ABSTRACT

Optimistic disposition is associated with benefits to psychological and physical health, including cardiovascular health. However, the mechanisms through which optimism exacts its benefits are not clear. Optimism may be related to smaller magnitude cardiovascular reactivity to stressors and promote more efficient recovery from the stressor. Additionally, optimism may influence cardiovascular health by impacting social support. Highly optimistic individuals may be better able to mobilize and utilize coping resources such as social support. Optimists’ utilization of social support may be particularly important with respect to their response to psychological stressors. Optimists may better employ social support to buffer their initial cardiovascular reactivity to stressors. Further, optimists may better employ social support to promote more efficient cardiovascular recovery following the termination of the stressor.

The current study was designed to test whether highly optimistic women incur greater benefit from social support manipulations than women who are low in optimism with respect to their responses to acute psychosocial stressors. This investigation directly investigated the hypothesis that optimism’s relationship with a positive health outcome is mediated in part by the effective utilization of social support. Data from this study did not support the notion that highly optimistic individuals are more adept at utilizing a
stranger-support manipulation as a buffer to potentially damaging cardiovascular reactivity to an acute math stressor. However, future research is needed to investigate whether the utilization of alternative support manipulations or stress tasks yield differing results.

Though the major hypothesis of this investigation was not supported, baseline data from this study do suggest that optimistic individuals experience a different social environment than their less optimistic counterparts. Optimism does appear to be related to social network size and perceptions of social support, such that greater optimism is related to greater support. Greater optimism was also associated with less hostility, less inwardly-directed anger, fewer depressive symptoms, and greater extraversion, each of which may in fact influence individuals’ levels of social support, as well as less perceived stress. This suggests that outside of the laboratory, highly optimistic individuals may have greater access to social support which they may then use to combat stress.
To my family: Thank you for your patience.
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It is rather ironic that I must ultimately affix my name as the sole author of this dissertation on the benefits of social support, because this is project truly would have been impossible without the support of a wonderful group of people. I first thank my advisor, Kate Stoney, for her guidance and support on this project. I also thank my committee members, Dr. Barbara Andersen and Dr. Janice Kiecolt-Glaser for their many insightful comments and suggestions on the design and conduct of this research.

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CHAPTER 1
INTRODUCTION

Cardiovascular diseases, which include hypertension, coronary heart disease, and stroke, among other diseases, are the most prominent causes of death and disability in both men and women in the United States (Grewen et al., 2000; Manson, Gaziano, Ridker, & Hennekens, 1996). In fact, cardiovascular diseases remain the most common causes of death in most industrialized nations, despite the fact that the rate of cardiovascular disease-related mortality has actually declined sharply over the past 25 years (Manson, Gaziano, Ridker, & Hennekens, 1996). Interestingly, rates of cardiovascular disease in women have declined much more slowly than rates for men (Tofler et al., 1987). Further, although younger women are at less risk for cardiovascular disease than are younger men (Higgins & Thom, 1989), the gender gap in incidence of cardiovascular disease narrows with advancing age, with the rates of disease in women actually surpassing those in men after the age of sixty-five years (American Heart Association [AHA], 2000). Because cardiovascular diseases are a significant health risk among American women, it is vitally important that potential causes and contributors to the development of cardiovascular disease, as well as potential cardioprotective factors, be carefully and thoroughly explored in women.
The effects of estrogen are believed to account for a significant portion of the sex difference in the incidence of cardiovascular diseases (Manson, 1994). Premenopausal women appear to be somewhat protected from the development of heart disease, with the rate of disease in women increasing after menopause (Gordon, Kannel, Hjortland, & McNamara, 1978). Further, some (Gruchow, Anderson, Barboriak, & Sobocinski, 1988; Manson, 1994; Stampfer et al., 1991; Stampfer et al., 1985; Sullivan et al., 1988), but not all (Grady et al., 2002; Kuller, 2003; Rossouw et al., 2002) studies have shown an association between exogenous estrogen use and decreased disease risk in postmenopausal women. Any demonstrated benefit of estrogen use does not fully account for the gender difference in cardiovascular disease morbidity and mortality (Kaplan et al., 1996; Stoney, Davis, & Matthews, 1987). Behavioral and psychosocial factors also may be involved in this sex difference (Kaplan et al., 1996; Matthews, 1989; Stoney et al., 1987).

In order to better understand this gender difference in cardiovascular disease morbidity, more research must be conducted using female participants. Relatively few studies have been published which examine issues related to cardiovascular disease in women (Beery, 1995; Fleury, Keller, & Murdaugh, 2000; Jenkins, 1998). The inclusion of female participants in research studies is particularly important given evidence that some disease risk factors in women differ from those in men. Compared to men, women exhibit lower resting blood pressure and smaller blood pressure responses to stress, but higher resting heart rate and greater heart rate responses to stress (Stoney, Davis, & Matthews, 1987). Women also exhibit smaller low-density lipoprotein cholesterol
responses to stress compared to men (Stoney, Matthews, McDonald, & Johnson, 1988). An investigation of hemodynamic response patterns further indicated that women exhibit greater increases in cardiac output during stress, whereas men exhibit greater vascular resistance during stress (Girdler, Turner, Sherwood, & Light, 1990).

In addition to an abundance of research that has explored traditional risk factors for cardiovascular diseases, including smoking status, dietary factors, family history, and physiological stress responses, a substantial body of research has also focused on personality factors that may influence risk of development of the diseases. For example, Type A behavior pattern, and its key component, hostility, have been associated with cardiovascular disease as well as risk of sudden cardiac death (Brackett & Powell, 1988; Friedman & Rosenman, 1959). Anger expression style also has been linked to risk of cardiovascular disease (Lai & Linden, 1992). The study of differential effects of personality variables according to gender is also a worthwhile undertaking. Some psychosocial factors, such as hostility and social support, interact with gender to produce cardiovascular responses to stress (Davidson, Hall, & McGregor, 1996; Engebretson & Matthews, 1992; Linden, Chambers, Maurice, & Lenz, 1993). More research is necessary to identify the specific factors that contribute to the development of heart disease among women.

Positive Psychology and the Study of Optimism

It is also interesting to note that most of the research to date exploring the relationship between personality factors and CVD has focused on negative personality
characteristics that are assumed to be health-damaging. However, there is now a movement in the psychological literature toward studying personality factors with a more positive connotation that may actually be cardioprotective.

Over the past few years, there has been a movement towards the study of positive psychology and the study of psychological strengths instead of focusing exclusively on psychological weakness (Peterson, 2000). Similarly, there has been a shift among researchers towards the study of preventive factors in health, rather than focusing on factors that make individuals vulnerable to illness (Seligman & Czikszentmihalyi, 2000). Researchers have identified various factors that appear to buffer individuals from illness, including future mindedness, perseverance, and optimism (Peterson, 2000; Seligman & Czikszentmihalyi, 2000).

Optimism has been discussed and researched according to a variety of conceptualizations (Peterson, 2000). For example, Seligman and colleagues frame optimism in terms of explanatory style (Peterson et al., 1982). According to their conceptualization, individuals are assumed to have a habitual manner of interpreting bad events, deemed their explanatory style. Individuals who explain outcomes in terms of external, specific, and unstable causes are said to display an optimistic explanatory style. Conversely, individuals who ascribe outcomes to internal, global, and stable causes are said to display a pessimistic explanatory style. Pessimistic explanatory style is proposed as an influence on helplessness following hardship (Peterson, 2000).

However, perhaps the most widely researched conceptualization of optimism, particularly as it pertains to physical health, has stemmed from Scheier and Carver’s view
of optimism that is based on self-regulation and the pursuit of goals. Scheier and Carver (1992) define dispositional optimism as an expectation that in the future, good things will be more plentiful than bad things. Scheier and Carver’s view of optimism grew largely out of their work on a self-regulatory model of goal-pursuit, which suggests that individuals will work to overcome challenges that they face in their pursuit of goals as long as they have favorable beliefs regarding their eventual success in obtaining these goals (Carver & Scheier, 1981). However, when individuals harbor doubts regarding their likelihood of eventually achieving their goals, they are more likely to abandon their goals (Carver & Scheier, 1981). The researchers suggest that optimists are individuals who generally hold positive expectations for their future, and relatedly, believe that they are capable of attaining their goals (Carver & Scheier, 1981). Consequently, optimists are likely to persist in the pursuit of goals, even when that pursuit proves difficult (Carver & Scheier, 1981). Further, the researchers suggest that optimists tend more often than pessimists to use adaptive problem-focused and emotion-focused coping strategies in their persistence to achieve their goals (Scheier, Carver, & Bridges, 1994).

Alternately, pessimists tend to hold negative expectations for the future (Carver & Scheier, 1981). As a result, pessimists are less likely to persist in their goals in the face of hardship and tend to disengage from their goals earlier than their optimistic peers (Scheier, Carver, & Bridges, 1994). Further, the researchers suggest that pessimists tend to use less adaptive coping strategies than optimists (Scheier et al., 1994).

Scheier and Carver developed a measure, the Life Orientation Test (LOT) (Scheier, Carver, & Bridges, 1994) to assess optimism. The brief measure consists of positively-
worded and negatively-worded items pertaining to optimism which are scored on a Likert-type scale, along with four non-scored filler items not included in scoring. The LOT is the most widely-used measure of dispositional optimism (Robinson-Whelen, Kim, MacCallum, & Kiecolt-Glaser, 1997), and in particular has been used very often in investigations of the relationship between optimism and health (Mahler & Kulik, 2000).

In their early work on the construction of the LOT, Scheier and Carver (1985) conceptualized it as being a unidimensional assessment tool that measured optimism using positively and negatively worded items (Scheier & Carver, 1987). It is important to note that though most studies using the LOT have interpreted optimism and pessimism as conceptual opposites of a single factor, factor analytic studies have consistently suggested that optimism and pessimism are distinct, though generally negatively correlated, constructs (Mahler & Kulik, 2000; Robinson-Whelen, Kim, MacCallum, & Kiecolt-Glaser, 1997). Further, investigations have suggested that the two constructs may be differentially related to various psychological and physiological parameters (Mahler & Kulik, 2000). Interestingly, data suggest that whereas lack of pessimism may be more relevant for longer-term health outcomes (Cohen et al., 1999; Robinson-Whelen et al., 1997), levels of optimism appear to have greater impact on physiological functioning during acute stress (Cohen et al., 1999).

Optimism is associated with a wide variety of benefits related to both psychological functioning and physical health (Peterson, 2000). Some of the diverse benefits of optimism include resistance to postpartum depression (Carver & Gaines, 1987), increased self-reported quality of life following coronary artery surgery (Scheier & Carver, 1987),
and adjustment to cancer surgery (Carver et al., 1993). Additionally, optimism appears to be related to choice of coping style (Aspinwall & Taylor, 1997; Scheier, Weintraub, & Carver, 1996; Taylor et al., 1992), positive affect (Salovey & Birnbaum, 1989), and levels of social support (Scheier & Carver, 1987; Taylor & Brown, 1994).

**The Association Between Optimism and Physical Health**

Optimism is associated with a variety of positive health outcomes. Optimism is associated with decreased mortality from all causes (Grewen et al., 2000; Peterson, Seligman, & Vaillant, 1998). Further, optimism is associated with the later report of fewer physical symptoms of illness (Scheier & Carver, 1987). Optimism has been linked to better pulmonary function and slower levels of pulmonary decline (Kubzansky et al., 2002). Additionally, optimism has been linked to greater pain tolerance and lower reported pain-related discomfort among temporomandibular disorder (TMD) patients (Costello et al., 2002).

Optimism may have specific effects on the immune system, with optimistic individuals exhibiting better immune profiles during the experience of stressful stimuli than pessimistic individuals. Stressed law school students who scored high on a measure of optimism had higher numbers of CD4 (helper) T cells than stressed students who scored low on the measure (Segerstrom, Taylor, Kemeny, & Fahey, 1998). Further, among temporomandibular disorder patients, individuals high in optimism exhibited lower levels of norepinephrine and interleukin-6 levels during stress relative to individuals low in optimism (Costello et al., 2002).
Further, optimism is associated with cardiovascular health. Some studies have found that optimistic individuals tend to have lower ambulatory blood pressure than pessimistic individuals (Raeikkoenen, Matthews, Flory, Owens, & Gump, 1999), and that pessimism combined with low socioeconomic status is associated with greater risk of hypertension (Grewen et al., 2000). High levels of optimism are associated with lower risk of coronary heart disease among older men (Kubzansky, Sparrow, Vokonas, & Kawachi, 2001). Further, optimism continues to confer cardioprotective benefits even after diagnosis of cardiovascular disease. For example, optimists show fewer signs of surgical complications and quicker recovery from coronary bypass surgery than do pessimists (Scheier & Carver, 1987). A high level of optimism is also associated with lower pain ratings soon after coronary bypass surgery (Mahler & Kulik, 2000).

Additionally, compared to pessimistic individuals, optimistic individuals recovering from myocardial infarction are less likely to suffer a second cardiac event or die from cardiac causes (Buchanan, 1995).

The benefit that optimism confers on health may be mediated in part by health behaviors. Highly optimistic individuals may be more likely than less optimistic individuals to engage in beneficial health behaviors and refrain from harmful health behaviors. Evidence has suggested that optimistic college students are more likely to engage in health-enhancing behaviors such as engaging in regular exercise (Robbins, Spence, & Clark, 1991). Further, optimists appear to take better care of themselves than pessimistic individuals when faced with illnesses including the common cold (Lin & Peterson, 1990), as well as with more serious illnesses (Aspinwall & Brunhart, 1996). In
a study of patients recovering from coronary artery bypass surgery, optimism was associated with greater likelihood of regular vitamin use and enrollment in a cardiac rehabilitation program (Scheier & Carver, 1992).

However, not all research supports the notion that optimism is associated with health benefits. Particularly with regard to health protective behaviors, there is controversy in the literature regarding any benefit or detriment of optimism (Taylor, Kemeny, Reed, Bower, & Gruenewald, 2000). Some researchers have argued that unrealistic optimism may deter individuals from engaging in appropriate health behaviors (Aspinwall & Brunhart, 1996). However, some studies reporting such findings may have failed to differentiate true optimistic beliefs from detrimental denial. Health-enhancing overly optimistic beliefs can be distinguished from potentially health-damaging denial based on the relationship of those beliefs to attention to threatening health information (Aspinwall & Brunhart, 1996). If optimistic beliefs were, like denial, primarily defensive in nature, they should function to decrease attention to threatening health information thereby preserving self-esteem and protecting perceptions of control over aversive outcomes (Aspinwall & Brunhart, 1996).

However, empirical evidence suggests that optimistic disposition is, in fact, related to increased attention to threatening health information, which may promote the effective management of health threats (Aspinwall & Brunhart, 1996). In fact, optimistic beliefs may be health-protective even if the beliefs are illusory (Taylor, Kemeny, Reed, Bower, & Gruenewald, 2000). HIV-positive men who held unrealistically optimistic beliefs regarding their ability to impede the progression of AIDS practiced better health habits
than their peers who held more pessimistic views (Taylor et al., 1992).

In addition to the influence of optimistic disposition on the practice of health behaviors, optimism may also affect health through other pathways. For example, optimism may impact physical health by predisposing individuals to the experience of positive emotions (Salovey & Birnbaum, 1989; Salovey, Rothman, Detweiler, & Steward, 2000; Taylor et al., 2000). Dispositional optimism is associated with greater overall positive affect and less negative affect than is pessimism (Raikkonen, Matthews, Flory, Owens, & Gump, 1999). Optimism has also been prospectively associated with smaller increases in reports of stress and depression during a period of adjustment in college students (Brissette, Scheier, & Carver, 2002).

This increased frequency with which optimists experience positive emotions may trigger beneficial physiological changes (Futterman, Kemeny, Shapiro, & Fahey, 1994; Segerstrom et al., 1998). Positive emotions have been associated with immune system changes (Salovey, Rothman, Detweiler, & Steward, 2000), including enhanced immune system response to the common cold (Stone, Cox, Valdimarsdottir, Jandorf, & Neale, 1987; Stone et al., 1994). Affective states are believed to be associated with physiological effects on the cardiovascular system (Kamarck & Jennings, 1991). Over time, the experience of positive emotions may then lead to improvements in physical health (Pettit, Kline, Gencoz, Gencoz, & Joiner, 2001). Interestingly, when optimists do experience negative emotions they register elevations in ambulatory blood pressure similar to those observed in pessimists (Raikkonen et al., 1999).
Optimism’s association with positive affect may also have an effect on health indirectly, by influencing one’s availability of social support (Salovey et al., 2000; Scheier & Carver, 1987). Although acute distress prompts people to provide social support, prolonged distress may actually drive away potential support providers (Salovey et al., 2000). Evidence suggests that individuals who display high or prolonged levels of negative affect may receive less social support (e.g. Pennebaker, 1993; Strack & Coyne, 1983) People may prefer to provide social support to others who typically display an optimistic outlook (Salovey et al., 2000; Scheier & Carver, 1987). This increased availability of social support may be yet another pathway that optimism benefits health.

**Optimism and Cardiovascular Responses to Stress**

Scheier and Carver (1987) hypothesized that cardiovascular reactivity may be a mechanism driving the relationship between optimism and cardiovascular health. Cardiovascular reactivity to psychological stress is of particular interest to behavioral scientists studying the development of cardiovascular diseases. Cardiovascular reactivity is the immediate increase in activity of the sympathetic nervous system, typically indexed by measures such as blood pressure and heart rate, which occurs during exposure to stressful stimuli.

Exaggerated cardiovascular reactivity, or hyperreactivity, appears to be an independent risk factor for the development of cardiovascular disease (Kaplan & Manuck, 1998; Krantz & Manuck, 1984; Thomas & Liehr, 1995). Several studies have linked excessive activation of the sympathetic nervous system with progression of
atherosclerosis (Kaplan et al., 1996). Evidence suggests that such activation is associated with increases in shear stress that may potentiate endothelial injury, precipitating the development of cardiovascular disease (Kaplan et al., 1996). Additionally, such activation results in elevation of blood concentrations of atherogenic lipids (Niaura, Stoney, & Herbert, 1992).

While many studies have investigated the role of hyperreactivity of the cardiovascular response to stress in the risk of CVD, far fewer studies have examined possible protective factors involved in the converse reaction. A relatively smaller magnitude cardiovascular response to stress may be viewed as the result of proactive mechanisms that guard an individual against the potentially harmful effects of the exaggerated stress response (Lane, Adcock, & Burnett, 1992). Based on this conceptualization, it is useful to examine the pathways through which cardiovascular response to stress may be dampened, in order to bring to light any clinically useful protective mechanisms that may be at work.

If optimistic disposition is associated with a dampened cardiovascular response to a stressor, this may be a pathway through which optimism is related to cardiovascular health. The small amount of work in this area does, in fact, lend empirical evidence in support of this claim. One study found that optimists exhibited significantly smaller diastolic blood pressure reactivity to a math task than did pessimistic individuals (Williams, Riels, & Roper, 1990). Another study found that whereas optimistic participants exhibited decreases in systolic blood pressure from pre-task measurement to post-task measurement, pessimistic participants exhibited increases in systolic blood
pressure from pre-task to post-task (Van Treuren & Hull, 1986, as cited in Scheier & Carver, 1987). Unfortunately, no other published studies could be identified that have investigated this potential relationship.

When encountering a challenge or threat, an optimistic explanatory style may act as a psychological reserve, buffering harmful reactions to those stressors by allowing them ample cognitive resources to effectively cope (Taylor, Kemeny, Reed, Bower, & Gruenewald, 2000). Optimism appears to be linked to mobilization of active coping resources (Aspinwall & Taylor, 1997; Scheier, Weintraub, & Carver, 1986; Taylor et al., 1992). For example, investigations of adjustment following coronary artery surgery have suggested that optimism is related to increased utilization of active coping strategies, including coping with their surgery by focusing on postoperative goals, as well as decreased utilization of avoidance coping (King, Rowe, Kimble, & Zerwic, 1998; Scheier et al., 1989). This increased utilization by optimists of active coping strategies may also occur in response to acute stressors such as those encountered frequently as daily hassles. Moreover, optimists’ utilization of these coping strategies may also occur in response to those stressors that are commonly used in laboratory studies of reactivity. The use of these strategies may confer a benefit to optimists with respect to attenuated cardiovascular reactivity to those stressors.

Importantly, the study of cardiovascular reactivity alone may be insufficient to understand the relationship between cardiovascular responses to stress and development of cardiovascular diseases. In life outside the laboratory, physiological responses to stress vary along several parameters, including the magnitude of the reactivity to the
stressor, the frequency of activation of the stress response, and the duration of elevations in blood pressure and heart rate (Schwartz et al., 2003). However, laboratory reactivity studies often seek to describe only the magnitude of the response (Schwartz et al., 2003). In order to more fully understand the physiological impact of stressors, it is useful also to assess duration of and recovery from stress (Schwartz et al., 2003).

**Optimism and Cardiovascular Recovery from Stress**

In addition to the abundant evidence that suggests that reactivity to stressors is related to cardiovascular health, recovery from stressors may also be important for health. Recovery refers to the period following the stressor during which physiological parameters are allowed to regress back toward pretask levels. Individuals vary in the persistence of elevations in physiological parameters following the end of a stressor, and this individual difference can be quantified using a variety of methods (Linden, Earle, Gerin, & Christenfeld, 1997). In psychophysiological research, recovery is typically operationalized as either the interval of time required for physiological parameters to return to pre-stressor levels following the removal of a stressor, or the degree of elevation above baseline levels during a specified post-task period (Stewart & France, 2001).

Several studies have provided evidence linking recovery to risk of hypertension (Haynes, Gannon, Orimoto, O’Brien, & Brandt, 1991; Schuler & O’Brien, 1997). At least two studies have reported that hypertensive individuals recover more slowly following laboratory stressors than normotensive individuals (Falkner & Kushner, 1989; Fredrikson & Engel, 1985). Prospective studies provide evidence of the relevance of
recovery as a precursor of health status. Among youth with a family history of cardiovascular disease, cardiovascular recovery from laboratory stressors predicts resting blood pressure and heart rate at four-year follow-up (Treiber et al., 2001). Further, among young borderline hypertensives, diastolic blood pressure recovery is related to later development of hypertension (Borghi, Costa, Boschi, Mussi, & Ambrosioni, 1986).

Although the mechanism driving the relationship between prolonged elevations in cardiovascular parameters following the removal of a stressor and risk of hypertension is as yet unclear, at least one model implicates a sympathetic basis for the relationship. Slow cardiovascular recovery from stress may be indicative of chronic sympathetic activation, leading to a down-regulation of beta-adrenergic receptors in the heart and vasculature (Schuler & O’Brien, 1997). This down-regulation may bring about an unhealthy combination of reduced cardiac output and increased vascular peripheral resistance, resulting in increased blood pressure (Schuler & O’Brien, 1997). Another model, more directly related to the reactivity hypothesis, suggests that slower recovery simply reflects prolonged elevations in cardiovascular parameters, allowing more time for these elevations to damage the vessels (Christenfeld, Glynn, & Gerin, 2000).

Several psychosocial and individual difference variables which influence cardiovascular disease risk also influence cardiovascular recovery from stress. For example, relative to European Americans, African Americans show slower diastolic blood pressure recovery from stressors (Schuler & O’Brien, 1997). Additionally, individuals with a family history of cardiovascular disease exhibit delayed blood pressure recovery from acute stress (Gerin & Pickering, 1995). Further, physical fitness is related
to recovery, such that more physically fit individuals recover more quickly from stress than do unfit individuals (Jamieson & Lavoie, 1987). Finally, the experience of relatively high numbers of stressful life events is associated with slower recovery from stressors (Pardine & Napoli, 1983).

Further, personality factors may also influence cardiovascular recovery. For example, the interaction between anger expression style and situation variables influences recovery from stress (Faber & Burns, 1996; Lai & Linden, 1992). When anger expression style matches the situation (e.g. when an individual with an anger-out expression style is allowed to vent his frustration), recovery is swifter than when anger expression style clashes with the situation (e.g. when an anger-out individual is barred from expressing his frustration) (Lai & Linden, 1992). Additionally, components of the Type A behavior pattern, particularly high levels of hostility, may be related to less efficient recovery from stress, though not all investigations have found this association (Vitaliano, Russo, Paulson, & Bailey, 1995). Increased state anxiety and higher scores on measures of avoidance coping also appear to be associated with slower cardiovascular recovery (Vitaliano et al., 1995).

These individual difference variables may affect cardiovascular recovery by influencing individuals’ cognitive or emotional representations of the completed stressor (Schwartz et al., 2003). Stress-related thoughts and emotions regarding the stressor not only occur during the experience of a stressor, but also precede the stressor and persevere after the stressor has ended (Schwartz et al., 2003). Efficiency of physiological recovery from psychosocial stressors may be mediated by the extent to which certain thoughts or
emotions that persist following termination of the stressor serve to prolong cardiovascular arousal (Schwartz et al., 2003). For example, repeated cognitive representation of the stressor, or rumination, may negatively impact the recovery process (Glynn, Christenfeld, & Gerin, 2002; Schwartz et al., 2003). Interestingly, the experience of positive emotions is specifically related to the enhanced cardiovascular recovery from the effects of negative emotions (Fredrickson & Levenson, 1998).

Only one published study has examined whether optimism is related to cardiovascular recovery from stress. The study failed to find a significant difference between optimists and pessimists with respect to reactivity to a cold pressor task or a mental arithmetic task, but did find that optimistic individuals showed greater rate of recovery to the cold pressor stressor (Williams, Matthews, & Dobbs, 1988). Clearly, more work needs to be done in this area to clarify the existence of, and mechanisms driving, this potential relationship.

In addition to influencing cognition and emotion, optimism may also be related to more efficient recovery because of choice of coping style. As noted above, optimism appears to be linked to mobilization of active coping resources (Aspinwall & Taylor, 1997; Scheier, Weintraub, & Carver, 1986; Taylor et al., 1992) as well as decreased utilization of avoidance coping (King, Rowe, Kimble, & Zerwic, 1998; Scheier et al., 1989). An association between optimistic disposition and recovery may be related to the association between avoidance coping and recovery. Optimistic individuals may exhibit healthier recovery from stress relative to pessimistic individuals in part because optimists are less likely to employ avoidance coping.
Despite promising evidence which suggests the importance and relevance of studying recovery, relatively few published studies have included any report of, let alone analysis of, recovery data (Christenfeld, Glynn, & Gerin, 2000; Linden et al., 2000). In their review of the literature in which they monitored published reactivity studies over a two-year period, Linden and colleagues reported that fewer than two-thirds of studies identified included a recovery period in their protocol, and fewer than a quarter of the studies actually reported recovery data (Linden et al., 1997). They hypothesize that recovery has been excluded largely due to the lack of consensus regarding proper statistical treatment and analysis of recovery data (Linden et al., 1997).

Several divergent methods have been employed to quantify cardiovascular recovery, each with particular benefits and drawbacks. The most commonly utilized measure of recovery is to assess levels of cardiovascular parameters at one or more arbitrary intervals following termination of the stressor (Linden, Earle, Gerin, & Christenfeld, 1997). An adaptation of this method involves subtracting the baseline value from this value to obtain a recovery change score (Linden et al., 1997). This method of quantifying recovery is appealing in large part because is intuitively useful and easily interpretable (Linden et al., 1997). However, the success of this method is highly dependent upon the experimenter’s choice of an appropriate time interval, because an interval either too brief or too long might miss capturing the downward curve of the recovery (Linden et al., 1997). Additionally, the method is typically based on one or a few readings, which may render this method unreliable (Christenfeld, Glynn, & Gerin, 2000).
Another commonly employed method of assessing recovery is to calculate the time interval that elapses between the termination of the stressor and the return of the cardiovascular parameters to baseline levels (Linden, Earle, Gerin, & Christenfeld, 1997). In order to be precise, this method requires frequent sampling, since the initial downslope of recovery often occurs quite swiftly (Linden et al., 1997). One difficulty with this method is that some individuals may either not fully return to pretask baseline levels, or may have parameters that drop to baseline levels for one measurement and subsequently rise again (Linden et al., 1997). Another drawback of this method is that it ignores the slope of the recovery curve (Linden et al., 1997).

Curve-fitting analyses have also been proposed as a means of assessing recovery. Curve-fitting uses a least-squares algorithm to provide estimates of parameters using all available data points, presumably making this procedure more reliable because it is less sensitive to the presence of outliers (Linden, Earle, Christenfeld, & Gerin, 1997). Curve-fitting methods provide simultaneous estimates of several parameters, each of which can capture different aspects of the recovery process. For example, Christenfeld and colleagues present a single equation that they contend represents simultaneously the amount that the parameter drops between stressor and recovery, the time it takes the parameter to drop from stressor to recovery, and the level to which the parameter drops in recovery (Christenfeld, Glynn, & Gerin, 2000). An additional advantage of curve-fitting methods is that they can be made independent of reactivity levels (Linden et al., 1997). The main drawback of this method is the necessity of frequent sampling (Linden et al., 1997).
Finally, researchers have also assessed recovery by looking at total carryover, which is calculated by subtracting the average of all readings over the baseline period from the average of all readings during the recovery period (Christenfeld, Glynn, & Gerin, 2000). This calculation is mathematically equivalent to computing the area between the recovery curve and the baseline curve (Christenfeld, Glynn, & Gerin, 2000). It is intuitively appealing because the value represents the level of excess activation that remains after the cessation of the stressor. This method overcomes some of the limitations of the other methods because it combines several readings to increase reliability, because it controls for the steepness of the recovery curve, and because it is not dependent on the return of parameters to baseline values (Linden, Earle, Christenfeld, & Gerin, 1997).

**Optimism and the Utilization of Social Support**

In addition to any cardiovascular effects that optimism may trigger on its own, other variables also may interact with optimistic disposition to produce cardiovascular effects. One variable which may interact with optimism to produce cardiovascular effects is social support. Social support refers to any of a number of conceptualizations of social networks (arrays of social relationships) and the functions of those networks (Cassel, 1976; Cobb, 1976; Cohen, 1988; Cohen, Gottlieb, & Underwood, 2001; Winemiller, Mitchell, Sutliff, & Cline, 1993). Optimism’s relationship with better health may be mediated by social relationships and social support. Optimistic individuals may
have greater access to social support (Salovey et al., 2000), or they may be better able to mobilize and utilize that support (Scheier & Carver, 1987; Taylor & Brown, 1994).

Research to date has been equivocal with regard to the question of whether optimism is related to greater access to social support. In a sample of women of low socioeconomic status, optimistic women reported greater availability of social support than their pessimistic peers (Grewen et al., 2000). In another study, however, highly optimistic college students reported greater increases in perceived social support during a period of adjustment than their less optimistic peers, but optimism was not related to actual social network size (Brissette et al., 2002).

In addition to the benefit of its potential association with larger social network size, optimism may also benefit health through its relationship with more efficient activation of that support in times of distress. Optimists’ utilization of social support may be especially useful in moderating cardiovascular responses to psychological stress, because optimists may be better able than pessimists to effectively use social support as a buffer against the negative consequences of stress.

Social support has consistently been associated with health. In fact, convincing evidence points to social support as a causal factor in health outcome, even when controlling for other health-relevant variables such as age and initial health status (House, Landis, & Umberson, 1988). A particularly strong relationship is evident between social support and cardiovascular health (Seeman & Syme, 1987). Epidemiological studies, studies of myocardial infarction patients, and cardiovascular reactivity studies have provided considerable evidence that suggests a significant relationship between
inadequate social support and increased risk of development of cardiovascular diseases (Knox & Uvnas-Moberg, 1998).

Social support appears in particular to have effects on heart rate and blood pressure. For example, recent studies have reported positive effects of social support on ambulatory blood pressure and heart rate while at work (Evans & Steptoe, 2001; Steptoe, 2000). Additionally, at least two studies have reported that social support mediates age-related changes in resting blood pressure, such that increasing age was associated with increased blood pressure in individuals with low social support, but not in individuals with high social support (Uchino, Cacciopo, Malarkey, Glaser, & Kiecolt-Glaser, 1995; Uchino, Holt-Lundstad, Uno, Betancourt, & Garvey, T. S., 1999).

Social support may exact its effects on cardiovascular health through at least two possible pathways. Supportive others may play an instrumental role in encouraging an individual to engage in specific health-protective behaviors, such as exercising, refraining from smoking, or visiting the doctor regularly (Cohen, 1988). Support from family members has been implicated in the successful control of hypertension, likely by means of encouraging healthful behaviors such as keeping medical appointments (Morisky, DeMuth, Field-Fass, Green, & Levine, 1985). Social support is also related to such diverse health-relevant behaviors as seat-belt use (Allgower, Wardle, & Steptoe, 2001) and adherence to an exercise regimen (Moore, Dolansky, Ruland, Pashkov, & Blackburn, 2003). Although the influence of social support on health behaviors is very likely a contributor to the effects of social support, it is insufficient to explain the full impact of social support on health. Social support appears to have a positive effect on
cardiovascular health above that which is related to the effects of health behaviors (Cohen, Kaplan, & Manuck, 1994).

One other means through which social support could exact its effects on health is by bringing about physiological changes within an individual (Cohen, 1988; Uchino, Cacciopo, & Kiecolt-Glaser, 1996). Two models have been proposed to explain the process through which social support affects these physiological changes. The direct effects model suggests that social support benefits health at all levels of stress, including during conditions of very low stress (Gerin, Milner, Chawla, & Pickering, 1995). The buffering model, however, posits that social support incurs health benefits to individuals only under conditions of high stress (Gerin et al., 1995). It is the buffering model that is often tested in laboratory studies of the effects of social support on physiological reactivity to an acute stressor.

Social support may directly or indirectly influence neuroendocrine, immune, or cardiovascular reactivity in stressful situations, particularly under acute stress (Cohen, 1988). A recent meta-analysis indicated an association between social support and each of these physiological processes (Uchino et al., 1996). In particular, the review indicated a significant association between social support and reduced autonomic nervous system reactivity (Uchino et al., 1996). These associations support the hypothesis that effects on physiological changes during stress is one mechanism through which social support influences health. Certainly, the impact of social support on cardiovascular reactivity may have important implications for the study of the relationship between social support and cardiovascular health.
To better understand the role of social support in the moderation of cardiovascular reactivity to stressors, several laboratory-based studies have been conducted in which social support is manipulated. In many cases, the manipulation involves controlling the presence or absence of another individual during the task protocol. The mere presence of another person during a stress task results in smaller cardiovascular responses to stress in some situations (Fontana, Diegnan, Villeneuve, & Lepore, 1999; Gerin, Milner, Chawla, & Pickering, 1995; Kamarck, Manuck, & Jennings, 1990; Lepore, 1995). In the classic study by Kamarck, Manuck, and Jennings (1990), subjects who completed the experimental stress tasks in the presence of a friend who remained silent but touched the participant lightly on the wrist in a show of support were compared to subjects who completed the tasks alone. Kamarck and colleagues (1990) found that subjects who completed the experimental stress tasks in the presence of a friend showed significantly smaller systolic blood pressure and heart rate reactivity than subjects who completed the tasks alone.

As a whole, evidence supports the notion that social support manipulations are generally effective at reducing cardiovascular responses to a stressor. Thorsteinsson and James (1999) recently concluded, based on a meta-analysis of 22 experimental studies of the effects of social support manipulations during laboratory stress, that there are significant beneficial effects of such manipulations in dampening cardiovascular and neuroendocrine reactivity. They reported average effect sizes of 0.61 for heart rate and systolic blood pressure, 0.51 for diastolic blood pressure, and 0.83 for cortisol.
Though most studies investigating the effects of social support on the stress response have investigated cardiovascular reactivity, social support may also influence cardiovascular recovery from psychosocial stressors. In a study comparing the cardiovascular responses to a mental arithmetic task of individuals scoring in the lower and upper 50% of a social support questionnaire (Roy, Steptoe, & Kirschbaum, 1998), significant differences in recovery were noted. This study found that individuals who scored in the upper 50% on the questionnaire (i.e. those with more developed social support systems) recovered more quickly than did participants who scored in the lower 50% on the questionnaire (Roy et al., 1998).

Social support may impact cardiovascular recovery by interrupting rumination regarding the recently completed stressor. Glynn, Christenfeld, and Gerin (2002) provided evidence to support their suggestion that rumination accounted for increased blood pressure during recovery from an emotional stressor. Further, the researchers found that this rumination, and the associated elevations in blood pressure, could be interrupted via the distraction of completing questionnaires (Glynn, Christenfeld, & Gerin, 2002). However, no published study to date has investigated whether social support manipulations similarly interrupt rumination following a stressor.

However, it is important to note that not all investigations have supported the notion that social support acts as a moderator of cardiovascular responses to stress (Sheffeild & Carroll, 1994). For instance, Anthony and O’Brien (1999) failed to replicate the findings of Kamarck and colleagues (1990) in either of two studies reported together. In fact, some researchers have reported an enhanced cardiovascular response to a stressor
in the presence of a supportive other (Allen, Blascovich, Tomaka, & Kelsey, 1991; Edens, Larkin, & Avel, 1992; Roy et al., 1998; Stoney & Finney, 2000).

Inconsistencies in the social support literature pose an interesting question for researchers who desire to explain why some investigations fail to find a buffering effect of social support. In fact, numerous psychosocial and situational variables have been shown to influence social support’s effect of cardiovascular responses to stress. Gender, relationship variables, and threat perception have all been examined as potential factors moderating the effect of social support on cardiovascular responses.

Women seem to be particularly responsive to social support manipulations that aim to reduce cardiovascular reactivity to stressors. Results of an early investigation of this gender difference indicated that quality of one’s support network was inversely related to ambulatory blood pressure in women, but this relationship did not hold for men (Linden, Chambers, Maurice, & Lenz, 1993). The gender of the supportive other may also be important in this paradigm. Glynn, Christenfeld, and Gerin (1999) found that both male and female participants who were in the presence of a supportive female confederate exhibited smaller cardiovascular changes in response to a speech task than participants who were in the presence of a non-supportive female confederate. This same relationship was not observed among participants who were in the presence of a supportive or non-supportive male confederate.

The relationship between an individual and the supportive other also influences the effects on cardiovascular reactivity (Uchino et al., 1996; Uno, Uchino, & Smith, 2002). Most, but not all, investigations have found that support offered by a friend results in
significantly smaller cardiovascular reactivity to a stressor relative to support offered by a stranger (Christenfeld et al., 1997; Edens, Larkin, & Abel, 1992; Snydersmith & Cacciopo, 1992). However, Fontana and colleagues (1999) found that while the presence of a friend or stranger both resulted in smaller cardiovascular reactivity than a no-support condition, there was no significant difference in cardiovascular reactivity between the friend and stranger conditions.

Further, the degree of support offered by another individual can also affect cardiovascular reactivity (Gerin, Pieper, Levy, & Pickering, 1992; Glynn, Christenfeld, & Gerin, 1999; Lepore, Allen, & Evans, 1993). Participants who complete a stress task in the presence of a confederate trained to act in a supportive manner demonstrate smaller cardiovascular reactivity than participants who complete the task in the presence of a neutral confederate (Christenfeld et al., 1997).

Stoney and Finney (2000) suggest that the increased reactivity noted in their study may be explained in part by increased threat appraisal related to social evaluation. No explicit preventative measures were included in this study to reduce threat appraisal. Interestingly, participants who had a friend present during the speech task actually reported more stress during the stressor. In a review of the literature reporting increased reactivity to a stressor in the presence of a supportive other, researchers noted that none of those studies took steps to reduce threat associated with social evaluation (Kamarck, Annunziato, & Amateau, 1995). This suggests that increased threat appraisal may influence reactivity in some social support paradigms. Decreased threat appraisal has been proposed as a reason for the occasional finding that support from a pet better
moderates the stress response than presence of a friend or spouse (Allen, Blascovich, & Mendes, 2002; Allen, Blascovich, Tomaka, & Kelsey, 1991; Friedmann, Katcher, Thomas, Lynch, & Messent, 1983).

In addition to those factors listed above, individual differences, including differences in levels of personality factors such as optimism, may also affect social support’s ability to buffer cardiovascular responses. No study to date has tested the utilization of social support by optimists in buffering cardiovascular responses to psychological stress. The current study is the first whose aim is to directly examine optimists’ utilization of social support during an acutely stressful task.

**The Current Study**

The current study measured cardiovascular responses to a stressor in women who varied according to degree of optimism as assessed by the LOT-R, and who either were in the presence or absence of a supportive confederate. The study was designed to determine whether highly optimistic women benefit more from social support manipulations than do women who demonstrate low levels of optimism with respect to their responses to acute psychosocial stressors. Healthy women who scored high on the LOT-R measure of optimism and healthy women who scored low on the LOT-R were randomly assigned to complete the protocol either alone (Alone condition) or in the presence of a supportive other (Friend condition). Blood pressure and electrocardiogram data were collected from participants throughout the course of the protocol. A series of regression analyses were conducted on the data to determine whether disposition (LOT-R
score) and experimental condition (Alone versus Friend) work independently or interact
to influence cardiovascular responses to stress. Both cardiovascular reactivity and
subsequent cardiovascular recovery, operationalized in this study as total carryover, were
investigated in this study.

A number of baseline differences between high-optimism women and low-
optimism women were predicted. With regard to baseline questionnaire measures of
social support, it was predicted that High-Optimism women and Low-Optimism women
would differ in their perceptions of social support as measured by the Interpersonal
Support Evaluation List. Further, it was hypothesized that these perceptions may have
bearing on participants’ utilization of the social support manipulation as a buffer of
responses to stress. It also was hypothesized that High-Optimism women would report
greater access to support as measured by the Social Network Index. However, this
difference was not expected to influence participants’ responses to stress.

Additionally, High-Optimism participants were expected to indicate less hostility
by scoring lower on the Cook-Medley Hostility Scale than Low-Optimism participants.
Further, High-Optimism participants were expected to report fewer depressive symptoms
than Low-Optimism participants. With respect to physiological measures, High-
Optimism participants were expected to demonstrate lower baseline resting systolic blood
pressure and diastolic blood pressure than Low-Optimism participants.

An interaction between disposition and support condition was expected to produce
effects on participants’ perceptions of support during the task. It was hypothesized that
the support manipulation would produce a main effect of increased perceptions of support
among Friend condition participants compared to Alone condition participants among both High-Optimism and Low-Optimism women. However, it was expected that this effect would be more pronounced among High-Optimism women. Group differences were predicted with respect to performance of the stressful task. Because High-Optimism women were expected to exhibit significantly greater persistence in the face of the difficult math stressor, it was predicted that High-Optimism participants would provide a greater number of attempted responses to the task stimuli than Low-Optimism participants.

It was predicted that the stress task would elicit certain psychological effects. The task was expected to elicit increases in negative emotions including feelings of stress, anxiety, and threat. Additionally, the task was expected to induce decreases in feelings of happiness. Additionally, group differences were predicted in the levels of negative emotion elicited by the stress task. High-Optimism women were expected to report lower levels of negative emotion following the initiation of the stress task than Low-Optimism women. Additionally, an interaction between disposition and support condition was expected to produce effects on levels of negative emotion elicited by the task. Friend condition women were expected to report lower levels of negative emotion than Alone condition women, and this effect was expected to be more pronounced among High-Optimism women.

Further, group differences in the magnitude of physiological responses to the task were predicted. High-Optimism women were expected to demonstrate smaller magnitude cardiovascular changes in response to the initiation of the task than Low-
Optimism women. Additionally, an interaction between disposition and support condition was predicted for physiological measures. Among High-Optimism women, it was hypothesized that Friend condition women would show smaller magnitude cardiovascular responses to the initiation of the stress task than would Alone condition women. However, among Low-Optimism women, it was predicted that there would be no difference between Alone condition women and Friend condition women with respect to their responses to stress.

Additionally, group differences in recovery from the stressor were predicted. It was predicted that High-Optimism women would exhibit better cardiovascular recovery, as indexed by less total carryover in the ten minutes following the stress task, than would low-optimism women. Further, an interaction was predicted between disposition and support condition such that High-Optimism women in the Friend condition would exhibit better cardiovascular recovery following the task than High-Optimism women in the Alone condition, whereas no difference was predicted between Low-Optimism Alone and Friend condition women with respect to recovery.

Summary

Optimistic disposition has been consistently associated with various benefits to psychological and physical health. In particular, optimism is related to improved cardiovascular health. However, the mechanisms through which optimism exacts its health benefits are not yet clear. Optimistic disposition may be related to smaller magnitude cardiovascular reactivity to acute stressors and may promote more efficient
recovery from the stressor. Additionally, optimism may influence cardiovascular health by impacting social support. Highly optimistic individuals, compared to individuals who are low in optimism, may be better able to mobilize and utilize coping resources such as social support. Optimists’ effective utilization of social support may be particularly important with respect to their response to psychological stressors. Optimists may better employ social support to buffer their initial cardiovascular reactivity to stressors. Further, optimists may better employ social support to promote more efficient cardiovascular recovery following the termination of the stressor.

The current study was designed to test whether highly optimistic women incur greater benefit from social support manipulations than women who are low in optimism with respect to their responses to acute psychosocial stressors. Importantly, if optimistic women are shown to profit more from the social support manipulation, this might suggest another pathway through which optimistic disposition promotes health. It will suggest that during stressful situations, optimistic individuals are more adept at utilizing social support than pessimistic individuals, which would be consistent with the theory that highly optimistic individuals are better able to mobilize and utilize social support than their less optimistic peers. This finding might help to elucidate a potential interaction between a personality style and the social characteristics of a situation. Finally, the finding that disposition interacts with the social support manipulation to produce effects on cardiovascular responses to stress might provide new insight into the conflicting literature that sometimes suggests that the presence of a supportive other buffers stress, but other times fails to show such an effect.
CHAPTER 2

METHOD

Participants and Recruitment

Six hundred eighty-three women were prescreened through the Department of Psychology’s Research Experience Program using the Revised Life Orientation Test (LOT-R) (Scheier, Carver, & Bridges, 1994), a measure of optimism. Women who scored in the upper quartile (LOT-R total greater than 18; N = 165, 24.16% of respondents) and lower quartile (LOT-R total less than 12; N = 163, 23.87% of respondents) on this instrument were contacted via email for additional screening with respect to a variety of health-related criteria. Eligible participants were between the ages of 18 and 35 years. They had no personal history of cardiovascular disease. They were not taking any medications, including oral contraceptives, which were likely to affect their blood pressure or heart rate. All participants were non-smokers and no more than 30% above ideal body weight according to height.

Women who met all criteria and wished to participate selected an appointment for the study using the Research Experience Program’s website. Immediately prior to meeting with the participant on the day of testing, the researcher randomized the participant into either the Friend condition or the Alone condition by means of a coin flip.
As compensation for her time investment in the experiment, each participant received her choice of either monetary payment or Psychology 100 class credit.

Ninety-one women consented to participate in this investigation. One participant withdrew from the study prior to the initiation of the stress protocol; that participant’s data was not included in the final analyses. Additionally, five participants’ data were excluded from final analyses due to inconsistency between their prescreening and experiment day LOT-R scores. For these participants, a median split of experiment day LOT-R scores placed them in the opposite disposition of that which was indicated by their prescreening LOT-R scores.

**Psychological Measures**

**Optimism.** Optimism was measured both in Research Experience Program (REP) prescreening and during the experimental session. The two separate assessments of optimism served separate purposes. Assessment during prescreening allowed for selection of potential participants who scored in the highest and lowest quartiles with regard to optimistic disposition. The second assessment of optimism, obtained during the experimental session, was used to confirm participants’ classification as “high-optimism” or “low-optimism.” Also, the experiment day assessment of optimism allowed researchers to control for potential regression of scores toward the mean. Thus, the second assessment was used in all subsequent statistical analyses. When participants’ second LOT-R assessment was inconsistent with her initial classification as high-optimism or low-optimism, that participant’s data was excluded from final analyses.
Optimism was measured with the Revised Life Orientation Test (LOT-R) (Scheier, Carver, & Bridges, 1994). The LOT-R consists of six Likert-type items pertaining to optimism along with four filler items which are not included in scoring. Each item is scored on a scale from one to five, yielding total scores for the measure of between six and thirty. Lower total scores on the measure indicate greater optimism. The scale has demonstrated acceptable internal consistency (Cronbach’s alpha = 0.78) and test-retest reliability (correlations ranging from 0.56 to 0.79) (Scheier, Carver, & Bridges, 1994). Scheier & Carver (1985) reported that the LOT is appropriately correlated with measures of locus of control, depression, hopelessness, alienation, self-esteem, and perceived stress, while it diverges appropriately from measures of self-consciousness and social desirability.

Social Support. The Interpersonal Support Evaluation List (ISEL) (Cohen, Mermelstein, Kamarck, & Hoberman, 1985) was used to measure qualitative components of social support available to each participant. The ISEL consists of 48 items pertaining to the availability of certain social resources. Individuals respond “probably true” to indicate they believe that a given resource is available to them, or “probably false” to indicate they believe the resource is unavailable. The items are arranged into four ten-item scales: tangible support, appraisal support, belongingness, and self-esteem. This measure has demonstrated high test-retest reliability and acceptable internal consistency (alphas between .77 and .86) (Cohen et al., 1985).

Additionally, the Social Network Index (Cohen et al., 1997) will be used to assess social integration. The index measures quantitative social support with respect to twelve
types of social relationships. Those relationships assessed include relationships with a spouse, parents, parents-in-law, children, other family members, neighbors, friends, coworkers, schoolmates, fellow volunteers, members of organizations, and members of religious groups. The measure yields subscale scores for Number of High-Contact Roles (network diversity) and Number of People in Social Network (network size). Number of High Contact Roles refers to the number of the twelve types of social relationships for which respondents indicate that they have regular contact with someone in that relationship. Number of People in Social Network refers to the total number of individuals across all relationship categories with whom the respondent keeps in regular contact.

**Hostility.** Because of its relationship with cardiovascular disease and its proposed relationship to optimism, hostility was measured in this study. Trait hostility was measured with the Ho scale (Cook & Medley, 1954). The Ho scale consists of 50 true-false items and is scored along three dimensions: total hostility, cynicism, and paranoid hostility. The Ho scale has demonstrated acceptable internal consistency (Cronbach’s alpha = 0.82) (Cook & Medley, 1954).

**Anger Expression.** The Anger Expression Scale (Spielberger et al., 1985; Spielberger, Krasner, & Solomon, 1988), a 24-item Likert type scale, was used to assess an individual's usual manner of dealing with feelings of anger. The instrument has three subscales: Anger-In, Anger-Out, and Anger Control. The Anger-In scale measures the frequency of nonexpressive responses to angry feelings, whereas the Anger-Out scale measures the frequency of aggressive responses to angry feelings. The Anger Control
scale assesses the frequency of behaviors aimed at mastering an individual's feelings of anger. Cronbach's alphas for these scales range from 0.73 to 0.84 (Spielberger, Krasner, & Solomon, 1988).

**Medical History.** Because family history of cardiovascular disease has been shown in previous research to affect cardiovascular reactivity in otherwise healthy individuals, participants were asked to report their medical and family history with respect to certain cardiovascular and respiratory disorders. Each participant was asked to indicate whether she or a first degree relative has been diagnosed with or treated for conditions such as coronary heart disease, stroke, and hypertension. That data was used to determine whether each participant has a positive or negative family history of cardiovascular disease. Positive family history of cardiovascular disease is defined in this investigation as the current or past presence of myocardial infarction, angina pectoris, hypertension, or heart disease in one or more first-degree relatives.

**Perceived Stress.** Cohen’s Perceived Stress Scale-10 (PSS-10) (Cohen, Kamarck, & Marmelstein, 1983) was used to assess the degree to which each participant perceives her experiences and environment to be stressful. The PSS-10 is a short, 10-item Likert-type self-report scale. The authors report test-retest correlations ranging from 0.55 to 0.85 and coefficient alphas between 0.84 and 0.86 in college samples (Cohen et al., 1983). Further, the authors state that the scores on the instrument correlate well with measures of stressful life events, social anxiety, physical symptoms of stress, and utilization of health-care services (Cohen et al., 1983). PSS-10 scores have also been shown to diverge appropriately from measures of depression (Cohen et al., 1983).
**Social Desirability.** Social desirability/defensiveness was assessed using the Marlowe-Crowne Social Desirability Scale (Crowne & Marlowe, 1960). The scale, which consists of 33 true-false type items is often used in research to investigate the impact of social desirability on participants’ responses on other self-report measures. The scale demonstrates high internal consistency (alpha equal to 0.88) and test-retest reliability (correlation of 0.89).

**Extraversion.** Since evidence suggests that the measure of optimism employed in this study may be correlated with extraversion (Williams, 1992), a measures of extraversion was included in this study. The bipolar extraversion scale used in this study includes seven scales on which participants indicate their perceived levels of trait terms associated with extraversion (Hofstee, de Raad, & Goldberg, 1992).

**Depressive Symptoms.** The Center for Epidemiological Studies Depression Scale (CES-D) (Radloff, 1977) is a brief self-report scale which assesses depressive symptoms. The measure gauges respondents’ endorsement of 20 symptoms associated with depression. Participants responded to the items on a four-point Likert-type scale. The scale is scored such that each item receives a valued between zero and three, yielding a total score for the measure between zero and thirty. Higher scores indicate greater reported symptoms of depression. Among the symptoms assessed, heavy emphasis is placed on the affective symptoms. The scale also includes items which probe the behavioral, cognitive, somatic, and social aspects of depression. The CES-D demonstrates good internal consistency with an alpha of .85 in the general population (Radloff, 1977). The scale also demonstrates good concurrent validity with other
established depression measures and discriminates well between clinical and nonclinical populations (Radloff, 1977).

Physiological Measures

**Body Composition.** Because excess body weight has been shown in several studies to be associated with blood pressure elevations (Muntner, He, Cutler, Wildman, & Whelton, 2004; Siani et al., 2002), a measure of body composition was obtained in this study. Participants’ height and weight were obtained and used to calculate body mass index (BMI). Body mass index was calculated by dividing weight in kilograms by squared height in meters (Muntner et al., 2004).

**Cardiovascular Measures.** An oscillometric blood pressure monitor (Dinamap model 1846, Critikon Inc., Tampa, FL) was employed to collect systolic blood pressure and diastolic blood pressure. This system, which automatically adjusts deflation rates and inflation levels, correlates well with mercury sphygmomanometer readings in adults (Manolio et al., 1988).

Heart rate data was collected beat-by-beat using an electrocardiogram (ECG) employing a modified lead II configuration. A personal computer running National Instruments Labview software was used to collect and measure the electrocardiogram. The ANS Suite (Version 6.7) custom software package, developed at The Ohio State University, was employed to view and edit the collected signals. The same software was employed in order to derive respiratory sinus arrhythmia from the ECG. A subset of
participants’ files was scored independently by two research associates for heart rate and respiratory sinus arrhythmia so that interrater reliability could be assessed.

**Laboratory Stress Task**

The five-minute stress task involved subtracting the number thirteen repeatedly from a four-digit number aloud as quickly and accurately as possible while being recorded by a video camera. Participants subtracted serial thirteens for two minutes, thirty seconds beginning with the number 9309. They then repeated the task beginning with the number 7524. Participants were prompted by the experimenter three times during the task to perform the task more quickly and with greater accuracy. This math task was chosen because it is an active coping task that tends to elicit sympathetic nervous system responses (Sherwood, 1983). Similar math tasks have been shown to elicit reliable increases in cardiovascular and sympathetic activity (Fontana et al., 1999; Stoney, Matthews, McDonald, & Johnson, 1988).

**Social Support Manipulation**

The social support manipulation used in this investigation was based on the manipulation developed by Kamarck and colleagues (Kamarck et al., 1990). Participants who were randomized into the Friend condition were informed that they would receive silent support from a study assistant. The confederate was instructed to sit near and within view of the participant and quietly read a magazine while the participant completed the second baseline period, the stress task, and the recovery period. The
confederate was instructed to silently cheer the participant on throughout the experiment. She was further instructed to avoid speaking with the participant or distracting her in any way during the experiment, but to attempt eye contact and smile at the participant throughout the monitoring period. In order to minimize evaluation effects (Kamarck et al., 1995), companions were fitted with headphones playing white noise during the stress task. Participants were assured prior to the onset of the task that their companions would be unable to hear their task performance.

Since all participants in this study were female, female confederates were used in order to reduce variability that may be associated with the meaning of supportive actions (Kamarck et al., 1990). Though the original conceptualization of this manipulation involved using participant-recruited friends, the manipulation has been successfully adapted in other studies using study confederates who are unfamiliar to participants (Fontana, Diegnan, Villeneuve, & Lepore, 1999).

**Manipulation Checks**

**Task Perceptions.** Following task completion, participants reported on their perceptions of the math task by completing the brief Post-Task Evaluation scale. All items on the scale utilize a five-point Likert-type response format. Nine of the scale’s thirteen items require the participant to report on psychological variables including anxiety and stress associated with the performance of the task. The remaining items on the scale assess participants’ perceptions of task difficulty and exerted effort. Items include “How difficult was the task?” and “How hard did you try?” Each participant also
completed a shortened version of this scale, the Rest Period Evaluation, following the first baseline period.

**Task Performance.** Two measures of task performance were employed in this study. First, as a measure of speed and effort, the total number of responses given by a participant over the five minute period was recorded (Fontana et al., 1999). Second, as a measure of correctness, an accuracy index was calculated. The accuracy index was determined by dividing the number of participants’ correct responses by the number of attempted responses (Fontana et al., 1999).

**Social Support.** Two true-false items, developed by Kamarck and colleagues (1995), were used to assess the level of support felt by the participant during the task. These questionnaires were completed by participants in both the Friend condition and the Alone condition.

**Procedure**

Each participant reported to the Cardiovascular Behavioral Medicine Laboratory at her scheduled time. A member of the research team greeted the participant and escorted her to a designated room in the laboratory. The researcher played a brief video for the participant that described the nature of the study and the procedure. The benefits and risks of the study were thoroughly explained. The researcher discussed consent procedures with the participant, including an explanation of her right to terminate the procedure at any time. Written consent was obtained from each participant before any data were collected.
The participant then completed a set of questionnaires assessing emotions, mood states, and brief medical history. The researcher next measured the participant’s height and weight. Sensors were placed on the participant’s abdomen and chest, which were used to measure heart function during the protocol. The participant sat in a comfortable armchair chair, and leads to the monitoring equipment were attached to each sensor. The researcher then attached a blood pressure cuff to the participant’s non-dominant arm. After the monitoring equipment was in place, the participant was notified of the results of her randomization. Participants randomized into the Friend condition were informed that her companion would be joining her in approximately 20 minutes. All participants then began a ten-minute period of acclimation to the equipment.

Following the acclimation period, the participant rested quietly for a ten-minute period. Those ten minutes, during which participants in both conditions were without social support, comprised baseline 1. Following baseline 1, the participant reported on her mood using the Rest Period Evaluation. Participants in the Friend condition then were joined by the supportive confederate. Participants were reminded that they must not speak unless it is absolutely necessary. In the Friend condition, the confederate then began providing support, which she continued to provide until the end of the monitoring period.

The participant rested for another period of ten minutes, which was be designated baseline 2. The two baseline periods were included in order to examine the effects of the social support manipulation on baseline parameters. The participant then completed the math task. A ten-minute recovery period followed the task. Immediately following the
task’s recovery period, participants completed the Post-Task Evaluation and the Support Assessment questionnaire. The recovery period that followed the stress task will conclude the monitoring period.

Cardiovascular data were collected throughout the study. During the acclimation period, electrocardiogram data were monitored every minute, though these data were not recorded. Also during this period, blood pressure data were collected every two minutes. From the beginning of the baseline 1 period until the conclusion of the study, the electrocardiogram data were collected beat by beat, while blood pressure data were collected and recorded each minute.

At the conclusion of the monitoring period, the participant was disconnected from the monitoring equipment. The participant was debriefed and compensated. Participation was complete following debriefing.

Data Analysis

Data Reduction. For each participant, one minute means were calculated for heart rate. These means were then averaged to obtain single values for each of the measurement periods (baseline 1, baseline 2, math task, and recovery period). The same procedure was utilized to calculate period scores for respiratory sinus arrhythmia. Similarly, one-minute measurements of systolic blood pressure and diastolic blood pressure were averaged to obtain a single value for each of the measurements periods.

Additionally, change scores were calculated for all physiological variables as indices of reactivity. Because the main thrust of the investigation was to determine
whether the presence or absence of a companion affects reactivity among the high-optimism and low-optimism participants, only baseline 2 period scores were employed in analyses of physiological response to the task. Thus, change scores were determined by subtracting baseline 2 average scores from math task average scores. Change scores were calculated in this manner for heart rate, respiratory sinus arrhythmia, systolic blood pressure, and diastolic blood pressure.

In order to analyze recovery, total carryover was calculated for physiological variables. Total carryover was calculated by subtracting baseline 2 average scores from recovery average scores. Total carryover was calculated for heart rate, respiratory sinus arrhythmia, systolic blood pressure, and diastolic blood pressure.

Statistical Procedure. The first step in the analysis was to verify that randomization within disposition was successful by determining whether high-optimism Friend condition women differed significantly from high-optimism Alone condition women with respect to demographic, baseline psychosocial, or baseline physiological variables of interest. These variables include age and BMI; scores on the LOT-R, ISEL, Social Network Index, Ho scale, Anger Expression Scale, Medical History, and PSS-10; and baseline 2 heart rate, respiratory sinus arrhythmia, systolic blood pressure, and diastolic blood pressure. Independent samples t-tests were performed on continuous variables, using support condition (Friend versus Alone) as the between-subject comparison. Chi-square tests of independence were performed on nominative variables.

The same set of analyses as those listed above then were repeated on the sample of low-optimism participants in order to determine whether there were preexisting
differences between low-optimism Friend condition women and low-optimism Alone condition women. Independent samples t-tests and chi-square tests of independence were performed to determine whether low-optimism Friend condition women differed significantly from low-optimism Alone condition women at baseline assessment.

Next, a set of analyses were performed to determine whether high-optimism women differed from low-optimism women with respect to the baseline variables of interest listed above. As above, independent samples t-tests were performed on continuous variables, using disposition (high-optimism versus low-optimism) as the between-subject comparison. Chi-square tests of independence were performed on nominative variables.

Then, in order to determine whether the social support manipulation was effective, the true/false items from the Support Assessment questionnaire were analyzed using a chi-square test of independence in order to determine if responses varied according to disposition or support condition. Also, in order to determine if the math task induced a measurable change in perceptions of stress, as well as whether there were group differences in those perceptions, a series of 2 (Disposition: high-optimism versus low-optimism) x 2 (Support Condition: Alone versus Friend) x 2 (Time: pre-task versus post-task) repeated measures ANOVAs were performed on self-reported measures from the Rest Period Evaluation and Post Task Evaluation scales.

In order to determine whether the task induced significant physiological reactivity, a series of one-way repeated measures (Experimental Period: baseline 1, baseline 2, speech task, recovery) ANOVAs were performed using heart rate, respiratory
sinus arrhythmia, systolic blood pressure, and diastolic blood pressure as dependent variables. Main effects for variables that were shown in this step to be reactive to experimental period were then further examined using post-hoc Tukey tests.

Next, to determine whether the groups exerted comparable effort and performed similarly on the task, a series of 2 (Disposition: high-optimism versus low-optimism) x 2 (Support Condition: Friend versus Alone) analyses of variance (ANOVAs) were performed on the task speed and accuracy indices.

The major aim of this investigation was to determine whether optimism and support condition act separately or interact to produce effects on cardiovascular responses. Because optimism was assessed as a continuous variable, and because the groups were likely to differ on relevant psychosocial variables, multiple regression was selected for the main analyses. First, Pearson correlation analyses were conducted to determine which, if any, of the psychosocial variables on which low-optimism and high-optimism participants differed were related to cardiovascular reactivity or recovery. Any variables found to be significantly related to physiological responses to stress were then included in subsequent regression analyses, entered into the first step of the hierarchical regression. Next, for each of the relevant reactivity and recovery variables, disposition (LOT-R score) and support condition (dummy coded) were entered into the model. Finally, the interaction between disposition and support condition was entered in this final step of the regression analyses.

The alpha level was restricted to 0.05 for this study. Because of the large number of tests being conducted on this data set, the alpha level was further restricted using the
Bonferroni correction within each set of analyses in order to minimize the chance of a Type I error.

**Power Analysis**

In order to determine the power of this investigation to detect influences of optimistic disposition and support condition and their interaction on cardiovascular responses, a power analysis was conducted using the procedure outlined in Cohen and Cohen (1983). To date, no published study has directly examined the combined effects of a personality characteristic and social support on cardiovascular reactivity or recovery. However, according to a recent meta-analysis, the experimental manipulation of social support alone generally yields a medium to large effect on hemodynamic reactivity measured in a laboratory setting (Thorsteinsson & James, 1999). Thorsteinsson and James report average ANOVA effect sizes $d = 0.61$ for systolic blood pressure and $d = 0.51$ for diastolic blood pressure. Here, with a sample size of 85 participants and setting alpha equal to 0.05, power analysis revealed that this study had power of approximately 0.84 to detect a medium-sized effect ($r^2 = 0.15$, equivalent to an $R^2 = 0.13$) in multiple regression using three predictor variables (LOT-R score, support condition, and the interaction between the two).
CHAPTER 3
RESULTS

Confirmation of Successful Randomization

In order to determine whether randomization within disposition was success in minimizing preexisting group differences, separate baseline comparisons were conducted within High-Optimism participants only, then within Low-Optimism participants only. Within the subsample of High-Optimism participants, the two experimental conditions (Alone condition versus Friend condition) did not differ with respect to any of the demographic or descriptive measures assessed at baseline (see Table 1). The groups did not differ with respect to participants’ mean age at testing ($t = 0.92$, $p = 0.36$) or body mass index ($t = -1.38$, $p = 0.18$). Chi-square tests of independence indicated that there was no significant association between condition and positive family history of cardiovascular disease ($\chi^2 = 0.05$, $p = 0.82$) or the percentage of participants in each condition identifying their race as White/Caucasian versus another race or ethnicity ($\chi^2 = 0.54$, $p = 0.46$).

Within High-Optimism participants, Alone condition women and Friend condition women did not differ with respect to any of the baseline psychosocial variables (see Table 1). Independent samples $t$-tests indicated that the groups did not differ
significantly with respect to experiment day LOT-R scores ($t = -1.34, p = 0.19$). The groups did not differ significantly with respect to the ISEL subscales Appraisal ($t = 0.81, p = 0.42$), Tangible ($t = 1.01, p = 0.32$), Self-Esteem ($t = 0.00, p = 1.00$), or Belonging ($t = 0.90, p = 0.37$). Additionally, the groups did not differ with respect to SNI scales High-Contact Roles ($t = -0.08, p = 0.93$) or Number of People in Social Network ($t = 0.51, p = 0.61$).

Further, independent samples t-tests indicated that there were no differences between the experimental conditions with respect to total hostility ($t = -0.23, p = 0.82$), cynicism ($t = -0.13, p = 0.82$), or paranoid hostility ($t = -1.31, p = 0.20$). With regards to anger expression, there were no differences with respect to Anger-Control ($t = -1.04, p = 0.31$), Anger-In ($t = -1.29, p = 0.20$), or Anger-Out ($t = -0.26, p = 0.80$). The groups did not differ at baseline on measures of perceived stress ($t = 0.63, p = 0.53$) or social desirability/defensiveness ($t = -1.39, p = 0.17$). Alone condition women and Friend condition women did not differ on self-report of extraversion ($t = -0.16, p = 0.87$). The groups also did not differ with respect to depressive symptoms as assessed by the CES-D ($t = -1.00, p = 0.32$).

High-Optimism Alone condition women did not differ from High-Optimism Friend condition women on any of the physiological measures at baseline 2 (see Table 1). The groups did not differ with respect to baseline 2 average heart rate ($t = 0.57, p = 0.57$) or respiratory sinus arrhythmia ($t = -0.44, p = 0.66$). The groups also did not differ with respect to baseline 2 average systolic blood pressure ($t = 0.15, p = 0.88$) or average diastolic blood pressure ($t = -1.80, p = 0.08$).
Within the subsample of Low-Optimism participants, the two experimental conditions (Alone condition versus Friend condition) did not differ with respect to any of the demographic or descriptive measures assessed at baseline (see Table 2). The groups did not differ with respect to participants’ mean age at testing \( (t = -0.34, p = 0.74) \) or body mass index \( (t = -1.74, p = 0.09) \). Chi-square tests of independence indicated that there was no significant association between condition and positive family history of cardiovascular disease \( (\chi^2 = 0.32, p = 0.57) \) or the percentage of participants in each condition identifying their race as White/Caucasian versus another race or ethnicity \( (\chi^2 = 0.03, p = 0.85) \).

Within Low-Optimism participants, Alone condition women and Friend condition women did not differ with respect to any of the baseline psychosocial variables (see Table 2). Independent samples \( t \)-tests indicated that the groups did not differ significantly with respect to experiment day LOT-R scores \( (t = 0.09, p = 0.93) \). The groups did not differ significantly with respect to the ISEL subscales Appraisal \( (t = -1.55, p = 0.13) \), Tangible \( (t = -1.32, p = 0.20) \), Self-Esteem \( (t = -0.18, p = 0.86) \), or Belonging \( (t = 0.32, p = 0.75) \). Additionally, the groups did not differ with respect to SNI scales High-Contact Roles \( (t = -1.81, p = 0.08) \) or Number of People in Social Network \( (t = -1.44, p = 0.16) \).

Further, independent samples \( t \)-tests indicated that there were no differences between the experimental conditions with respect to total hostility \( (t = -1.16, p = 0.25) \), cynicism \( (t = -1.24, p = 0.22) \), or paranoid hostility \( (t = -0.33, p = 0.74) \). With regards to anger expression, there were no differences with respect to Anger-Control \( (t = 0.33, p = 0.74) \),
$p = 0.75$), Anger-In ($t = -1.19, p = 0.24$), or Anger-Out ($t = 0.20, p = 0.84$). The groups did not differ at baseline on measures of perceived stress ($t = 1.40, p = 0.17$) or social desirability/defensiveness ($t = 0.55, p = 0.59$). Alone condition women and Friend condition women did not differ on self-report of extraversion ($t = 0.33, p = 0.74$). The groups also did not differ with respect to depressive symptoms as assessed by the CES-D ($t = 0.36, p = 0.72$).

Low-Optimism Alone condition women did not differ from Low-Optimism Friend condition women on any of the physiological measures at baseline 2 (see Table 2). The groups did not differ with respect to baseline 2 average heart rate ($t = 0.61, p = 0.54$) or respiratory sinus arrhythmia ($t = -0.65, p = 0.52$). The groups also did not differ with respect to baseline 2 average systolic blood pressure ($t = -1.75, p = 0.09$) or average diastolic blood pressure ($t = -1.89, p = 0.07$).

**Comparison of High-Optimism and Low-Optimism Participants at Baseline**

Independent samples t-tests indicated that the two dispositions (High-Optimism versus Low-Optimism) did not differ at baseline with respect to participants’ mean age at testing ($t = 0.78, p = 0.44$) or body mass index ($t = -0.96, p = 0.34$) (see Table 3). However, statistical analyses revealed that there was a significant association between disposition and family history of cardiovascular disease. Frequency analyses revealed that fifty-one percent of the total sample reported a positive family history of disease. A chi-square test of independence indicated that a significantly greater number of
Low-Optimism participants reported a first-degree family history of cardiovascular
disease than did High-Optimism participants ($\chi^2 = 7.38, p < 0.01$) (see Table 3).

The majority (68%) of participants in the full sample described their race or
ethnicity as White/Caucasian (see Table 4). A chi-square test of independence indicated
that there was no difference between the percentage of Low-Optimism participants and
the percentage of High-Optimism participants identifying their race as White/Caucasian
versus another race or ethnicity ($\chi^2 = 0.22, p = 0.63$).

High-Optimism and Low-Optimism women differed at baseline with respect to
several of the baseline assessments of psychosocial variables (see Table 5). Independent
samples t-tests indicated that the groups differed significantly with respect to the ISEL
subscales Self-Esteem ($t = 5.33, p < 0.001$), and Belonging ($t = 4.06, p < 0.001$), such
that High-Optimism participants reported greater perceptions of support on each
subscale. Group differences in this sample with respect to the Appraisal ($t = 2.91,$
$p = 0.004$) and Tangible ($t = 2.90, p = < 0.005$) subscales did not reach the Bonferroni-
adjusted significance level for this group of analyses ($\alpha = 0.05/16 = 0.003$). Additionally,
High-Optimism women on average reported a greater number of individuals within their
social network ($t = 3.13, p = 0.002$) than Low-Optimism women. No significant
difference was detected with regards to High-Optimism and Low-Optimism participants’
reports of their number of high-contact social roles ($t = 2.07, p = 0.042$).

Further, the groups differed in their patterns of response on the Ho Scale.
Independent samples t-tests indicated that Low-Optimism participants reported greater
total hostility ($t = -4.98, p < 0.001$), cynicism ($t = -3.99, p < 0.001$), and paranoid hostility
than did High-Optimism participants. Independent samples t-tests also revealed differences in patterns of response on the Anger Expression Scale, such that Low-Optimism women endorsed items reflecting greater Anger-In ($t = -3.54, p < 0.001$). There were no significant differences between High-Optimism and Low-Optimism women with respect to Anger-Control ($t = 2.56, p = 0.012$) or Anger-Out ($t = -0.96, p = 0.34$).

Low-Optimism participants reported significantly more baseline perceived stress ($t = -5.57, p < 0.001$), whereas High-Optimism participants endorsed items consistent with greater social desirability/defensiveness ($t = 4.43, p < 0.001$). No significant group differences were revealed in participants’ reports of extraversion ($t = 3.03, p = 0.0032$). Finally, an independent samples t-test revealed that Low-Optimism women reported significantly higher levels of depression than High-Optimism women ($t = -5.48, p < 0.001$).

Additionally, since optimism was measured on a continuous scale, Pearson correlation analyses were performed between optimism and each of the other baseline psychosocial variables (see Table 6). LOT-R scores were significantly correlated with each of the ISEL scales, social network size, all three hostility scales, Anger-Control and Anger-In, perceived stress, social desirability/defensiveness, and depression (absolute value of all Pearson $r$’s $> 0.36$, all $p$’s $< 0.001$). Additionally, intercorrelations among the rest of the baseline psychosocial variables were investigated.

High-Optimism women did not differ from Low-Optimism on any of the physiological measures at baseline 2 (see Table 7). The groups did not differ with respect
to baseline 2 average heart rate \((t = -0.78, p = 0.44)\) or respiratory sinus arrhythmia \((t = 0.16, p = 0.87)\). The groups also did not differ with respect to baseline 2 average systolic blood pressure \((t = 0.69, p = 0.49)\) or baseline 2 average diastolic blood pressure \((t = 0.29, p = 0.77)\).

**Manipulation Checks**

**Social Support Manipulation.** In order to determine whether Friend condition participants felt supported by their companion during the protocol, responses to the two true/false items aimed at assessing perceived support were analyzed. A chi-square test of independence revealed a significant association between support condition (Friend or Alone) and feelings of isolation and loneliness during the task \(\chi^2 = 9.38, p < 0.01\).

Whereas 68.29\% of Alone condition participants reported feeling isolated and alone during the task, only 34.88\% of Friend condition women reported feeling isolated and alone. However, regardless of experimental condition, most (86.9\%) of the participants reported feeling unsupported during the task. In this sample, 90.24\% of Alone condition participants and 83.72\% of Friend condition participants reported feeling unsupported during the task. A chi-square test of independence indicated that this small difference in percentage was not statistically significant \(\chi^2 = 0.78, p = 0.38\). Additionally, disposition (High-Optimism versus Low-Optimism) was not significantly related to participants’ reports of feelings of isolation \(\chi^2 = 3.07, p = 0.08\) or support \(\chi^2 = 2.35, p = 0.13\).

Analyses also revealed no significant effect of disposition, condition or their interaction
on feelings of support as assessed by a Likert-type item included on the Math Task Questionnaire (all $F$’s < 1.57, all $p$’s > 0.21).

**Psychosocial Response to the Stressor.** A series of one-way repeated measures (time: pretask versus posttask) analyses of variance (ANOVAs) revealed significant time effects on each of the nine assessed psychosocial variables (all $p$’s < 0.0056) (see Table 8). Participants across experimental condition reported experiencing statistically significant increases in feelings of anxiety ($F(1, 84) = 111.70$), irritation ($F(1, 84) = 107.96$), sadness ($F(1, 83) = 9.96$), stress ($F(1, 84) = 190.40$), anger ($F(1, 84) = 68.18$), frustration ($F(1, 84) = 199.06$), challenge ($F(1, 83) = 342.71$), and threat ($F(1, 84) = 27.35$) following the speech stressor relative to pre-task. Additionally, subjects reported a statistically significant decrease in feelings of happiness post-task ($F(1, 83) = 107.65$).

Further, a series of 2 (disposition: High-Optimism versus Low-Optimism) x 2 (support condition: Alone versus Friend) ANOVAs using change in those psychosocial variables from pretask to posttask as dependent variables were conducted. No significant effects of disposition or condition were identified for increases in anxiety, irritation, sadness, stress, frustration, challenge, or threat, nor decreases in happiness (all $F$’s < 4.08, all $p$’s > 0.04). An effect of disposition on increases in anger, such that Low-Optimism women reported greater increases in feelings of anger than High-Optimism, approached significance ($F(1, 84) = 5.80$, $p = 0.018$) but did not reach the adjusted significance level for this set of analyses.
Physiological Response to the Stressor. A series of separate one-way repeated measures (experimental period: baseline 1 versus baseline 2 versus math task versus recovery) ANOVAs using the cardiovascular measures as dependent variables indicated that the speech task induced statistically significant increases in cardiovascular activity (see Table 9). Analyses revealed significant main effects for time on heart rate, respiratory sinus arrhythmia, systolic blood pressure, and diastolic blood pressure (all $F$’s > 11.63, all $p$’s < 0.001). Post-hoc Tukey tests revealed that the stress task elicited a statistically significant increase in each of these variables relative to baseline 2 (all $F$’s > 13.67, all $p$’s < 0.001). Post-hoc analyses also revealed that recovery from the task was met with a statistically significant decrease in these variables relative to levels during stress (all $F$’s > 10.19, all $p$’s < 0.001). For heart rate and systolic blood pressure, recovery levels failed to return to baseline 2 levels ($F(1, 79) = 10.96, p < 0.01$; and $F(1, 80) = 29.71, p < 0.01$, respectively); however, recovery levels of respiratory sinus arrhythmia and diastolic blood pressure were not statistically different from baseline 2 levels ($F(1, 79) = 2.53, p = 0.12$; and $F(1, 80) = 2.32, p = 0.13$, respectively). Finally, post-hoc analyses revealed that participants experienced a statistically significant decrease from baseline 1 to baseline 2 in diastolic blood pressure ($F(1, 80) = 20.94, p < 0.001$).

Effort and Performance on the Math Task

In order to determine whether the groups exerted comparable effort on the math task, a series of 2 (disposition: High-Optimism versus Low-Optimism) x 2 (support
condition: Alone versus Friend) ANOVAs were conducted using the task speed and accuracy indices. Analyses revealed no significant main effect of disposition \( (F(1, 77) = 0.06, p = 0.91) \) or support condition \( (F(1, 77) = 0.14, p = 0.71) \), or their interaction \( (F(1, 77) = 0.19, p = 0.67) \) (see Figure 1). Additionally, analyses revealed no significant main effect of disposition or support condition \( (F(1, 77) = 0.01, p = 0.93; F(1, 77) = 0.02, p = 0.89, \text{ respectively}) \) or their interaction \( (F(1, 77) = 1.00, p = 0.32) \) on task accuracy (see Figure 2).

Correlations Between Relevant Psychosocial Variables and Physiological Responses

In order to determine which baseline psychosocial variables, if any, should be included in subsequent regression analyses, correlation analyses were performed to examine relationships between reactivity variables and those baseline psychosocial variables on which High-Optimism and Low-Optimism women differed (see Table 10). No significant relationships were detected at the Bonferroni-adjusted alpha level. Correlation analyses failed to detect significant relationships between scores on the ISEL self-esteem scale and changes in heart rate, respiratory sinus arrhythmia, systolic blood pressure, or diastolic blood pressure in response to the stressor (absolute value of all Pearson \( r \)’s < 0.16, all \( p \)’s > 0.15). Similarly, analyses failed to detect significant relationships between those reactivity variables and scores on the ISEL Belongingness scale (absolute value of all Pearson \( r \)’s < 0.10, all \( p \)’s > 0.39) or the number of people in participants’ social networks (absolute value of all Pearson \( r \)’s < 0.09, all \( p \)’s > 0.44).
Additionally, correlation analyses revealed no significant relationships between the aforementioned reactivity variables and total hostility (absolute value of all Pearson r’s < 0.23, all p’s > 0.04), cynicism (all r’s < 0.27, all p’s > 0.01), or paranoid hostility (all r’s < 0.22, all p’s > 0.05). Analyses failed to detect significant relationships between the reactivity variables and Anger-In (all r’s < 0.09, all p’s > 0.43), perceived stress (all r’s < 0.14, all p’s > 0.22), social desirability/defensiveness (all r’s < 0.23, all p’s > 0.04), or depressive symptoms (all r’s < 0.16, all p’s > 0.17).

Further, correlation analyses were performed to examine relationships between recovery variables and those baseline psychosocial variables on which High-Optimism and Low-Optimism women differed, with no significant effects identified at the adjusted alpha level (see Table 11). Correlation analyses failed to detect significant relationships between scores on the ISEL self-esteem scale and heart rate, respiratory sinus arrhythmia, systolic blood pressure, or diastolic blood pressure total carryover (absolute value of all Pearson r’s < 0.18, all p’s > 0.11). Similarly, analyses failed to detect significant relationships between those reactivity variables and scores on the ISEL Belongingness scale (all r’s < 0.14, all p’s > 0.24) or the number of people in participants’ social networks (all r’s < 0.17, all p’s > 0.15).

Additionally, correlation analyses revealed no significant relationships between the aforementioned recovery variables and total hostility (absolute value of all Pearson r’s < 0.24, all p’s > 0.03), cynicism (all r’s < 0.27, all p’s > 0.01), or paranoid hostility (all r’s < 0.24, all p’s > 0.11). Analyses failed to detect significant relationships between the reactivity variables and Anger-In (all r’s < 0.09, all p’s > 0.47), perceived stress (all
r’s < 0.18, all p’s > 0.12), social desirability/defensiveness (all r’s < 0.26, all p’s > 0.02), or depressive symptoms (all r’s < 0.25, all p’s > 0.03).

Disposition and Condition as Predictors of Reactivity

Hierarchical regression analyses were employed to investigate potential predictors of heart rate, respiratory sinus arrhythmia, systolic blood pressure, and diastolic blood pressure reactivity scores. Since none of the psychosocial variables were significantly correlated with the physiological reactivity variables, no psychosocial variables were entered into the subsequent regression analyses. For each of the regressions, LOT-R score and support condition (dummy-coded) were entered individually into the model in the first step. The interaction of LOT-R score and support condition was entered into the model in the second step. Contrary to prediction, this model was not a significant predictor of heart rate reactivity change scores ($F(3, 79) = 0.57, p = 0.64$), yielding an $R^2$ of 0.02 for the full model (see Figure 3). Further, the analysis revealed no main effects of LOT-R score ($t = -0.60, p = 0.55$) or support condition ($t = 0.07, p = 0.94$) on heart rate reactivity. There was also no significant interaction between LOT-R scores and support condition on heart rate reactivity ($t = 0.57, p = 0.64$).

The model was not a significant predictor of respiratory sinus arrhythmia change scores ($F(3, 79) = 0.30, p = 0.83$), yielding a full-model $R^2$ equal to 0.01 (see Figure 4). Further, the analysis revealed no effects of LOT-R score ($t = 0.67, p = 0.51$) or support condition ($t = 0.61, p = 0.55$), nor their interaction ($t = -0.41, p = 0.68$), on respiratory sinus arrhythmia reactivity. The model also was not a significant predictor of systolic
blood pressure change scores \( F(3, 79) = 0.30, p = 0.82 \), yielding a full-model \( R^2 \) equal to 0.01 (see Figure 5). Further, the analysis revealed no main effects of LOT-R score \( (t = -0.22, p = 0.83) \) or support condition \( (t = 0.14, p = 0.89) \), nor their interaction \( (t = -0.36, p = 0.72) \), on systolic blood pressure reactivity.

The full model also was not a significant predictor of diastolic blood pressure change scores \( F(3, 79) = 1.73, p = 0.17 \), yielding an \( R^2 \) for the full model of 0.06 (see Figure 6). Further, the analysis revealed no main effects of LOT-R score \( (t = 1.09, p = 0.28) \) or support condition \( (t = 1.60, p = 0.11) \) on diastolic blood pressure reactivity.

The interaction between LOT-R scores and support condition in predicting diastolic blood pressure reactivity approached significance, but was not significant at the Bonferroni-adjusted significance level \( (t = -2.06, p = 0.04) \). The squared semi-partial correlation between the interaction and diastolic blood pressure reactivity was 0.05, while partialling variance that diastolic blood pressure reactivity shared with the other two predictors in the model.

**Disposition and Condition as Predictors of Recovery**

Similarly, hierarchical regression analyses were employed to investigate potential predictors of heart rate, respiratory sinus arrhythmia, diastolic blood pressure, and systolic blood pressure total carryover recovery. Since none of the psychosocial variables were significantly correlated with the physiological reactivity variables, no psychosocial variables were entered into the subsequent regression analyses. For each of the regressions, LOT-R score and support condition (dummy-coded) were entered
individually into the model in the first step. The interaction of LOT-R score and support condition was entered into the model in the second step. Contrary to prediction, this model was not a significant predictor of heart rate total carryover ($F(3, 79) = 0.67$, $p = 0.57$), yielding an $R^2$ of 0.03 for the full model (see Figure 7). Further, the analysis revealed no main effects of LOT-R score ($t = -1.05$, $p = 0.30$) or support condition ($t = -0.50$, $p = 0.62$) on heart rate recovery. There was also no significant effect of the interaction between LOT-R scores and support condition on heart rate recovery ($t = 0.95$, $p = 0.35$). The model also was not a significant predictor of respiratory sinus arrhythmia recovery ($F(3, 79) = 1.32$, $p = 0.28$), yielding a full-model $R^2$ equal to 0.05 (see Figure 8). Further, the analysis revealed no effects of LOT-R score ($t = 0.22$, $p = 0.83$) or support condition ($t = -0.49$, $p = 0.62$), nor their interaction ($t = -0.29$, $p = 0.77$), on respiratory sinus arrhythmia recovery.

The model was not a significant predictor of systolic blood pressure total carryover ($F(3, 79) = 0.51$, $p = 0.68$), yielding a full-model $R^2$ equal to 0.02 (see Figure 9). Further, the analysis revealed no main effects of LOT-R score ($t = -0.93$, $p = 0.36$) or support condition ($t = 0.05$, $p = 0.96$), nor their interaction ($t = 0.10$, $p = 0.92$), on systolic blood pressure total carryover. The full model also was not a significant predictor of diastolic blood pressure total carryover ($F(3, 79) = 0.87$, $p = 0.46$), yielding an $R^2$ for the full model of 0.03 (see Figure 10). Further, the analysis revealed no main effects of LOT-R score ($t = 0.76$, $p = 0.45$) or support condition ($t = 1.00$, $p = 0.32$) on diastolic blood pressure recovery. Finally, the interaction between LOT-R scores and support condition was not a significant predictor of diastolic blood pressure recovery.
CHAPTER 4
DISCUSSION

Implications

The primary aim of this study was to determine whether optimistic disposition moderates the effectiveness of a social support manipulation in buffering physiological responses to an acute stressor. Many have speculated that highly optimistic individuals are particularly adept at utilizing social support resources that they have available to them. However, no published study to date has attempted to directly investigate the hypothesis that optimism’s relationship with a positive health outcome is mediated in part by the effective utilization of social support.

In fact, data from this investigation do not support the hypothesis that optimistic disposition and a laboratory social support manipulation interact to produce effects on cardiovascular responses to stress. The interaction was not a significant predictor of heart rate, respiratory sinus arrhythmia, systolic blood pressure, or diastolic blood pressure reactivity. Further, the interaction was not a significant predictor of recovery from stress. It does not appear that in this specific context optimistic disposition had a noticeable
impact on participant’s ability to successfully utilize the support manipulation to buffer sympathetic activation in response to the math task.

The utilization of the math task in this protocol, rather than a speech task or other more interpersonal stressor, may have contributed to the failure of this investigation to find significant effects. Physiological effects elicited by the math task, with its clear performance component, may be more prone to influence by concern regarding the participant’s evaluation by others. It is important to note that in this sample, scores on the LOT-R were significantly associated with scores on the Marlowe-Crowne Social Desirability Scale, such that greater optimism was related to greater concern regarding social desirability. Their increased concern regarding social desirability may prompt high-optimistic women to exhibit greater reactivity in the presence of a companion because of increased concern regarding their appearance of competence to their companion. This may be particularly relevant given that the math task contains a clear performance component, which may have been less salient if another task were employed.

In addition to the hypothesized interaction between disposition and support condition, a main effect of optimistic disposition was also hypothesized. Highly optimistic participants were expected to exhibit smaller magnitude cardiovascular responses to, and more efficient recovery from, the stress task than less optimistic participants. In fact, no main effect of optimism was found for any of the reactivity or recovery variables. This finding is in opposition to at least two published studies that have indicated that optimistic disposition is associated with healthier physiological
responses to the initiation of stressors (Williams, Riels, & Roper, 1990), as well as more efficient subsequent recovery from stressors (Williams, Matthews, & Dobbs, 1988). However, it is important to note that the Williams and colleagues (1990) reactivity study does not include data regarding relevant health behaviors, such as smoking status or weight control, of their high- and low-optimism participants, nor do the authors indicate that they attempted to control for such variables. This investigation’s careful control of such factors may explain the discrepancy between this study and previous work.

Further, the failure of this investigation to find a significant relationship between optimistic disposition and reactivity change score may be due in part to the degree of negative emotion evoked by the task. Though it was predicted that optimistic disposition would be related to participants’ task perceptions, there were no significant differences between highly optimistic women and less optimistic women with regards to their reports of positive or negative affect in response to the stress task. Raikkoenen and colleagues (1999) noted in their research that when optimists experience negative emotions, their physiological responses to stress were equivalent to those of pessimists. It is possible in this study that similar levels of negative affect among high- and low-optimism participants may have rendered any potential difference in physiological responsiveness to stress negligible.

There is also no evidence in this study to support the hypothesis that highly optimistic and less optimistic individuals differed with respect to their persistence on the math task. Contrary to prediction, highly optimistic individuals did not offer more responses, nor were they more accurate than their less optimistic counterparts in the
performance of this particular task. It is likely that this five-minute stressor was too brief a period to see group differences in persistence.

This investigation also allowed for the analysis of baseline data which provide additional information regarding the possible associates of optimism. It was hypothesized that high-optimism participants would exhibit lower baseline systolic or diastolic blood pressure than low-optimism participants, further supporting the idea that optimistic disposition is protective of health. In fact, no significant relationship was detected between optimistic disposition and resting blood pressure. This finding opposes previous research suggesting that optimistic women have healthier blood pressure levels than their more pessimistic counterparts (Raikkonen, Matthews, Flory, Owens, & Gump, 1999). However, it is important to note two key differences between this study and previous research by Raikkonen and colleagues (1999). First, while the Raikkonen and colleagues study assessed ambulatory blood pressure throughout the day, including during interpersonal interactions at work and at home, blood pressure levels in this study were assessed while the participant was resting quietly. During this study’s baseline assessment, participants were not engaging actively in a social interaction.

Second, the Raikkonen and colleagues study (1999) used a significantly older sample than was used in the current study. Participants in the Raikkonen and colleagues study ranged in age from thirty to forty-five years with a mean age of approximately thirty-seven years, whereas participants in current sample ranged in age from eighteen to twenty-five, with a mean age of approximately nineteen years. The very young sample
studied in this investigation may not yet exhibit overt signs of cardiovascular damage that may yet develop in the next several years.

Baseline data from this investigation also provides important information regarding potential psychological benefits of optimistic disposition. Particularly with regard to social support, several key differences were noted between highly optimistic and less optimistic participants. Consistent with previous work in this area (Grewen et al., 2000), highly optimism participants in this investigation reported significantly greater perceptions of support on the Interpersonal Support Evaluation List than did less optimistic participants. Specifically, highly optimistic individuals reported significantly higher self-esteem and feelings of belongingness. Additionally, it appears that in this sample of participants, higher levels of optimism were related to greater access to social support. Highly optimistic participants reported an average of six more people in their social networks than did less optimistic participants.

In fact, the aforementioned baseline differences between highly optimistic and less optimistic individuals that were identified in this study do provide us with some evidence to suggest that highly optimistic women experience a significantly different social environment than less optimistic individuals. Further, baseline psychosocial data from this study also provides clues to what factors may influence optimism’s enhancement of social support. For example, data from this study suggest that greater optimism is related to greater reports of extraversion. If optimistic women are also more extraverted, that trait may drive their development of a larger social network.
Additionally, data from this investigation suggest that highly optimistic women differ from less optimistic with respect to several personality characteristics that may interfere with the development of a social network. Lower levels of optimism were related to greater total hostility, cynicism, and paranoid hostility, as well as inwardly-directed anger. Lower levels of optimism also were related to greater depression. Though speculative, the relationship between optimistic disposition and these traits might suggest possible reasons that women low in optimism have less access to social support (Salovey et al., 2000; Scheier & Carver, 1987).

Highly optimistic women’s greater numbers of individuals within their social networks may allow them to more often utilize social support outside of the laboratory context, in order to reduce stress, or encourage health behaviors. Low-optimism individuals may tend to perceive a greater frequency of stressful events, leading to a more frequent activation of the stress response system, which may ultimately place them at higher risk for disease. In fact, this investigation provides some support for that hypothesis, since Low-Optimism participants actually reported greater perceived stress on Cohen’s Perceived Stress Scale than did High-Optimism participants.

Limitations

The research literature suggests that in some similar protocols, participants may tend perceive the experimenter as supportive, particularly when the experimenter is female (Uchino, Cacioppo, & Kiecolt-Glaser, 1996). Therefore, numerous steps were taken in the development of this protocol in order to reduce the interaction between the
participants and the experimenter in an attempt to limit participants’ perceptions of the experimenter as supportive. In fact, participants’ responses to the support assessment questionnaire suggest that this study design was successful in minimizing participants’ perceptions of the experimenter as supportive. However, though the reduction of participant-experimenter contact had clear benefits, it was also the source of two key limitations of this investigation.

First, in order to reduce interaction between participants and the experimenter, impedance data were not collected. Certainly, the collection of impedance data would have allowed for a more complete analysis of the mechanism driving any potential relationship between disposition and cardiovascular reactivity, such as whether blood pressure changes were primarily mediated by changes in stroke volume or changes in total peripheral resistance. This data would have provided evidence to test the hypothesis that poor recovery from stress results from sympathetic down-regulation, marked by decreased cardiac output and increased peripheral resistance (Schuler & O’Brien, 1997). However, application of impedance bands would have required a significant amount of close physical contact between the participant and experimenter. Because the social support manipulation was the key portion of this investigation, it was important to maintain the integrity of the Alone condition. To avoid misperceptions of the experimenter as a source of support for Alone condition participants, that close physical contact had to be avoided.

Similarly, in order to minimize participant-experimenter interaction, blood pressure data was collected each minute using an automatic inflatable blood pressure
cuff. The choice of this blood pressure collection system limited the selection of recovery analyses. Clearly, collection of continuous blood pressure using a Finepres or Pilot system would have provided more frequent sampling, allowing for the use of curve-fitting recovery analyses, as well as possibly providing more reliable data (Gerin, Pieper, & Pickering, 1993; Linden, Earle, Gerin, & Christenfeld, 1997). However, the use of a continuous blood pressure collection system would have required significantly more participant-experimenter interaction and more monitoring by the experimenter. In contrast, the automatic inflatable blood pressure cuff was able to be quickly and easily attached to the participant, again reducing interaction and limiting perceptions of support from the experimenter.

Another potential limitation of this investigation concerns the external validity of the support manipulation. Stranger support was employed in this investigation to balance out any possible preexisting differences in the quality of established friendship relationships. However, stranger support may not impart the same support benefits as a close friend or relative who may serve as a serve partner. Future studies may choose to include a more sophisticated assessment of participants’ perceptions of the support they received in order to better assess this possibility.

An additional limitation of laboratory investigations of the stress reaction, such as this one, is that they are typically unable to assess frequency of the activation of the stress response system in day-to-day life. Low-optimism individuals may tend to perceive a greater frequency of stressful events, leading to a more frequent activation of the stress response system, which may ultimately place them at higher risk for disease. As support
for this hypothesis, one recent study found that participants who obtained high scores on
the LOT (indicative of less optimism) experienced more negative interpersonal
interactions during the measurement period than participants who obtained low scores on
the LOT (Raikkonen et al., 1999). In fact, this investigation also provides some support
for that hypothesis, since Low-Optimism participants actually reported greater perceived
stress on Cohen’s Perceived Stress Scale than did High-Optimism participants. Future
investigations may seek to further investigate this hypothesis using ambulatory methods
to more accurately quantify participants’ experience of stress.

Summary and Conclusions

This investigation is the first known study to directly investigate the hypothesis
that optimism’s relationship with a positive health outcome is mediated in part by the
effective utilization of social support. Data from this study did support the notion that
highly optimistic individuals are more adept at utilizing a stranger-support manipulation
as a buffer to potentially damaging cardiovascular reactivity to an acute math stressor.
However, future research is needed to investigate whether the utilization of alternative
support manipulations or stress tasks yield differing results.

Though the major hypothesis of this investigation was not supported, baseline data
from this study do suggest that highly optimistic individuals do experience a different
social environment than their less optimistic counterparts. Optimistic disposition does
appear to be related to social network size, as well as perceptions of social support, such
that greater optimism is related to greater support. Greater optimism was also associated
with less hostility, less inwardly-directed anger, fewer depressive symptoms, and greater extraversion, each of which may in fact influence individuals’ levels of social support. Finally, higher optimism was related less perceived stress. Taken together this suggests that outside of the laboratory, highly optimistic individuals, because of greater extraversion and less negative affect, may have greater access to social support which they may then use to combat stress.
BIBLIOGRAPHY


APPENDIX A: TABLES
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<th>Demographic Variables</th>
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<td>23.82 (3.45)</td>
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Table 1. Means and standard deviations of baseline variables for Alone and Friend condition High-Optimism participants. There were no significant differences between the conditions with respect to baseline variables.
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Table 2. Means and standard deviations of baseline variables for Alone and Friend condition Low-Optimism participants. There were no significant differences between the conditions with respect to baseline variables.
### Table 3. Means and standard deviations of demographic and descriptive variables for High-Optimism participants and Low-Optimism Participants.

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<td>White/Caucasian</td>
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Table 4. Racial/ethnic composition of the sample by condition.
### Table 5. Means and standard deviations of psychosocial variables for High-Optimism participants and Low-Optimism participants. Asterisks (*) mark variables on which the dispositions differed significantly at baseline.

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<td>Depressive Symptoms*</td>
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*p < 0.0031 (α = 0.05/16)
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*p < 0.001

Table 6. Correlations among the baseline psychosocial variables.
Table 6 continued

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<td>Diastolic Blood Pressure (mmHg)</td>
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Table 7. Means and standard deviations of baseline 2 mean values of physiological parameters for High-Optimism participants and Low-Optimism participants. There were no significant differences between the dispositions with respect to baseline 2 physiological parameters.
Table 8. Means and standard deviations of task impression variables for High-Optimism participants and Low-Optimism participants assessed before and after the task. Variables marked with an asterisk (*) significantly increased or decreased in response to the math task.
<table>
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<th>Baseline 2</th>
<th>Math Task</th>
<th>Recovery</th>
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<td>73.75(^a)</td>
<td>86.74(^b)</td>
<td>75.10(^c)</td>
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<tr>
<td></td>
<td>(10.54)</td>
<td>(10.95)</td>
<td>(13.82)</td>
<td>(11.29)</td>
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<tr>
<td>Respiratory Sinus Arrhythmia</td>
<td>6.76(^a)</td>
<td>6.70(^a)</td>
<td>6.34(^b)</td>
<td>6.63(^a)</td>
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<tr>
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<td>(0.96)</td>
<td>(0.92)</td>
<td>(1.03)</td>
<td>(0.94)</td>
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<tr>
<td>Systolic Blood Pressure (mmHg)</td>
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<td>113.10(^b)</td>
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<td>(7.55)</td>
<td>(7.33)</td>
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<td>(8.37)</td>
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<td>Diastolic Blood Pressure (mmHg)</td>
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<td>64.94(^c)</td>
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<tr>
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<td>(4.79)</td>
<td>(4.94)</td>
<td>(7.21)</td>
<td>(5.06)</td>
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Table 9. The effect of the math task on physiological variables (means and standard deviations). Values with different superscripts are significantly different at the \( p < 0.001 \) level.
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<td>-.27</td>
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<td>-.19</td>
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<td>Anger-In</td>
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<td>.09</td>
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<td>.02</td>
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<td>Social Desirability/Defensiveness</td>
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<td>.23</td>
<td>.12</td>
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<td>Depressive Symptoms</td>
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<td>.15</td>
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<td>.01</td>
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Table 10. Correlations between reactivity scores for physiological variables and psychosocial variables that differed between High-Optimism participants and Low-Optimism participants at baseline (Pearson coefficients). None of the correlations reached statistical significance (all p’s > 0.01).
<table>
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<tr>
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<td>People in Social Network</td>
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<td>Depressive Symptoms</td>
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Table 11. Correlations between recovery scores for physiological variables and psychosocial variables that differed between High-Optimism participants and Low-Optimism participants at baseline (Pearson coefficients). None of the correlations reached statistical significance (all p’s > 0.01).
APPENDIX B: FIGURES
Figure 1. Task speed (total number of responses given during the 5-minute task) by disposition and support condition. There were no significant effects of disposition, support condition, or their interaction on task speed.
Figure 2. Task accuracy (percentage of responses correct) by disposition and support condition. There were no significant effects of disposition, support condition, or their interaction on task accuracy.
ΔHR = 15.59 – 0.14(LOT-R) + 0.38(condition) – 0.10(interaction)

Figure 3. Regression of the interaction of optimism and support condition in predicting heart rate reactivity.
Figure 4. Regression of the interaction of optimism and support condition in predicting respiratory sinus arrhythmia reactivity.

\[ \Delta \text{RSA} = -0.64 + 0.02(\text{LOT-R}) + 0.31(\text{condition}) - 0.01(\text{interaction}) \]
SYSTOLIC BLOOD PRESSURE REACTIVITY

\[ \Delta \text{SBP} = 13.07 - 0.05(\text{LOT-R}) + 0.68(\text{condition}) - 0.11(\text{interaction}) \]

Figure 5. Regression of the interaction of optimism and support condition in predicting systolic blood pressure reactivity.
ΔDBP = 6.69 + 0.14(LOT-R) + 4.55(condition) – 0.37(interaction)

Figure 6. Regression of the interaction of optimism and support condition in predicting diastolic blood pressure reactivity.
HEART RATE RECOVERY

HR Total Carryover = 2.35 – 0.10(LOT-R) – 1.07(condition) + 0.13(interaction)

Figure 7. Regression of the interaction of optimism and support condition in predicting heart rate total carryover.
RESPIRATORY SINUS ARRHYTHMIA TOTAL CARRYOVER

RSA Total Carryover = -0.01 + 0.00(LOT-R) – 0.12(condition) + 0.00(interaction)

Figure 8. Regression of the interaction of optimism and support condition in predicting respiratory sinus arrhythmia total carryover.
SBP Total Carryover = 3.88 – 0.10(LOT-R) + 0.12(condition) + 0.02(interaction)

Figure 9. Regression of the interaction of optimism and support condition in predicting systolic blood pressure total carryover.
DBP Total Carryover = -1.19 + 0.07(LOT-R) + 1.97(condition) – 0.17(interaction)

Figure 10. Regression of the interaction of optimism and support condition in predicting diastolic blood pressure total carryover.
LOT-R

Please be as honest and accurate as you can throughout. Try not to let your response to one statement influence your responses to other statements. There are no “correct” or “incorrect” answers. Answer according to your own feelings rather than how you think “most people” would answer.

1 = I agree a lot.
2 = I agree a little.
3 = I neither agree nor disagree.
4 = I disagree a little.
5 = I disagree a lot.

1. ________ In uncertain times, I usually expect the best.
2. ________ It’s easy for me to relax.
3. ________ If something can go wrong for me, it will.
4. ________ I’m always optimistic about my future.
5. ________ I enjoy my friends a lot.
6. ________ It’s important for me to keep busy.
7. ________ I hardly ever expect things to go my way.
8. ________ I don’t get upset too easily.
9. ________ I rarely count on good things happening to me.
10. ________ Overall, I expect more good things to happen to me than bad.
ISEL- College Version

Instructions: This scale is made up of a list of statements each of which may or may not be true about you. For each statement we would like you to circle probably TRUE (PT) if the statement is true about you or probably FALSE (PF) if the statement if not true about you.

You may find that many of the statements are neither clearly true nor clearly false. In these cases, try to decide quickly whether probably true or probably false is most descriptive of you. Although some questions will be difficult to answer, it is important that you pick one alternative or the other. Remember to circle only one of the alternatives for each statement.

Please read each item quickly but carefully before responding. Remember that this is not a test and there are no right or wrong answers.

1. PT PF I know someone who would loan me $50 so I could go away for the weekend.
2. PT PF I am not a member of any social groups (such as church groups, clubs, teams, etc.).
3. PT PF There isn’t anyone at school or in town with whom I would feel perfectly comfortable talking about any problems I might have with making friends.
4. PT PF Most people who know me well think highly of me.
5. PT PF I don’t know anyone who would loan me several hundred dollars to pay a doctor or dental bill.
6. PT PF Lately, I often feel lonely, like I don’t have anyone to reach out to.
7. PT PF I know someone who I see or talk to often with whom I would feel perfectly comfortable talking about problems I might have budgeting my time between school and my social life.
8. PT PF Most of my friends think that I’m smart.
9. PT PF I know someone who would give me some old dishes if I moved into my own apartment.
10. PT PF There are people at school or in town who I regularly run with, exercise with, or play sports with.
11. PT PF I know someone who I see or talk to often with whom I would feel perfectly comfortable talking about any problems I might have adjusting to college life.
12. PT PF Most of my friends don’t do as well as I do in school.
13. PT PF I don’t know anyone who would give me some old furniture if I moved into my own apartment.

14. PT PF I hang out is a friend’s room or apartment quite a lot.

15. PT PF There isn’t anyone at school or in town with whom I would feel perfectly comfortable talking about any problems I might have getting along with my parents.

16. PT PF I don’t feel friendly with any teaching assistants, professors, campus or student officials.

17. PT PF I know someone who would lend me $100 to help pay my tuition.

18. PT PF I don’t have friends at school or in town who would comfort me by showing some physical affection.

19. PT PF There isn’t anyone at school or in town with whom I would feel perfectly comfortable talking about difficulties with my social life.

20. PT PF Most of my friends are most satisfied or happier with themselves than I am.

21. PT PF Even if I needed it, my family would (or could) not give me money for tuition or books.

22. PT PF I don’t often get invited to do things with other people.

23. PT PF I know someone who I see or talk to often with whom I would feel perfectly comfortable talking about sexually transmitted diseases.

24. PT PF Most of my friends are more popular than I am.

25. PT PF If I needed it, my family would provide me with an allowance and spending money.

26. PT PF I can get a date who I enjoy spending time with whenever I want.

27. PT PF I know someone who I see or talk to often with whom I would feel perfectly comfortable talking about problems I might have meeting people.

28. PT PF I will have a better future than most other people will.

29. PT PF I don’t know anyone at school or in town who would help me study for an exam by spending several hours reading me questions.

30. PT PF If I decided at dinner time to take a study break this evening and go to a movie, I could easily find someone to go with me.

31. PT PF There isn’t anyone at school or in town with whom I would feel perfectly comfortable talking about my feelings of loneliness or depression.

32. PT PF Most of my friends have not adjusted to college as easily as I have.

33. PT PF If I wanted a date for a party next weekend, I know someone at school or in town who would fix me up.
34. PT PF I don’t talk to a member of my family at least once a week.
35. PT PF I don’t know anyone at school or in town who makes my problems clearer and easier to understand.
36. PT PF Most people think I have a good sense of humor.
37. PT PF I don’t know anyone at school or in town who would loan me their car for a couple of hours.
38. PT PF I don’t usually spend two evenings on the weekend doing something with others.
39. PT PF I know someone who I see or talk to often with whom I would feel perfectly comfortable discussing any sexual problems I might have.
40. PT PF Most of my friends are more interesting than I am.
41. PT PF I know someone at school or in town who would bring my meals to my room or apartment if I were sick.
42. PT PF People hang out in my room or apartment during the day or in the evening.
43. PT PF I know someone who I see or talk to often with whom I would feel perfectly comfortable talking about problems I might have with drugs.
44. PT PF Most of my friends have more control over what happens to them than I.
45. PT PF I don’t know anyone at school or in town who would get assignments for me from my teachers if I was sick.
46. PT PF I belong to a group at school or in town that meets regularly or does things together regularly.
47. PT PF Lately, when I’ve been troubled, I keep things to myself.
48. PT PF Most people are more attractive than I am.
Social Network Index

Instructions: This questionnaire is concerned with how many people you see or talk to on a regular basis including family, friends, workmates, neighbors, etc. Please read and answer each question carefully. Answer follow-up questions where appropriate.

1. Which of the following best describes your marital status?
   ____ currently married & living together, or living with someone in a marital-like relationship
   ____ never married & never lived with someone in a marital-like relationship
   ____ separated
   ____ divorced or formerly live with someone in a marital-like relationship
   ____ widowed

2. How many children do you have? (If you don’t have children, check “0” and skip to question 3.)
   ____0     ____1     ____2     ____3     ____4     ____5     ____6     ____7 or more

   2a. How many of your children do you see or talk to on the phone at least once every two weeks?
      ____0     ____1     ____2     ____3     ____4     ____5     ____6     ____7 or more

3. Are either of your parents living? (If neither is living, check “neither” and skip to question 4.)
   ____ neither      ____ mother only      ____ father only      ____ both

   3a. Do you see or talk on the phone to either of your parents at least once every 2 weeks?
      ____ neither      ____ mother only      ____ father only      ____ both

4. Are either of your in-laws (or partner’s parents) living? (If neither are living, or you have none, check the appropriate space and skip to question 5.)
   ____ neither      ____ mother only      ____ father only      ____ both      ____ have none

   4a. Do you see or talk on the phone to either of your partner’s parents at least once every 2 weeks?
      ____ neither      ____ mother only      ____ father only      ____ both
5. How many other relatives (other than your spouse, parents, & children) do you feel close to? (If “0”, check that space and skip to question 6.)

____0     ____1     ____2     ____3     ____4     ____5     ____6     ____7 or more

5a. How many of these relatives do you see or talk to on the phone at least once every 2 weeks?

____0     ____1     ____2     ____3     ____4     ____5     ____6     ____7 or more

6. How many close friends do you have? (meaning people that you feel at ease with, can talk to about private matters, and can call on for help)

____0     ____1     ____2     ____3     ____4     ____5     ____6     ____7 or more

6a. How many of these friends do you see or talk to at least once every 2 weeks?

____0     ____1     ____2     ____3     ____4     ____5     ____6     ____7 or more

7. Do you belong to a church, temple, or other religious group? (If not, check “no” and skip to question 8.)

____no     ____yes

7a. How many members of your church or religious group do you talk to at least once every 2 weeks? (This includes at group meetings and services.)

____0     ____1     ____2     ____3     ____4     ____5     ____6     ____7 or more

8. Do you attend any classes (school, university, technical training, or adult education) on a regular basis? (If not, check “no” and skip to question 9.)

____no     ____yes

8a. How many fellow students or teachers do you talk to at least once every 2 weeks? (This includes at class meetings.)

____0     ____1     ____2     ____3     ____4     ____5     ____6     ____7 or more

9. Are you currently employed either full or part-time? (If not, check “no” and skip to question 10.)

____no     ____yes, self-employed     ____yes, employed by others

9a. How many people do you supervise?

____0     ____1     ____2     ____3     ____4     ____5     ____6     ____7 or more
9b. How many people at work (other than those you supervise) do you talk to at least once every 2 weeks?

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</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

10. How many of your neighbors do you visit or talk to at least once every 2 weeks?

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<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

11. Are you currently involved in regular volunteer work? (If not, check “no” and skip to question 12.)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>no</td>
<td>yes</td>
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</table>

11a. How many people involved in this volunteer work do you talk to about volunteering-related issues at least once every 2 weeks?

<p>| | | | | | | | |</p>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

12. Do you belong to any groups in which you talk to one or more members of the group about group-related issues at least once every 2 weeks? Examples include social clubs, recreational groups, trade unions, commercial groups, professional organizations, groups concerned with children like the PTA or Boy Scouts, groups concerned with community service, etc. (If you don’t belong to any such groups, check “no” and skip the section below.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>no</td>
<td>yes</td>
</tr>
</tbody>
</table>

Consider those groups in which you talk to a fellow group member at least once every 2 weeks. Please provide the following information for each such group: the name or type of group and the total number of members in that group that you talk to at least once every 2 weeks.

<table>
<thead>
<tr>
<th>Name of Group</th>
<th>Number of members that you talk to at least once every 2 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
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<tr>
<td>3.</td>
<td></td>
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<tr>
<td>4.</td>
<td></td>
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<tr>
<td>5.</td>
<td></td>
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<tr>
<td>6.</td>
<td></td>
</tr>
</tbody>
</table>

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HO SCALE

Please respond to every statement by indicating whether it is true or false for you. If you are not sure how to respond, decide whether the statement is mostly true or mostly false and pick that response. Be sure to respond to every statement.

Please write a 0 or 1 in the blank line to the right of each statement.

0 = False
1 = True

1. When I take a new job, I like to be tipped off on who should be gotten next to. ____

2. When someone does me a wrong, I feel I should pay him back if I can, just for the principle of the thing. ____

3. I prefer to pass by school friends, or people I know but have not seen for a long time, unless they speak to me first. ____

4. I have often had to take orders from someone who did not know as much as I did. ____

5. I think a great many people exaggerate their misfortunes in order to gain the sympathy and help of others. ____

6. It takes a lot of argument to convince most people of the truth. ____

7. I think most people would lie to get ahead. ____

8. Someone has it in for me. ____

9. My relatives are nearly all in sympathy with me. ____

10. Most people are honest chiefly through fear of being caught. ____

11. Most people will use somewhat unfair means to gain profit or an advantage rather than to lose it. ____

12. I commonly wonder what hidden reason other people may have for doing something nice for me. ____

13. It makes me impatient to have people ask my advice or otherwise interrupt me when I am working on something important. ____
14. I feel I have often been punished without cause.

15. I am against giving money to beggars.

16. Some of my family have habits that bother and annoy me very much.

17. My way of doing things is apt to be misunderstood by others.

18. I can be friendly with people who do things which I consider wrong.

19. I don’t blame anyone for trying to grab everything he can get in this world.

20. No one cares what happens to you.

21. It is safer to trust nobody.

22. I do not blame a person for taking advantage of someone who lays himself open to it.

23. I have often felt that strangers were looking at me critically.

24. Most people make friends because friends are likely to be useful to them.

25. I am sure I am being talked about.

26. I am likely not to speak to people until they speak to me.

27. Most people inwardly dislike putting themselves out to help other people.

28. I tend to be on my guard with people who are somewhat more friendly than I had expected.

29. People often disappoint me.

30. I have often met people who were supposed to be experts who were no better than I am.

31. I makes me feel like a failure when I hear of the success of someone I know well.

32. I am not easily angered.

33. People generally demand more respect for their own rights than they are willing to allow for others.
34. I am quite often not in on the gossip and talk of the group I belong to.
35. I have often found people jealous of my good ideas just because they had not thought of them first.
36. I have sometimes stayed away from another person because I feared doing or saying something that I might regret afterwards.
37. I would certainly enjoy beating a crook at his own game.
38. I have at times had to be rough with people who were rude or annoying.
39. There are certain people whom I dislike so much that I am inwardly pleased when they are catching it for something they have done.
40. I am often inclined to go out of my way to win a point with someone who has opposed me.
41. The man who had the most to do with me when I was a child (such as my father, stepfather, etc.) was very strict with me.
42. I like to keep people guessing what I’m going to do next.
43. When a man is with a woman he is usually thinking about things related to her sex.
44. I do not try to cover up my poor opinion or pity of a person so that he won’t know how I feel.
45. I strongly defend my own opinions as a rule.
46. I frequently ask people for advice.
47. I have frequently worked under people who seem to have things arranged so that they get credit for good work but are able to pass off mistakes onto those under them.
48. People can pretty easily change me even though I thought that my mind was already made up on a subject.
49. Sometimes I am sure that other people can tell what I am thinking.
50. A large number of people are guilty of bad sexual conduct.
ANGER EXPRESSION SCALE

For the following items, please circle the number which best describes how you generally act or feel when you are angry.

<table>
<thead>
<tr>
<th>When angry or furious…</th>
<th>Almost Never</th>
<th>Sometimes</th>
<th>Often</th>
<th>Almost Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I control my temper.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. I express my anger.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. I keep things in.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. I control my behavior.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. I pout or sulk.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. I withdraw from people.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. I control my angry feelings.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8. I make sarcastic remarks to others.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9. I keep my cool.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10. I do things like slam doors.</td>
<td>1</td>
<td>2</td>
<td>3</td>
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</tr>
<tr>
<td>11. I boil inside, but I don’t show it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12. I try to be tolerant and understanding.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13. I argue with others.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>14. I tend to harbor grudges that I don’t tell anyone about.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>15. I strike out at whatever infuriates me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>16. I am secretly quite critical of others.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>17. I am usually quite patient with others.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>18. I am angrier than I am willing to admit.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>19. I calm down faster than most people.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>20. I say nasty things.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>21. I am irritated a great deal more than people are aware.</td>
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<td>4</td>
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</tr>
<tr>
<td>22. I lose my temper.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>23. If someone annoys me I am apt to tell him or her how I feel.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>24. I stop myself from losing my temper.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
**MEDICAL HISTORY QUESTIONNAIRE**

Please indicate if you or any biological family members have experienced any of the following by placing the correct number on the line to the right of each question:

\[ \text{O = No} \quad \text{1 = Yes} \]

<table>
<thead>
<tr>
<th>SELF</th>
<th>SIBLINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Heart attack</td>
<td>1. Heart attack</td>
</tr>
<tr>
<td>2. Angina pectoris (chest pain)</td>
<td>2. Angina pectoris (chest pain)</td>
</tr>
<tr>
<td>3. Other heart disease</td>
<td>3. Other heart disease</td>
</tr>
<tr>
<td>4. High blood pressure</td>
<td>4. High blood pressure</td>
</tr>
<tr>
<td>5. Elevated cholesterol</td>
<td>5. Elevated cholesterol</td>
</tr>
<tr>
<td>7. Stroke</td>
<td>7. Stroke</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FATHER</th>
<th>MOTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Heart attack</td>
<td>1. Heart attack</td>
</tr>
<tr>
<td>2. Angina pectoris (chest pain)</td>
<td>2. Angina pectoris (chest pain)</td>
</tr>
<tr>
<td>3. Other heart disease</td>
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</tr>
<tr>
<td>4. High blood pressure</td>
<td>4. High blood pressure</td>
</tr>
<tr>
<td>5. Elevated cholesterol</td>
<td>5. Elevated cholesterol</td>
</tr>
<tr>
<td>7. Stroke</td>
<td>7. Stroke</td>
</tr>
</tbody>
</table>
COHEN’S PSS-10

The questions in this scale ask you about your feelings and thoughts during the past week. In each case, please indicate how often you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don’t try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate.

**Circle the appropriate number.**

<table>
<thead>
<tr>
<th></th>
<th>Almost</th>
<th>Fairly</th>
<th>Very</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Never</td>
<td>Never</td>
<td>Sometimes</td>
</tr>
</tbody>
</table>

1. In the **last week**, how often have you been upset because of something that happened unexpectedly?  

   0 1 2 3 4

2. In the **last week**, how often have you felt that you were unable to control the important things in your life?  

   0 1 2 3 4

3. In the **last week**, how often have you felt stressed?  

   0 1 2 3 4

4. In the **last week**, how often have you felt confident about your ability to handle your personal problems?  

   0 1 2 3 4

5. In the **last week**, how often have you felt that things were going your way?  

   0 1 2 3 4

6. In the **last week**, how often have you found that you could not cope with all the things that you had to do?  

   0 1 2 3 4

7. In the **last week**, how often have you been able to control irritation in your life?  

   0 1 2 3 4

8. In the **last week**, how often have you felt that you were on top of things?  

   0 1 2 3 4
9. In the last week, how often have you been angered because of things that happened that were outside of your control?  

10. In the last week, how often have you felt difficulties were piling up so high that you could not overcome them?
Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is true or false as it pertains to you.

T  F  1. Before voting I thoroughly investigate the qualifications of all the candidates.
T  F  2. I never hesitate to go out of my way to help someone in trouble.
T  F  3. It is sometimes hard for me to go on with my work if I am not encouraged.
T  F  4. I have never intensely disliked someone.
T  F  5. On occasion I have had doubts about my ability to succeed in life.
T  F  6. I sometimes feel resentful when I don’t get my way.
T  F  7. I am always careful about my manner of dress.
T  F  8. My table manners at home are as good as when I eat out in a restaurant.
T  F  9. If I could get into a movie without paying and be sure I was not seen, I would probably do it.
T  F  10. On a few occasions, I have given up doing something because I thought too little of my ability.
T  F  11. I like to gossip at times.
T  F  12. There have been times when I felt like rebelling against people in authority even though I knew they were right.
T  F  13. No matter who I’m talking to, I’m always a good listener.
T  F  14. I can remember “playing sick” to get out of something.
T  F  15. There have been occasions when I took advantage of someone.
T  F  16. I’m always willing to admit it when I make a mistake.
T  F  17. I always try to practice what I preach.
T  F  18. I don’t find it particularly difficult to get along with loud-mouthed, obnoxious people.

T  F  19. I sometimes try to get even, rather than forgive and forget.

T  F  20. When I don’t know something I don’t at all mind admitting it.

T  F  21. I am always courteous, even to people who are disagreeable.

T  F  22. At times I have really insisted on having things my own way.

T  F  23. There have been occasions when I felt like smashing things.

T  F  24. I would never think of letting someone else be punished for my wrongdoings.

T  F  25. I never resent being asked to return a favor.

T  F  26. I have never been irked when people expressed ideas very different from mine.

T  F  27. I never make a long trip without checking the safety of my car.

T  F  28. There have been times when I was quite jealous of the good fortune of others.

T  F  29. I have almost never felt the urge to tell someone off.

T  F  30. I am sometimes irritated by people who ask favors of me.

T  F  31. I have never felt that I was punished without cause.

T  F  32. I sometimes think when people have a misfortune they only got what they deserved.

T  F  33. I have never deliberately said something that hurt someone’s feelings.
Please use the scales below to describe yourself as accurately as possible, by circling the appropriate number along each scale. Describe yourself as you see yourself at the present time, not as you wish to be in the future. Describe yourself as you are generally or typically, as compared with other persons you know of the same sex and roughly your same age. Try not to let your response to one statement influence your responses to other statements.

Please note: If for any reason you are uncomfortable providing a response for any of the scales below, you may skip that scale. You will not be penalized for leaving scales blank.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Very</th>
<th>Moderately</th>
<th>Neither</th>
<th>Moderately</th>
<th>Very</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introverted</td>
<td>1</td>
<td>2</td>
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<td>4</td>
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Instructions: Below is a list of the ways you might have felt or behaved recently. Please indicate how often you have felt this way during the past week by writing a number which corresponds to the following choices to the left of each item.

Please note: If for any reason you are uncomfortable answering any of the questions below, you may skip that question. You will not be penalized for leaving questions blank.

1 = RARELY OR NONE OF THE TIME (LESS THAN ONE DAY)
2 = SOME OR A LITTLE OF THE TIME (1-2 DAYS)
3 = OCCASIONALLY OR A MODERATE AMOUNT OF TIME (3-4 DAYS)
4 = MOST OR ALL OF THE TIME (5-7 TIMES)

During the past week:

_____ 1. I was bothered by things that usually don’t bother me.
_____ 2. I did not feel like eating: my appetite was poor.
_____ 3. I felt that I could not shake off the blues even with help from my family or friends.
_____ 4. I felt that I was just as good as other people.
_____ 5. I had trouble keeping my mind on what I was doing.
_____ 6. I felt depressed.
_____ 7. I felt that everything I did was an effort.
_____ 8. I felt hopeful about the future.
_____ 9. I thought my life had been a failure.
_____ 10. I felt fearful.
_____ 11. My sleep was restless.
_____ 12. I was happy.
_____ 13. I talked less than usual.
_____ 15. People were unfriendly.
_____ 16. I enjoyed life.
_____ 17. I had crying spells.
_____ 18. I felt sad.
_____ 19. I felt that people dislike me.
_____ 20. I could not get going.