Personality resources and stress reactivity: Potential mechanisms in stress-related psychopathology

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Abstract

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The aim of the present study was to explore processes potentially implicated in the formation of symptoms of psychopathology. It was hypothesized that the "adaptiveness" of the individual is reflected in stress-related patterns of mood change, cardiac activity, and selective attention. Cognitive adaptiveness to stress was defined by a profile of five personality traits: locus of control, self-efficacy, self-esteem, optimism, and anxiety. The sample consisted of 38 normally functioning university students who were assigned the stress-inducing task of preparing and presenting a speech for evaluation by a panel of "judges". Stress was assessed via a mood questionnaire and heart rate. Selective attention was evaluated using a reaction time computer task in which participants responded to a dot appearing in the spatial location formerly occupied by either a threat or neutral cue (dot probe task). Faster latencies to dot probes replacing threat cues indicate attentional bias to threat. In general, the results supported the hypothesis that individual differences in adaptiveness affect stress reactions in ways that could increase the risk of psychopathology. Specifically, it was found that: (a) individuals low in adaptiveness reported more stress-related mood lowering than those high in adaptiveness, even after differences prior to stress were statistically controlled; (b) low adaptives avoided threat cues more than high adaptives in anticipation of an imminent threat; (c) low adaptives showed more instability in selective attention patterns than high adaptives; and (d) the greater the stress-related physiological arousal, the better the mood in high adaptives. The implications of these findings are discussed in the context of risk and psychopathology.

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There is considerable evidence linking stress and psychopathology (e.g., anxiety and depression; Thoits, 1983; Blazer, Hughes, & George, 1987; Benes, 1994; Brown, Bifulco, Harris, & Bridge, 1986). However, the specific mechanisms implicated in the relationship between stress and psychopathology are poorly understood. Broadly defined, stress refers to life challenges that exceed an individual's perceived coping resources (Bandura, 1989; Gunnar, Marvinney, Isensee, & Fisch, 1989). Individual differences exist as to how people experience, respond to, and recover from stress. Past reactions to life challenges throughout development promote a tendency to respond to stress with certain stable goal-directed behaviors and emotional responses that usually require an interpretation of environmental information or higher order cognitive processing (Izard, 1993). If some form of cognition is intimately associated with reactions to life challenges, then it may be that individual differences in dispositional cognitions are at the root of why certain individuals are susceptible to produce maladaptive stress-related responses. In other words, dispositional cognitions, defined as relatively stable thought patterns, could be understood to guide or prompt other behaviors in response to stress. In essence, dispositional cognitions constitute a key sub-category of personality traits. Understood in this way, dispositional cognitions are the catalysts of a host of relatively stable patterns of action that, in some instances, may predispose individuals to react to stress in ways that can eventually lead to psychopathology.

It is conceivable that certain dispositional cognitions promote maladaptive behaviors by influencing selective attention (Mogg, Bradley, & Hallowell, 1994). That

is, dispositional cognitions may serve to select specific stimuli from the entire array of environmental information for further mental processing. This process of selective attention may set in motion a complex series of mental maneuvers used to perceive and interpret information in ways that can lead to psychopathology (Rothbart, Posner, & Rosicky, 1994). Another possibility is that multiple stressful events during development interact with dispositional cognitions to elicit mood states that may inhibit adaptive goal-directed behaviors. Repeated failures to effectively deal with normative stress are associated with increased psychological disturbance (Thoits, 1983). The intent of the present study was to examine mechanisms that may serve as points of origin for patterns of maladaptive stress-related responses. Specifically, this study deals with the role of dispositional cognitions in the relationship between stress and mood state, cardiac activity and selective attention. The ensuing literature review is guided by a conceptual framework that addresses the above mechanisms as potential risk processes in the development of psychopathology.

Model of risk processes implicated in psychopathology

The conceptual model presented in Figure 1 is based on the assumption that dispositional cognitions play a pivotal role in stress responses that are associated with psychopathology. Based on the model it is proposed that during stressful challenges dispositional cognitions influence three separate, but intercorrelated, levels of behavior. First, the model implies that dispositional cognitions alter the impact of stressful events on selective attention. Attention can be understood as a junction between the external environment and thought processes (Corbetta, Miezen, Dobmeyer, Shulman, & Petersen, 1990). One of the basic roles of attention is to aid cognitive functioning by intensifying

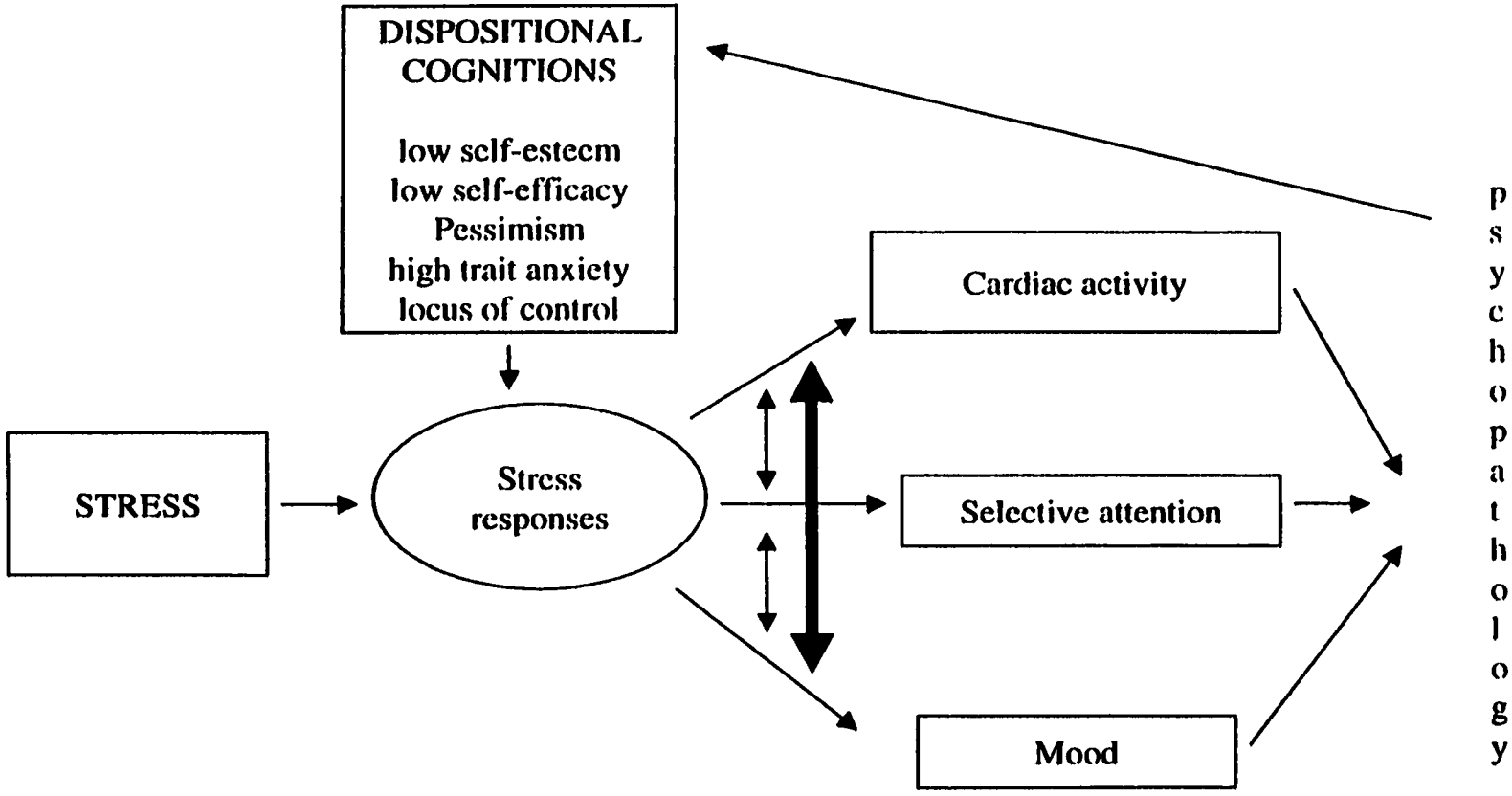

Figure 1. Model of risk processes implicated in psychopathology

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, and thus represents an early point of influence on behavior. Dispositional cognitions may influence attention during stress via a mechanism that Laberge (1995) has called preparatory attention. That is, relatively stable belief systems may produce expectations regarding life challenges that in the context of psychopathology serve to direct attention to spatial locations that are conducive to 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, repeated and non-adaptive anxiety episodes can lead to clinical levels of anxiety (Williams, Watts, MacLeod, & Mathews, 1988). In essence, the model of risk for psychopathology illustrates that certain dispositional cognitions elicit a type of attentional expectancy that is associated with a mechanism of attention that is overly sensitive to the detection of threat or negatively valenced information.

Second, the model points to certain dispositional cognitions providing a maladaptive framework for interpreting life challenges that results in overly negative mood state changes in response to stress. Research has shown that a key precursor of impending psychological disturbance is an increasing incapacity to cope with normative life stresses (Thoits, 1983). It can be argued that individuals who become overly anxious or depressed when faced with normative stressors are less likely to deal effectively with life challenges (Beh, 1998), and therefore are at risk for psychopathology.

Third, the model draws attention to certain dispositional cognitions altering stress responses by influencing cardiac activity. Heart rate has been shown to be sensitive to increases in stress-related physiological arousal (Beh, 1998). A hyper-reactive cardiac system is a potential index of a malfunctioning autonomic nervous system indicating a diminished capacity to cope with stress. Another possible index of a malfunctioning cardiac system is slow recovery following a stressful challenge. Delayed rates of recovery from stress are associated with prolonged general arousal potentially leading to unneeded anxiety responses. Long periods of unnecessary tension can eventually become maladaptive reactions to stress that can put individuals at risk for clinical levels of generalized anxiety. The model of risk for psychopathology illustrates that certain dispositional cognitions are associated with slower rates of recovery following a stressful challenge.

Lastly, the conceptual framework points to intercorrelations among the three levels of stress responses. Of particular interest is the relationship between mood state and physiological response to stress. Concordance between these response systems has been interpreted as a factor predicting an increase in the salience of stressful events (Zahn, Nurnberger, Berrettini, & Robinson, 1991). In the model, it is proposed that certain dispositional cognitions are associated with a potentially chronic hypersensitivity to stress as indexed by a significant level of concordance between subjective and physiological response systems.

Adaptiveness Construct

At the center of the model of risk for psychopathology is the concept of dispositional cognitions. A number of investigators have proposed that the relationship

between stress and psychopathology varies as a function of personal characteristics (Cohen & Edwards, 1989). That is, individual differences in dispositional cognitions, defined as consistent patterns of processing information, probably relate to coping efficacy or level of adaptiveness to stress. Dispositional cognitions likely to be involved in the relationship between stress and emotional disorders are relatively stable thought patterns that are ego-related and directly connected to emotional expression. In other words, dispositional cognitions related to the individual's *perceived* ability to cope with stress and thought processes that are affect-laden are likely to have an important impact on an individual's level of adaptiveness in the face of stressful challenges. A number of dispositional cognitions have been shown to have a bearing on stressors in ways that influence mental health. Among the most cited are locus of control, self-esteem, self-efficacy, optimism, and trait anxiety (see below for definitions of dispositional cognitions: Fortin, 1992; Calvo & Cano-Vindel, 1997; Taylor & Aspinwall, 1996). In the context of the present study therefore, high adaptiveness to stress refers to individuals characterized by an internal locus of control, high self-esteem, high self-efficacy, high optimism and low trait anxiety. In contrast, low adaptiveness to stress refers to individuals characterized by an external locus of control, low self-esteem, low self-efficacy, pessimism and high trait anxiety. Although there are sizeable correlations among the aforementioned traits (Scheier & Carver, 1992; Walsh, Wilding, & Eysenck, 1994; Fortin, 1992), the great majority of studies have examined the separate influence of each of these traits on stress reactivity. In the present study "adaptiveness" was extracted as the factor common to the correlated traits, and its impact on stress-related responses was examined. The focus of the remaining sections of the literature review is the

relationship between "adaptiveness" and stress-related mood change, cardiac activity and selective attention.

Adaptiveness and stress-related mood state change

In the following section the research literature that has examined the effect of each trait comprised by the "adaptiveness construct" on stress-related mood state change is reviewed. A clear relationship emerges between adaptiveness and mood state change in response to stress. That is, low levels of adaptiveness are associated with an increase in depressive and anxiety symptoms in response to stress. Interestingly, stress-related mood state change observed in a normal, but low adaptive population, parallel the maladaptive stress-related mood state changes observed in anxiety patients (Stein, Tancer, & Uhde, 1992; Hofmann, Newman, Ehlers, & Roth, 1995). For example, the moods of anxiety patients are negatively influenced by stress relative to normal controls. These findings lend credence to the argument that hypersensitive mood state changes (increase in depressive and anxiety symptoms) in response to stress are associated with psychopathology.

Locus of control and stress-related mood state change

Locus of control refers to an individual's general belief regarding his control over important life challenges. *Internal locus of control* refers to one's belief that the outcome of events is dependent on one's own behavior, while *external locus of control* refers to one's belief that life events are beyond one's control and are dependent on such factors as destiny or chance (Fortin, 1992). The latter is associated with low adaptiveness, and the former with high adaptiveness. In one of the first studies examining locus of control as a buffer against the ill effects of stress, Johnson and Sarason (1978) collected data from

124 college students on stressful life events and anxiety and depressive symptoms. A significant positive correlation was found between negative life events and depression and anxiety only for external locus of control participants.

Wheaton (1982) studied a multicultural sample of 132 Anglo-Americans and 108 Mexican-Americans living in Texas. Regression analyses revealed that, after controlling for the variables of sex, church-going frequency, education, physical problems, and social desirability. internal locus of control was associated with fewer depressive symptoms when participants confronted acute stressors, but not when chronic stressors were present.

Krause and Stryker (1984) examined locus of control as a moderator of stress in a longitudinal study of 2090 middle-aged men. Their results indicated that the relation between stress and distress was positive and significantly greater for participants with external locus of control than for the internal locus of control group. even though the positive association was significant for both groups. Further analyses involved four groups formed by dividing the two earlier groups into moderate and extreme Internals and moderate and extreme Externals. It was found that men with a moderate level of internal locus of control were most resistant to stressful life events.

Although the above studies, along with other investigations (Sandler & Lakey. 1982; Lefcourt, Miller, Ware & Sherk, 1981), suggest that internal locus of control is associated with diminished subjective stress, and less anxiety and depressive symptoms in response to stress, the findings of other studies are counterindicative (McFarlance, Norman, Streiner & Roy, 1983; Nelson & Cohen, 1983; Walsh, Wilding, & Eysenck, 1994). For example, Walsh and colleagues reported that the moods of Internals and Externals did not differ following a laboratory stressor. Fortin (1992) points out that the

discrepancy in results may be partly due to methodological differences among the studies in this research area (e.g., the use of various measures of locus of control). It should be noted that studies using the Rotter scale to measure locus of control reported a moderator effect for locus of control in the relationship between subjective stress and psychological symptoms. The relative success of studies using the Rotter scale may be due to its generality and its emphasis on control of external events instead of self-control (Cohen & Edwards, 1989).

In sum, research to date provides tentative support for the hypothesis that internal locus of control acts as a buffer between stress and self-reported anxiety and depressive symptoms (Fortin, 1992).

Self-efficacy and stress-related mood state changes

In addition to locus of control, self-efficacy has been examined as a possible source of influence on stress responsivity. Self-efficacy can be 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 be regarded as a sub-type of self-efficacy. In relation to the concept of adaptiveness, self-appraised effective problem-solvers are considered high adaptives, and those who appraise themselves as poor problem-solvers are considered low adaptives.

In one of the first studies examining the relation between problem solving and distress, Nezu (1985) reported differences in psychological distress between self-perceived effective and ineffective problem-solvers. The methodology of this study will be described in some detail because of its similarity to that of the present investigation. From a pool of 213 participants who completed the Problem Solving Inventory (Heppner

& Peterson, 1982). 43 scored one standard deviation above the mean and were classified as ineffective problem-solvers, whereas 38 scored one standard deviation below the mean and were categorized as effective problem-solvers. The final sample also completed a depression inventory, an anxiety inventory and a locus of control scale. Results indicated that those who appraised themselves as ineffective problem-solvers, compared to their self-appraised effective counterparts, reported more depression, more state and trait anxiety, more external locus of control orientation, more frequent problems, and more distress. These findings replicated those reported by Heppner and Anderson (1985) and suggest a strong inverse association between perceived problem-solving effectiveness and emotional distress.

Nezu (1986) also examined problem solving as a moderator variable between negative life stress and anxiety. Nezu hypothesized that, compared to individuals who appraise themselves as ineffective problem-solvers, self-appraised effective problem-solvers would report fewer incidences of negative life stressors, and consequently experience less anxiety. Three hundred university students completed the Problem Solving Inventory (Heppner & Peterson, 1982), an anxiety inventory, and a stress measure that allows participants to report incidences of important life changes. Multiple regression analyses provided support for problem solving as a moderator variable. That is, self-appraised effective problem-solvers were less anxious than their self-appraised ineffective counterparts. Furthermore, results indicated that both negative life stress and ineffective problem solving were significant predictors of state anxiety. Lastly, the frequency of self-reported negative life events and of ineffective problem solving was related to high levels of trait anxiety.

D'Zurilla and Sheedy (1991) point out that, although there is much convergent evidence that is consistent with the hypothesis that problem-solving ability predicts lower stress levels (D'Zurilla, 1986; D'Zurilla & Nezu, 1990; Nezu & D'Zurilla, 1989; Nezu, Nezu, & Perri, 1989), the majority of such studies used cross-sectional correlational designs. Given this method of inquiry, it is possible that initial stress levels influence responses to problem-solving tests, or that problem-solving ability is a consequence of stress. In order to adequately test whether problem-solving effectiveness predicts lower stress levels a prospective longitudinal design is needed so that prior stress levels can be controlled when future stress levels are predicted.

D'Zurilla and Sheedy used a prospective design to investigate the relation between problem solving and psychological stress in college students. The experimental procedure consisted of two separate testing times. First, students completed measures of problem solving, psychological stress, and frequency of current life problems during the first month of the academic year. Three months later, participants' stress levels were reassessed. The stress measure (Derogatis Stress Profile; Lazarus & Folkman, 1984) used in this study was designed to assess transitional stress phenomena that could affect the development of future clinical disorders. Also, the problem-solving inventory used in the study measured general ability, but also assessed more specific processes such as problem-solving orientation and problem-solving skills (D'Zurilla & Nezu, 1990). Results of hierarchical multiple regressions indicated that general problem-solving ability and stress at Time 2 were negatively related after stress at Time 1 and the frequency of life problems were statistically controlled. Closer inspection of the data revealed that

participants' problem orientation was a better predictor of stress than their self-appraised problem-solving skills.

Despite consistent findings, the generalizability of these results remains uncertain. One limitation of the literature in this area is its exclusive focus on a college student population (D'Zurilla & Sheedy, 1991). Also, studies examining problem-solving efficacy (and locus of control) in relation to stress have relied very heavily on reports of negative life events and daily hassles to measure stress. Dohrenwend, Dohrenwend, Dodson, and Shrout (1984) pointed out that the interpretational difficulty with this literature is the degree to which reporting of stress events is confounded with concurrent distress. In other words, recall of stressful events can be influenced by current mood state. Also, memory can be affected by suggestion and imagination and therefore can sometimes be unreliable (Loftus, 1997). For this reason, investigations using lab-induced stressors aimed to minimize the above interpretational difficulties are required. Lastly, relative to studies examining locus of control, there is a paucity of research that examines problem-solving efficacy and its impact on the risk of psychological symptomatology. Nevertheless, investigations of problem-solving self-efficacy have generally shown that self-appraised effective problem-solvers experience less stress and psychological distress than those who see themselves as ineffective problem-solvers. In other words, the relation between life stress and emotional distress appears to be influenced by self-appraised problem-solving ability.

Self-esteem and stress-related mood state changes

Another personality trait that has been examined as a potential source of influence on stress-related behavior is self-esteem. In the present context, self-esteem

refers to an individual's evaluation of his own self-worth (Rosenberg, 1965), where high self-esteem indicates high adaptiveness and low self-esteem indicates low adaptiveness. Cooppel (1980) conducted one of the early studies examining the effects of self-esteem on stress-related mood state. Two hundred and six undergraduate students completed measures of self-esteem, daily hassles, and level of adjustment. Results indicated that self-esteem was negatively correlated with the level of daily hassles and level of adjustment.

Recently, Rector and Roger (1997) conducted two studies to determine whether exposure to a high self-esteem manipulation resulted in less stress responsivity. In the first study, they examined the potential moderating influence of self-esteem by manipulating level of self-esteem and recording subjective stress appraisal in response to a stress-inducing laboratory task. Fifty-three female undergraduate students completed a series of personality scales prior to returning to the laboratory, at which point they received either, a positive or neutral 'personality profile report' as feedback. This constituted the self-esteem manipulation. Participants were given 2 minutes to read and think about the report prior to completing a stressful task (the stroop test). Results showed that participants with high state self-esteem reported less subjective stress and outperformed neutral self-esteem participants on the stroop task.

Other studies, however, have been unable to replicate these findings. For example, Hobfoll and Walfisch (1984) evaluated women at high stress prior to a biopsy and at low stress following the biopsy. The results did not support the hypothesis that self-esteem buffers subjective reporting of stress. That is, in both high and low stress states, self-esteem was not relevant as a source of influence.

In another study that examined the relationship among self-esteem, stress and psychiatric symptoms, Westcott (1989) reported a significant negative relationship between self-esteem and symptom reporting, but no relationship was found between self-esteem and reporting of stress. Interestingly, a composite variable that included self-esteem and social support moderated the effects of stress. That is, those who were both low in self-esteem and had low levels of social support, compared to individuals who scored high on both variables, presented significantly more psychiatric symptoms.

Similarly, Ormel, Sanderman and Stewart (1988) reported that desirable events reduced symptomatology *only* for participants who had very high levels of self-esteem and an internal locus of control.

To summarize, the findings of studies examining self-esteem as a moderator of subjectively reported stress (e.g., life events; daily hassles) are mixed (Fortin, 1992; Cohen and Edwards, 1989). The results, however, support the hypothesis that a direct link exists between self-esteem and psychiatric symptomatology. Finally, there is evidence suggesting that self-esteem in combination with other resources (i.e., locus of control; social support) buffers negative stress effects.

Optimism and stress-related mood state changes

A fourth personality trait that has been cited as a factor relevant to stress is dispositional optimism, defined as generalized positive expectancies (i.e., high optimism relates to high adaptiveness and pessimism relates to low adaptiveness; Scheier & Carver, 1992). Although researchers have largely ignored the specific link between optimism, stress, and psychiatric symptomatology, there have been several prospective studies that have examined the impact of dispositional optimism on subjective well-being. One of the

first examined the reactions of a group of men to coronary artery bypass surgery (Scheier, Mathews, Owens, Magovern, & Carver, 1989; as cited in Scheier & Carver, 1992). Participants were interviewed prior to surgery, six to eight days postsurgery, and again six months later. Results showed that, presurgically, optimists reported lower levels of hostility and depression. During the days following the operation, optimists reported feeling greater relief and happiness. Lastly, at the six-month follow-up optimists reported a much better quality of life than did pessimists.

Scheier, Mathews, Owens, Magovern, and Carver (1990; as cited in Scheier & Carver, 1992) gathered additional information from the same patients five years postsurgery. Results showed optimism to be a good predictor of the subjective well-being of these men. Compared to pessimists, optimists were more likely to report that their lives were more interesting and free from pressures and annoyances. Optimists were also more likely than pessimists to report obtaining greater satisfaction from relationships, work, and life in general. Thus, despite having to endure the stress of recovering from a major set-back, optimists report feeling better than pessimists.

Aspinwall and Taylor (1992) conducted a study that also examined the hypothesis that optimism is related to less distress during stressful times. This study investigated the adjustment made by students in their first semester of college. Several personality factors were assessed, including optimism, self-esteem, and locus of control. A baseline measure of mood was obtained, and participants completed measures of psychological well-being three months into their first semester. Results showed that higher levels of optimism upon entering college were associated with lower levels of psychological distress three months later. Statistical controls enabled the authors to show that the association

between optimism and well-being was independent of baseline levels of mood and any effect due to self-esteem and locus of control. Scheier and Carver (1992) later replicated these results. They found that, across their first semester at college, optimists became significantly less stressed, less depressed, and received more social support than their pessimistic counterparts.

In sum, studies examining optimism and subjective reporting of well-being point to a robust positive relationship between these variables.

Trait anxiety and stress-related mood state changes

Trait anxiety has also been viewed as a dispositional factor that increases the risk of stress-related psychiatric disorders (Clark, Watson, & Mineka, 1994; Zinbarg & Barlow, 1996). The concept of trait anxiety has been defined as " a relatively stable proneness to react with subjective feelings of tension and apprehension, and a heightened autonomic system reactivity" (Calvo and Cano-Vindel, 1997; p. 301). Trait anxiety is inversely related to adaptiveness.

It appears that much of the support for the hypothesis that trait anxiety predicts stress responsivity comes from self-report measures (see Fahrenberg, 1992). For example, Calvo and Cano-Vindel (1997) examined the relationship between trait anxiety and self-report measures under social evaluative stress conditions (i.e., delivering a speech). Results showed trait anxiety was associated with elevated levels of self-reported cognitive and somatic distress. That is, high trait anxiety was positively related to self-appraised performance anxiety and moistness of hands. These findings are representative of much of the literature examining trait anxiety and subjective states in response to stress

(Calvo and Cano-Vindel). In sum, high-trait anxious individuals report more distress than low-trait anxious individuals in response to a stressful challenge.

Summary

In general, the research literature indicates that adaptiveness affects subjective stress and related emotional distress. That is, individuals who are oriented to an external locus of control, see themselves as ineffective problem-solvers and appraise themselves as being highly anxious report more feelings of stress and emotional disturbances in a variety of stress situations. Optimism and the combination of high self-esteem and internal locus of control have also been shown to affect self-reports of well-being and psychiatric symptoms. In addition, the subjective stress reactions of relatively healthy individuals with low-adaptive characteristics appear to mimic those of psychiatric patients (Stein et al., 1992; Hofmann et al., 1995), indicating that low adaptives may be at risk for psychiatric disorders.

Adaptiveness and stress-related cardiac responses

In comparison to the extensive research literature examining adaptiveness in the context of subjective stress, few studies have examined the physiological concomitants of the adaptiveness/stress response relationship. In general, psychophysiological studies present a complex picture of stress effects. For example, it has been found that cardiac hyper-reactivity to stress indexed by peak heart rate response is not necessarily characteristic of all anxiety disorders (e.g., generalized anxiety; Levin Saoud, Strauman, Gorman, Fyer, Crawford, & Liebowitz, 1993; and blood phobia; Stein et al., 1992). Moreover, studies examining cardiac hyper-reactivity in the non-disordered population have produced mixed results. That is, although there appears to be no association

between adaptiveness and peak heart rate reactivity in response to stress, there is evidence that high adaptives recover from stress more quickly than low adaptives.

In a previously reported study investigating the reactions of trait anxious individuals to a social-evaluative stressor, Calvo and Cano-Vindel (1997) also recorded heart rate prior, during, and post-stress. Results showed no relationship between trait anxiety and peak heart rate during stress, however, a significant relationship was found between trait anxiety and heart rate at post-stress. That is, following stress individuals lower in trait anxiety returned to baseline levels of heart rate more quickly than high-trait anxious individuals. The finding that trait anxiety and peak heart rate response to stress are not related is consistent with much of the literature examining trait anxiety and physiological stress responsivity (Baggett, Saab, & Carver, 1996; Craske, & Graig, 1984; Dua & King, 1987; Holroyd, Westbrook, Wolf, & Badhorn, 1978; Steptoe & Vogele, 1992; Walsh, Eysenck, Wilding, & Valentine, 1994). Although Fahrenberg (1992) concluded that individual differences in trait anxiety do not reliably predict peak heart rate responsivity, trait anxiety may predict heart rate recovery following stress.

Rector and Roger (1997) measured both subjectively reported stress and heart rate during a social-evaluative task. Twenty-nine female participants were divided into high and neutral self-esteem groups based on a self-esteem manipulation (i.e., positive or neutral feedback regarding a 'personality profile report'). Participants were told that they would be assessed on several dimensions that measure social skills prior to being asked to read a passage from a novel. Results indicated incongruency between subjective and physiological indices of stress. First, the self-esteem groups did not differ on self-reported stress. However, the groups differed on heart rate reactivity during the stressor,

with the neutral self-esteem group producing faster heart rates than the high self-esteem group. Also, a statistical trend was found for heart rate recovery, with the high self-esteem group characterized by heart rate levels that returned more quickly on average to baseline. These results replicate the findings of Greenberg, Solomon, and Pyszczynski (1992) who manipulated state self-esteem directly and found that self-esteem buffered the individual's autonomic arousal.

Only one study to date has demonstrated that optimism is implicated in cardiovascular reactivity. Williams, Riels, and Roper (1990) investigated the role of optimism in cardiovascular reactivity in a sample of 56 students divided into high and low optimists. Systolic (SBP) and diastolic (DBP) blood pressure, heart rate and subjective stress responses were recorded prior, during, and after a laboratory stressor. Results indicated that optimists displayed less DBP reactivity than the pessimists, whereas no difference in heart rate reactivity was found between the two groups.

Similarly, there have been a limited number of studies that have examined the relation between locus of control and psychophysiological response. Nevertheless, there exists some evidence which indicates that locus of control is associated with heart rate responses during stress. For example, Houston (1986) and Steptoe (1990) found that Internals display faster heart rates than Externals in a variety of situations.

The above results, however, are inconsistent with those reported by Walsh and colleagues (1994). In an effort to examine the role of individual differences in stress responsivity, Walsh and colleagues categorized participants as Externals and Internals while recording heart rate responses during a mental arithmetic exercise. The results showed no relation between heart rate responses (including heart rate recovery) and locus

of control. This finding, however, awaits replication in future studies using larger sample sizes and more intense stressors.

Summary

The evidence supporting a positive relationship between low adaptiveness and a hyper-reactive cardiac system in response to stress is tentative. Cardiac hyper-reactivity was observed only in low-esteem individuals confronted with a challenging task. None of the other personality traits reviewed was found to have a bearing on stress-related physiological responsivity except for locus of control, where, unexpectedly, Internals showed higher levels of peak heart rate in response to stress than Externals. Finally, although more studies are needed, there is evidence of a relationship between adaptiveness and heart rate recovery following a stressor. Specifically, results were in the expected direction in studies examining trait anxiety and self-esteem; low trait anxious individuals produced faster heart rate recovery than high trait anxious individuals and high self-esteem individuals showed a similar trend compared to low self-esteem individuals.

Adaptiveness and concordance between mood and cardiac activity

In the previous section, the research literature pertaining to the relationship between adaptiveness and stress-related cardiac activity was reviewed. In this section, the relationship between subjective and physiological stress response systems as a function of adaptiveness is discussed. The model of risk for psychopathology depicts that concordance between subjective stress responses and cardiac responsivity signifies an oversensitization to stress and an increased vulnerability to psychiatric disorder. Although more research is needed in this area, there is some evidence supporting the idea

that compared to high adaptives, low adaptives display more concordance between the subjective and physiological response systems. Zahn and colleagues (1991) examined the level of concordance between subjective anxiety and heart rate activity in normal controls and participants at risk for affective disorders. Participants who had a parent with bipolar affective disorder were categorized as high-risk. Significant and positive correlations between subjective anxiety and physiological arousal at rest and under stress were found in high-risk participants, but not in controls. These results were interpreted as signifying an oversensitization to stress in high-risk participants compared to controls.

Calvo and Miguel-Tobal (1998) reported similar results. These authors compared high and low-trait anxious individuals on self-reported distress and heart rate reactivity under a social-evaluative stressor. Concordance was found to be much higher in high than in low-trait anxious participants. Low-trait anxious participants actually exhibited a trend for 'reversed concordance', meaning that a borderline significant and negative correlation was found between self-report distress and physiological arousal. The authors put forth two potential interpretations of the results. First, compared to low-trait anxious participants, high-trait anxious participants exhibited greater physiological arousal at baseline and during the anticipation phase of stress. It is therefore conceivable that an increase in arousal facilitated concordance between subjective and physiological response systems. The authors point out however, that this interpretation cannot explain the reverse concordance found in low-trait anxious participants. In addition, the interpretation is inconsistent with the results of many other studies that found no significant association between physiological reactivity and trait anxiety (see section on adaptiveness and stress-related cardiac response). A second interpretation focuses on

suppression of negative feelings. It is proposed that low-trait anxious individuals, compared to individuals high in trait anxiety, either perceive less threat or inhibit reporting subjective feelings of distress. In both cases, the coping strategies of low-trait anxious individuals can theoretically decrease the salience of stressors, and consequently increase their ability to deal effectively with normative stress.

Summary

Although few in number, the available studies point to a significant relationship between adaptiveness and concordance between the subjective and physiological response systems. That is, low adaptives exhibit more concordance than high adaptives, who may even exhibit an inverse relationship. These data suggest that low adaptives may be hypersensitive to stress and therefore may be at risk for stress-related psychiatric disorders. On the other hand, high adaptives appear to use coping strategies that can decrease the salience of stressors which may protect them from the ill effects of recurring hypersensitive reactions to stress.

Adaptiveness and selective attention to emotional stimuli

There is considerable evidence suggesting that maladaptive selective attention patterns are characteristic of anxious and depressed patients (Mogg & Bradley, 1999; Mathews & MacLeod, 1994; Mathews, Ridgeway, & Williamson, 1996; Byrne & Eysenck, 1995; Dalgleish & Watts, 1990; MacLeod, Mathews, & Tata, 1986). Such individuals have been shown to maintain an oversensitive vigilance for negative sources of information in their environment. Based on these findings, investigators have hypothesized that individuals at risk for psychopathology may also possess an oversensitive selective attention bias for negative information (Mogg at al., 1994). The

results of studies examining the influence of adaptiveness and stress on attentional bias in the normal population have been mixed. Mogg, Bradley, De Bono, and Painter (1997) noted that attentional bias for threat has been associated with state anxiety (Chen, Lewin, & Creaske, 1996; Mathews & MacLeod, 1985), with trait anxiety (Mogg, Mathews, & Weinman, 1989; Richards & Millwood, 1989), and with the interacting effects of state and trait anxiety (MacLeod & Mathews, 1988). To overcome the methodological limitations of other attention paradigms, MacLeod et al., (1986) devised the dot probe task. This paradigm requires participants to respond to a neutral stimulus (a dot) that replaces one or the other member of a word pair presented on a computer screen. Participants press one button if the dot probe replaces a threat word, or another button if the probe replaces a neutral word. Faster response latencies to dots replacing threat cues denote selective attention to such information. The results of studies using the dot probe paradigm suggest a selective attention bias to threat in normative low adaptive individuals (MacLeod & Mathews, 1988; Mogg et al., 1994).

In order to effectively investigate patterns of selective attention in non-clinical populations, researchers must examine the separate influences of personality traits and stress-induced mood state on selective attention. Mogg and colleagues (1994) noted that clinical studies are unable to disentangle the effects of state and trait on processing biases in anxiety-disordered patients because they typically are high in both state and trait levels of anxiety. It is feasible, however, to manipulate state anxiety in a non-clinical sample so that state and trait can be examined independently. MacLeod and Mathews (1988) used this strategy to examine the independent effects of trait and state anxiety on selective attention using the dot probe task. They assessed 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). The results indicated that only high-trait anxious participants shifted attention to threat cues during both test occasions (i.e., had significantly faster response latencies to threat words than neutral words). Moreover, results provided support for the interaction hypothesis. That is, at high stress, high-trait anxious participants shifted attention to exam-related words (e.g., test, failure), whereas low-trait anxious participants shifted their attention away from such information (i.e., low-trait anxious participants had significantly faster response latencies to neutral words than threat words).

Mogg, Mathews, Bird, and Macgregor-Morris (1990) point out an important limitation of the Mathews and MacLeod (1988) study, namely, that the time interval between the two testing sessions may have allowed high trait-anxious participants to ruminate about exam-related concerns prior to the second testing session. If so, different patterns of rumination in high and low trait anxious participants may have primed the former group to be more vigilant to threatening stimuli. This interpretation excludes state anxiety as an influence on the relationship between trait anxiety and attentional bias.

To shed light on the relative importance of trait and state, Mogg and colleagues (1990) assessed attentional bias in high and low trait anxious students, but had the participants randomly allocated either to a high stress condition (difficult anagram task with false negative feedback) or a low stress condition (easy anagram task with false positive feedback). In this instance, all participants shifted their attention to threat stimuli under the high stress condition.

A possible reason for the failure of Mogg and colleagues (1990) to replicate the interaction effect between trait and level of stress in the MacLeod and Mathews study (1988) is the difference in ***time-course*** of the stressors (Mogg et al., 1994). The laboratory-induced stress in the study conducted by Mogg and colleagues (1990) was short lasting, whereas the real-life exam-induced stress used in the MacLeod and Mathews study may have allowed for negative ruminations to be present over several days. It may be that short-lasting and prolonged stressors produce different patterns of selective attention. Mogg et al. (1994) suggest that perhaps all individuals shift attention to threat under stressors of short duration, but that low trait-anxious people can reverse this effect by developing adaptive coping strategies under prolonged anticipatory stress. These authors tested this hypothesis by assessing attentional patterns of high and low trait anxious participants under no stress, under a short-lasting lab-induced stress, and under the identical prolonged and exam-induced stress used by MacLeod and Mathews (1988). The lab-induced stress was a time-restricted (30 seconds) multiple-choice test. Participants were told that the questions were practice for an upcoming "IQ test" that was not in fact administered. The dot probe paradigm was altered to include positive words so as to address the question of whether anxious subjects show an attentional bias for non-threatening, emotional words. Moreover, threat words were divided into two categories, physical (e.g., attack) and achievement (e.g., stupid), to test whether threat cues that related to the individual's concern induce selective attention results that differ from other threat cues.

Mogg et al. (1994) reported that there was no evidence of attentional bias for positive words. This result is consistent with much of the literature investigating this

question (see Ruiz-Caballero & Bermudez, 1997). Also, the type of threat word (achievement vs. physical) did not affect attentional bias. Of greater interest were the results comparing attention to threat cues relative to neutral cues. Under the prolonged stressor condition, high-trait anxious participants shifted attention to threat words, whereas low-trait anxious participants shifted attention away from threat words. No differences in attentional bias were found between the high and low trait groups under the no stress and lab-stress conditions. These results suggest that selective attention for threat may be a function of prolonged anticipatory stress.

In summary, studies that use a methodologically sound selective attention task, such as the dot probe paradigm, have provided evidence that trait anxiety interacts with duration of stressor to produce attentional bias to threat information. This set of results is consistent with the attentional bias for threatening stimuli observed in psychiatric patients. Thus, low adaptives characterized by high-trait anxiety may be particularly vulnerable to psychiatric disorders. More research in this area is needed, however, in order to fully elucidate which aspects of stressful events besides time-course help to produce attentional biases for threat information. Finally, investigations of selective attention to emotional stimuli as a function of traits other than anxiety are sorely lacking. This area of inquiry is important for potential treatment and prevention programs in that it increases the number of dispositional cognitions that can be targeted for change.

OVERVIEW AND RATIONALE OF THE STUDY

The goal of the present study was to investigate mechanisms that have been hypothesized to have a bearing on the relationship between stress and emotional

disorders. The current conceptualization of risk processes in psychopathology suggests that a set of relatively stable thought processes constitute a belief system that is a pivotal in establishing patterns of maladaptive stress-related behaviors. It was hypothesized that a belief system characterized by maladaptive dispositional cognitions alters stress responses in ways that are associated with an increased risk of psychopathology. Specifically, individuals characterized by low adaptiveness may possess poorly regulated and coordinated attentional, cardiac, and mood state response systems. The aim of the present study was to investigate the relationship of personal adaptiveness to the aforementioned stress-related response systems. Studies of this kind may shed light on ways to prevent maladaptive patterns of stress-related coping behaviors. In the ensuing sections, the rationale for the methodology of the present study is discussed.

Stressor Condition. The lab-induced stressor used in the present study was the "Trier Social Stress Test" (TSST; 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 a speech, and a recovery period in which participants relax following speech delivery. The TSST was chosen for four reasons: 1) It is a validated tool for investigating psychobiological stress in a laboratory setting with a non-clinical population (Tersman, Collings, & Eneroth, 1991; Bassett, Marshall, & Spillane, 1987); 2) The segmented tasks (e.g., speech preparation, delivery of speech) provide an opportunity to assess subjective ratings of stress via questionnaires without disrupting the natural flow of the stressor; 3) The duration of the stressor (approximately 30 minutes) is prolonged compared to other lab stressors (Mogg et al., 1994; Mogg et al., 1990), and therefore permits the examination of how a long-lasting

lab-induced stress influences selective attention; and 4) Despite being a laboratory stressor, the TSST has good ecological validity because it is a fairly intense stress manipulation that closely approximates naturalistic social stressors

Reporting of Mood. The stressor used in the present study avoided interpretational difficulties associated with the reporting of incidences of negative life events as a measure of stress because it was current. For example, the findings that those with an internal locus of control report fewer undesirable life events than Externals may be a function of dispositional differences in memory for negative events (Taylor & Aspinwall, 1996). The use of a lab-induced stressor enables participants to report their mood while in the midst of experiencing it, thereby essentially eliminating any potential confound caused by a heavy reliance on memory. The result is that participants are in a position to provide a more authentic subjective appraisal of mood state in response to a specific stressor.

Physiologic Index of Stress. Heart rate was chosen as the preferred index of physiological stress for several reasons. The first reason is related to the need to add to the literature on stress recovery. As a physiological measure, heart rate lends itself easily to the calculation of a stress recovery index. Second, heart rate has been shown to be a reliable index of stress (Swain & Suls, 1996; Veit, Brody, & Rau, 1997). Lastly, heart rate is measurable in ways which are non-invasive and which do not disrupt the flow of the stressor, a factor that adds authenticity to the stress condition.

Attention Paradigm. The most used attention paradigms have been the Stroop color-naming task and the dot probe paradigm. In the Stroop task, participants are shown words varying in their emotional valence and printed in a variety of colors. Participants

are then asked to name the color in which the words are printed. Any delay in color naming is attributed to the meaning of the word interfering with the task. In other words, delay in color naming serves as an index of the attention-grabbing power of the word (Mathews & MacLeod, 1985). Attentional effects in this paradigm, however, cannot be disentangled from other non-attentional response factors. It is possible that the emotional stimuli simply interfere with the execution of a response, thereby producing an effect that is independent of selective attention. For this reason, the attention paradigm of choice was the methodologically sound dot probe task.

The attentional task used in the present study was identical to the one used by Mogg and colleagues, (1994). A noteworthy aspect of the attention task is the use of two types of threat words, achievement threat words (e.g., fail, stupid) and more general physical threat words (e.g., disease). This strategy was originally employed to demonstrate selective attention to emotional stimuli that relate to the participant's most prominent concern. Although this manipulation has been used successfully in the clinical population (McNally, 1996), it has provided mixed results when used with a normal population (Mogg et al., 1994; MacLeod and Mathews, 1988). Given the variable findings in the normal population, the effect of this manipulation was uncertain. Nevertheless, the different types of threat words were used for exploratory purposes.

Hypotheses. Based on the evidence reviewed in the preceding sections, individuals with maladaptive belief systems are likely to be predisposed to psychiatric disorders. Specifically, the mechanism of selective attention and patterns of maladaptive subjective and physiological stress responses may facilitate the stress/psychopathology

relationship for individuals characterized by a set of maladaptive dispositional cognitions. Accordingly, the present study was expected to show the following:

Compared to high adaptive individuals:

1) Low adaptive individuals confronted with a moderate social-evaluative laboratory stressor were expected to report more emotional distress as measured by mood state.
2) Low adaptive individuals were expected to take longer to recover from a stress situation as measured by cardiac activity.
3) Low adaptive individuals were expected to exhibit significantly more concordance between their subjective and physiological responses during stress.
4) Low adaptive individuals were expected to shift attention toward, as opposed to away from, the spatial locations of threat cues under conditions of relatively prolonged stress.

Method

Sample

Two hundred undergraduate students of Concordia University completed the Life Orientation Test (LOT), a self-report measure of dispositional optimism. Originally, only those with scores three quarters of a standard deviation from the mean (24 or above and 16 or below) on the LOT were to be tested. However, in order to arrive at a statistically viable sample size, a portion of the final sample was recruited from volunteers scoring in the middle range on the LOT. In all, 50 volunteers were asked to participate in the study. Of the 50 participants, 12 were excluded from the study because of psychiatric disturbance, current substance abuse, or insufficient fluency in English. Thus, the final sample consisted of 38 participants (25 females, 13 males) whose average age was 23 years (SD 2.1; range 18 to 35 years). Twenty-nine of 38 participants scored at least three quarters of a standard deviation above or below the mean on the LOT. Participants tested prior to February 13, 2000 received $10 for their time and effort. To draw more participants, those tested after February 13, 2000 received $20.

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). Only

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 personality traits.

The **LOT** consists of eight items (plus four filler items) that assess for dispositional optimism defined as generalized outcome expectancies (Scheier & 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_t = .79, respectively. In evaluating convergent validity, Carver and Scheier found the correlation between the LOT and the Rosenberg Self-Esteem Scale to be r_t = .48.

The **RSES** 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_t = .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 widely used in both clinical and nonclinical populations (Spielberger & Vagg, 1984; see Appendix F). The higher scores of neurotic 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 reinforcements and achievements as dependent on one's own abilities, or as dependent on environmental factors beyond one's control (Duke & Norwicki, 1973; see Appendix G). The ANSIE is a 40-item yes-no scale that controls for social desirability (Duke & Norwicki, 1973). Duke and Norwicki report that the ANSIE has excellent psychometric properties with a test-retest reliability of r. = .83 and internal consistency ratings ranging from .66 to .73.

Measures of Affective State. Self-reported mood and stress levels were assessed using the Bipolar Profile of Mood States questionnaire (**POMS**) and the Visual Analogue Scale (**VAS**). The former 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, & Droppleman, 1988; see Appendix H). Participants rate themselves from 0 to 3 in relation to an emotionally valenced word (e.g., sad, nervous), where "0" indicates that they *feel much unlike* the word, and "3" indicates that they *feel much like* the word. This measure is reported to be sensitive to changes in mood state and to have good psychometric properties (McNair et al., 1988).

The VAS is a brief self-report measure assessing current mood state that includes stress level, motivational state and intrusive thoughts. In this study it was used to assess subjective stress (see Appendix I). Participants indicated their level of stress by simply marking an "X" on a 100 mm line, with responses ranging from "not at all" (0 mm) to "very much" (100 mm).

Physiological Stress Measure. Heart rate was used as the physiological index of stress. The Polar Vantage NV, a wireless transmission device, was utilized to monitor heart rate. This device consists of a dual-electrode band placed around the participant's chest, and a watch placed on the participant's wrist that receives signals from the band and automatically averages heart rates across one-minute intervals. The physiological stress index relevant to the study's aims was heart rate recovery. Recovery from stress was defined as the rate of decline in heart rate in the 10-minute interval following the peak heart rate recorded during the stressor task. Heart rate decline was expressed in percent and calculated as follows: $[(T2 - T1) / T1 \times 100]$, where T1 was peak heart rate (in beats per minute) and T2 was heart rate 10 minutes after peak heart rate.

Attention Paradigm. The probe detection paradigm (a reaction time task) was employed 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. Attentional bias scores were calculated using the following equation: Attentional bias scores = 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 is in the upper position. Bias scores where values are positive reflect selective attention towards the spatial location of threat words relative to neutral words, whereas negative values reflect 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 (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 words 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.

Stressor Task. A modified version of the "Trier Social Stress Test" (TSST) was used to induce moderate stress (Kirschbaum, Pirke, & Hellhammer, 1993). Participants were asked to take on the role of a job applicant and prepare a speech that detailed the reasons why they should be hired for a hypothetical job opening of their choice (see Appendix K for description of instructions to participants). Participants were given 30 minutes to prepare a five-minute speech which they subsequently delivered in front of a panel of two confederates acting as staff mangers. The speech delivery was video-recorded and participants were deceived into believing that their performance would be evaluated in order to add authenticity to the stress manipulation.

Procedure

During the recruitment phase, the real aim of the present study was not disclosed to potential volunteers because prior knowledge that the study included a stress manipulation could distort stress responses. Volunteers completed the LOT at the time of recruitment after they were told that the objective of the study was to examine the relationship between personality and performance in job interviews. Based on the LOT

scores, a group of volunteers was selected and invited to continue to participate in the study.

On arrival at the laboratory, participants completed the consent form (see Appendix L), the trait scales, and the screening procedures for substance abuse, psychiatric disorder, and when appropriate, for English fluency. Those who met the inclusion criteria received the baseline measures of stress and mood state. First, participants were fitted with the heart rate monitor and asked to relax for 15 minutes while their heart rate was recorded. Following the relaxation period, participants completed the POMS and the VAS.

Participants then removed the heart rate monitor and were escorted to another room where a baseline measure of attentional bias to threat words was obtained using one of two versions of the probe detection task. Participants performed this task in a seated position, with their chins resting on a chin rest 57 cm away from the computer screen.

Following completion of the baseline attention task, participants returned to the original testing room where they were once again fitted with the heart rate monitor in preparation for the stressor task. Twenty minutes into the speech preparation time, participants were interrupted and asked to complete the VA and POMS. Once the measures of stress and mood state during *anticipatory* stress were obtained, participants removed the heart rate monitor prior to returning to room 2 where they completed the alternative version of the probe detection task (without practice trials). Once stress-related reaction times to threat and neutral cues were recorded, participants were escorted to a third room where they were refitted with the heart rate monitor prior to delivering their speech. Participants were given 10 more minutes to review their notes prior to

being asked to deliver their speech without the use of notes. Following their speech, participants completed a third VAS, and then relaxed for 10 minutes. The testing session ended with the experimenter debriefing participants (see Appendix M) on the rationale for having used deception and on the overall purpose of the study. Each testing session lasted approximately two hours (see Figure 2 for a schematic representation of the experiment).

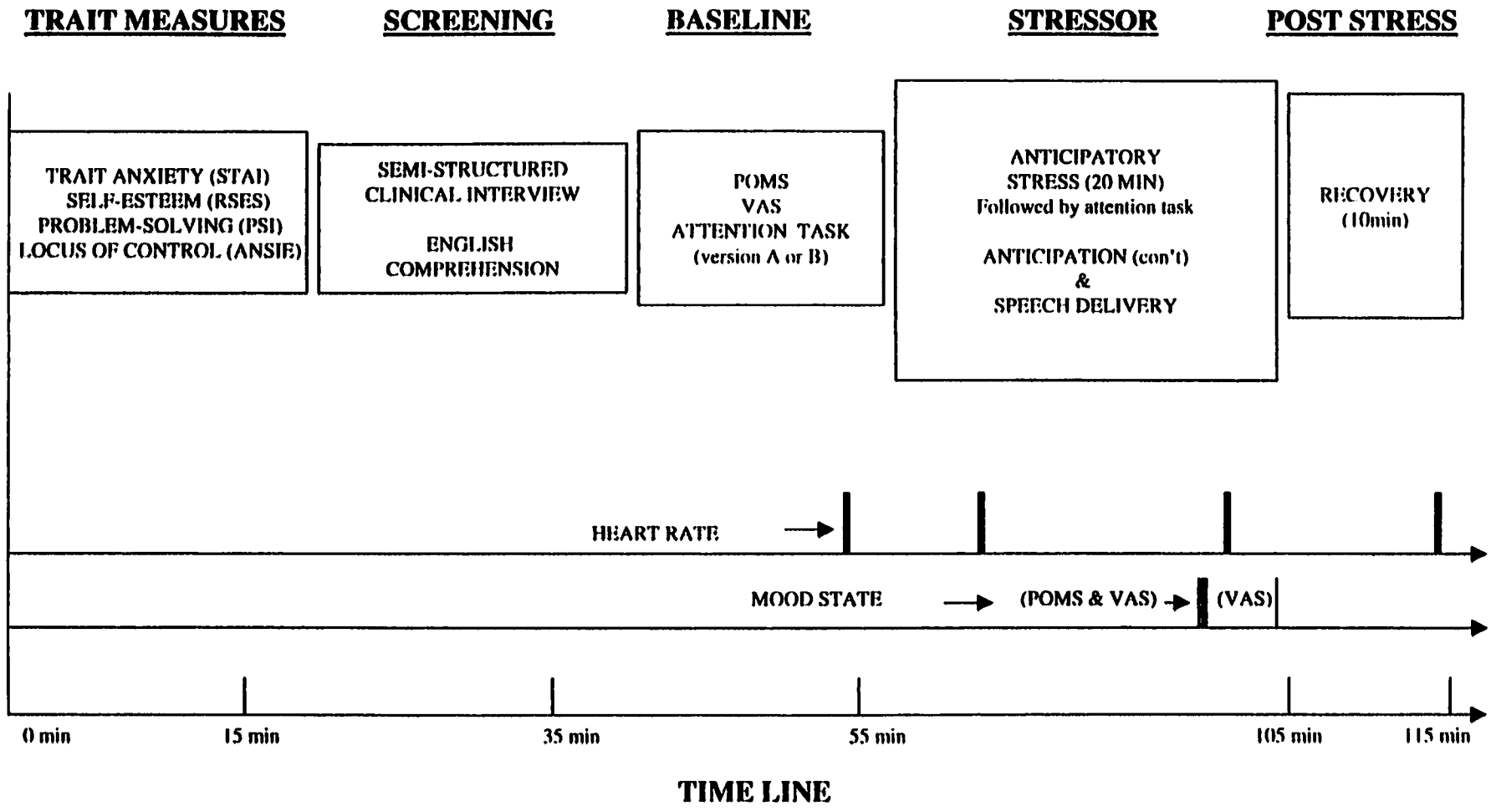

Figure 2. Schematic representation of the experiment

Results

General statistical approach: Given the exploratory nature of the present study, it was believed that the statistical approach should be one that exploited the present data set to its fullest. In other words, it was deemed important that findings provide leads that encourage researchers to continue with potentially promising lines of investigation. Consequently, statistical analyses were conducted to test the specific hypotheses previously described as well as other related hypotheses. Furthermore, findings with a significance level that ranged between .05 and .10 were considered statistical trends and interpreted as positive results that await replication in studies with larger samples. Although this type of statistical approach increases the probability of committing a type I error, the likelihood is that only a single type I error is committed per study that includes multiple comparisons and such potential error is easily rectified by replicating the present study (Keppel, 1991).

Preliminary statistics: Descriptive statistics were conducted to evaluate the normality of the distribution of each dependent variable and to assess the presence of outliers. Certain abnormalities were found in the selective attention data (see section entitled "hypothesis 4" for a description of how outliers and skewness were dealt with). All other variables were characterized by normal distributions and were devoid of outliers.

Gender effects: The relevance of gender as a source of variation in the dataset was examined. Repeated–measure analyses of variance (ANOVAS) did not show any gender by time interaction effects for POMS scores [$F(1,36) = 0.74$, $p > .10$], for peak heart rate [$F(2,72) = 1.24$, $p > .10$], and for attentional bias scores related to physical

threat cues [$F(1,36) = 0.76$, $p > .10$], and achievement threat cues [$F(1,36) = 0.29$, $p > .10$]. There were also no significant main effects of gender revealed for POMS scores [$F(1,36) = 0.01$, $p > .10$], for peak heart rate, [$F(1,36) = 0.98$, $p > .10$], for heart rate recovery, [$F(1,36) = 0.04$, $p > .10$], and for attentional bias scores related to physical threat cues, [$F(1,36) = 3.34$, $p > .05$], and achievement threat cues, [$F(1,36) = 0.20$, $p > .10$]. Gender was therefore omitted from all subsequent analyses.

Stress manipulation check: To determine whether the stressor condition was meaningful, a repeated-measures ANOVA was conducted comparing POMS scores at baseline (T1) and stress (T2). There was a statistically significant main effect for time, [$F(1,36) = 12.06$, $p < .01$], with a progressive lowering of mood from T1 (M=26.38, SD=4.62) to T2 (M=23.65, SD=5.27).

The impact of the stressor was also tested by conducting a repeated-measures ANOVA on VAS scores. This analysis provided further support for the effectiveness of the stress manipulation by revealing a significant main effect of time, [$F(2,72) = 29.75$, $p < .0001$]. Follow-up Tukey tests revealed significant increases in stress for all possible pairwise comparisons between baseline (M=14.00, SD=14.94), speech preparation (M=41.81, SD=26.47), and post-speech delivery (M=53.68, SD= 30.81) scores.

A repeated-measures ANOVA was also conducted to test for significant increases in heart rate during the stress condition. This analysis revealed a significant main effect for time, [$F(2,72) = 79.78$, $p < .0001$]. Follow-up Tukey tests showed that participants' heart rates increased significantly for all possible pairwise comparisons between baseline (M=71.83, SD=8.90), speech preparation (M=92.00, SD=11.06), and speech delivery (M=97.29, SD=15.50) heart rates.

Finally, a t-test comparing peak heart rate during speech delivery and heart rate 10 minutes post peak heart rate was used to examine whether cardiac activity decreased significantly following peak heart rate. This analysis showed that heart rate declined significantly, [$t(37) = 13.64$, $p < .0001$, 2-tailed].

Adaptiveness factor: The level of correlation between trait measures was sizeable enough to allow a principle components factor analysis to be performed in order to further examine the relations among trait variables (Tabachnick and Fidell, 1996; see Table 1 for intercorrelations among trait variables). The five trait variables combined to form a single factor (adaptiveness factor; eigenvalue = 2.73, factor explained 54.5 % of the variance), and factor loadings for each of the traits are reported in Table 2. A median split was subsequently performed on the newly built hypothetical factor, allowing for the categorization of participants as either high or low adaptives.

Statistical analyses dealing directly with each hypothesis and other related analyses of interest are described below.

Hypothesis 1: It was hypothesized that, compared to high adaptives, low adaptives confronted with a stressor were expected to report more emotional distress. Scores from each POMS scale were transformed into standard T scores and combined to yield a single mood index per participant. Preliminary analyses using standard scores and raw scores indicated that transforming raw scores into standard scores had no effect on the results. Accordingly, statistical analyses related to raw mood scores will be reported.

First, to determine whether low and high adaptives differed on mood state at T1, adaptive groups were compared on POMS scores using an ANOVA. This analysis revealed a significant main effect for group, [$F(1,37) = 6.99$, $p < .025$], with low

Table 1

Intercorrelations Between Trait Measures (n=38)

		1	2	3	4	5
1.	PSI	-	.50	-.45	.22	.32
2.	RSES		-	-.80	.47	.49
3.	STAI			-	-.40	-.33
4.	LOT				-	.13
5.	ANSIE					-

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

Table 2.

Factor Loadings of Trait Measures Included in the Adaptiveness Factor

Trait Measures	Factor Loadings
Self-Efficacy (PSI)	.67
Self-Esteem (RSES)	.91
Trait Anxiety (STAI)	-.85
Optimism (LOT)	.58
Locus of Control (ANSIE)	.60

adaptives (M=25.54, SD=4.06) reporting lower mood (i.e. more mood disturbance) compared to high adaptives (M=28.22, SD=4.50). Next, to determine the effect of group on mood state at T2, while controlling for group differences at T1, an analysis of covariance (ANCOVA) was conducted on the POMS data using T1 as the covariate. This analysis revealed a significant covariate effect, [$F(1,37) = 14.81$, $p < .0001$], and a main effect for group, [$F(1,37) = 5.46$, $p < .05$], with low adaptives (M=20.96, SD=4.41) reporting more lowering of mood than high adaptives (M=26.33, SD=4.73) (see Figure 3).

Hypothesis 2: It was hypothesized that, compared to high adaptives, low adaptives would take longer to recover from a stress situation. An ANOVA was conducted to test the hypothesis that following peak cardiac activity during a stressful social-evaluative challenge, the heart rates of high adaptives decline faster than the heart rates of low adaptives. This analysis revealed a nonsignificant main effect for group, [$F(1,35) = 0.70$, $p > .10$].

Hypothesis 3: It was hypothesized that, compared to high adaptives, low adaptives exhibit more concordance between their physiological and subjective response systems during stress. Pairwise correlations were calculated using POMS scores at T2 and peak heart rate during speech preparation for each adaptive group. Correlations indicated nonsignificant relationships between the physiological and subjective response systems for low adaptives, [$r = -0.13$, $p > .10$], and high adaptives, [$r = .34$, $p > .10$].

To further ascertain the relationship between the physiological and subjective response systems in high and low adaptive groups, correlation analyses were conducted using a revised global mood score. That is, a mood score was calculated using the three

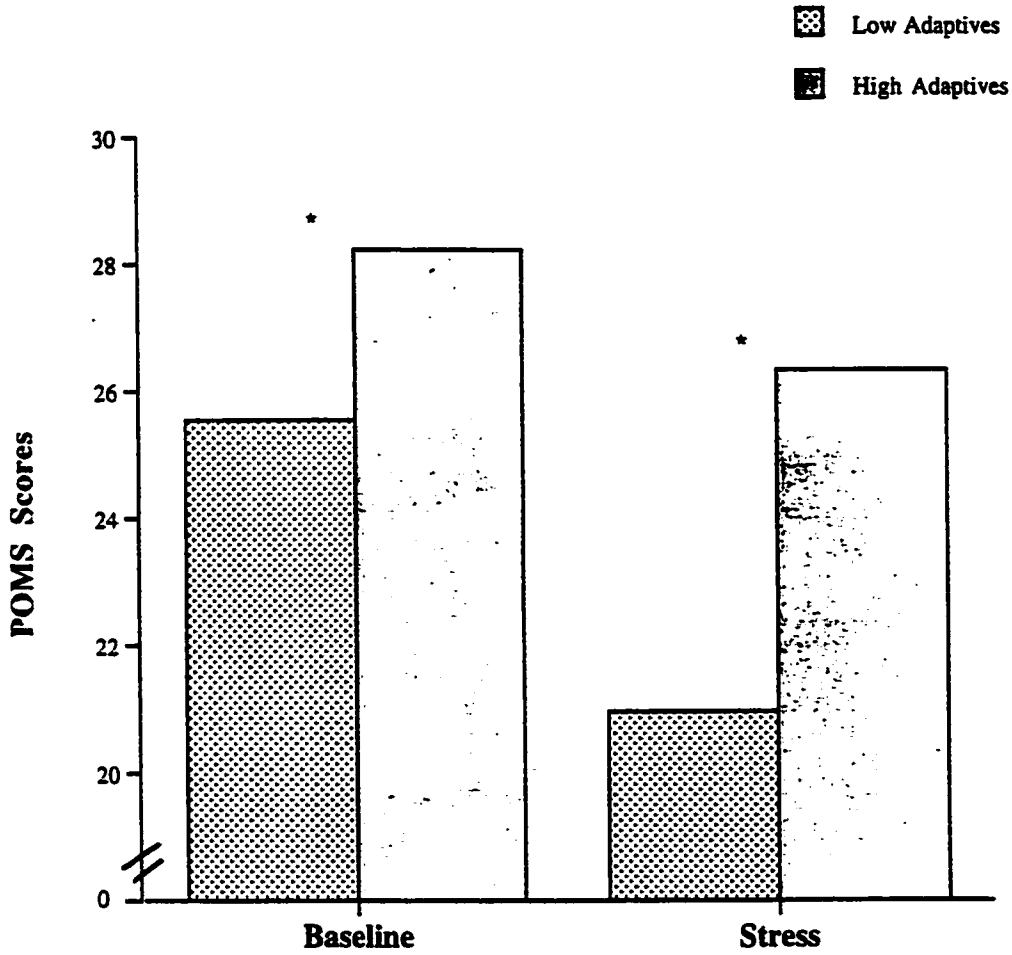

Figure 3. Mean POMS scores for low (n=19) and high adaptives (n=19) during baseline and stress.

*p<.05
High adaptives were significantly different from low adaptives at baseline and at stress with baseline scores as the covariate.

POMS subscales that are conceptually most related to the adaptiveness construct, scale A (anxious/composed), scale B (depressed/elated), and scale E (unsure/confident). Correlation analysis between the revised mood state score at T2 and peak heart rate during speech preparation revealed nonsignificant relationships for low adaptives, [$r = -0.18$, $p > .10$]. For high adaptives, however, a significant relationship was found between heart rate and POMS scores, [$r = 0.49$, $p < .05$], indicating that the higher the heart rate the more high adaptives reported feeling composed, elated and confident. Given that the correlation between the physiological and subjective response systems for high adaptives was significantly different from zero ($r = 0.49$), and that the correlation between response systems for low adaptives was not significant and in the opposite direction ($r = -0.18$), it can be argued that high adaptives exhibit significantly more reversed concordance than low adaptives (i.e., reversed concordance refers to relationships in the opposite direction to those expected).

Hypothesis 4: It was hypothesized that under conditions of relatively prolonged stress, low adaptives would shift attention toward the spatial location of threat cues, whereas high adaptives shift attention away from the spatial location of threat cues. As previously reported, mean reaction times to probes replacing threat words were compared with reaction times to probes replacing neutral words to produce an index of attentional bias to threat (see Method section). Faster latencies to dots replacing threat cues reflected selective attention to threat. All latencies below 100 milliseconds (ms) were considered anticipation reactions and were therefore omitted from statistical analyses. Latencies above 750 ms (approximately two standard deviations from the mean) were considered outliers and were also omitted from statistical analyses (Mogg et al., 1994). Descriptive

statistics yielded a positively skewed distribution of attentional bias scores related to physical threat cues at T2. Keppel (1991) suggests that with asymmetrically skewed data shifting the significance level from the typical alpha = .05 to a more stringent .025 or .01 should provide a reasonable correction for distortions that might occur under these particular situations. Accordingly, all analyses involving attentional bias scores related to physical threat words at T2 were evaluated using the .01 significance level.

To examine whether attention for high and low adaptives shifted toward or away from threat cues at T2, attentional scores were compared to "0" using a series of t-test (all t-tests were 2-tailed). These analyses indicated that low adaptives did not significantly shift attention toward or away from physical threat words, [$t(18) = -1.63$, $p > .10$], or achievement threat words, [$t(18) = 1.28$, $p > .10$]. A similar pattern of results was found for high adaptives, with attentional bias scores not significantly differing from zero for physical threat words [$t(18) = -1.44$, $p > .10$], or achievement threat words, [$t(18) = 0.46$, $p > .10$].

Analyses were conducted to determine whether low and high adaptive groups shifted toward or away from threat cues at T1. T-tests showed that low adaptives did not significantly shift attention toward or away from physical threat words [$t(18) = 1.16$, $p > .10$], or achievement threat words, [$t(18) = 1.28$, $p > .10$]. Similarly, for high adaptives, t-tests provided evidence against attention shifts toward or away from physical threat words, [$t(18) = -1.39$, $p > .10$], or achievement threat words, [$t(18) = 0.46$, $p > .10$].

Statistical analyses were also conducted to test if low and high adaptives *differed from each other* on attentional bias scores at T1. An ANOVA on attentional bias scores for physical threat words showed a trend for the main effect of group, [$F(1,37) = 3.26$, p

< .08], indicating that high adaptives (M=.008, SD=.026) tend to orient to physical threat words more quickly than low adaptives (M= -.007, SD= .026), who, in turn, tend to avoid threat cues more than high adaptives. For attentional bias scores related to achievement threat words, however, an ANOVA indicated that the main effect for group was not statistically significant, [F(1,37) = 1.54, p > .10].

ANCOVAS were used to test for differences between adaptive groups on attentional bias scores T2, controlling for T1 attentional bias scores. In a first ANCOVA, group differences in attentional bias scores for physical threat words were examined using attentional bias scores for physical threat cues at T1 as the covariate. This analysis indicated a significant covariate effect [F(1,35) = 4.45), p < .05], but a nonsignificant main effect for group, [F(1,37) = 1.17, p > .10]. In a second ANCOVA, group differences in attentional bias scores for achievement threat cues were examined using attentional bias scores for achievement threat words at T1 as the covariate. This analysis revealed a nonsignificant covariate effect, [F(1,35) = 1.18, p >.10], and a nonsignificant main effect for group, [F(1,37) = 0.77, p > .10].

Repeated-measure ANOVAS (one for each type of threat cue) were used to test for differences between groups regarding amount of change in attentional bias scores from T1 to T2. The group by time interaction effects for attentional bias scores related to physical threat cues and achievement threat cues were not significant, [F(1,36) = .46, p > .10], and, [F(1,36) = 2.02, p > .10], respectively.

It has been suggested that selective attention effects in nonclinical populations are more likely to be obtained the when substantive differences exist between groups being compared (Mogg et. al., 1997). To further examine the relationship between

adaptiveness and selective attention, the sample was split into three and the data from the upper and lower thirds were retained for further statistical analyses. To test whether extreme groups shift attention toward or away from threat cues at T2, a series of t-tests comparing attentional bias scores to "0" were conducted (all t-tests were 2-tailed). This analysis indicated that extreme high adaptives did not shift attention toward or away from physical threat words [$t(12) = -0.70$, $p > .10$], or achievement threat words, [$t(12) = 0.72$, $p > .10$], during stress. Also, Extreme low adaptives did not shift attention toward or away from physical threat words, [$t(12) = -1.62$, $p > .10$], or achievement threat words [$t(12) = 0.99$, $p > .10$], at T2.

A series of t-tests were also conducted to determine whether extreme adaptive groups shifted attention toward or away from threat cues at T1. These analyses indicated a trend for extreme high adaptives (M=.010, SD=.020) to shift attention ***toward*** physical threat cues, [$t(12) = -1.82$, $p < .10$]. For achievement threat cues, however, extreme high adaptives did not significantly shift attention toward or away from threat words [$t(12) = -0.84$, $p > .10$]. Also, extreme low adaptives did not significantly shift attention toward or away from physical threat cues, [$t(12) = 1.61$, $p > .10$], or achievement threat cues, [$t(12) = -0.84$, $p > .10$], at T1.

To determine whether extreme low and extreme high adaptives differed from each other on attentional bias scores at T1, two ANOVAS were conducted (one for each type of threat word). There was a significant main effect for group for attentional bias scores related to physical threat words, [$F(1,25) = 5.66$, $p < .05$], indicating that extreme high adaptives (M=.010, SD=.020) **attend to** probes replacing physical threat words significantly more quickly than extreme low adaptives (M= -.012, SD=.027), who, in

turn, **avoid** threat words more than extreme high adaptives (see Figure 4). For attentional bias scores related to achievement threat words, however, the main effect for group was not significant, [$F(1,25) = 1.88$, $p > .05$].

Two ANCOVAS were conducted to test differences between extreme groups on attentional bias scores at T2, using T1 attentional bias scores as covariates. The first ANCOVA dealt with attentional bias scores related to physical threat words and it revealed a nonsignificant covariate effect [$F(1,25) = 1.23$, $p > .10$], and a nonsignificant main effect for group, [$F(1,25) = 0.02$, $p > .10$]. The second ANCOVA dealt with attentional bias scores related to achievement threat words and it also revealed a nonsignificant covariate effect, [$F(1,25) = 1.30$, $p > .10$], and a nonsignificant main effect for group, [$F(1,25) = 0.35$, $p > .10$].

Finally, repeated-measure ANOVAS were used to test for differences between groups regarding amount of change in attentional bias scores from T1 to T2. There was a trend to significance for the group by time interaction effect for attentional bias scores related to physical threat cues, [$F(1,24) = 3.96$, $p < .06$], with extreme low adaptives showing marginally more change in attentional bias from T1 to T2 than extreme high adaptives (see Figure 5). For attentional bias scores related to achievement threat words, however, the group by time interaction effect was not significant, [$F(1,24) = .42$, $p > .10$].

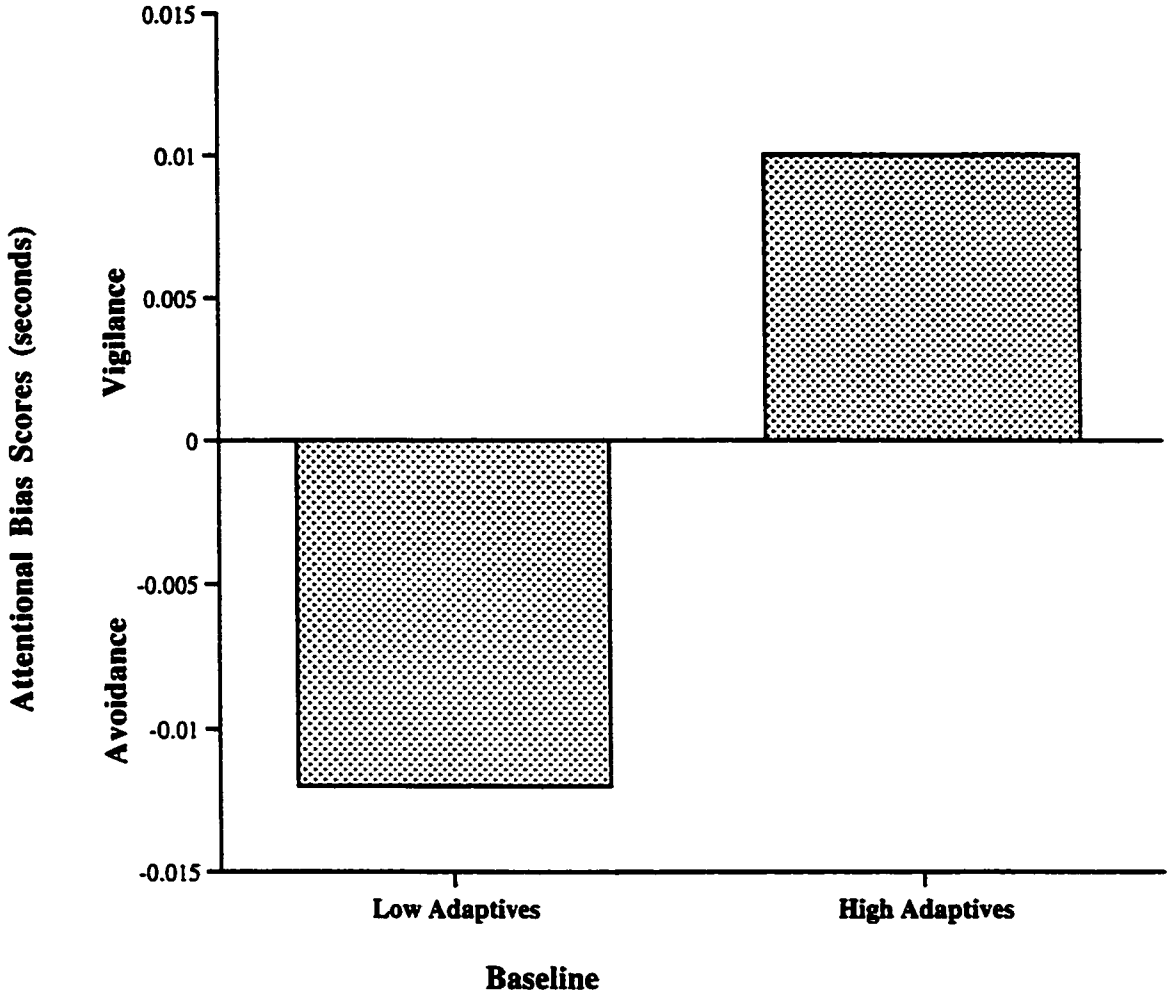

Figure 4. Mean attentional bias scores for low and high adaptives at baseline.

*p<.05 Sigificant difference between low and high adaptives.

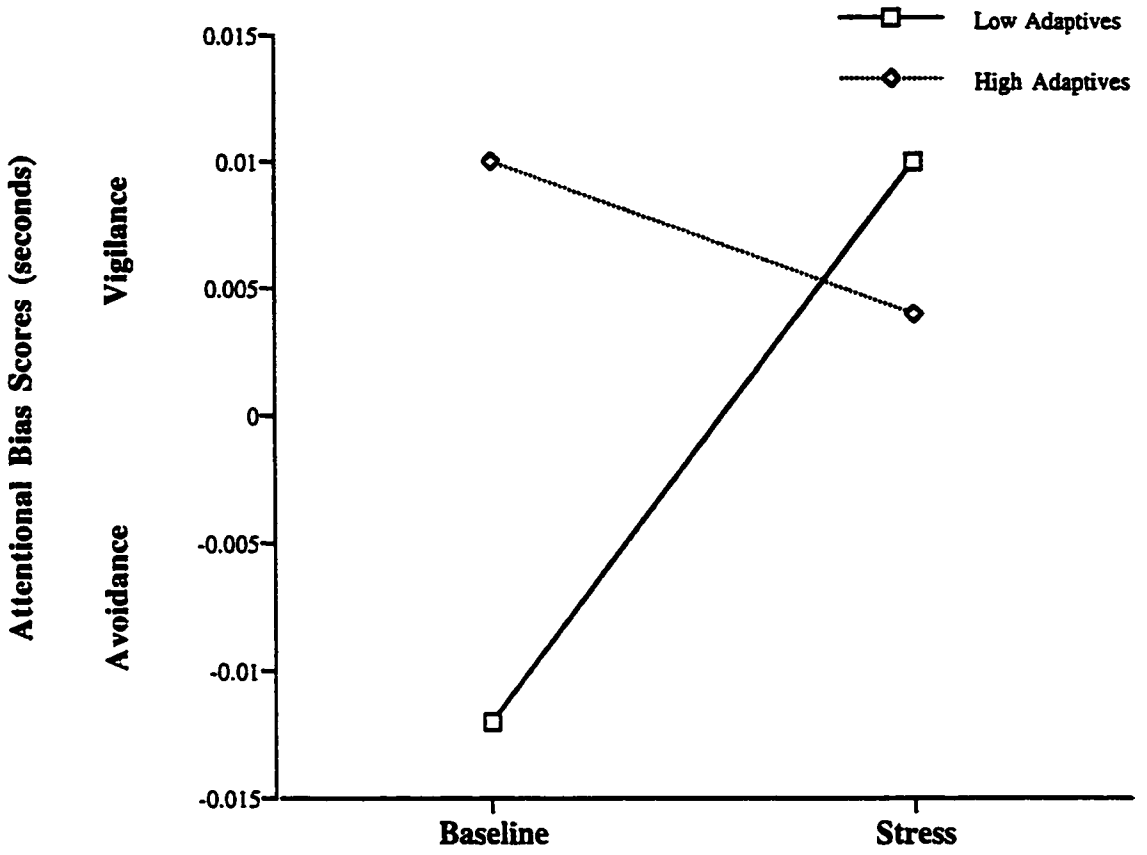

Figure 5. Changes in attentional bias scores for high (n=13) and low adaptives (n=13).

Discussion

The present study was conducted to explore mechanisms potentially implicated in the relationship between stress and psychopathology. The focus of this study was to investigate the impact of individual differences in "adaptiveness" on stress responsivity. Adaptiveness was defined by a profile of five dispositional cognitions: locus of control, self-efficacy, self-esteem, optimism, and anxiety. It was expected that this study would elucidate the nature of the interplay between adaptiveness and stress-related mood, cardiac activity, and selective attention. In essence, the goal was to identify a set of individual characteristics that may serve as catalysts for stress responses that increase the risk for psychopathology.

The general thrust of the present results provided support for the idea that individual differences in adaptiveness affect stress reactions in ways that could increase the risk of psychopathology. The results indicated that, compared to high adaptives, low adaptives experience more stress-related mood lowering, avoid threat cues despite the imminence of threat, and show patterns of selective attention that could signal instability in mood. In addition, compared to low adaptives, high adaptives seem to compensate for increases in physiological arousal with favorable subjective appraisals of threat. That is, results showed that as heart rate increased during stress, high adaptive participants reported feeling increasingly more composed, more confident and more content. In the sections below, the implications of these findings are discussed in the context of the original hypotheses of the present study.

Adaptiveness and stress-related mood

The hypothesis that low adaptives confronted with a social-evaluative laboratory stressor report more emotional distress than high adaptives was supported. That is, low adaptives showed more mood lowering than high adaptives prior to stress, and, above and beyond these initial differences, low adaptives also displayed more mood lowering than high adaptives during a stressful challenge. This finding is consistent with an extensive research literature that has examined the association between particular dispositional cognitions, life events (stress) and mood (Fortin, 1992; Cohen and Edwards, 1989; Taylor and Aspinwall, 1996).

The present study extends the existing research literature by combining three important methodological factors. First, this study takes into account the intercorrelations among dispositional cognitions. Substantive correlations among traits have made it difficult to interpret the results of studies examining the relationship between particular traits and stress reactivity. Second, this study is prospective in that participants reported mood state at two separate times. Given this method of investigation, initial mood state levels can be statistically controlled when subsequent stress-related mood changes are predicted. Lastly, the present study manipulated stress directly and asked participants to report mood while they were in the midst of experiencing it. The implication is that participants are able to reliably report mood state levels that are directly impacted by a specific social-evaluative stressor.

The finding that adaptiveness significantly impacts stress-related mood change has important implications for our understanding of processes involved in the relationship between stress and psychopathology. Individual differences in adaptiveness potentially

constitute a pivotal mechanism linking stress and psychopathology. In other words, individuals characterized by maladaptive dispositional cognitions inevitably face multiple social-evaluative stressors during development that lead to increasing levels of emotional distress. Theoretically, the cumulative effects of multiple stressors can eventually lead individuals who are hyper-reactive to stress (low adaptives) to develop clinical levels of anxiety and/or depression.

Adaptiveness and selective attention

Based on a review of the relevant research literature (MacLeod & Mathews, 1988; Mogg et al., 1990; Mogg et al., 1994), it was hypothesized that under conditions of prolonged stress high adaptives shift their attention away from stress whereas low adaptives shift their attention toward threat. This hypothesis was not supported by the results of the present study. Other exploratory analyses did not yield any differences in attentional bias, except for a trend for high adaptives to orient attention more quickly toward the spatial location of physical threat cues than low adaptives.

Some researchers have suggested that selective attention effects in nonclinical populations are more likely to occur when substantive differences in personal adjustment exist between the groups being compared (Mogg et al., 1997). In order to further ascertain the relationship between adaptiveness and selective attention, the sample was divided into three levels of adaptiveness and the data from the upper and lower thirds were retained for further comparison. The use of more extreme groups yielded three main findings: 1) a trend for high adaptives to shift attention toward the spatial location of physical threat cues prior to stress; 2) high adaptives attended to the spatial location physical threat cues more quickly than low adaptives prior to stress; and 3) a trend for

low adaptives to display more instability than high adaptives on attentional bias scores related to physical threat cues. That is, the amount of change in attentional bias scores from baseline to stress (speech preparation) was greater for low adaptives than high adaptives. These findings are discussed in some detail in the following sections.

Prior to examining the implications of the results pertaining to the association between adaptiveness and attentional bias to threat, it should be noted that these findings should be interpreted with caution. Given the relatively small sample size associated with the statistical analyses performed on the extreme groups, the results yielded by these analyses should be seen as preliminary findings that await replication in studies with larger samples. Notwithstanding the statistical concerns imposed by the limited number of participants in the extreme groups, important implications can be derived from the results concerning the relationship between adaptiveness and selective attention to threat.

A. Selective attention to threat cues prior to stress: The findings that *prior to stress* 1) high adaptives tend to *shift* attention *to* threat, and 2) *orient* attention *toward* the spatial location of physical threat cues significantly faster than low adaptives were unexpected. Methodological differences pertaining to the nature and duration of the stressor may explain the discrepant results between past research and the present study. For example, previous studies have used naturalistic stressors characterized by an extended period of anticipatory stress (e.g., testing for attentional bias one week prior to final exams). The results have indicated that low-trait anxious individuals shift their attention away from threat and high-trait anxious individuals keep attending to threat during prolonged anticipatory stress. High-trait anxious participants, therefore, would be seen as applying maladaptive attentional strategies that hinder goal-directed behavior, whereas low trait-

anxious individuals would be seen as applying the adaptive cognitive strategies that allow them to focus on instrumental action in preparation for the impending threat.

In the present study, however, being told the purpose of the study (i.e. examining the relationship between personality and performance in job interviews) may have prompted participants to anticipate stress that was imminent rather than distal. It is conceivable therefore, that high adaptives in anticipating an imminent stressful challenge, made a relatively positive appraisal of the potential threat that facilitated selective attention to threatening stimuli. Indeed, positive evaluation of potential threat has been reported to predict attention to threat stimuli (Taylor & Aspinwall, 1996). In general, it could be argued that when anticipating an imminent challenge, orienting attention toward threat is adaptive behavior (McNally, 1996). In contrast to high adaptives, low adaptives may have anticipated an imminent stressor, amplified the threat through negative appraisals, and consequently avoided threatening information. Chronically unfavorable appraisals of potentially threatening situations have been linked to cognitive avoidance of threat cues (Taylor & Aspinwall, 1996). If this interpretation of the data is correct, it could be argued that the cognitive response of low adaptives to avoid threat cues is counterproductive in that it impedes instrumental action.

The above interpretations make it possible to reconcile the apparently discrepant results between previous work and the present study. High adaptives appear to be characterized by a flexible mechanism of selective attention that is capable of discerning appropriately when to attend to threat and when to avoid it. For example, in cases when the stressful challenge is impending but not imminent, high adaptives may attend away from threat to focus on problem-solving efforts (Mogg et al., 1994) and in cases when the

stressor is imminent high adaptives focus on threat information so as to facilitate instrumental action.

The interpretation drawn from the present study that, compared to low adaptives, high adaptives will focus on threat appropriately is consistent with the findings of other studies which suggest that high adaptives attend to negative information when it is in their interest to do so. For example, it has been reported that optimistic young adults pay more attention to information about severe illnesses and about the risks associated with their own health behavior than pessimists (Aspinwall, 1993). In contrast to the efficacious selective attention mechanism possessed by high adaptives, low adaptives appear to apply a cognitive filtering system that avoids or attends to threat in ways that impede appropriate goal-directed behavior.

For individuals characterized by low adaptiveness the implications of a malfunctioning mechanism of selective attention are twofold. First, an inability to selectively attend to information that promotes stress-related instrumental behaviors increases the risk for normative challenges to end up in repeated failures. As mentioned in previous sections, the consequence of an inability to cope effectively with normative stress is an increased risk for psychopathology (Thoits, 1983). Second, an argument could be made that interventions which target maladaptive patterns of selective attention can improve stress-related coping effectiveness and potentially reduce the risk of psychopathology.

B. Instability in attentional bias scores: The results of the present study also indicate that adaptiveness is related to instability of attentional bias scores over time. Specifically, low adaptives tended to show more change in stress-related patterns of

selective attention over time than high adaptives. If selective attention acts as a mechanism of emotion regulation (Rothbart et al., 1994), then instability in stress-related attentional patterns may lead to hyper-reactive mood changes that could signal risk for emotional disorders in low adaptives. Likewise, stable patterns of selective attention in response to stress are theoretically associated with unwavering mood. Accordingly, the selective attention mechanism possessed by high adaptives may constitute a buffer against emotional disorders.

C. Other relevant findings pertaining to adaptiveness and selective attention: Low and high adaptives differed on selective attention to physical threat cues but not achievement threat cues. It may be that physical threat words are more representative of general threat than achievement threat words. However, prior research examining the specificity of attentional bias in nonclinical populations is mixed (Mogg et al., 1994; MacLeod & Mathews, 1998). Consequently, more research is needed to shed light on this matter.

The relative dearth of actual *shifts* in attention in the present study was unexpected (i.e., attentional bias scores for high and low adaptives statistically differing from zero). Researchers using nonclinical populations have reported (MacLeod & Mathews, 1988) and replicated (Mogg et al., 1994) the finding that individual differences in trait anxiety are associated with statistically significant shifts in attention toward and away from threat cues. The absence of a link between adaptiveness and shifts in selective attention to threat cues may be a function of the varying relationships between the individual dispositional cognitions that comprise the construct of adaptiveness and shifts in attention. Essentially, the adaptiveness factor may be too general to produce a reliable association with shifts toward and away from threat cues. Also, although the small size

of the sample in the present study may be a factor, it should be noted that individual differences in attentional shifts have been detected in small sized samples (e.g. MacLeod & Mathews, 1988, 36 participants). It is possible that it is the type of stressor employed that is pertinent. Past research has demonstrated attentional shifts using a naturalistic stressor (i.e., exam stress) and short-lasting laboratory stressors, whereas the present study used a laboratory stressor that included an extended anticipation period. It may be that the specific type of stressor used in the present study is not conducive to eliciting actual shifts in attention.

Adaptiveness and concordance between mood and cardiac acitivity

Based on findings by Zahn and colleagues (1991) and by Calvo and Miguel-Tobal (1998), it was hypothesized that low adaptives exhibit more concordance between heart rate and mood during stress than high adaptives. The results of the present study did not support this hypothesis. As a post-hoc exploratory strategy, a revised global mood score based on the three POMS subscales most related to the adaptiveness score was computed to test further the effect of adaptiveness on correlations between the physiological and subjective response systems. There was no relationship found between heart rate and mood for low adaptives, but a significant relationship emerged between the two response systems for high adaptives. Specifically, the results indicated that the higher the heart rate the more positive were the feelings reported by high adaptives. In other words, high adaptives displayed "reversed concordance" or a relationship in the opposite direction to what would be theoretically expected.

The finding of reversed concordance in the high adaptives has important implications in terms of coping efficacy in times of stress. It may be that the reversed

concordance exhibited by high adaptives during speech preparation served to maintain physiological arousal at manageable levels. Essentially, optimistic appraisals of potentially threatening stressors may facilitate problem-solving efforts (Tomaka & Blascovich, 1994), which in turn can theoretically help avoid the ill effects of recurring failures. The notion that high adaptives in the present study are characterized by more positive threat appraisals is consistent with many other findings in the research literature. For example, high levels of optimism, self-efficacy (Jerusalem, 1993), self-esteem (Cambell, Chew, & Scratchly, 1991), and locus of control (Vitaliano, Russo, & Maiuro, 1987) have been linked to favorable threat appraisals or fewer negative interpretations of life events. In the context of the present study, if the purpose of favorable appraisals of potential stressors is to help manage high levels of arousal, then it may be that high adaptives reported positive mood states (favorable appraisals) to counteract a sensation of physiological arousal caused by increased heart rate. A logical extension of this argument is that, the greater the arousal level, the more positive the subjective appraisal must be if it is to help maintain arousal at manageable levels, hence, reversed concordance.

It should be noted that although the hypothesis that low adaptives would display concordance of the physiological and subjective stress response systems did not receive support in the present study, the reversed concordance observed in high adaptives points to the specificity of the relationship between the two domains. That is, high, but not low adaptives, appear to have the personality resources to view certain stressor conditions as positive challenges and to suppress negative feelings that may arise in response to physiological arousal. It may be that the coordination of physiological arousal and

subjective threat appraisal helps high adaptives cope effectively with stressors by helping them prepare for threat. On the other hand, it appears that low adaptives do not have the personal resources to maintain stress-related physiological arousal at manageable levels. Essentially, the inability of low adaptives to minimize the salience of the stressor may signal risk to psychopathology.

Differences in methodology constitute a potential explanation for discrepant findings between the present study and prior research examining individual differences and concordance levels. Specifically, it may be that differences in samples and measures of subjective anxiety are responsible for inconsistent results between past research and the present study. For example, past research has included participants at genetic risk for bipolar disorder (Zahn et al., 1991) and measures of somatic anxiety (Calvo & Miguel-Tobal, 1998), whereas the present study did not target a particular population and used a measure of mood more closely related to cognitive than to somatic anxiety.

Adaptiveness and physiological recovery from stress

Lastly, a review of the relevant literature (Calvo & Cano-Vindel, 1997; Rector & Roger, 1997) led to the hypothesis that low adaptives recover more slowly from stress than high adaptives. The present results were not consistent with this hypothesis. There was no difference between low and high adaptives in heart rate decline following stress-related peak cardiac activity. This finding can be interpreted in several ways. First, given the limited number of studies investigating the relationship between each of the dispositional cognitions included in the adaptiveness factor and heart rate recovery, the positive results reported in previous research require replication.

Second, the absence of a link between adaptiveness and heart rate recovery in the present study may exist for the same reason that adaptiveness may not be associated with shifts in selective attention to threat cues. That is, varying relationships may exist between the individual dispositional cognitions that comprise the construct of adaptiveness and heart rate recovery. In other words, it may be that positive associations between certain dispositional cognitions and heart rate recovery are counterbalanced by other dispositional cognitions that relate to heart rate recovery only marginally or not at all.

Finally, it is conceivable that a relationship exists between adaptiveness and heart rate recovery, but that the present study lacked the statistical power to demonstrate this effect. Indeed, it may be that larger samples are needed to test the hypothesis of a relationship between adaptiveness and heart rate recovery.

Limitations and methodological considerations

The main limitation of the present study concerns the generalizability of the findings. First, the concept of stress is complex and heterogeneous. The result is that stressor effects are likely to be specific to the type of stressful event examined. For example, major negative life events (e.g., death of a family member, loss of employment) may have an impact on mental health that is very different from social-evaluative stress. Moreover, chronic or enduring stressors may differ from acute or transient stressors in how they affect psychiatric symptomatology (see Wheaton, 1982). Given the variety in type of stressors and their potentially specific impact on mental health, researchers must proceed cautiously when interpreting findings associated with a particular kind of stress. For example, the well-replicated finding that multiple life event stressors are associated

with increasing mental instability (Thoits, 1983) may not apply to the intense and/or more transient social-evaluative stressors.

A second limitation regarding the generalizability of findings in the present study concerns the ecological validity of the laboratory stressor and the attention paradigm. While acknowledging this limitation, controlled experiments make it feasible to manipulate stressors and attention tasks in ways that are conducive to testing hypotheses that are otherwise extremely difficult to test in the field. In particular, controlled experimental manipulations are effective means of isolating mechanisms associated with maladaptive stress-related behaviors. Nevertheless, to be meaningful, information from controlled experiments must be applicable to real-life situations. In the context of the present study, a job interview simulation seemed to effectively mimic the kind of stress that most people experience in a society such as ours.

A greater concern is the ecological validity of the attention paradigm. During the dot probe task participants react to a neutral stimulus that replaces one of two words on a computer screen. This act does not seem representative of how human beings usually pay particular attention to certain types of information in their vastly more complex environment. When using the dot probe task, the assumption is that reactions to a very small subsample of emotionally valenced information can be extended to a much more complex reality. Although this argument has some merit, the counter-argument that statistical differences in attentional bias deriving from a simplistic task do not predict real-life patterns of attention cannot be ruled out.

Finally, the question of generalizability of the present study extends to the use of a small number of participants from a fairly homogeneous subsample of the population.

First, given the small sample size and the exploratory nature of the present study it is conceivable that its findings are attributable to chance. Also, the age range of participants in this study was 18 to 35 years, and the level of education was elevated. It may be that individuals who attend university are distinct from those who do not in how they appraise social-evaluative stressors. Moreover, there is evidence that age affects stress-related heart rate responses (McNeilly and Anderson, 1996). Consequently, it is not known whether the generalizability of the findings in the present study are restricted to well-educated young adult populations.

Summary and conclusions

The specific mechanisms implicated in the relationship between stress and psychopathology are poorly understood. The purpose of the present investigation was to examine processes that are thought to be associated with maladaptive stress-related responses and that may increase the risk of psychopathology. The present study examined personal adaptiveness as a resource and its relationship to stress-related mood change, heart rate reactivity and selective attention. The general tenor of the results indicates that personal adaptiveness is associated with the kind of responses young well-educated individuals make in the face of social-evaluative stress. Specifically, it was found that: (a) low adaptives report more stress-related mood lowering than high adaptives, even after differences prior to stress are statistically controlled; (b) low adaptives avoid threat cues more than high adaptives in anticipation of an imminent threat; and (c) low adaptives show more instability in stress-related selective attention to threat than high adaptives; (d) high adaptives exhibit more reversed concordance than low adaptives, a fact that may help high adaptives maintain physiological arousal at

manageable levels in preparation for stressful challenges. Only one finding is not consistent with the notion that personal adaptiveness is related to stress reactivity. This study did not demonstrate a difference between high and low adaptives in speed of heart rate decline following stress-related peak cardiac activity.

A major implication of the positive results of the present study is that individual differences in adaptiveness and associated stress responses may play an important role in the development of emotional disorders. Future research should seek to establish robust evidence that personal adaptiveness interacts with responses to social-evaluative stress in ways that increase the individual's susceptibility to psychiatric disorder. This can be done in at least two ways. First, studies could investigate whether multiple social-evaluative stressors have cumulative effects on emotional distress as a function of adaptiveness. Establishing the cumulative effect of social-evaluative stressors would lend credence to the assumption that multiple and transient social stressors that are mild compared to most life events can have enough impact on behavior to adversely affect mental health. Second, individuals low in personal resources could more firmly be identified as an 'at risk' population if they were shown to share the maladaptive dispositional cognitions of a known 'at risk' population (e.g., the offspring of clinically anxious and depressed individuals). Once the risk of psychopathology is more firmly established, future research could then investigate the effectiveness of prevention programs that target the specific dispositional cognitions and the related stress responses that signal psychiatric vulnerability. The long-term goal is that appropriately targeted prevention programs based on solid experimental investigation will help decrease the incidence of emotional disorders.

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Appendix A

Semi-Structured Clinical Interview

ALCOHOL AND DRUG CONSUMPTION

Now I am going to ask you a few questions about your alcohol consumption.

Do you drink?
if yes, about how many glasses a week?
if few, was there a time when you drank more than that?
if yes, tell me about it.

Did you ever do something that might be dangerous after drinking (driving a car, a bicycle, using power tools, and the like)?

Has anyone ever complained to you that you drank too much?

Have you ever thought that you should drink less or stop drinking altogether?

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:
How many times a week?

IF PRESCRIBED:
Did you ever get hooked [become dependent on] it?

Was there ever a time when you took more drugs that you take now?
if yes tell me about it.

Have you ever missed school, work, an appointment or family obligation because you were using (DRUG) or hung over?

Did you ever do something that might be dangerous after doing drugs (drive a car, a bicycle, using power tools, and the like)?

Has anyone ever complained to you that you do too much drugs or spend too much time getting high?

Have you ever thought that you should do less drugs (or take pills less often) or stop doing drugs (taking pills) altogether?

DEPRESSIVE EPISODES

Has there ever been a period in your life when you were feeling depressed or down for most of the day nearly every day? Days where you were not interested in anything, you could not concentrate or make any decisions; you could not eat, and felt like just staying in bed all day?

if yes, How long did it last? How old were you? Did you take any medication? Were there particular circumstances that made you feel like that?

If Yes: Age started, length of episode (over two weeks, not uncomplicated bereavement)

MANIC EPISODES

Have you had periods when you were feeling so good or hyper that other people thought you were not your normal self, or you were so hyper that you got into trouble? ... Periods when you were more irritable than at other times?

Were there ever periods when you were feeling more self-confident than usual, when you needed much less sleep, you were more talkative, or your thoughts were racing through your head? In other words, you were living in the "very fast lane"?

Have you had periods when you were more impulsive, to the point where it could have meant trouble in some form or other?

If Yes: Age started, length of episodes (between 4 - 7 days)

DYSTHYMIA

For the past couple of years, have you been bothered by depressed mood most of the day, more days than not?

Check for poor appetite or overeating, insomnia or hypersomnia, low energy or fatigue, poor concentration, feelings of hopelessness.

ANXIETY DISORDERS

Have you ever had a panic attack, when you *suddenly* felt frightened, anxious or extremely uncomfortable? How were you feeling? (Shortness of breath, dizziness, palpitations, trembling, sweating, cold spells, chest pain, etc...

How do you feel when you are with people? Are there any things you don't like to do or you're uncomfortable to do in front of people (like speaking, eating, or writing)?

Are there things you're especially afraid of like heights, seeing blood, closed spaces, certain kinds of animal or insects? How serious is it? Are there things you avoid doing because of that?

Was there ever anything that you had to do over and over again and couldn't resits doing, like washing your hands again and again or checking things many, many times to make sure it was okay?

In the last six months, have you been particularly nervous or anxious? Do you worry a lot about terrible things that might happen to you? What do you worry about?

EATING DISORDERS

Was there ever a time when you weighed much less than other people thought you ought to weigh? Are you concerned a lot by your weight?

Have you ever had eating binges during which you ate a lot of food in a short period of time? Tell me more.

PSYCHOTIC SYMPTOMS

Now, we're getting in unusual experiences that people sometimes have.

- Did it ever seem that people were talking about you, or that you got "special messages addressed especially to you" from the TV or the radio or the way things were?
- Are there any people that give you a hard time or who try to hurt you?
- DO you feel that you are especially important in some way or that you have powers others don't have?
- Did you ever hear or see things that others could not see or hear?

Appendix B

English Fluency Test

ENGLISH FLUENCY TEST

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

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

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

Appendix C

Life Orientation Test (LOT)

Identification number_____

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

Appendix D

Rosenberg's Self-Esteem Scale (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

Identification number_____

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 didn't 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

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.	1	2	3	4	5	6
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's Trait Anxiety Inventory (STAI)

STAI (XE2)

PART 2

DIRECTIONS: *A number of statements which people have used to describe themselves are given below. Read each statement and then darken the appropraite 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 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 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)

ID # _____

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?

ID # _____

___ ___ 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 State 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

Visual Analogue Scale (VAS)

Visual analog 1 Identification No _____

For each of the following lines, mark an "X" on the line at the point which best describes how you are feeling RIGHT NOW:

I feel stressed.

_____

not at all very much

I feel discouraged.

_____

not at all very much

I feel confident.

_____

not at all very much

I feel determined.

_____

not at all very much

For the following line, mark an "X" on the line at the point which best describes the amount of distracting thoughts you had during the relaxation period.

I had negative thoughts during the relaxation period.

_____

not at all very much

Appendix J

Word Pairs Used in Selective Attention Task

Physical Threat - Neutral Pairs

assault/receipt

attack/volume

brutal/staple

burial/unwrap

cemetery/daydream

collapse/civilian

crippled/bearings

cruelty/lengthy

disease/balloon

fracture/mackerel

harm/palm

hazard/agency

hurt/sing

infection/mysteries

injury/shorts

defeated/duration

killer/import

lethal/pastel

murder/decade

mutilated/spectator

operation/connected

paralysis/harmonica

strangled/exchanges

suffocated/archeology

suicide/preface

surgery/loosely

trapped/sending

unwell/update

victim/paused

violence/geometry

wounded/density

coffin/allied

Achievement Threat – Neutral Pairs

ashamed/context

blunder/touring

careless/involves

criticism/supplying

discredited/springwater

disgrace/external

embarrassed/speedometer

fail/rail

feeble/denote

foolish/mission

hopeless/windmill

humiliated/positioned

idiotic/entitle

ignorant/announce

inadequate/fingertips

incompetent/handwritten

indecisive/reflecting

inept/overt

inferior/eyesight

intimidated/feasibility

mistake/compass

mocked/evolve

pathetic/junction

pitiful/dynasty

ridicule/currency

shame/rural

silly/image

stupid/traded

unsuccessful/abbreviation

useless/display

worthless/grassland

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

Instructions Prior to Job Interview Simulation

INVESTIGATOR:

"Now, what I want you to do is to take on the role of a job applicant who was invited for a personal interview with the company's staff mangers. You will be given 30 minutes to prepare a free speech that will last five minutes. In this speech you should introduce yourself to the managers and convince them that you are the perfect candidate for the vacant position. The two people acting as staff mangers are trained to monitor nonverbal behavior. The video and audio recorders will help them analyze your voice frequency and your overall performance."

Appendix L

Consent Form

ID NO:_____

Center for Research in Human Development
Concordia University

Investigator: Frank Salerno
Thesis Supervisor: Alex Schwartzman, Ph. D.

CONSENT FORM

I understand and I 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 (30 minutes)
7) Brief questionnaire (5 minutes)
8) Paper and pencil task

Remuneration: I understand that I will receive the sum of **$10.00**

I understand that all information that I provide will be identified by code number and will therefore remain strictly confidential. 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 this study.

_____ _____
Signature Date

_____
Experimenter's Signature

Appendix M

Debriefing

As you may have gathered by now, this study is dealing with how stress affects attention. The job interview simulation and the computerized test are good at measuring precisely that. The job interview simulation is something that has been used before in the study of stress reactivity. We tell you that the panel of two people is specially trained to monitor nonverbal behavior and that we are going to analyze your voice frequency and overall performance simply to make it feel as if you're really going to be evaluated. In fact, the panelists are untrained confederates and we are not really interested in your performance during the interview.

What we are interested in is measuring stress and various factors that may influence it. That is why we ask you to complete brief questionnaires and monitor your heart rate throughout the experiment.

The goal of the computer task is to help us compare how people process different types of information. The main purpose was to get a measure of attention to stress-related information. As you may have noticed, some of the words that appeared on the screen were negative while others were neutral. How quickly one reacts to a dot probe that replaces or appears in the location of a negative word tells us how much attention is being given to such information.

Do you have any questions? Is anything unclear?

It is very important that you do not discuss the study with anyone so that we can recruit as many participants as we can who know nothing in advance about the study and its procedures.