measured with the BDI (Steer & Beck, 1997). In the current study, the discriminant validity of the BAI relative to the BDI-II was moderate (r = .56).

Procedure

The current study consisted of two testing sessions. The first testing session included the recording of baseline measures, the assessment of reactivity to an experimental stressor, and the measurement of different types of life event stressors experienced in the past 12 months. The second testing session was a follow-up session that focused on obtaining measures of depression and anxiety. At the outset of the first testing session, participants completed the consent form (see Appendix K) prior to undergoing screening procedures for substance abuse, psychiatric disorder, and when appropriate, English fluency. Those who met the inclusion criteria completed the trait measures and were then fitted with the heart rate monitor and asked to relax for 10 minutes during which baseline IBIs were recorded. Following the relaxation period, the

heart rate monitor was deactivated in order to clearly identify the end of the baseline IBI file, and subjects then completed baseline measures of mood (POMS). Participants were then escorted to another area of the laboratory (room 2) where a baseline measure of attentional bias to threat words was obtained using one of the two versions of the probe detection task. Participants performed this task in a seated position with their chins supported by a chin rest 57 cm away from the computer screen.

After completion of the baseline attention task, participants returned to the original testing room where part of the stressor task took place. A modified version of the "Trier Social Stress Test" (TSST) was used to induce moderate stress (Kirschbaum, Pirke, & Hellhammer, 1993). Subjects were asked to take on the role of a job applicant and prepare a speech which detailed why they should be hired for a hypothetical job opening of their choice. Participants were told that they had 10 minutes to prepare a five-minute speech which they would subsequently deliver in front of a panel of two confederates acting as staff managers. Participants were also advised that their speech would be video-recorded and that their performance would be evaluated in order to add authenticity to the stress manipulation. Following these instructions, the heart rate monitor was reactivated marking the start of speech preparation or *anticipatory* stress. Once the allotted 10 minutes had expired, the heart rate monitor was once again deactivated so that the IBI files that corresponded to *anticipatory* stress could be clearly identified. Participants then completed the measure of mood state (POMS) during *anticipatory* stress prior to returning to room 2 where they completed the alternate version of the probe detection task (without practice trials).

Once anticipatory stress reactions were recorded, participants were escorted to a third room where the speech delivery portion of the stressor task took place. At the outset of speech delivery the heart rate monitor was once again reactivated. Following their speech, participants were asked to relax for 10 minutes. When the relaxation period was completed the heart rate monitor was deactivated and participants could remove the electrode band from their chest and the watch from their wrist. Lastly, participants completed the SSQ in order to assess the level of stress experienced in the past 12 months associated with varying types of life events. The first testing session ended with the experimenter debriefing participants on the rationale for having used deception and on the overall purpose of the study. Participants were given $20 for their involvement in this portion of the study which lasted roughly 2 hours.

The second testing session took place approximately six months after the participant's initial involvement in the study. Participants were re-contacted and simply asked to complete the BDI-II and the BAI as a follow-up to the first testing session.

Results

Preliminary statistics: Descriptive statistics were used to evaluate the normality of the distribution of each key variable in the study and to assess for the presence of outliers. The distributions for anxiety and depressive symptoms were found to be positively skewed. Corrections were made to normalize these distributions. The square root correction was used to normalize the depression distribution, while the reflective inverse technique [1 – (1/beck anxiety)] was used to normalize the more severely skewed anxiety distribution. Abnormalities were also found for the independent stress variable and the selective attention reactivity (achievement threat) variable. However, these distributions were not corrected for skewness in order to permit comparisons with other similar variables (e.g., uncorrected independent stress scores remained on the same scale as dependent and normative stress scores). Outliers for several variables were also found and replaced as the most extreme scores in normal distributions. Analyses were conducted using both the corrected data for outliers and skewness and the uncorrected raw data. The results were not significantly different.

Personal Resources: The level of correlation between trait measures was sizeable enough to permit a principle components factor analysis of the relations among trait variables (Tabachnick & Fidell, 1989; see Table 1 for correlations among trait variable). The five trait variables combined to form a single factor termed Personal Resources (eigenvalue = 2.94, factor explained 58.8% of the variance). The factor loadings for each of the traits are reported in Table 2.

Table1

Correlations between trait measures (n=167)

		1	2	3	4	5
1.	PSI	-	.50	-.53	.45	.44
2.	RSES		-	-.72	.52	.42
3.	STAI			-	-.55	-.44
4.	LOT				-	.31
5.	ANSIE					-

Note: all correlations are significant, $p < .001$

PSI = problem-solving inventory
RSES = self-esteem scale (Rosenberg)
STAI = trait anxiety inventory (Spielberger)
LOT = life orientation test
ANSIE = locus of control scale (Nowicki-Strickland)

Table 2

Factor loadings of trait measures comprising the Personal Resources factor

Trait Measures	Factor Loadings
Self- Efficacy (PSI)	.74
Self-Esteem (RSES)	.84
Trait Anxiety (STAI)	-.86
Optimism (LOT)	.73
Locus of Control (ANSIE)	.65

Stress manipulation check: To determine whether the stressor task was meaningful, a repeated-measures ANOVA was conducted to test for significant increases in heart rate from baseline (T1), to speech preparation (T2), and speech delivery (T3). This analysis indicated a significant main effect for time, [$F(2,166) = 213.02$, $p < .001$]. Follow-up Bonferroni tests showed that the heart rate of participants increased significantly for all pairwise comparisons between T1 (M=72.98, SD=8.9), T2 (M=79.99, SD=11.39), and T3 (M=89.11, SD=15.03) heart rates.

The impact of the stressor was also tested by conducting a repeated-measures ANOVA on vagal tone scores. This analysis provided further support for the effectiveness of the stress manipulation by showing a significant effect for time, [$F(2,147) = 32.71$, $p < .001$]. Follow-up Bonferroni tests indicated significant decreases for all pairwise comparisons between T1 (M=6.82, SD=0.92), T2 (M=6.54, SD=0.92), and T3 (M=6.36, SD=0.93) vagal tone scores.

Lastly, a t-test comparing overall POMS scores at baseline and speech preparation was used to examine whether mood decreased significantly from baseline to speech preparation. Consistent with physiological measures, this analysis showed that mood declined significantly, [$t(167) = 10.12$, $p < .001$, 2-tailed], from T1 (M=27.05, SD=4.04) to T2 (M=24.18, SD=4.96).

Correlation Matrix: The first-order correlations among key variables in this study are presented in Table 3. Variables labeled mood reactivity, vagal reactivity (anticipatory stress), attention reactivity (physical threat words), and attention reactivity (achievement

threat words) represent residualized scores which indicate stress responses at speech preparation taking into account scores at baseline. That is, scores for mood, vagal tone, and selective attention during speech preparation were regressed on their respective baseline scores and the resulting residuals were used as markers of anticipatory stress. In addition, the variable labeled vagal reactivity (stress task) was obtained by regressing vagal scores recorded during speech delivery on baseline vagal scores and the resulting residuals were averaged to indicate stress responsivity. Lastly, the variable labeled personal resources also represents a latent variable (see above), while all other variables are observable measures.

A number of correlations in Table 3 reflect expected associations between certain variables. Consistent with hypotheses deriving from the direct link-model, personal resources were negatively associated with anxiety and depression symptoms. Partial correlations, however, showed that the association between resources and anxiety was not significant when controlling for their shared variance with depression ($r = -.05$, $p > .10$). Alternatively, partial correlations demonstrated that the association between resources and depression remained significant even after controlling for their shared variance with anxiety ($r = -.25$, $p < .01$). Also, several correlations were compatible with hypotheses deriving from the stress-generation model. For example, personal resources were negatively related to dependent stress, which in turn, was associated with depression and anxiety symptoms. As expected, personal resources were not significantly associated with independent stress, providing support for the validity of independent stress as a construct unrelated to person variables. By contrast, most of the correlations expected to

Table 3

Intercorrelations between predictor and criterion variables

Measures	1	2	3	4	5	6	7	8	9	10	11
1. Personal Resources	-	.21**	-.08	-.16	.06	-.04	-.41**	-.33**	-.04	-.32**	-.22*
2. Mood Reactivity		-	.12	.05	-.05	-.06	-.25**	-.27**	-.06	-.12	-.10
3. Vagal Reactivity (anticipatory stress)			-	.50**	-.08	.02	-.08	-.04	-.25**	-.06	-.17
4. Vagal Reactivity (stress task)				-	-.09	-.01	.07	.05	-.11	.04	-.12
5. Attention Reactivity (physical threat)					-	.00	.01	.00	.06	.01	.09
6. Attention Reactivity (achievement threat)						-	-.09	-.11	-.07	-.07	-.17
7. Dependent Stress							-	.56**	.29**	.39**	.33**
8. Normative Stress								-	.21**	.28**	.30**
9. Independent Stress									-	.09	.29**
10. Depression Symptoms										-	.56**
11. Anxiety Symptoms											-

Note: ns range between 121 - 167

*p<.05; **p<.01

reflect relationships consistent with the stress-moderation hypotheses were not significant. Personal resources were not linked to vagal or attention reactivity, nor were these reactivity measures related to symptoms. The only exception was a significant and negative correlation between personal resources and mood reactivity.

Overview of Analyses: Path models and hierarchical regression analyses were used to assess the predictive strength of three separate conceptualizations of psychiatric risk: (1) the direct-link model; (2) the stress-moderation model; and (3) the stress-generation model. Four a priori path models were developed to test both the direct and indirect effects of personal resources on depression and anxiety symptoms respectively. Two of these path models assessed hypotheses deriving from the direct-link and stress-moderation models. One such path model was characterized by depression as the outcome measure. In this model, a direct path from personal resources to depression was hypothesized. The stress-moderation hypothesis was examined via indirect paths from personal resources to depression by way of stress-induced mood lowering, vagal suppression, and selective attention to threat words. A similar a priori path model in which anxiety was the outcome measure was also tested.

The other two a priori path models assessed hypotheses stemming from the direct-link and stress-generation models. In the path model depicting depression as the outcome measure, a direct path from personal resources to depression was hypothesized. The stress-generation hypothesis was assessed via two indirect paths from personal resources to depression; (a) an indirect path from personal resources to depression by way of dependent stress; and (b) an indirect path from personal resources to depression through

normative stress, which in turn, was predicted to be linked with dependent stress. A similar a priori path model in which anxiety was the outcome measure was also tested.

Path models were submitted to path analyses using EQS statistical software (Bentler, 1995). Maximum likelihood estimation was used to test the models. The chi-square statistic tests the degree to which a proposed model fits the sample data. A non-significant chi-square suggests a good fit. Two other goodness of fit indices were also selected, namely, the comparative fit index (CFI) and the root mean square of approximation (RMSEA). The CFI represents the proportion of improvement of the overall fit of a proposed model relative to no fit at all. A CFI value equal to or above 0.95 reflects a good fit. The RMSEA is an index of residuals with the cut-off value of 0.10 with smaller values indicating a better fit (Lucie Bonneville, personal communication, June 28, 2007).

Regression analyses were also used to test the stress-moderation and stress-generation models of psychiatric risk. To examine the validity of the stress-moderation model, regression analyses were utilized to assess whether 2-way interactions existed between personal resources and either subjective stress (mood reactivity), physiological stress (vagal reactivity), or behavioral stress (attention reactivity) predicting either depression and/or anxiety symptoms. Exploratory regression analyses also assessed potential 3-way interactions among personal resources and each possible combination of two of the three aforementioned stress reactions predicting distress symptoms. To test the stress-generation model, regression analyses were used to assess whether personal resources interacted with dependent stress to predict depression and/or anxiety

symptoms. Exploratory regression analyses also tested two possible 3-way interactions predicting distress symptoms; (a) personal resources/dependent stress/independent stress; and (b) personal resources/dependent stress/normative stress.

In sum, four a priori path models tested the hypotheses deriving from the direct-link model of risk for distress disorders. Of these path models, two path models also tested hypotheses stemming from the stress-moderation model where one model depicted depression as the outcome measure and the other anxiety. In addition, two path models assessed hypotheses deriving from both the direct-link and the stress-generation models, where one model tested depression as the outcome measure and the other anxiety. Regression analyses assessing 2-way and 3-way interactions were also employed to examine the predictive validity of both the stress-moderation and stress-generation models of psychiatric risk.

Path Model testing hypotheses 1a and 2a

The results for the path model testing the direct-link and stress moderation hypotheses for the prediction of depression symptoms are presented in Figure 1. The fit for the overall model was good (chi-square = 2.82, p = 0.83; CFI = 1.00; RMSEA = 0.00). This model provided strong support for the direct link hypothesis but not for the stress moderation hypothesis. As expected, deficits in personal resources were found to be a direct predictor of depression symptoms. By contrast, the stress moderation hypothesis was not supported by this model. Specifically, personal resources did not predict depression symptoms indirectly through its relation with stress responses. That is, although low levels of personal resources predicted greater decreases in mood during

anticipatory stress, the path from mood reactivity to depression was not significant. Moreover, paths from personal resources to vagal tone reactivity, selective attention reactivity (physical threat words), and selective attention reactivity (achievement threat words) were not significant. Lastly, the only reactivity measure which predicted depression symptoms was selective attention (achievement threat words), where more attention to achievement threat words during anticipatory stress was associated with fewer depression symptoms. Of note, replacing the vagal tone reactivity variable representing anticipatory stress with a variable representing vagal tone reactivity during stress did not alter the model significantly (see Appendix L).

Path Model testing hypotheses 1b and 2b

The results of the path model testing the direct-link and stress moderation hypotheses for the prediction of anxiety symptoms are presented in Figure 2. This model is characterized by results which are very similar to those described above. That is, the fit for the overall model was good (chi-square = 3.47, p = 0.75; CFI = 1.00; RMSEA = 0.00), providing support for the direct link hypothesis but not for the stress moderation hypothesis. Consistent with past research, low levels of personal resources were found to be a direct predictor of anxiety symptoms. By contrast, the stress moderation hypothesis was not supported by this model. Specifically, personal resources did not predict anxiety symptoms indirectly through its relation with stress responses. For example, although low levels of personal resources predicted greater decreases in mood during stress, the path from mood reactivity to anxiety was not significant. Additionally, paths from

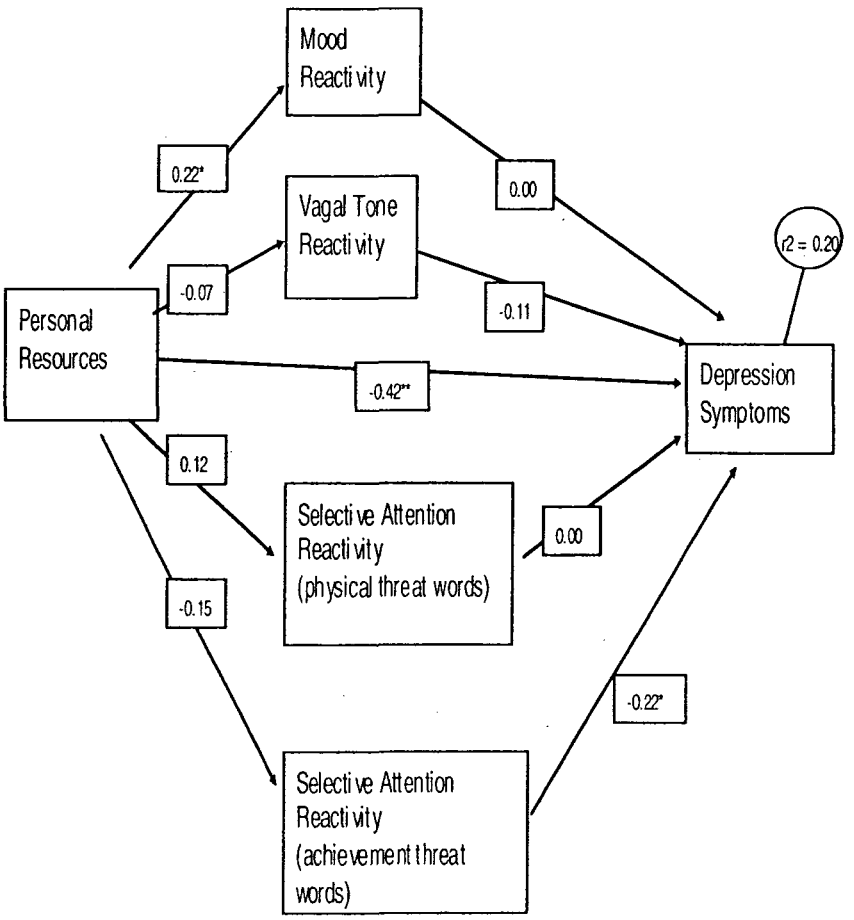

Figure 1. Path model testing the direct-link and stress moderation hypotheses for the prediction of depression symptoms (n = 113)

Chi Square = 2.82, p = 0.83, CFI = 1.00, RMSEA = 0.00

* = p < .01; ** = p < .001

personal resources to vagal tone reactivity, selective attention reactivity (physical threat words), and selective attention reactivity (achievement threat words) were not significant.

Finally, the only reactivity measure which significantly predicted anxiety symptoms was selective attention (achievement threat), where more attention to achievement threat words during anticipatory stress predicted fewer anxiety symptoms. As in the previous model, replacing the vagal tone reactivity variable representing anticipatory stress with a variable representing vagal tone reactivity during stress did alter the model significantly (see Appendix M).

Regression analyses testing hypotheses 2c and 2d

Hierarchical regressions were used to further assess hypotheses deriving from the stress-moderation model of psychiatric risk. Personal resources did not interact with mood, vagal tone, or selective attention to threat stimuli during a laboratory stressor to predict anxiety or depressive symptoms (see Appendix N for summary of non-significant results). In addition, 16 other hierarchical regressions were conducted to test 3-way interactions among personal resources and each possible combination of two of the three stress reactivity measures predicting anxiety and depression. Two 3-way interaction effects were found to be significant. First, the 3-way interaction of personal resources, vagal tone reactivity (*speech preparation*), and selective attention reactivity (achievement threat) predicted depression (beta = .24, $t = 2.55$, p = .01, see Table 4). The interaction is shown in Figure 3.

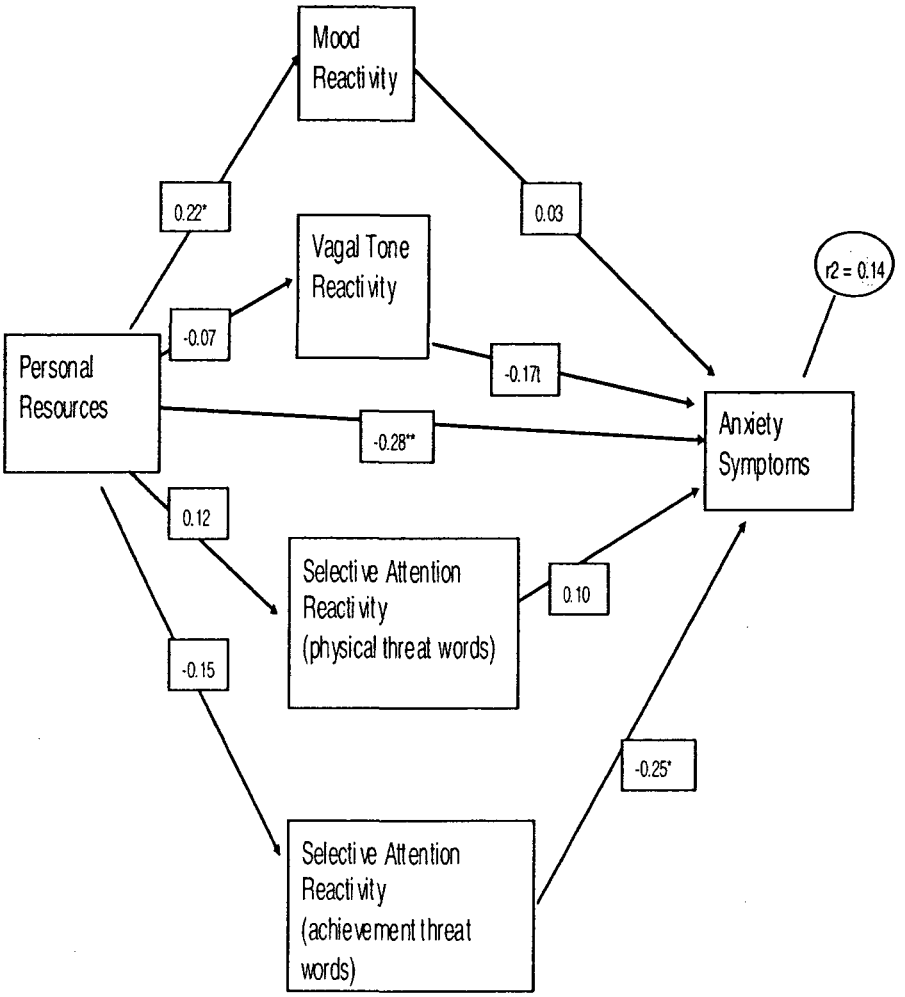

Figure 2. Path model testing the direct-link and stress moderation hypotheses for the prediction of anxiety symptoms (n = 113)

Chi Square = 3.47, p = 0.75, CFI = 1.00, RMSEA = 0.00

*= p < .01; ** = p < .001; t = p < .10

This graph depicts the relation between personal resources and depression as a function of high and low values of vagal reactivity and attention reactivity. The significance test developed by Dawson and Richter (2006) was used to examine whether differences existed between each possible combination of pairs of simple slopes. Results showed that slope 2 differed significantly from slope 3, (t = -2.46, $p < .05$), slope 2 differed significantly from slope 4 (t = -3.35, $p < .01$), and slope 2 differed marginally from slope 1 (t = 1.93, $p = .06$). In addition, Figure 3 illustrates a significant negative relationship between personal resources and depression given the combination of high vagal tone (or low vagal suppression) and low attention to achievement threat words (slope 2, beta = -.54, t = -4.60, $p < .001$). At high vagal tone and high attention to achievement threat words, the relationship between personal resources and depression was also significant (slope 1, beta = -.35, t = -2.04, $p < .05$). Moreover, the steepness of slope 3 was marginally significant (beta = -.26, t = -1.94, $p < .10$), whereas slope 4 was not significant (beta = -.01, t = -.04, $p > .05$). This pattern of results indicates that, although a significant relationship between personal resources and depression exists at multiple combinations of high and low physiological and cognitive responses, the slope for high vagal tone (low suppression) and low attention to achievement threat was significantly steeper than all other slopes.

The 3-way interaction of personal resources, vagal tone reactivity *during* the stress task (*speech delivery*), and attention reactivity (achievement threat) also predicted depression (beta = .22, t = 2.18, $p < .05$, see Table 5).

Table 4

Hierarchical regression model predicting depression symptoms (n=122)

Step	Variables	β	t	R^2 change	F change
1.	Personal Resources	-.33	-3.86**	.11	14.88**
2.	Personal Resources	-.36	-4.15**	.03	1.89
	Vagal Reactivity	-.09	-1.02		
	Attention Reactivity	-.14	-1.58		
3.	Personal Resources	-.38	-4.45**	.06	3.05*
	Vagal Reactivity	-.05	-.57		
	Attention Reactivity	-.20	-2.25*		
	Vagal x Attention	-.22	-2.46*		
	Resources x Vagal	-.19	-2.17*		
	Resources x Attention	-.02	-.23		
4.	Personal Resources	-.37	-4.45**	.04	6.50*
	Vagal Reactivity	.00	.01		
	Attention Reactivity	-.20	-2.28*		
	Vagal x Attention	-.23	-2.70**		
	Resources x Vagal	-.24	-2.78**		
	Resources x Attention	.07	.76		
	Resources x Vagal x Attention	.24	2.55*		
			$R^2 = .25$	R^2 adj. = .20	$F = 5.27$**

Note: *p<.05, **p<.01

Vagal variable refers to marker of anticipatory stress (speech preparation)

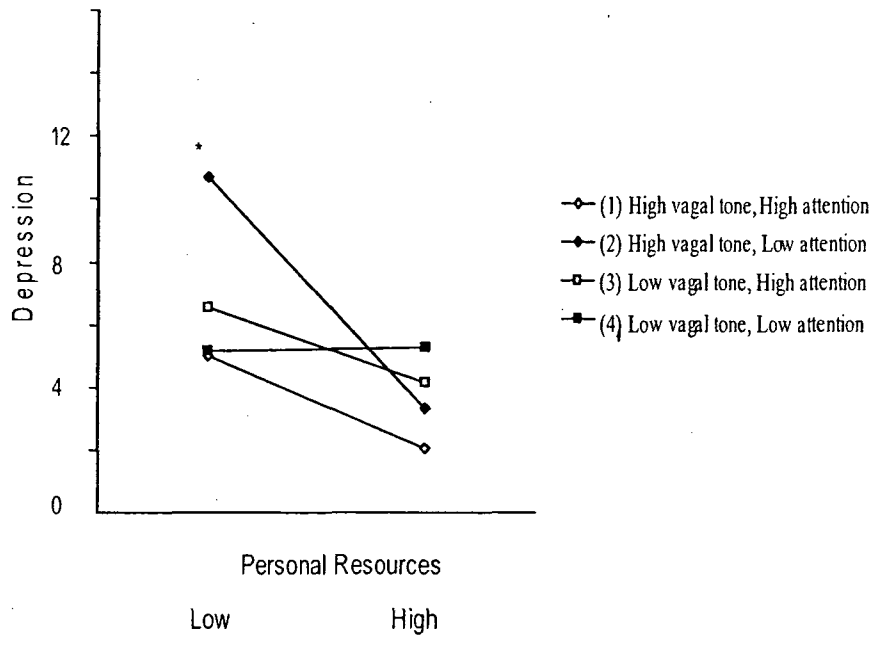

Figure 3. The association between depression and personal resources as a function of vagal suppression and attention to achievement threat during anticipatory stress (n=122)

* Indicates that significant slope differences exist among lines 2 and lines 3 & 4 respectively, $p<.05$; and that a marginal slope difference exists between lines 2 and 1, $p<.06$

The application of the slope difference test produced findings similar to those revealed by the 3-way interaction that included vagal reactivity at speech preparation. Specifically, slope 2 differed significantly from slope 1, (t = 2.22, $p < .05$), slope 2 differed significantly from slope 4, (t = -2.16, $p < .05$), and slope 2 differed marginally from slope 3, (t = -1.69, $p < .10$). Figure 4 also depicts a significant negative relationship between personal resources and depression given a pattern of high vagal tone (or low vagal suppression) and low attention to achievement threat words (slope 2, beta = -.70, t = -3.75, $p < .001$). Moreover, the steepness of slope 3 was marginally significant, (beta = -.27, t = -1.65, p =.10), whereas slope 1 (beta = -.15, t = -.88, $p > .10$) and slope 4 (beta = -.03, t = -.16, $p > .10$) were not significant. Accordingly, this pattern of results can be interpreted in the same way as the previously reported 3-way interaction which included vagal tone reactivity at speech preparation instead of vagal tone reactivity at speech delivery. That is, given a pattern of low physiological response and low cognitive reactivity during a stressor task, individuals with low levels of personal resources reported more depressive symptoms than individuals with high levels of personal resources.

Several other regression analyses testing 3-way interactions among personal resources and two of the three stress reactivity measures predicting anxiety or depression symptoms were also conducted. The results were not significant and are summarized in Appendix N.

Table 5

Hierarchical regression model predicting depression symptoms (n=122)

Step	Variables	*ß*	*t*	R^2 change	*F* change
1.	Personal Resources	-.30	-3.35**	.09	11.22**
2.	Personal Resources	-.30	-3.35**	.01	.43
	Vagal Reactivity	.00	.04		
	Attention Reactivity	-.08	-.93		
3.	Personal Resources	-.31	-3.36**	.04	1.65
	Vagal Reactivity	.02	.17		
	Attention Reactivity	-.08	-.87		
	Vagal x Attention	.14	1.41		
	Resources x Vagal	-.08	-.82		
	Resources x Attention	-.07	.76		
4.	Personal Resources	-.29	-3.20**	.04	4.77*
	Vagal Reactivity	.10	.97		
	Attention Reactivity	-.07	-.75		
	Vagal x Attention	.05	.48		
	Resources x Vagal	-.13	-1.31		
	Resources x Attention	.09	1.04		
	Resources x Vagal x Attention	.22	2.18*		
			R^2 = .17	R^2 adj. = .12	*F* = 3.21**

Note: *p<.05, **p<.01

Vagal variable refers to marker of stress during task (speech delivery)

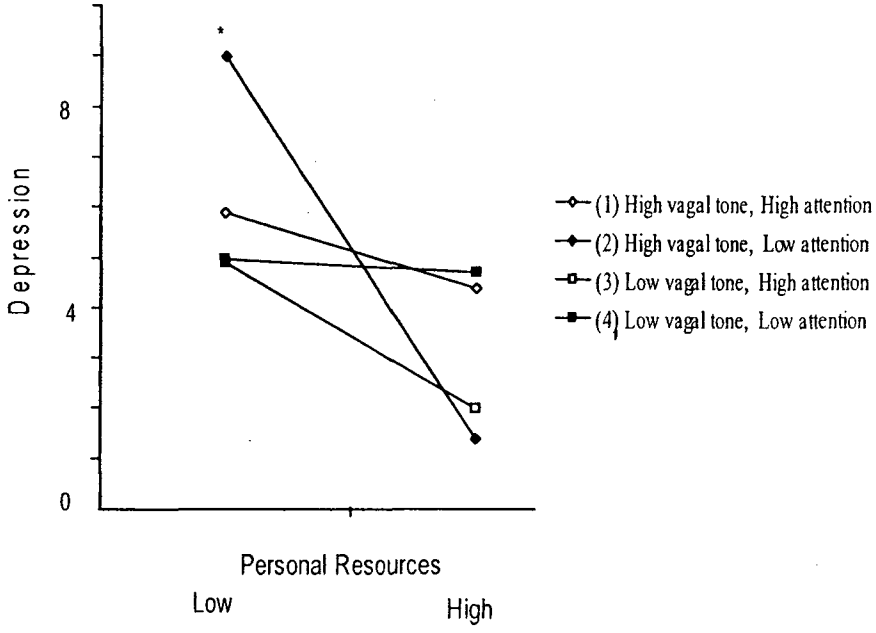

Figure 4. The association between depression and personal resources as a function of vagal suppression and attention to achievement threat at speech delivery (n=122)

* Indicates that significant slope differences exist among lines 2 and lines 1 & 4 respectively, $p<.05$; and that a marginal slope difference exists between lines 2 and 3, $p<.10$

Path Model testing hypotheses 1a and 3a

Findings from the path model assessing the direct-link and stress generation hypotheses for the prediction of depressive symptoms are shown in Figure 5. The fit for the model was good (chi-square = 5.34, p = 0.15; CFI = 0.98; RMSEA = 0.08), providing support for both the direct link and stress generation hypotheses. Specifically, all paths in the model were significant at the 0.01 level or beyond, with the only exception being the expected lack of association between personal resources and independent stress. As in path model 1, the direct-link hypothesis was supported with lower levels of personal resources being a direct predictor of more depression symptoms. Consistent with previous research, the stress generation hypothesis was also supported with lower levels of personal resources predicting more depression symptoms indirectly through its negative association with dependent stress. That is, low personal resources predicted more dependent stress, which, in turn predicted more depression symptoms. In addition, personal resources predicted depression symptoms indirectly via its negative relation to normative stress, which in turn was positively related to dependent stress.

Path Model testing hypotheses 1b and 3b

The a priori path model which assessed personal resources as both a direct predictor of anxiety symptoms, and an indirect predictor of anxiety symptoms through its relation with dependent stress and normative stress did not have a good fit to the data. To improve model fit, the path from personal resources to independent stress was removed from the model and paths were added from independent stress to normative stress and anxiety symptoms. The final model is shown in Figure 6. The fit for the overall model

was good (chi square = 1.85, p = 0.40; CFI = 1.00; RMSEA = 0.00). However, the direct link and stress generation hypotheses only received marginal support. Specifically, the path from personal resources to anxiety and the one from dependent stress to anxiety only reached the level of statistical trends ($p < .10$). All other paths retained in this model were significant at the 0.01 level or beyond. Unexpectedly, independent stress was the best predictor of anxiety symptoms.

Regression analyses testing hypotheses 3c and 3d

Hierarchical regressions were used to assess hypotheses generated by the stress-generation model of psychiatric risk. Personal resources did not interact with dependent stress to predict anxiety or depressive symptoms (see Appendix N for summary of non-significant results). By contrast, the 3-way interaction of personal resources, dependent stress, and independent stress predicted both depression (beta = -.73, t = -2.27, $p < 05$; see Table 6), and anxiety (beta = -.66, t = -2.03, $p < 05$; see Table 7).

First, the interaction predicting depression is shown in Figure 7. This graph illustrates the relation between personal resources and depression as a function of high and low values of dependent and independent stress. The significance test for each possible combination of pairs of slopes showed that slope 3 differed from slope 4, (t = 5.96, $p< .01$). Slope 4 is characterized by a significant downward tilt (beta = -.50, t = -2.86, $p < .05$), indicating that given low levels of stress (combination of low dependent stress, low independent stress) individuals with low levels of personal resources are more depressed than those with high levels of personal resources. Conversely, slope 3 is characterized by a non-significant upward slant (beta = .15, t = .59, $p > 05$), indicating

that given high occurrences of negative life events (combination of high independent stress, low dependent stress) personal resources and depression are unrelated. This pattern of results is in accordance with the notion that patterns of life stress moderate the relationship between personal resources and depression.

The significant 3-way interaction of personal resources, dependent stress, and independent stress predicting anxiety is shown in Figure 8. This graph illustrates the relation between personal resources and anxiety as a function of high and low values of dependent and independent stress. The significance test for pairs of slopes indicated that slope 1 differed significantly from slope 2 (t = -2.05, p < 05). Slope 1 was characterized by a marginal downward tilt (beta = -.21, t = -1.76, P < .10), indicating that given a combination of high dependent and independent stresses, individuals with low personal resources displayed more anxiety symptoms than those with high personal resources. Conversely, slope 2 was non-significant (beta = .04, t = .26, P > .05), indicating that given the combination of high dependent stress and low independent stress personal resources and anxiety were unrelated.

Hierarchical regressions analyses were performed to test for 3-way interactions of personal resources, dependent stress, and normative stress predicting anxiety and depression symptoms were also conducted. The results were not significant and are summarized in Appendix N.

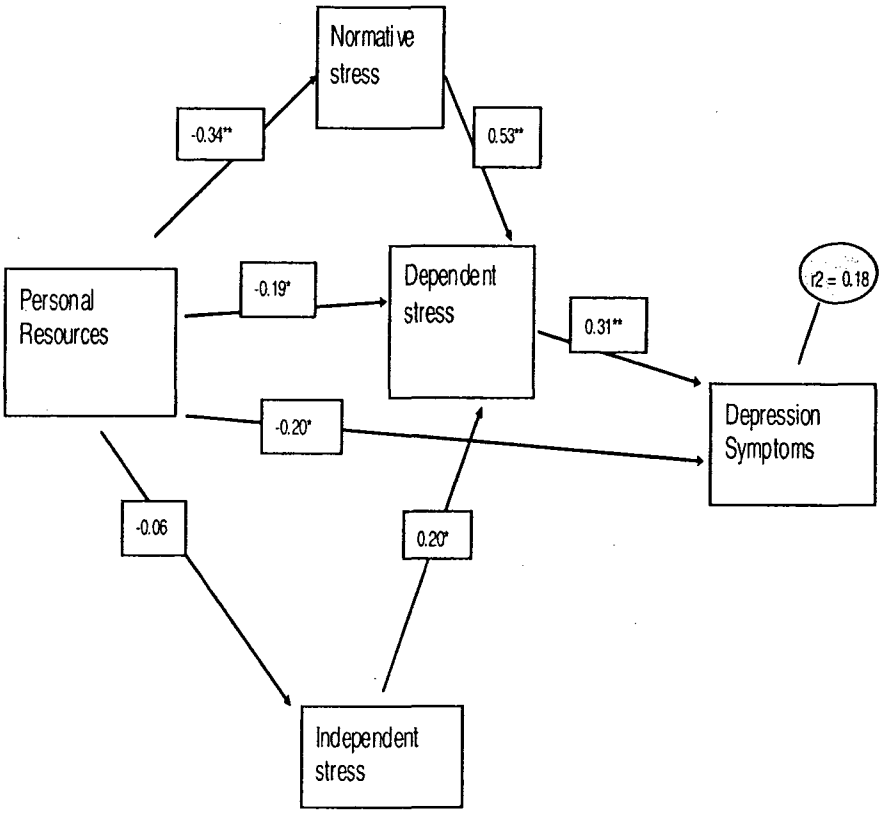

Figure 5. Path model testing the direct-link and stress-generation hypotheses for the prediction of depression symptoms (n = 131)

Chi Square = 5.34, p = 0.15, CFI = 0.98, RMSEA = 0.08

* = p < .01; ** = p < .001

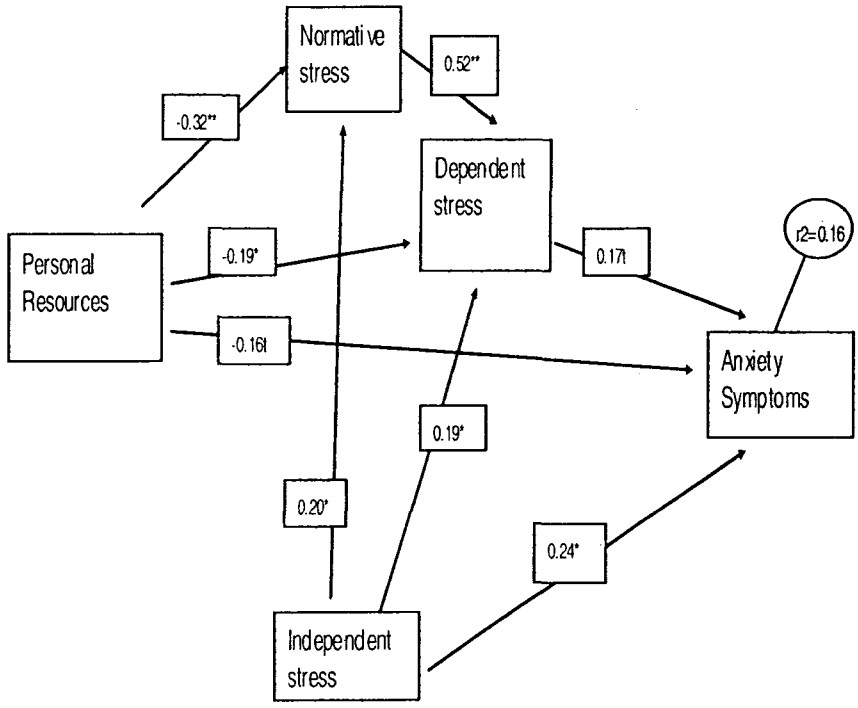

Figure 6. Path model testing the direct-link and stress-generation hypotheses for the prediction of anxiety symptoms (n = 131)

Chi Square = 1.85, p = 0.40, CFI = 1.00, RMSEA = 0.00

* = p < .01; ** = p < .001; t = p < .10

Table 6

Hierarchical regression model predicting depression symptoms (n=131)

Step	Variables	β	t	R^2 change	F change
1.	Personal Resources	-.20	-2.31*	.19	9.75**
	Dependent stress	.32	3.53**		
	Independent stress	-.03	-.31		
2.	Personal Resources	-.31	-1.76	.01	.64
	Dependent stress	.40	3.32**		
	Independent stress	.15	.71		
	Resources x Dependent	.15	.79		
	Resources x Independent	-.01	.93		
	Independent x Dependent	-.24	-.95		
3.	Personal Resources	-.63	-2.82**	.03	5.15*
	Dependent stress	.41	3.40**		
	Independent stress	.11	.53		
	Resources x Dependent	.45	2.00*		
	Resources x Independent	.68	2.05*		
	Dependent x Independent	-.27	-1.09		
	Resources x Dependent x Independent	-.73	-2.27*		
			R^2 = .23	R^2 adj. = .19	F = 5.30**

Note: *p<.05, **p<.01

Table 7

Hierarchical regression model predicting anxiety symptoms (n=131)

Step	Variables	β	t	R^2 change	F change
1.	Personal Resources	-.20	-1.34	.16	8.13**
	Dependent stress	.22	2.37*		
	Independent stress	.21	2.48*		
2.	Personal Resources	.07	.39	.02	1.13
	Dependent stress	.34	2.77**		
	Independent stress	.52	2.36*		
	Resources x Dependent	-.07	-.36		
	Resources x Independent	-.17	-1.28		
	Independent x Dependent	-.37	-1.47		
3.	Personal Resources	-.22	-.97	.03	4.11*
	Dependent stress	.34	2.83**		
	Independent stress	.48	2.22*		
	Resources x Dependent	.21	.91		
	Resources x Independent	.45	1.36		
	Dependent x Independent	-.40	-1.60		
	Resources x Dependent x Independent	-.66	-2.03*		
			R^2 = .21	R^2 adj. = .17	F = 4.67**

Note: *p<.05, **p<.01

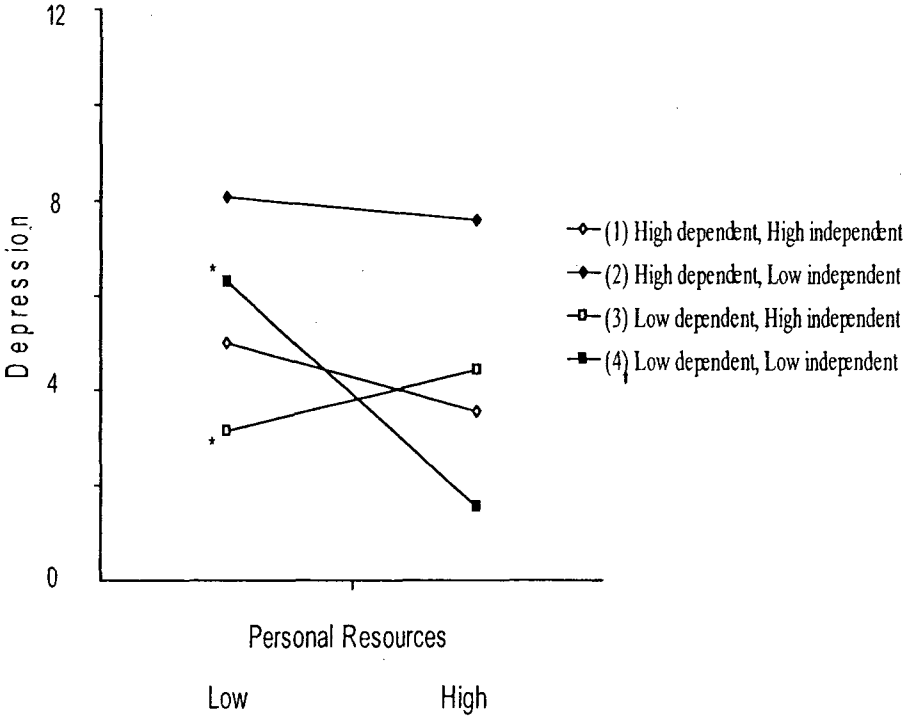

Figure 7. The association between depression and personal resources as a function of dependent and independent life events (n=131)

* Indicates that a significant slope difference exists between lines 3 and 4, $p<.05$

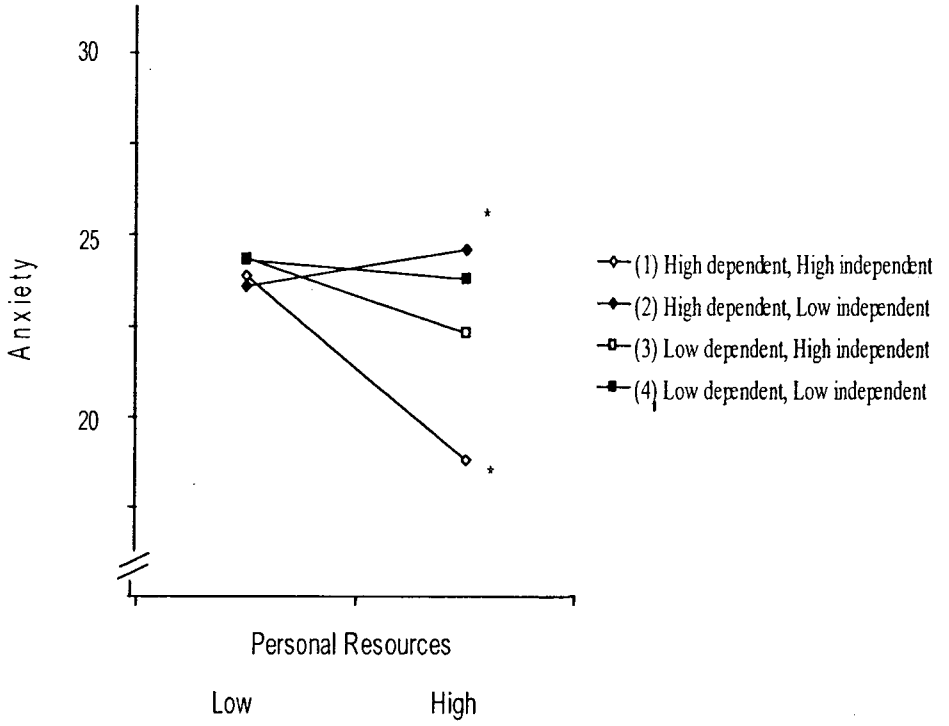

Figure 8. The association between anxiety and personal resources as a function of dependent and independent life events (n=131)

* Indicates that a significant slope difference exists between lines 1 and 2, $p<.05$

Discussion

The aim of the present study was to identify mechanisms implicated in the development of distress disorders. To do so, processes linking individual differences in personal resources to symptoms of anxiety and depression were examined. Hypotheses related to three theoretical perspectives of psychiatric risk were assessed: (1) the direct-link model, which posits that certain personality characteristics are associated with distress symptoms. In this conceptualization, the link between personal resources and risk is direct; (2) the stress-moderation model, a theory which emphasizes that certain personality features interact with reactions to stressors in ways that either increase or decrease the likelihood of distress disorders; and (3) the stress-generation model, which points to an indirect influence of certain personality dimensions on distress symptoms based on their propensity to *generate* stressful situations and feelings of stress. Overall, results indicated that processes of risk for anxiety and depression are consistent with each of the above theoretical models. More specifically, results provided strong support for the direct-link model, partial support for the stress-generation model, and qualified support for the stress-moderation model.

Direct-link model

As stated above, findings from the current investigation provided considerable support for the direct-link model of psychiatric vulnerability. Robust associations between personal resources and distress symptoms indicated *direct* pathways of risk for both anxiety and depression. As expected, low personal resources were linked with high levels of anxiety and depression symptoms. However, negative correlations between

personal resources and depression were consistently larger than those between personal resources and anxiety. In addition, analyses assessing partial correlations revealed that the significant association between personal resources and anxiety was accounted in large part by the variance that these variables shared with depression. The evidence from the present study therefore suggests that low personal resources consisting of negative thoughts about the self (low self-esteem and low self-efficacy) and about the future (pessimism, external locus of control, and high trait anxiety) constitute a mindset which is more closely associated with risk for depression than with risk for anxiety. This finding is consistent with Beck's (1976) Cognitive Theory which states that depression is in part produced by a person's negative thoughts about the self and about the future. Even so, the above results are generally in accord with an extensive research literature that has consistently demonstrated significant associations between each of the trait components of personal resources and both depression and anxiety (e.g., Benassi et al., 1988, & Clark et al., 1994).

Stress-generation model

The results provided partial support for the stress-generation model of psychiatric risk. Findings did not support the hypothesis that personal resources interact with dependent stress (i.e., self-generated stress) to predict risk for anxiety and depression. However, findings were consistent with the hypothesis that personal resources are indirectly related to symptoms of anxiety and depression via self-generated stress. Results indicated that personal resources were negatively associated with stress deemed to be self-generated (e.g., time management problems), and self-generated stress, in turn,

was linked with depressive symptoms. This result is consistent with the well replicated finding that self-generated stress is associated with clinical depression (Cui & Vaillant, 1997; Hammen, 1991; and Hammen & Brennan, 2002). Similarly, personal resources were indirectly associated with anxiety symptoms by way of self-generated stress. However, the association between self-generated stress and anxiety symptoms was marginal. For both anxiety and depression, indirect pathways connecting personal resources to symptoms also pertained to normative stress. Specifically, low personal resources were associated with high normative and independent stresses, which, in turn, was associated with high self-generated stress.

The main implication of the above findings is that vulnerability to depression and anxiety goes beyond the difficulties of managing normative challenges or regulating emotions in response to acutely negative life events. The risk for distress disorders is also associated with stress generated by the individual. Results clearly demonstrated that individuals low in personal resources actively contribute to their stressful environments in ways which increase the risk for depression and anxiety.

In addition, the findings suggest that stress generation plays a more pivotal role in predicting risk for depression than it does in predicting risk for anxiety. That is, self-generated stress was the central variable linking personal resources, normative stress, and independent stress to symptoms of depression (see Figure 5). Such findings indicate that stresses generated by individuals low in personal resources are more closely associated with risk for depression than independent and normative stresses. In fact, independent and normative stresses were linked to depression *only* via self-generated stress. By

comparison, self-generated stress played a less central role with regard to anxiety. Along with only a marginal association between self-generated stress and anxiety, the link between *independent* stress and anxiety was the lone significant path to anxiety (see Figure 6). Thus, the results suggest that the stress-generation model has more predictive validity for depression than for anxiety.

Stress-moderation model

Hypotheses stemming from the stress-moderation model of psychiatric risk were not supported by the findings. Personal resources were not indirectly associated with depression and anxiety via stressor-induced mood lowering, vagal suppression, and attentional bias to threat cues. In addition, personal resources did not interact with each of the abovementioned dimensions of stressor reactivity to predict symptoms of anxiety and depression. However, analyses assessing 3-way interactions revealed that the interplay among personal resources, and stressor-induced vagal suppression and selective attention to achievement threat cues was associated with the risk for depression. Moreover, the interactions of personal resources, dependent stress, and independent stress drew attention to mechanisms that are likely to be implicated in the risk for depression and anxiety. In effect, these analyses underscored the moderating influence of particular patterns of stress on the linkages between personal resources and symptoms of depression and anxiety.

Vulnerability to depression was characterized by low personal resources paired with low vagal suppression and low attention to achievement threat cues. The same pattern of low vagal suppression and low attention to achievement threat cues but paired

with high personal resources was associated with low risk. This aspect of the findings is important for two reasons. First, risk for depression was indicated by a pattern of selective attention centered on achievement threat cues but not physical threat cues. This suggests that the threat of performance 'failure' was particularly meaningful for a student population completing a social-evaluative challenge. Thus, it appears that patterns of selective attention indicative of risk for depression are likely to be specific to stressors that are of personal significance.

Second, the above finding suggests that a given pattern of stressor reactivity – in this instance, low vagal suppression and low selective attentional bias - can be associated on the one hand with high personal resources and low risk for depression; and on the other hand, with low personal resources and elevated risk for depression. The low risk profile is consistent with the notion in Polyvagal Theory that low vagal suppression constitutes an adaptive response to relatively innocuous social situations (Porges, 2007). Moreover, the low attentional bias shown by those high in resources is consistent with findings which suggest that low selective attention to threat in response to challenge perceived as non-threatening represents an adaptive cognitive strategy (e.g., Macleod & Matthews, 1988). Alternatively, the high risk profile is consistent with findings which suggest that low vagal suppression represents a blunting of parasympathetic reactivity in the face of perceived threat (Cohen et. al., 2000; Weinstein & Quigley, 2006), and low attentional bias an avoidant cognitive strategy that has been identified as an earmark of depression (Seligman, Walker, & Rosenhan, 2001). The pattern of stress reactivity evidenced in both those high and those low in personal resources may be a manifestly

similar end point of differing neurocognitive processes. That is, the experimental stressor may have been viewed and experienced as only moderately stressful by those with high personal resources, eliciting relatively low levels of vagal activity and attentional engagement; and as highly stressful by those with low personal resources, eliciting a defensive "damping" down of vagal activity and attentional engagement. It should be noted that, compared to individuals high in personal resources, those low in resources reported experiencing more stressor-induced tension, nervousness, and less composure as measured by the anxiety component of the POMS. Warranting further study, therefore, are the neurocognitive underpinnings of vagal activity and attentional engagement in relation to *perceived* stress and personal resources. This line of research should help to determine whether manifestly similar patterns of stress-related vagal activity and attentional engagement are in fact endpoints of differing neurocognitive processes.

The present results place emphasis on the relevance of stress as perceived or experienced. For example, although the laboratory stressor was a mock 'job interview' simulating a normative challenge of only moderate intensity, the prospect of performance evaluation, as noted above, was viewed and experienced as considerably more stressful by those low in personal resources than by those high in personal resources. The perception of relatively high stress during a stressor of moderate intensity placed low-resource individuals at risk for depression. Moreover, the low-resource individuals who experienced the laboratory challenge as more stressful than their more resourceful counterparts were also at risk for depression in situations of low dependent and independent stress. This aspect of the findings suggests that the risk for depression in

low-resource individuals is characterized by an *overestimation of low/moderate threat.* These results are in accord with Beck's Cognitive Theory which contends that the recurrent magnifications of minor negative events are errors in logic representing an important mechanism in the development and maintenance of depression (Beck, Rush, Shaw, & Emery, 1979).

By contrast, results indicated that in situations of objectively *high* stress (e.g., death of a family member) personal resources were unrelated to risk for depression. Thus, intensely stressful life events are perceived in ways which indicate that low-resource individuals are no more at risk for depression than high-resource individuals.

As with depression, the interactions of personal resources, independent stress, and dependent stress also predicted risk for anxiety. In this framework, however, it was the pattern *high* independent and dependent stress paired with low resources which was associated with risk. By comparison, in situations of high dependent stress but *low independent* stress personal resources were unrelated to risk for anxiety. The fact that personal resources are unrelated to risk for anxiety in situations that are essentially characterized by high dependent stress highlights the key role of independent stress in permitting personal resources to contribute to the prediction of risk for anxiety. This aspect of the findings therefore suggests that, despite the necessary contribution of high dependent stress, it is *high independent stress* which is most closely associated with low resources indicating risk for anxiety disorders. The above results and the previously reported finding that high independent stress was the best predictor of risk for anxiety in a path model that included dependent stress and personal resources (see Figure 6)

together place emphasis on objectively stressful life events as the primary feature of vulnerability to clinical anxiety.

Null findings

Null findings can be more frequent when hypotheses do not adequately cover the complexities of the phenomena under investigation. This was the case in the present study. The model of psychiatric risk that the data supported, the direct-link hypothesis, pertained to one source of influence, personal resources, and one clinical outcome, either depression or anxiety. Despite the robustness of the positive findings, the perspective that this model affords is limited. It does not inform us about other factors and processes implicated in the individual's vulnerability to distress disorders. Null findings occurred, however, when the causal models were more complex. The stress moderation and stress generation formulations involve more sources of influence. Statistical treatments limited to the analysis of two-factor interactions did not yield results in support of the hypotheses. Analyses of 3-way interactions - personal resources, dependent stress, and independent stress in one analysis, and personal resources, stressor-induced vagal suppression, and attention to achievement threat in the other – yielded positive findings in support of a more complex picture of stress-related risk processes than was hypothesized.

When hypotheses are not supported the question of unmeasured 'third variable' effects also becomes particularly pertinent when hypothesized models identify sources of influence that may themselves be subject to other sources of influence. For example, trait defensiveness may moderate the association between personal resources and selective attention to threat in the present study. Ioannou, Mogg and Bradley (2004) reported that

among participants characterized by high trait anxiety (a component of personal resources), only those low in defensiveness demonstrated a selective attention bias for threatening faces. It may also be that trait defensiveness moderates the relationship between personal resources and HRV. Weinberger, Schwartz, and Davidson (1979) showed that in response to a stressful situation, the physiological reactivity of those low in trait anxiety and high in defensiveness (i.e., repressors) differed significantly from those low on the two traits. In fact, repressors displayed physiological reactions indicative of high levels of stress similar to the elevated physiological responses exhibited by individuals high in trait anxiety.

In addition, null findings can be attributed to methodological shortcomings. It was expected that stressor-induced mood lowering would be associated with risk for anxiety and depression. Although low personal resources were indeed associated with lower mood in response to a stressor, mood decline was not associated with symptoms of depression and anxiety. It may be that the laboratory stressor lacked the salience required to lower mood sufficiently to be of clinical significance. Mood as measured on the POMS scale declined from a pre-stress score of 27 to a post-stress score 24 on a scale ranging from 0 to 36. Although stress-induced mood lowering was statistically significant, the stressor effect on mood was not associated with the risk of either depression or anxiety.

In sum, the study's null findings may best be attributed to (a) hypotheses that do not adequately reflect the complexity of processes implicated in the risk for depression

and anxiety; (b) third variable effects; and (c) methodological shortcomings that preclude adequate assessment of stressor effects.

Limitations

The main limitation of the present study concerns the generalizability of the findings. First, there is the relatively small size of the sample to consider as a possible restriction of statistical power. This is true *only* for results pertaining to the path models testing hypotheses related to the stress-moderation model (see Figures 1 & 2). The convention in structural equation modeling is a minimum of 10 participants for every estimate of variable linkage (Lucie Bonneville, personal communication, June 28, 2007). The study's sample size afforded a ratio of 8 participants per estimate for each of the path models assessing hypotheses related to the stress-moderation model. Supplementary analyses that met the minimum power requirement by excluding non-significant linkages between variables, however, did not alter the results. Nevertheless, sample size remains a limitation that calls for replication of the study using a larger sample. Second, the majority of the participants were young undergraduate women, a limitation that precluded assessment of gender effects as well as other sources of influence. Needed, in effect, are larger community samples that can permit replication of the present study in a broader sociodemographic context.

Future directions

First, the personal significance of a stressor has not been sufficiently examined in studies of risk processes implicated in distress disorders. Warranted in this line of research is the use of measures that can elicit individual differences based on the personal

relevance or salience of a broad range of stressors. Needed as well are studies that use a wide variety of measures to examine the neurophysiological, attentional, and affective underpinnings of individual differences in stressor reactivity. In addition, future studies could target the identification of risk processes associated with particular types of stress-related anxiety disorders. As a first step, they should distinguish between anxiety disorders associated with stress generation and low personal resources, and those centered on problems coping with the impact of highly stressful independent life events. Lastly, an important implication of the present findings is that individual differences in personal resources represent significant risk factors for the onset of clinical anxiety and major depression. Thus, efforts to alter the negative thoughts associated with low personal resources could reduce sub-clinical distress and may therefore help prevent the onset of distress disorders. Upgrading an individual's personal resources requires the difficult task of altering entrenched personality dimensions, however, there is reason to believe that self-esteem, locus of control, and optimism can be altered in ways that are associated with meaningful changes in affect and behavior (Godbey & Courage, 1994; Manning, Hooke, Tannenbaum, Blythe, 1994; Seligman, Schulman, & DeRubeis, & Hollon, 1999).

In sum, refining our understanding of risk for anxiety disorders and major depression can be achieved by assessing the interplay among personality, stress, and symptoms. Once replicated findings firmly establish risk processes, researchers could then investigate the effectiveness of prevention programs that target particular personality dimensions, and related maladaptive stress responses and misperceptions of stress that

signal risk for anxiety and depression. The long-term goal is that appropriately targeted prevention programs based on solid experimentation will help decrease the incidence of distress disorders.

Summary and Conclusions

The present investigation sought to elucidate mechanisms of risk for anxiety and depression. Accordingly, three models of risk factors and processes were examined: the direct-link, stress-generation, and stress-moderation models. The findings were consistent with the hypotheses of the direct-link model, namely that low personal resources constitute a risk factor for both depression and anxiety-spectrum disorders. The association between personal resources and depressive symptoms, however, was stronger than that between personal resources and anxiety symptoms.

The stress-moderation model received qualified support. Personal resources were not associated with depression and anxiety as a function of stress-induced mood lowering, vagal suppression, and attentional bias to threat cues; nor did each of the aforementioned dimensions of stressor reactivity interact with personal resources to predict symptoms of anxiety and depression. However, stress-induced vagal suppression and selective attention bias to threat together moderated the association between personal resources and symptoms of depression. Risk for depression was characterized by low personal resources paired with low vagal suppression and low attention to threat cues. The same pattern of low vagal suppression and low attention to threat cues but paired with high personal resources was associated with low risk. In this context, selective attentional bias was specific to achievement but not physical threat. These findings

suggest first, that the specificity of stressor effects is a function of the stressor's personal significance or salience, and second, that manifestly similar stress effects are endpoints of differing neurocognitive processes. These aspects of the findings warrant further study. In addition, combinations of high and low dependent and independent stress moderated the relationship between personal resources and symptoms of anxiety and depression. For depression, a pattern of *low* independent and dependent stress paired with low resources was associated with risk. For anxiety, however, a pattern of *high* independent and dependent stress paired with low resources predicted risk.

The data supported the stress-generation risk model for depression but it only provided partial support for clinical anxiety. As hypothesized, personal resources were associated with risk for both depression and anxiety via self-generated or dependent stress. Results showed that dependent stress played a central role in increasing the risk of depression, but it only had a marginal role as a risk factor for anxiety-spectrum disorders. *Independent* stress, however, had a direct bearing on the risk of anxiety-spectrum disorders, but not depression. In addition, independent and normative stresses were risk factors for both clinical anxiety and depression but *only* via their association with dependent stress.

Taken together, the results indicate that there are risk processes common to depression and clinical anxiety, and others that are specific to each. Low personal resources are the key risk factor common to both types of disorder. Stress generation or the creation of stressful events by low-resource individuals also represents a risk process shared by depression and clinical anxiety. Although low resources and stress generation

are associated with vulnerability to both types of disorder, they are more closely linked to risk for depression than to risk for anxiety. The magnification of low threat or normative challenges places low resource individuals at risk for depression. Independent stresses, or intensely negative life events, represent the primary feature of an interaction with high self-generated stress that places low-resource individuals at risk for anxiety-spectrum disorders. In addition, the assessment of personal resources and different types of stressful life events as potential risk factors revealed that *independent* events were characterized by the most robust association with vulnerability to anxiety. In conclusion, risk for depression is more closely associated with the negative perceptions of those low in resources than with objectively negative events, whereas the opposite is true of risk for anxiety disorders.

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Appendix A

Semi-structured Clinical Interview (SSCI)

All disorders should be experienced within the past 12 months

Alcohol and Drug Consumption

ABUSE (1 or more of the following *recurrent* symptoms)

1) Do you often miss work or school because you were intoxicated, high or very hung over? If yes, how often? Has your performance suffered because you were intoxicated?

2) Do you often do something that might be dangerous after drinking (driving a car, a bicycle, using power tools, and the like)? If yes, how many times?

3) Does your drinking often get you into trouble with the law? If yes, how often?

4) Has your drinking often caused problems with other people, such as with family members, friends, or people at work? If yes, did you keep on drinking anyway?

[if subject answers yes to any of the above four abuse criteria, screen for dependence]

I'd now like to ask you some more questions about your drinking habits.

DEPENDENCE (3 or more)

1) Have you often found that when you started drinking you ended up drinking much more than you were planning to or for a longer period?

2) Have you tried to cut down or stop drinking alcohol?

3) Have you spent a lot of time drinking, being high, or hung over?

4) Have you had times when you would drink so often that you started to drink instead of working or spending time with your family or friends or engaging in other important activities, such as sports, gardening, or playing music?

5) a) Has your drinking ever caused any psychological problems like making you depressed or anxious, making it difficult to sleep, or causing "blackouts?"

b) Has your drinking ever caused significant physical problems or made a physical problem worse?

6) a) Have you needed to increase the amount of alcohol that you drink in order to become intoxicated?

b) Is drinking a certain amount of alcohol having less of an effect than in the past?

DRUG USE

Have you ever taken any drugs to get high, to sleep better, to lose weight, or to change your mood?

If yes, what did you take?

IF STREET DRUG:

When were you using (DRUG) the most? How many times?

(has ever taken street drug more than 10 times in a one-month period)

ABUSE (1 or more of the following *recurrent* symptoms)

1) Do you often miss work or school because you were intoxicated, high, or very hung over? Has your performance suffered because you were intoxicated?

2) Do you often use (DRUG) in a situation in which it might have been dangerous to be using (DRUG) at all? (Have you ever driven a car while you were really too high to drive?) If yes, how often?

3) Does your use of (DRUG) often get you into trouble with the law? If yes, how often?

4) Has your use of (DRUG) often caused problems with other people, such as with family members, friends, or people at work? (Did you ever get into physical fights or bad arguments about your drug use?) If yes, did you keep on using (DRUG) anyway?

[if subject answers yes to any of the above four abuse criteria, screen for dependence]

Now I am going to ask you some specific questions about your use of (DRUG).

DEPENDENCE (3 or more of the following *recurrent* symptoms)

1) Have you often found that when you started using (DRUG) you ended up using much more of it than you were planning to?

2) Have you tried to cut down or stop using (DRUG)?

3) Have you spent a lot of time using (DRUG) or doing whatever you had to do to get it?

4) Have you had times when you would use (DRUG) so often that you used (DRUG) instead of working or spending time on hobbies or with your family or friends?

5) a) Has your (DRUG) use ever caused any psychological

problems like making you depressed or anxious, making it difficult to sleep, or causing "blackouts?"

b) Has your (DRUG) use ever caused significant physical problems or made a physical problem worse?

6) a) Have you needed to increase the amount of (DRUG) that you drink in order to become intoxicated?

b) Is using a certain amount of (DRUG) having less of an effect than in the past?

Depressive Episodes

(5 or more with at least 1 being 1a or 1b)

1) a) Has there ever been a period in your life when you were feeling depressed or down for most of the day nearly every day for at least 2 weeks?

IF YES (*in the past 12 months*): How long did it last? Did you take any medication? Were there particular circumstances that made you feel like that?

b) What about losing pleasure or interest in the things you usually enjoyed?

2) Did you lose or gain any weight (increase or decrease in appetite almost everyday, change of 5% of body

weight in 1 month)? How were you sleeping? (how many hours per night compared to usual); Did you find it difficult to get out of bed in the morning?

3) Were you fidgety or restless that you were unable to sit still? *Did others observe this?*
IF NO: Did You feel "slowed down?

4) What was your energy like? (Tired all the time? Nearly every day?)

5) Did you have trouble concentrating on the things you usually do, like school or work or did you have trouble making decisions?

6) Did you feel worthless almost everyday?

7) Did you have thoughts of suicide? (Either there was a plan, thoughts were recurrent, or an attempt was made)

Dysthymia

1) For the past couple of years, have you been bothered by depressed mood most of the day, more days than not? (If yes, 2 or more of the following must be present)

Poor appetite or overeating, insomnia or hypersomnia, low energy or fatigue, poor concentration, feelings of hopelessness, low self-esteem.

Manic Episodes

1) Has there been a period of time lasting at least 1 week when you were feeling so good, "high," excited or hyper that other people thought you were not your normal self, or you were so hyper that you got into trouble?

IF NO: What about a period of time when you were so irritable that you found yourself shouting at people or starting fights or arguments?

If Yes: Length of episodes (1 week or more), must have 3 or more of the following symptoms.

1) How did you feel about yourself? (More self-confident than usual)

2) Did you need less sleep than usual?

3) Were you more talkative than usual?

4) Were your thoughts racing through your head?

5) Were you so easily distracted by things around you that you had trouble concentrating or staying on track?

6) During this period what were doing in terms of activities? What were you doing with all that "energy"? (probe for excessive spending sprees, sexual indiscretions, or foolish behaviour ie. long-shot investments, writing great work of literature, etc.)

Anxiety Disorders

(Isolated attack is fine, presence of disorder is not)

1) Have you ever had a panic attack, when you *suddenly* felt frightened or anxious or suddenly developed a lot of physical symptoms? [How were you feeling?] IF YES, go through major symptoms (for an attack, 4 or more must be present):

1) palpitations, increased heart rate or "pounding heart"
2) trembling, shaking
1) shortness of breath, difficulty breathing
2) chest pain/discomfort
3) nausea, abdominal pain

4) feeling dizzy, lightheaded

5) fear of losing control or going crazy

6) fear of dying

7) numbness or tingling sensations

8) chills or hot flushes

9) sweating

10) feeling of choking

2) After you had this attack (1 or more of the following and attacks must be recurrent, at least twice)

a) Were you afraid of having another one?

b) Were you concerned about the possible consequences or implications of this attack?

c) Did you change your behaviour following the attack? Did you begin to avoid certain places after the attack?

Social Phobia (all 3)

1) Is there anything that you have been afraid to do or felt uncomfortable doing in front of other people, like speaking, eating, or writing?

2) Do you avoid these situations?

3) Does this interfere with normal functioning?

Specific Phobia (Both)

1) Are there any other things that you have been especially afraid of like flying, seeing blood, getting shot, heights, closed places, or certain kinds of animal or insects? [How serious is it? Are there things you avoid doing because of that?]
2) Does this fear interfere with your normal functioning?

OCD (Both)

1) Was there ever anything that you had to do over and over again and couldn't resist doing, like washing your hands again and again, counting up to a certain number, or checking something several times to make sure that you'd done it right?
2) Are these actions meant to prevent or reduce distress or prevent some dreaded situation?

Generalized Anxiety

1) Do you find it difficult to control worry?
2) In the last six months, have you been particularly nervous, anxious, or worried? IF YES, go through symptoms (3 or more):
    1) restlessness or feeling "on edge"
    2) fatigued much of the time

3) difficulty concentrating

4) irritable

5) muscle tension or soreness

6) problems sleeping

Eating Disorders

1) Have you ever had a time when you weighed much less than other people thought you ought to weigh? Were you concerned by your weight even though you were underweight?

2) a) Have you often had times when your eating was out of control? Tell me more.

b) Did you do anything to prevent weight gain (e.g. vomit, laxatives, fast, excessive exercise)?

(a and b must happen at least twice/week for 3 months)

Psychotic Symptoms

Now, I am going to ask you about unusual experiences that people sometimes have.

1) Has it ever seemed like people were talking about you, or taking special notice of you? IF YES: Were you convinced they were talking about you or did you think it might have been your imagination?

2) What about receiving special messages from the TV, radio, or newspaper, or from the way things were arranged around you?

3) What about anyone going out of their way to give you a hard time or trying to hurt you?

4) Did you ever feel that you were especially important in some way or that you had special powers to do things that other people couldn't do?

5) Did you ever hear things that other people couldn't hear, such as noises, or the voices of people whispering or talking? IF YES: What did you hear? How often did you hear it?

6) Did you see things that others weren't able to see?

Appendix B

Cloze English Fluency Test

ENGLISH FLUENCY TEST answer sheet

Write only ONE word (neatly) in each blank. Guess if you do not know. Spelling mistakes will not be marked wrong. Take as much time as you need.

The science of automatic control depends on certain common principles by which an organism, machine, or system regulates itself. Many historical developments up to the present day have helped to identify these principles.

For hundreds of years there were many (EXAMPLES_kinds_types) of automatic control systems, but no connections were recognized among them. A very early example was a device on windmills designed _____TO_____ keep their sails facing into the wind. (_____IT__this_) consisted simply of a miniature windmill which rotated the whole mill to face in any direction. (_____THE___this_) small mill was at right angles to the main (mill_ONE_windmill), and whenever the latter faced in the (_WRONG_incorrect) direction, the wind caught the small mill's sails and rotated the (_MAIN_whole_large other) mill to the correct position. (many_OTHER_two_then_new) automatic control mechanisms were invented with the development of steam power: first the engine governor, _____AND_____ then the steering engine controller, (____WHICH_that____) operated a ship's rudder in correspondence with the helm. These __MECHANISMS_____ and a few others constituted the achievement of the (SCIENCE_technology_field) of automatic control, up to about 50 years ago. In the past (FIVE_few_several) decades, however, rapid technological development has created numerous urgent and complex ___PROBLEMS_____. The solutions to these problems have given birth to new families of ___AUTOMATIC_____ control devices. For example, chemical plants needed (CONTROLS_regulation) for both temperature and flow; homes needed controls for complex (HEATING_warming) and cooling systems; radios required control circuits which would (GUARANTEE_control_regulate_maintain_assure) the accuracy of signals.

Historically, then, the modern science of automatic ____CONTROL_____ has been aided by related advances in many fields. _____IT_____ now seems surprising to recall that the relationships among these developments were not originally _RECOGNIZED_. Yet we know that (AUTOMATIC_these_all) control and regulating systems depend on common (PRINCIPLES_properties_laws) which are found in both nature and human affairs.

Indeed, _____STUDIES_____ of modern and old automatic control systems give us new insight into a wide (VARIETY_range) of natural and human phenomena. The results of these studies have been very (HELPFUL_useful_important) in understanding how a (PERSON_man_child_ human) is able to walk upright, how the ____HUMAN_____ heart beats, why our economic (SYSTEM_developmeny_condition) suffers from slumps and booms, and (_WHY__how_____) the rabbit population in parts of Canada regularly fluctuates between scarcity and abundance.

Appendix C

Life Orientation Test

L O T

Read each statement, and indicate the extent to which you agree or disagree with that statement, using the following alternatives. Be as accurate and honest as you can. Try not to let your answer to one question influence your answer to the other questions. There are no correct or incorrect answers.

0. strongly disagree
1. disagree
2. neutral
3. agree
4. strongly agree

1.	In uncertain times, I usually expect the best.	0 1 2 3 4
2.	It's easy for me to relax.	0 1 2 3 4
3.	If something can go wrong for me, it will.	0 1 2 3 4
4.	I always look on the bright side of things.	0 1 2 3 4
5.	I'm always optimistic about my future.	0 1 2 3 4
6.	I enjoy my friends a lot.	0 1 2 3 4
7.	It's important for me to keep busy.	0 1 2 3 4
8.	I hardly ever expect things to go my way.	0 1 2 3 4
9.	Things never work out the way I want them to.	0 1 2 3 4
10.	I don't get upset to easily.	0 1 2 3 4
11.	I'm a believer in the idea that "every cloud has a silver lining."	0 1 2 3 4
12.	I rarely count on good things happening to me.	0 1 2 3 4

SUM (1, 3, 4, 5, 8, 9, 11, 12; 3, 8, 9, 12 are reversed) (Filler items = 2, 6, 7, 10)

Appendix D

Rosenberg Self-Esteem Scale (RSES)

RSES

For this questionnaire, please circle the number which corresponds to how much you agree or disagree with each statement.

1. Strongly disagree
2. Disagree
3. Agree
4. Strongly Agree

1.	On the whole, I am satisfied with myself.	1	2	3	4
2.	At times I think I am no good at all.	1	2	3	4
3.	I feel that I have a number of good qualities.	1	2	3	4
4.	I am able to do things as well as most other people.	1	2	3	4
5.	I feel I do not have much to be proud of.	1	2	3	4
6.	I certainly feel useless at times.	1	2	3	4
7.	I feel that I am a person of worth, at least on an equal plane with others.	1	2	3	4
8.	I wish I could have more respect for myself.	1	2	3	4
9.	All in all, I am inclined to feel that I am a failure.	1	2	3	4
10.	I take a positive attitude toward myself.	1	2	3	4

Appendix E

Problem-Solving Inventory (PSI)

P. S. I.

Read each statement and indicate the extent to which you agree or disagree with that statement, using the following alternatives:

1. Strongly agree
2. Moderately agree
3. Slightly agree
4. Slightly disagree
5. Moderately disagree
6. Strongly disagree

1.	When a solution to a problem was unsuccessful, I did not examine why it did not work.	1	2	3	4	5	6
2.	When I am confronted with a complex problem, I do not bother to develop a strategy to collect information so I can define exactly what the problem is.	1	2	3	4	5	6
3.	When my first efforts to solve a problem fail, I become uneasy about my ability to handle the situation.	1	2	3	4	5	6
4.	After I have solved a problem, I do not analyze what went right or what went wrong.	1	2	3	4	5	6
5.	I am usually able to think up creative and effective alternatives to solve a problem.	1	2	3	4	5	6
6.	After I have tried to solve a problem with a certain course of action, I take time and compare the actual outcome to what I think should have happened.	1	2	3	4	5	6
7.	When I have a problem, I think up as many possible ways to handle it as I can until I can't come up with any more ideas.	1	2	3	4	5	6
8.	When confronted with a problem, I consistently examine my feelings to find out what is going on in a problem situation.	1	2	3	4	5	6
9.	I have the ability to solve most problems even though initially no solution is immediately apparent.	1	2	3	4	5	6
10.	Many problems I face are too complex for me to solve.	1	2	3	4	5	6

1. Strongly agree
2. Moderately agree
3. Slightly agree
4. Slightly disagree
5. Moderately disagree
6. Strongly disagree

11.	I make decisions and am happy with them later.	1 2 3 4 5 6
12.	When confronted with a problem, I tend to do the first thing that I can think to solve it.	1 2 3 4 5 6
13.	Sometimes I do not stop and take time to deal with my problems, but just kind of muddle ahead.	1 2 3 4 5 6
14.	When deciding on an idea or possible solution to a problem, I do not take time to consider the chances of each alternative being successful.	1 2 3 4 5 6
15.	When confronted with a problem, I stop and think about it before deciding on a next step.	1 2 3 4 5 6
16.	I generally go with the first good idea that comes to mind.	1 2 3 4 5 6
17.	When making a decision, I weigh the consequences of each alternative and compare them against each other.	1 2 3 4 5 6
18.	When I make plans to solve a problem, I am almost certain that I can make them work.	1 2 3 4 5 6
19.	I try to predict the overall result of carrying out a particular course of action.	1 2 3 4 5 6
20.	When I try to think up possible solutions to a problem, I do not come up with very many alternatives.	1 2 3 4 5 6
21.	Given enough time and effort, I believe I can solve most problems that I confront.	1 2 3 4 5 6
22.	When faced with a novel situation I have confidence that I can handle problems that may arise.	1 2 3 4 5 6

1.	Strongly agree
2.	Moderately agree
3.	Slightly agree
4.	Slightly disagree
5.	Moderately disagree
6.	Strongly disagree

		1	2	3	4	5	6
23.	Even though I work on a problem, sometimes I feel like I am groping or wandering, and am not getting down to the real issue.						
24.	I make snap judgements and later regret them.	1	2	3	4	5	6
25.	I trust my ability to solve new and difficult problems.	1	2	3	4	5	6
26.	I have a systematic method for comparing alternatives and making decisions.	1	2	3	4	5	6
27.	When confronted with a problem, I do not usually examine what sort of external things in my environment may be contributing to my problem.	1	2	3	4	5	6
28.	When I am confronted by a problem, one of the first things I do is survey the situation and consider all the relevant pieces of information.	1	2	3	4	5	6
29.	Sometimes I get so charged up emotionally that I am unable to consider many ways of dealing with my problem.	1	2	3	4	5	6
30.	After making a decision, the outcome I expected usually matches the actual outcome.	1	2	3	4	5	6
31.	When confronted with a problem, I am unsure of whether I can handle the situation.	1	2	3	4	5	6
32.	When I become aware of a problem, one of the first things I do is to try to find out exactly what the problem is.	1	2	3	4	5	6

Appendix F

Spielberger Trait Anxiety Inventory (STAI)

STAI

PART 2

DIRECTIONS: *A number of statements which people have used to describe themselves are given below. Read each statement and then darken the appropriate number to the right of the statement to indicate how you generally feel. There are no right or wrong answers. Do not spend too much to much time on any one statement but give the answer which seems to describe how you generally feel.*

1 Not At All	3 Moderately So
2 Somewhat	4 Very Much So

21.	I feel pleasant	①	②	③	④
22.	I tire quickly	①	②	③	④
23.	I feel like crying	①	②	③	④
24.	I wish I could be as happy as others seem to be	①	②	③	④
25.	I am losing out on things because I can't make up my mind soon enough	①	②	③	④
26.	I feel rested	①	②	③	④
27.	I am "calm, cool, collected"	①	②	③	④
28	I feel that difficulties are piling up so that I cannot overcome them...	①	②	③	④
29.	I worry too much over something that really doesn't matter	①	②	③	④
30.	I am happy	①	②	③	④
31.	I am inclined to take things hard	①	②	③	④
32.	I lack self-confidence	①	②	③	④
33.	I feel secure	①	②	③	④
34.	I try to avoid facing a crisis or difficulty	①	②	③	④
35.	I feel blue	①	②	③	④
36.	I am content	①	②	③	④
37.	Some unimportant thought runs through my mind and bothers me	①	②	③	④
38.	I take disappointments so keenly that I can't put them out of my mind	①	②	③	④
39.	I am a steady person	①	②	③	④
40.	I get in a state of tension or turmoil as I think over my recent concerns and interests.	①	②	③	④

Appendix G

Adult Nowicki-Strickland Internal-External Locus of Control Scale (ANSIE)

ANSIE

Yes	No	
___	___	1. Do you believe that most problems will solve themselves if you just don't fool with them?
___	___	2. Do you believe that you can stop yourself from catching a cold?
___	___	3. Are some people just born lucky?
___	___	4. Most of the time do you feel that getting good grades means a great deal to you?
___	___	5. Are you often blamed for things that just aren't your fault?
___	___	6. Do you believe that if somebody studies hard enough, he or she can pass any subject?
___	___	7. Do you feel that most of the time it doesn't pay to try hard because things never turn out right anyway?
___	___	8. Do you feel that if things start out well in the morning that it's going to be a good day no matter what you do?
___	___	9. Do you feel that most parents listen to what their children have to say?
___	___	10. Do you believe that wishing can make good things happen?
___	___	11. When you get punished does it usually seem it's for no good reason at all?
___	___	12. Most of the time do you find it hard to change a friend's (mind) opinion?
___	___	13. Do you think that cheering more than luck helps a team to win?
___	___	14. Did you feel that it's nearly impossible to change your parent's mind about anything?
___	___	15. Do you believe that parents should allow children to make most of their own decisions?
___	___	16. Do you feel that when you do something wrong there's very little you can do to make it right?

___ ___ 17. Do you believe that most people are just born good at sports?

___ ___ 18. Are most of the other people your age stronger than you are?

___ ___ 19. Do you feel that one of the best ways to handle most problems is just not think about them?

___ ___ 20. Do you feel that you have a lot of choice in deciding whom your friends are?

___ ___ 21. If you find a four leaf clover do you believe that it might bring you luck?

___ ___ 22. Did you often feel that whether you did your homework had much to do with what kind of grades you got?

___ ___ 23. Do you feel that when a person your age decides to hit you there's little you can do to stop him or her?

___ ___ 24. Have you ever had a good luck charm?

___ ___ 25. Do you believe that whether or not people like you depends on how you act?

___ ___ 26. Did your parents usually help if you asked them to?

___ ___ 27. Have you felt that when people were angry with you it was usually for no reason at all?

___ ___ 28. Most of the time, do you feel that you change what might happen tomorrow by what you do today?

___ ___ 29. Do you believe that when bad things are going to happen they just are going to happen no matter what you try to do to stop them?

___ ___ 30. Do you think that people can get their own way if they just keep trying?

___ ___ 31. Most of the time, did you find it useless to try to get your own way at home?

___ ___ 32. Do you feel that when good things happen they happen because of hard work?

ID # _____

___ ___ 33. Do you feel that when somebody your age wants to be your enemy there's little you can do to change matters?

___ ___ 34. Do you feel that it's easy to get friends to do what you want them to do?

___ ___ 35. Do you usually feel that you have little to say about what you get to eat at home?

___ ___ 36. Do you feel that when someone doesn't like you there's little you can do about it?

___ ___ 37. Did you usually feel that it was almost useless to try in school because most other children were just plain smarter than you?

___ ___ 38. Are you the kind of person who believes that planning ahead makes things turn out better?

___ ___ 39. Most of the time, do you feel that you have little to say about what your family decides to do?

___ ___ 40. Do you think it's better to be smart than to be lucky?

Appendix H

Bipolar Profile of Mood States Questionnaire (POMS)

POMS 1

IDNO _____

Below are words that describe the feelings and moods that people often have. Please read EVERY word carefully. Then circle the answer which best describes how you are feeling RIGHT NOW. Suppose the word is happy. Mark the ONE answer which is closest to how you feel RIGHT NOW.
The numbers refer to the phrases in the box at right.

0	much unlike this
1	slightly unlike this
2	a little
3	much like this

Right now, I feel....

1. Composed	0	1	2	3	22. Fatigued	0	1	2	3
2. Angry	0	1	2	3	23. Bold	0	1	2	3
3. Cheerful	0	1	2	3	24. Efficient	0	1	2	3
4. Weak	0	1	2	3	25. Peaceful	0	1	2	3
5. Tense	0	1	2	3	26. Furious	0	1	2	3
6. Confused	0	1	2	3	27. Light-hearted	0	1	2	3
7. Lively	0	1	2	3	28. Unsure	0	1	2	3
8. Sad	0	1	2	3	29. Jittery	0	1	2	3
9. Friendly	0	1	2	3	30. Bewildered	0	1	2	3
10. Tired	0	1	2	3	31. Energetic	0	1	2	3
11. Strong	0	1	2	3	32. Lonely	0	1	2	3
12. Clearheaded	0	1	2	3	33. Sympathetic	0	1	2	3
13. Untroubled	0	1	2	3	34. Exhausted	0	1	2	3
14. Grouchy	0	1	2	3	35. Powerful	0	1	2	3
15. Playful	0	1	2	3	36. Attentive	0	1	2	3
16. Timid	0	1	2	3	37. Serene	0	1	2	3
17. Nervous	0	1	2	3	38. Bad-tempered	0	1	2	3
18. Mixed-up	0	1	2	3	39. Joyful	0	1	2	3
19. Vigorous	0	1	2	3	40. Self-doubting	0	1	2	3
20. Dejected	0	1	2	3	41. Shaky	0	1	2	3
21. Kindly	0	1	2	3	42. Perplexed	0	1	2	3

0	much unlike this
1	slightly unlike this
2	a little
3	much like this

Right now, I feel....

43. Active	0	1	2	3	58. Weary	0	1	2	3
44. Downhearted	0	1	2	3	59. Confident	0	1	2	3
45. Agreeable	0	1	2	3	60. Business-like	0	1	2	3
46. Sluggish	0	1	2	3	61. Relaxed	0	1	2	3
47. Forceful	0	1	2	3	62. Annoyed	0	1	2	3
48. Concentrated	0	1	2	3	63. Elated	0	1	2	3
49. Calm	0	1	2	3	64. Inadequate	0	1	2	3
50. Mad	0	1	2	3	65. Uneasy	0	1	2	3
51. Jolly	0	1	2	3	66. Dazed	0	1	2	3
52. Uncertain	0	1	2	3	67. Full of pep	0	1	2	3
53. Anxious	0	1	2	3	68. Gloomy	0	1	2	3
54. Muddled	0	1	2	3	69. Affectionate	0	1	2	3
55. Ready-to-go	0	1	2	3	70. Drowsy	0	1	2	3
56. Discouraged	0	1	2	3	71. Self-assured	0	1	2	3
57. Good-natured	0	1	2	3	72. Mentally alert	0	1	2	3

Appendix I

Student Stress Questionnaire (SSQ)

Student Stress Questionnaire (SSQ)

Normative items

1. Having papers or essays to write.
2. Studying.
3. Being concerned about your academic performance (e.g., worried about doing poorly on tests, papers, etc.).
4. Being unsure of your career or future job.

Dependent items

1. Trying to stay on a diet to lose weight.
2. Not having a boyfriend / girlfriend, or someone to date.
3. Being behind in your schoolwork.
4. Not liking your appearance (e.g., dissatisfied with height or facial features, etc., not your weight).
5. Having problems managing your time effectively (e.g., not enough time to get things done,
6. Gaining weight or overeating.

Independent items

1. Death of a parent / sibling.
2. Having your home broken into.
3. Close friend having personal/ health problems.
4. Parent / sibling being sick.
5. Being in a car accident.
6. Witnessing a car accident
7. Being robbed.
8. Being victim of in a traumatic incident (e.g., fire, earthquake, flood, etc.).
9. Witnessing a traumatic incident (e.g., fire, drowning, violence, etc.).
10. Death of a family member other than parent or sibling.
11. Death of a friend.

After each question participants indicate whether they have experienced a particular stressor in the past 12 months by placing a vertical bar across a 100 millimeter line to show how much the experience has been stressful ranging from not at all to extremely stressful.

Appendix J

Word pairs used for Attention Task

Physical Threat – Neutral Pairs

Assault/Receipt	Killer/Import
Attack/Volume	Lethal/Pastel
Brutal/Staple	Murder/Decade
Burial/Unwrap	Mutilated/Spectator
Cemetery/Daydream	Operation/Connected
Collapse/Civilian	Paralysis/Harmonica
Crippled/Bearings	Strangled/Exchanges
Cruelty/Lengthy	Suffocated/Archeology
Disease/Balloon	Surgery/Loosely
Fracture/Mackerel	Trapped/Sending
Harm/Palm	Unwell/Update
Hazard/Agency	Victim/Paused
Infection/Mysteries	Violence/Geometry
Injury/Shorts	Wounded/Density
Defeated/Duration	Coffin/Allied

Achievement Threat – Neutral Pairs

Ashamed/Context	Indecisive/Reflecting
Blunder/Touring	Inept/Overt
Careless/Involves	Inferior/Eyesight
Criticism/Supplying	Intimidated/Feasibility
Discredited/Springwater	Mistake/Compass
Disgrace/External	Mocked/Evolve
Embarrassed/Speedometer	Pathetic/Junction
Fail/Rail	Pitiful/Dynasty
Feeble/Denote	Ridicule/Currency
Foolish/Mission	Shame/Rural
Hopeless/Windmill	Silly/Image
Humiliated/Positioned	Stupid/Traded
Idiotic/Entitle	Unsuccessful/Abbreviation
Ignorant/Announce	Useless/Display
Inadequate/Fingertips	Worthless/Grassland
Incompetent/Handwritten	Wrong/Ahead

Neutral – Neutral Pairs

Antique/Sparrow

Basement/Tendency

Bathroom/Smoothed

Bedspread/Directory

Blanket/Prepare

Bookcase/Downwind

Bucket/Device

Cabinet/Session

Chimney/Doubled

Decorate/Nineteen

Duster/Dilute

Floorboards/Consequence

Furnished/Technique

Garage/Melted

Groceries/Perimeter

Hairbrush/Brochures

Handle/Nearby

Lamb/Pony

Mantelpiece/Superimpose

Pillow/Exists

Polished/Attended

Shelves/Volcano

Soap/Stem

Sofa/Gaze

Tablecloth/Automation

Towel/Elbow

Upholstery/Estimation

Upstairs/Rainfall

Varnish/Caption

Vase/Wink

Wallpaper/Timetable

Wardrobe/Airtight

Appendix K

Consent Form

ID # :_____

Center for Research in Human Development
Concordia University
Investigators: Frank Salerno
Thesis Supervisor: Alex Schwartzman

CONSENT FORM

I understand and agree to take part in a psychological study. I understand that to become a participant I will first be required to answer some questions dealing with eligibility for participation. I understand that some of these questions will pertain to substance abuse and psychiatric history. I also understand that if I do not meet all the study's requirements, I will receive five dollars (5$) in appreciation of my cooperation and I will not be asked to participate further in the study.

If I do meet the requirements, I will then join the study that consists chiefly of a job interview simulation and a computerized test about attention.

The session will consist of the following:

1) Personality questionnaires (25 minutes)
2) Questions dealing with eligibility for participation (15 minutes)
3) Relaxation (10 minutes)
4) Brief questionnaires (10 minutes)
5) Computerized tasks (20 minutes)
6) Job interview simulation (audio and videotaped) (15 minutes)
7) Brief questionnaires (10 minutes)

Remuneration: I understand that I will receive the sum of twenty dollars (20$) at the end of the session.

I understand that any information I provide will remain strictly confidential and that all questionnaires will be identified by code number only. Furthermore, I understand that my participation in this study is totally voluntary and that I may withdraw at any point in the study without prejudice of any kind.

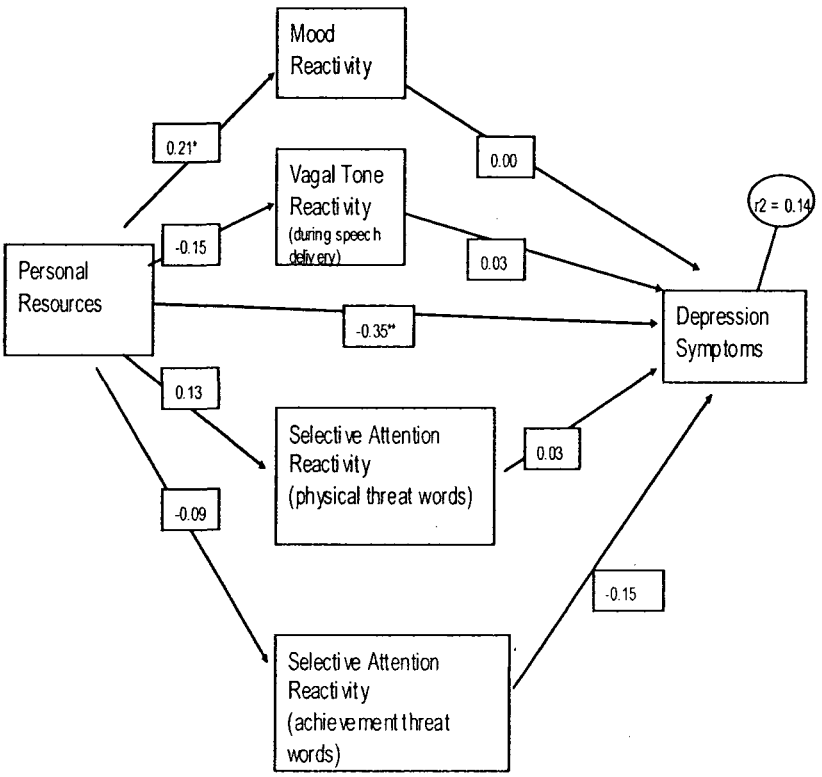
I, _____ have read this consent form and I understand what my participation in this study entails. By signing, I agree to participate in the study.

_____ _____

Signature Date

Appendix L

Path model predicting depression with measure of vagal tone reactivity during speech delivery



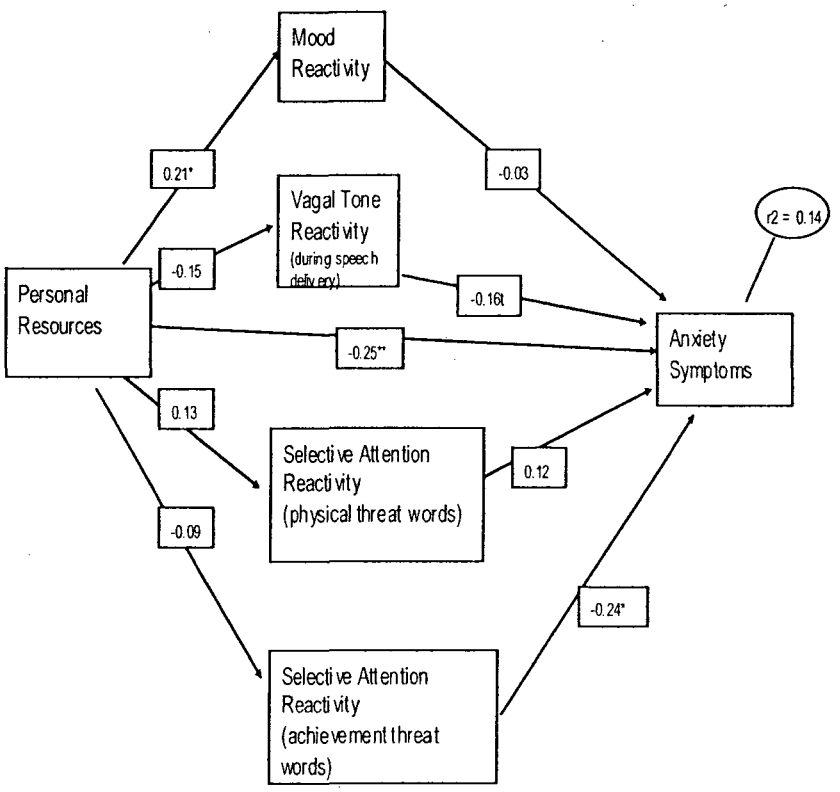
Path model testing the direct-link and stress moderation hypotheses for the prediction of depression symptoms including vagal tone variable representing reactivity during speech delivery (n = 113)

Chi Square = 0.70, p = 0.99, CFI = 1.00, RMSEA = 0.00

* = $p < .01$; ** = $p < .001$

Appendix M

Path model predicting anxiety with measure of vagal tone reactivity during speech delivery



Path model testing the direct-link and stress moderation hypotheses for the prediction of anxiety symptoms including vagal tone variable representing reactivity during speech delivery (n = 113)

Chi Square = 1.81, p = 0.94, CFI = 1.00, RMSEA = 0.00

* = p < .01; ** = p < .001; t = p < .10

Appendix N

Summary of non-significant results

Summary of non-significant results from hierarchical regression analyses testing 2-way interactions predicting anxiety symptoms

Non-significant predictors (interactions) in the final model	Statistics (final Equation)
Personal Resources x Vagal Tone residual (anticipatory stress)	R^2 adj = .06, F change = 0.72
Personal Resources x Vagal Tone residual (stress during speech)	R^2 adj = .04, F change = 0.71
Personal Resources x Attention residual (physical threat)	R^2 adj = .04, F change = 0.55
Personal Resources x Attention residual (achievement threat)	R^2 adj = .07, F change = 0.22
Personal Resources x Mood residual	R^2 adj = .04, F change = 0.54

Note: Variable entry was similar for all regression models: (Step 1) Personal resources; (Step 2) stress measure - residual score denoting stress reactivity or dependent stress; and (Step 3) interaction term -- cross-product of variables entered in prior steps.

Summary of non-significant results from hierarchical regression analyses testing 2-way interactions predicting depression symptoms

Non-significant predictors (interactions) in the final model	Statistics (final Equation)
Personal Resources x Vagal Tone residual (anticipatory stress)	R^2 adj = .11, F change = 1.97
Personal Resources x Vagal Tone residual (stress during speech)	R^2 adj = .08, F change = 1.74
Personal resources x Attention residual (physical threat)	R^2 adj = .08, F change = 0.49
Personal Resources x Attention residual (achievement threat)	R^2 adj = .09, F change = 0.25
Personal Resources x Mood residual	R^2 adj = .13, F change = 0.83

Note: Variable entry was similar for all regression models: (Step 1) Personal resources; (Step 2) stress measure - residual score denoting stress reactivity or dependent stress; and (Step 3) interaction term – cross-product of variables entered in prior steps.

Summary of non-significant results from hierarchical regression analyses testing 3-way interactions predicting depression symptoms

Non-significant predictors (interactions) in the final model	Statistics (final Equation)
Resources x Vagal reactivity* x Mood reactivity	R^2 adj = .14, *F* change = 1.22
Resources x Vagal reactivity** x Mood reactivity	R^2 adj = .11, *F* change = 1.74
Resources x Attention reactivity* x Mood reactivity	R^2 adj = .08, *F* change = .03
Resources x Attention reactivity ** x Mood reactivity	R^2 adj = .13, *F* change = .58
Resources x Attention reactivity* x Vagal reactivity*	R^2 adj = .12, *F* change = 2.43
Resources x Attention reactivity* x Vagal reactivity**	R^2 adj = .06, *F* change = .20

Notes: Vagal reactivity* = marker of stress during anticipation (speech preparation)
Vagal reactivity** = marker of stress during task (speech delivery)
Attention reactivity* = marker of selective attention to physical threat words
Attention reactivity** = marker of selective attention to achievement threat words

Summary of non-significant results from hierarchical regression analyses testing 3-way interactions predicting anxiety symptoms

Non-significant predictors (interactions) in the final model	Statistics (final Equation)
Resources x Vagal reactivity* x Mood reactivity	R^2 adj = .05, *F* change = 0.06
Resources x Vagal reactivity** x Mood reactivity	R^2 adj = .05, *F* change = 2.10
Resources x Attention reactivity* x Mood reactivity	R^2 adj = .03, *F* change = 1.65
Resources x Attention reactivity ** x Mood reactivity	R^2 adj = .06, *F* change = 1.26
Resources x Attention reactivity* x Vagal reactivity*	R^2 adj = .07, *F* change = 2.31
Resources x Attention reactivity** x Vagal reactivity*	R^2 adj = .14, *F* change = 3.78t
Resources x Attention reactivity* x Vagal reactivity**	R^2 adj = .03, *F* change = 1.96
Resources x Attention reactivity ** x Vagal reactivity**	R^2 adj = .09, *F* change = 2.40

Notes: t = trend, $p < .10$
Vagal reactivity* = marker of stress during anticipation (speech preparation)
Vagal Reactivity** = marker of stress during task (speech delivery)
Attention reactivity* = marker of selective attention to physical threat words
Attention reactivity** = marker of selective attention to achievement threat words

Summary of non-significant results from hierarchical regression analyses testing 2-way and 3-way interactions predicting distress symptoms

Outcome	Predictors in the final model	Statistics (final Equation)
Depression	Resources x Dependent stress	R^2 adj = .17, *F* change = 0.89
Anxiety	Resources x Dependent stress	R^2 adj = .10, *F* change = 0.16
Depression	Resources x Dependent x Normative	R^2 adj = .18, *F* change = .74
Anxiety	Resources x Dependent x Normative	R^2 adj = .11, *F* change = .31