THE EFFECTS OF SOCIAL SUPPORT AND SPEECH ANXIETY ON CARDIOVASCULAR REACTIVITY TO ACUTE STRESS

A thesis presented to
the faculty of
the College of Arts and Sciences of Ohio University

In partial fulfillment
of the requirements for the degree
Master of Science

Amy R. Borchardt
June 2008
This thesis titled
THE EFFECTS OF SOCIAL SUPPORT AND SOCIAL ANXIETY ON CARDIOVASCULAR
REACTIVITY TO ACUTE STRESS

by
AMY R. BORCHARDT

has been approved for
the Department of Psychology
and the College of Arts and Sciences by

______________________________

Kathi L. Heffner
Assistant Professor of Psychology

______________________________

Benjamin M. Ogles
Dean, College of Arts and Sciences
Abstract
BORCHARDT, AMY, M.S., June 2008, Experimental Psychology
The Effects of Social Support and Social Anxiety on Cardiovascular Reactivity to Acute Stress
(121 pp.)
Director of Thesis: Kathi L. Heffner

To further understanding of social support-health links, the current study examined the interacting effects of speech anxiety and thoughts of social support on cardiovascular reactivity (CVR) to stress. Participants, 77 low speech anxiety (LSA) and 80 high speech anxiety (HAS), were randomly assigned to a supportive tie or acquaintance priming condition prior to engaging in a speech task under conditions of high or minimized social evaluation. Results revealed that among low socially anxious participants, heart rate reactivity was significantly attenuated for those who thought about a supportive tie versus an acquaintance during anticipation of the evaluated speech task. These findings suggest that further consideration of person-environment interactions is needed to understand the conditions under which social support will buffer CVR to stress.

Approved: _____________________________________________________________

Kathi L. Heffner
Assistant Professor of Psychology
Acknowledgments

I am grateful to the many people who directly and indirectly helped me with this project. I would like to especially thank Dr. Kathi Heffner for her much needed guidance and support through all stages of this research project. I would also like to thank the members of my thesis committee for their constructive feedback: Dr. Kathi Heffner (Chair), Dr. Steve Patterson, and Dr. Chris France. And lastly, I would like to express my gratitude to the many research assistants I have had the pleasure to work with: Jordan Gardner, Lauren Elliot, Christine Valenti, Mitch Ford, and Danielle Fredericks.
TABLE OF CONTENTS

Abstract ................................................................................................................................3
Acknowledgments................................................................................................................4
List of Tables .......................................................................................................................8
List of Figures ......................................................................................................................9
Introduction ........................................................................................................................10
Cardiovascular Reactivity to Acute Stress is Predictive of Future Health .........................13
Acute Stress and Social Support Buffering .......................................................................15
Manipulation of Social Support in the Laboratory ............................................................19
Social Support and Personality ..........................................................................................45
Speech Anxiety as a Potential Moderator of Social Support’s Effects ..............................51
Purpose of the Current Research ........................................................................................52

   Overview .........................................................................................................................52

   Hypothesis One ................................................................................................................54

   Hypothesis Two ...............................................................................................................54

   Hypothesis Three ............................................................................................................54

   Secondary Hypotheses .................................................................................................55

Methods ..............................................................................................................................55

   Participants ......................................................................................................................56

   Psychosocial Measures .................................................................................................58

      Trait Speech Anxiety. .................................................................................................58

      Demographics and Health. .........................................................................................59
Social Relationships Index (SRI; modified) ..............................................................59
Stress Appraisal Questionnaire. ..................................................................................59
Physiological Measures .................................................................................60
Procedures .............................................................................................................60
Initial Contacting and Scheduling .................................................................60
Settings .................................................................................................................61
Session ..................................................................................................................61
Priming ..................................................................................................................61
Evaluative Threat Manipulation .........................................................................63
Data Reduction ....................................................................................................64
Trait Anxiety ..........................................................................................................64
Social Support Manipulation .............................................................................65
Physiological Data ...............................................................................................65
Data Analysis .......................................................................................................66
Manipulation Checks ..........................................................................................67
Hypothesis One Analyses (high vs. low anxiety): ........................................67
Hypothesis Two Analyses (evaluation vs. minimized-evaluation): ..............67
Hypothesis Three Analyses (support x anxiety x threat): .......................68
Secondary Hypotheses Analyses .....................................................................68
Results .................................................................................................................69
Sample Characteristics .......................................................................................69
Manipulation Checks ........................................................................................69
Baseline Assessments ........................................................................................................70

Change from Baseline .......................................................................................................71

Cardiovascular Responses to the Speech Task .................................................................71

Cardiovascular Responses to the Preparation Task .........................................................82

Cardiovascular Recovery .................................................................................................85

Limitations of the Present Study .....................................................................................92

Conclusion and Future Studies .......................................................................................94

References ..........................................................................................................................97

Appendix A: The Personal Report of Confidence as a Speaker (PRCS) .........................108

Appendix B: Ohio University Consent to Participate in a Research Study ......................111

Appendix C: Personal Data and Health Questionnaire ....................................................113

Appendix D: Social Relationships Index (Revised) ........................................................117

Appendix E: Stress Appraisal Questions .......................................................................118

Appendix F: Minimized-evaluation Scripted Argument ..................................................120

Appendix G: Debriefing Form .......................................................................................121
# List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Laboratory Studies that Manipulated Social Support</td>
<td>21</td>
</tr>
<tr>
<td>2</td>
<td>Confidence as a Speaker Anxiety Descriptives by Quarter</td>
<td>57</td>
</tr>
<tr>
<td>3</td>
<td>Confidence as a Speaker Anxiety Descriptives by Condition</td>
<td>58</td>
</tr>
<tr>
<td>4</td>
<td>Sample Sizes for each Dependent Variable during each Task</td>
<td>65</td>
</tr>
<tr>
<td>5</td>
<td>Baseline Levels for each Dependent Variable by Condition</td>
<td>73</td>
</tr>
<tr>
<td>6</td>
<td>Preparation Task Change Scores for each Dependent Variable</td>
<td>75</td>
</tr>
<tr>
<td>7</td>
<td>Speech Task Change Scores for each Dependent Variable</td>
<td>77</td>
</tr>
<tr>
<td>8</td>
<td>Recovery Task Change Scores for each Dependent Variable</td>
<td>79</td>
</tr>
<tr>
<td>9</td>
<td>Speech Reactivity: Comparing Evaluative Threat Conditions</td>
<td>81</td>
</tr>
</tbody>
</table>
List of Figures

Page

Figure 1: Cardiovascular Activity for Evaluative Threat x Speech Anxiety Conditions.............. 72
Figure 2: Total Peripheral Resistance (+/- SE) during the Speech Task........................................ 83
Figure 3: Heart Rate Reactivity (+/- SE) during Preparation and Speech Tasks ........................... 84
Introduction

Social support, defined as the actual or perceived availability of helpful behaviors by others (Uchino,Uno, & Holt-Lunstad, 1999), is positively associated with physical health and longevity (Cohen, 1988; Uchino, 2004), and further evidence supports its role in cardiovascular health specifically (Krantz & McCeney, 2002). A recent review examined research on psychological and psychosocial factors and their relation to coronary heart disease (CHD; Krantz & McCeney, 2002); the authors concluded that while the specific pathways for how social support impacts health are unclear, the epidemiological data provide strong evidence that social support plays a role in the development and progression of coronary heart disease.

One hypothesized pathway linking social support to cardiovascular health outcomes is via social support’s contribution to coping. Termed the buffering hypothesis (Cohen, 2004), social support is proposed to provide the necessary resources needed to cope with short-term (acute) stressful situations, minimizing the impact of acute stress on physiological systems, including the cardiovascular system (Uchino, Cacioppo, & Kiecolt-Glaser, 1996). Buffering stress is important given that research suggests that repeated activation of the cardiovascular system as a result of exaggerated responses to acute stress increases the risk of developing cardiovascular disease (CVD; Jennings, Kamarch, Manuck, & Everson, 1997; Krantz & Manuck, 1984; Markovitz, Raczynski, Wallace, Chettur, & Chesney, 1998), and researchers also suggest that it is the combination of having a chronic disposition in the face of repeated acute stressors, such as work stress or relationship stress, that leads to an increased risk for negative health outcomes (Steptoe, 2000). Thus, compelling hypotheses such as the buffering hypothesis warrant further investigation to determine if and how social support can buffer people from negative health outcomes.

Evidence for the buffering hypothesis remains mixed, and the mechanisms linking social support to cardiovascular health remain unclear as a result (Uchino et al., 1996). A number of
researchers have suggested that these inconsistencies in the social support and acute stress literature for the buffering hypothesis may be a result of failures to successfully control social support manipulations in the laboratory (Kors, Linden, & Gerin, 1997), and in addition, may be a result of overlooked interactions between individual personality characteristics and the laboratory situation (Smith, Ruiz, & Uchino, 2004), though less is known about the latter explanation.

To further examine the buffering effects of social support on the cardiovascular system, the current study addressed a person x environment interaction that was proposed to moderate the effects of social support on cardiovascular reactivity to a typically used laboratory stressor. Specifically, the study examined individual differences in speech anxiety and the possible interaction it has with social support in this particular evaluative, self-presentation context. In a more general sense, speech anxiety is a form of social anxiety, and social anxiety is formally defined as “a state of anxiety resulting from the prospect or presence of interpersonal evaluation in real or imagined social settings” (Schlenker, Miller, & Leary, 1983). In order to ensure that the conventional speech stressor in this study elicited the kind of anxiety thought to be present in this context (i.e. speech anxiety) the level of evaluative threat was also considered.

Self-presentation is ubiquitous in everyday life (Hartley, Ginsburg, & Heffner, 1999), and people vary in the amount of concern they will have about how others perceive them (Leary, 1983a). Therefore, it is probable that people also vary in the amount of cardiovascular reactivity they exhibit as a result of being in a self-presentation context. For instance, it is probable that a person with chronic social anxiety will exhibit greater cardiovascular reactivity to an acutely stressful situation given their predisposition. Indeed, chronically high levels of phobic anxiety, generalized anxiety, panic disorders, and worry are associated with higher risks of coronary artery disease and atherosclerosis (Paterniti et al., 2001).

Interestingly, many studies regarding social support’s influence on acute stress responses use social-evaluative, self-presentation tasks to elicit desired physiological responses
(Christenfeld, Gerin, Linden, & Sanders, 1997; Gerin, Milner, Chawla, & Pickering, 1995; Smith et al., 2004), yet no studies have ever been published examining the possible interacting forces social anxiety may have in this situation. An individual with chronic social anxiety is less equipped and less capable of coping with an acute socially evaluative situation compared to someone without social anxiety due to their greater apprehension about potential negative outcomes (Leary, 1983b). Providing social support to those with chronic social anxiety may be especially helpful to them in buffering reactivity to an acute laboratory stressor that includes evaluation components, such as videotaped speech tasks, because they will be better able to cope with the situation.

This study attempted to strengthen the evidence for the buffering hypothesis by considering chronic social anxiety related to typical laboratory situations in conjunction with social support. Because speech anxiety was examined in this study, two situations were devised, one with high evaluative threat, to elicit speech anxiety and one with low evaluative threat to be used as a comparison. Finally, to address mixed findings the current study will use a mental activation paradigm adapted by Smith et al. (2004). Using this paradigm should minimize the evaluative threat potential of the support provider and allow for the examination of primed thoughts of supportive ties.

Prior to elaborating on the specific aims of the current study, a brief review will be presented on the role of acute stress reactivity in cardiovascular health, followed by a conceptualization of social support and the role it plays in physiological responses to acute stressors. Then a review and critique of the existing research regarding social support’s effect on cardiovascular reactivity will be presented, and the benefits of addressing person x situation interactions, including social anxiety, will be provided.
Cardiovascular Reactivity to Acute Stress is Predictive of Future Health

For at least seventy-five years researchers have examined how people react to stress (e.g. Hines Jr. & Brown, 1932), considering reactivity to be a risk factor for developing cardiovascular disease, and as a result systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR) have independently and collectively been shown to be better predictors for developing cardiovascular disease than standard risk factors (e.g. smoking, obesity) (Lovallo, 2005; Matthews et al., 2004; Stamler, Stamler, & Neaton, 1993; Hadler, Larsen, Franklin, & Levy, 2003).

When an individual perceives a threat, the cardiovascular system is one of many systems that are stimulated in preparation for the threat while other systems, not considered vital to the threat, are suppressed (e.g., digestive system) (Kemeny, 2003). According to the reactivity hypothesis, individuals who have reliably exaggerated cardiovascular responses (i.e. larger increases in blood pressure and heart rate than others) to threats have a higher risk for developing cardiovascular disease (Ming et al., 2004; Uchino et al., 1996).

Support for the reactivity hypothesis is extensive. Both animal and human research have demonstrated a relationship between exaggerated cardiovascular responses to acute stress and cardiovascular diseases. For example, a study on cynomolgus monkeys found that monkeys with higher heart rate (HR) reactivity to acute stress developed almost twice the amount of atherosclerosis over a 22 month period than monkeys who did not display an exaggerated response to stress (Kaplan & Manuck, 1998).

Longitudinal studies have also found exaggerated responsiveness to laboratory stressors in humans to be predictive of future hypertension (McCabe, Schneiderman, Field, & Wellens, 2000). For instance, men with higher SBP, DBP, and HR reactivity to a threat of shock- reaction time task displayed higher ambulatory SBP, DBP, and HRs at a 10-15 year follow-up (Light, Dolan, Davis, & Sherwood, 1992). A cold-pressor task predicted hypertension 20-45 years later
for people who were cardiovascular hyperreactors to the task (Wood, Sheps, Elveback, & Scherger, 1984). Among young men, systolic blood pressure (SBP) reactivity to a video game task predicted hypertension five years later (Markovitz et al., 1998), and a 20-year follow-up study on air traffic controllers found evidence that SBP reactivity to work stress increased the risk for future hypertension (Ming et al., 2004); reactivity to work stress predicted later hypertension for originally normotensive (120/80 mm Hg) or stage I hypertensive men (>140/90 mm Hg).

There are numerous studies that have found evidence supporting the reactivity hypothesis in addition to the ones reported here (see McCabe et al., 2000), and taken together, these studies provide compelling evidence that reacting to stress in a consistently exaggerated way can lead to poor cardiovascular health outcomes. In fact, the three most predictive chronic dispositions that increase risk for developing cardiovascular disease are depression, anxiety, and hostility (Steptoe, 2000); in regards to anxiety, a review of 12 longitudinal studies revealed that the majority found a relationship between having anxiety and developing coronary heart disease (Suls & Bunde, 2005). It is possible that these people’s risk for developing a disease can be lowered if their anxiety is alleviated. Therefore, those faced with chronic social anxiety may benefit from provisions of social support and affiliation.

Besides the flight or fight response to stress, where humans either become confrontational or flee, there is also a tendency to tend and befriend in times of stress, meaning people have an inherent desire to come together and protect one another in times of need (Taylor, 2006). Researchers posit that if the social contact (e.g. social support) is positive, there will be a decreased stress response (Taylor, 2006), and they have found that women are more likely to seek out support than men, possibly as a result of the strong socialization of men to restrict emotional expression (Wester, Christianson, Vogel, & Wei, 2007).

In sum, repeated acute stress is thought to lead to heightened autonomic activation (hyper-responsiveness) of the cardiovascular system (i.e. exaggerated heart rate and blood
pressure responses) and may lead to serious long-term complications of the cardiovascular system (Uchino et al., 1996). Social support may protect individuals via its ability to buffer this autonomic activation, thereby curbing exaggerated cardiovascular responses, and reducing the risk for long-term cardiovascular system complications for people with social anxiety. The following section describes the ways social support may benefit an individual in need.

**Acute Stress and Social Support Buffering**

The buffering hypothesis states that social support can provide a protective barrier against physiological reactivity to stress by providing the necessary psychological tools needed to cope with the stress (Cohen, 2004); coping is an individual’s efforts to manage external and internal demands that are appraised as taxing or exceeding personal resources (Lazarus & Folkman, 1987). By providing appropriate social support, recipients become better able to cope with stress, which in turn, may influence physiological responses in the cardiovascular system and protect individuals from early mortality due to cardiovascular disease (Uchino et al., 1996).

Social support may help persons deal with stress in a variety of different ways. In the long-term, social support may work against feelings of loneliness and hopelessness, help the person recognize and evaluate stressors, and identify solutions to overcome stress (Orth-Gomer, 2000). In the short-term, social support may help individuals by providing solutions about and distractions from the stress or reduce the perceived importance of a problem, reduce maladaptive behavioral responses (e.g. smoking), buffer the effects of psychological distress, depression, and anxiety, and dampen physiological responses to stressful situations (Cohen, 2004). With that said, it should be noted that social support has been shown to heighten reactivity for some individuals, possibly as a result of person-social support mismatches (Ptacek & Gross, 1997) or feelings of evaluative threat (Allen, Blascovich, Tomaka, & Kelsey, 1991); this paper focused on studies examining the benefits of social support.
Longitudinal studies have long provided evidence for a link between social support and longevity (see House, Landis, & Umberson, (1988) for review), and perceptions of support are as important to health as actual social support ultimately because interpretations of social support determine the reaction people have to it (Sarason et al., 1991). As an example, a seven-year long study regarding the stress-buffering effects of perceived social support on mortality revealed that self-reported satisfaction of social support made no difference for men who also reported small amounts of stressful events in their lives over the past year (Orth-Gomer, Rosengren, & Wilhelmsen, 1993). However, men reporting low amounts of social support in their life had a greater risk of dying over the seven year period if they had high amounts of stress in their lives. This study focused on the effects of perceptions of social support and, though correlational, lends some support to the buffering hypothesis.

Longitudinal studies examining perceptions of social support prompted research in the laboratory setting, resulting in many studies on the effects of perceptions of social support on acute stress. However, these studies have had inconsistent results. Gender may be one individual difference accounting for discrepant results. For example, a study examining the role of perceived social support on cardiovascular reactivity in male firefighters (Roy, Steptoe, & Kirschbaum, 1998) found that men with high levels of social support, in some cases, experienced greater SBP, total systemic resistance (TSR; an estimation of vascular constriction), and heart rates during a mental arithmetic task (MAT). The increased reactivity associated with social support may be due to strong socialization of gender roles in these men (Wester et al., 2007). Men, as a result of socialization, may feel threatened by receiving social support because it threatens their masculinity, and firefighters in particular may have a strong sense of masculinity. Therefore, generalizations of the results of this study should be done with caution because of the specific sample used.
Social support has been able to buffer stress in some men perhaps because they were able to break through gender roles and embrace social support; a study including men and women from the general population revealed opposite SBP results but consistent HR results to that of Roy et al. (1998). Tardy, Thompson, and Allen (1989) examined the relationship between global perceptions of social support and cardiovascular reactivity to acute stress and found that men and women with low perceptions of social support had consistently higher SBP and mean arterial pressure (MAP) but lower heart rate compared to those with high perceptions of social support during acute stress. Only during the third minute of the speech task was DBP significantly higher for those low in satisfaction compared to those high in social support satisfaction.

And while Roy et al. (1998) found no DBP differences between groups and Tardy et al. (1989) found differences between groups for only a single minute, Knox (1993) found that men with lower perceived social support had higher DBP during a MAT and cold pressor task compared to men with higher perceived support, but there were no significant results for HR or SBP. As with other studies, caution should be used when looking at these data because the sample size was small (15 high; 14 low perceived social support), and the blood pressure and HR measures may not have been reliable because they were only measured once during each of the tasks. Nevertheless, there are definite inconsistencies within this framework for examining the effects of social support on health.

Taken as a whole, it is certain that the effects of social support on health are complex and that the results of social support studies require careful interpretations and considerations. When looking at perceptions of support, self-reports may be valid, however we cannot be sure that social support is influencing reactivity unless we manipulate social support. The following section will detail experimental findings that manipulated social support.

To manipulate social support in the laboratory, researchers have involved the physical presence of a support provider in the laboratory, be it a confederate (Christenfeld et al., 1997),
experimenter (Uchino & Garvey, 1997), stranger or friend (Fontana, Diegman, Villeneuve, & Lepore, 1999), who are instructed to provide support in varying ways. For example, the friend may sit silently in the room (Kors et al., 1997), or a confederate may provide encouragement during a speech (Christenfeld et al., 1997). One complication in having a person present during stressful tasks such as speech tasks is that participants may feel they are being evaluated rather than supported by the supposed support provider. As a result, investigations about the evaluative threat of support providers have suggested that social support may only be beneficial if the recipient does not feel threatened (Allen et al., 1991; Fontana et al., 1999; Hilmert, Kulik, & Christenfeld, 2002b; Kelsey et al., 2000; Kors et al., 1997). Thus, an advantage of examining social support by manipulating thoughts of social support, as the current study has done, is that it eliminates the potential for evaluative threat by a support provider during a stress task.

In addition, a variety of different tasks have been used to elicit stress in social support studies: mental arithmetic tasks (MAT; Kors et al., 1997), vocabulary tasks (Sheffield & Carroll, 1994), video game tasks (Gerin et al., 1995), speech tasks (Smith et al., 2004), and group debates (Gerin, Pieper, Levy, & Pickering, 1992). All of these tasks are classified as “active coping” tasks, in which participants are given the opportunity to influence the situation. Active coping tasks allow for the possibility of feeling threatened or challenged (Tomaka, Blascovich, Kelsey, & Leitten, 1993) and are characterized as tasks with sympathetic nervous system domination (Kelsey, Ornduff, & Alpert, 2007), with SBP and HR being affected more reliably than DBP (Gramer & Saria, 2007). In contrast, “passive coping” tasks (e.g. cold pressor task), in which participants are not given the opportunity to change the situation and must endure the task, are characterized by parasympathetic nervous system domination (Kelsey et al., 2007). Both active and passive coping tasks have high within task reliability in regards to cardiovascular parameters, but are less reliable across tasks that differ in their physical and psychological demands (Kelsey
et al., 2007), suggesting that comparisons of outcomes across studies that use different stress tasks should be done with caution.

Perhaps the best way to examine the buffering effects of social support in an acute laboratory setting is to consider evaluative threat, the appropriate stress task, and the person-environment interaction. However, most studies examining social support have only considered the prior two factors, focusing mainly on the external influences exerted on the individual rather than focusing on how external influences and personality characteristics interact with one another. The following section is a review of the experimental literature on the buffering effects of social support on acute stress responses.

**Manipulation of Social Support in the Laboratory**

Thorsteinsson and James (1999) conducted a meta-analysis of experimental studies of the effects of laboratory analogues of social support on physiological reactivity. Consistent with past reviews (Uchino et al., 1996), they concluded that social support did have attenuating effects on physiological reactivity, though they cautioned a need for methodological improvements in the future. One important consideration that emerged from the meta-analysis was the distinction between support offered by a confederate versus a friend and the role of evaluation potential: socially supportive friends who could evaluate performance (given their presence during a task) were less effective in buffering participants’ reactivity than non-evaluative friends, whereas evaluative potential of supportive confederates did not matter as much; confederates were able to attenuate cardiovascular reactivity regardless of evaluative threat (Thorsteinsson & James, 1999). In consideration of these findings, a review of the literature on laboratory manipulations of friend and confederate social support and the potential influence of evaluative threat are discussed.

The following studies manipulated social support from friends and strangers but disregarded the possible confounding effects of evaluative threat brought on by the support
provider. Still, the majority of the studies in this section reveal at least some support for the buffering hypothesis through either heart rate or blood pressure attenuation.

This next study is the only one in this section to find HR, SBP, and DBP attenuation when social support was provided by a confederate, but evaluation was not considered (Gerin et al., 1992). Often in social support studies, laboratory stressors that are utilized lack the dynamic qualities of daily life (e.g. mental arithmetic task). Though these tasks are excellent ways to induce stress, they are far from being naturalistic, and some argue that speech tasks may be the best kind of stress task to use because you can control the situation and also have a high degree of external validity (Moscovitch & Hoffman, 2006). While Gerin et al. (1992) did not use a speech task, they too recognized the limitations of these tasks and attempted to create a more realistic stressor that was likely to be related to social support; participants were asked to talk about a controversial topic with three confederates, two of them always disagreed with the participant’s viewpoint and one either provided support to the participant or remained silent. At all time points, the women that had no support during the task exhibited higher SBP, DBP, and HR compared to the women that were supported by one of the confederates. Results of this study strongly support the buffering hypothesis because women who were provided support in the midst of being personally attacked were able to attenuate blood pressure and heart rate reactivity at all points of the task compared to women who were left to fend for themselves. One reason this study as opposed to other studies yet to follow (see Table 1) may have been better able to reveal significant findings for all dependent variables (SBP, DBP, HR) may be because the stress task was specifically designed to elicit the need for social support in a setting that often commands social support. Nevertheless, there have been studies that revealed significant findings in spite of using less-social stress tasks, and these studies will be described momentarily. The following three studies include both SBP and DBP, and some HR attenuation as a result of social support.
<table>
<thead>
<tr>
<th>Study</th>
<th>Evaluated</th>
<th>Men / Women</th>
<th>Task</th>
<th>Manipulation</th>
<th>DV</th>
<th>Results</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kamarck et al., 1990</td>
<td>Yes</td>
<td>0/39 MAT; CF</td>
<td>Friend support w/Wrist Touch; Alone</td>
<td>HR, SBP, DBP</td>
<td>Alone greater SBP, HR than friend.</td>
<td>Cohen's d SBP = 1.01; HR = 0.99</td>
<td></td>
</tr>
<tr>
<td>Allen et al., 1991</td>
<td>Yes</td>
<td>0/45 MAT</td>
<td>Friend/ Pet Support; Alone</td>
<td>SBP, DBP</td>
<td>Friend greater SBP than Alone; Alone greater SBP than Pet.</td>
<td>Cohen's d for friend vs. alone SBP = 3.23. Cohen's d for alone vs. pet SBP = 5.44</td>
<td></td>
</tr>
<tr>
<td>Edens et al., 1992</td>
<td>Yes</td>
<td>0/60 MAT; MTT</td>
<td>Stranger/ Friend Touch/ No Touch; Alone</td>
<td>HR, SBP, DBP</td>
<td>Touch greater HR, SBP, DBP than No Touch; Strangers higher HR, DBP than Friend.</td>
<td>Cohen's d HR = 0.81; SBP = 1.04; DBP = NR; HR = 0.7; DBP = NR</td>
<td></td>
</tr>
</tbody>
</table>
Table 1 (continued)

**Laboratory Studies that Manipulated Social Support**

<table>
<thead>
<tr>
<th>Study</th>
<th>Evalua</th>
<th>Men / Women</th>
<th>Stress Task</th>
<th>Manipulation</th>
<th>DV</th>
<th>Results</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gerin et al., 1992</td>
<td>No</td>
<td>0/40</td>
<td>Discussion</td>
<td>Supportive/Nonsupportive</td>
<td>HR, SBP, DBP</td>
<td>Nonsupport higher SBP, DBP, HR than Support.</td>
<td>Cohen's d SBP = 1.38; DBP = 1.08; HR = .84</td>
</tr>
<tr>
<td>Lepore et al., 1993</td>
<td>No</td>
<td>43/47</td>
<td>Speech</td>
<td>Supportive/Nonsupportive</td>
<td>SBP, DBP</td>
<td>Alone greater SBP than Support; Nonsupport greater SBP, DBP than Alone.</td>
<td>Social condition Cohen's d = 0.93.</td>
</tr>
<tr>
<td>Sheffield &amp; Carroll, 1994</td>
<td>No</td>
<td>60/60</td>
<td>MAT; VT</td>
<td>Alone/Friend/Stranger</td>
<td>HR, SBP, DBP</td>
<td>No Significant Differences</td>
<td></td>
</tr>
</tbody>
</table>
### Table 1 (continued)

**Laboratory Studies that Manipulated Social Support**

<table>
<thead>
<tr>
<th>Study</th>
<th>Evaluation</th>
<th>Men / Women</th>
<th>Task</th>
<th>Manipulation</th>
<th>DV</th>
<th>Results</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gerin et al., 1995</td>
<td>No</td>
<td>0/26</td>
<td>Video game</td>
<td>Supportive Friend; Alone</td>
<td>HR, SBP, DBP</td>
<td>Alone greater SBP, DBP than friend.</td>
<td>Cohen's d SBP = 0.84; DBP = 1.2</td>
</tr>
<tr>
<td>Lepore, 1995</td>
<td>No</td>
<td>52/52</td>
<td>Speech</td>
<td>Alone; Supportive Confederate</td>
<td>HR, SBP, DBP</td>
<td>Low cynicism alone &amp; all high cynicism greater SBP, DBP than low cynicism support condition.</td>
<td>Cohen's d for SBP = 0.97; DBP = 0.64</td>
</tr>
<tr>
<td>Kors et al., 1997</td>
<td>Yes</td>
<td>0/50</td>
<td>MAT</td>
<td>Alone; Non-eval/ Evaluative Friend</td>
<td>HR, SBP, DBP</td>
<td>Alone greater SBP than non-evaluative friend.</td>
<td>Cohen's d SBP = 0.9</td>
</tr>
</tbody>
</table>
### Table 1 (continued)

**Laboratory Studies that Manipulated Social Support**

<table>
<thead>
<tr>
<th>Study</th>
<th>Evaluation</th>
<th>Men / Women</th>
<th>Task</th>
<th>Manipulation</th>
<th>DV</th>
<th>Results</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uchino &amp; Garvey, 1997</td>
<td>Yes</td>
<td>28/21</td>
<td>Speech</td>
<td>Support Available/ Not Available</td>
<td>HR, SBP, DBP</td>
<td>No available support greater SBP, DBP than available.</td>
<td>Cohen's d SBP = 0.69; DBP = 0.71</td>
</tr>
<tr>
<td>Christenfeld et al., 1997</td>
<td>No</td>
<td>0/90</td>
<td>Speech</td>
<td>Supportive/ Nonsup Friend/ Confederate</td>
<td>HR, SBP, DBP</td>
<td>Confed support greater SBP than friend. Non-support confed greater SBP than Sup.</td>
<td>Cohen's d for SBP = 0.99</td>
</tr>
<tr>
<td>Fontana et al., 1999</td>
<td>Yes</td>
<td>0/60</td>
<td>MAT; Speech</td>
<td>Alone; Stranger/ Friend present</td>
<td>HR, SBP, DBP</td>
<td>Alone greater HR, SBP than friend and stranger.</td>
<td>Cohen's d HR = 0.57; SBP = 0.67</td>
</tr>
<tr>
<td>Study</td>
<td>Evaluation</td>
<td>Men / Women</td>
<td>Stress</td>
<td>Task</td>
<td>Manipulation</td>
<td>DV</td>
<td>Results</td>
</tr>
<tr>
<td>-----------------</td>
<td>------------</td>
<td>-------------</td>
<td>--------</td>
<td>---------------</td>
<td>-------------------------</td>
<td>--------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>Anthony &amp; O’Brien, 1999</td>
<td>No</td>
<td>13/55</td>
<td>Speech</td>
<td>Alone;</td>
<td>Supportive/ Nonsupportive Confederate</td>
<td>HR, SBP, DBP, Imp.</td>
<td>No Significant Results</td>
</tr>
<tr>
<td>Craig et al., 2000</td>
<td>Yes</td>
<td>32/9</td>
<td>TAT</td>
<td>Dog/ No Dog</td>
<td></td>
<td>SBP, DBP, MAP</td>
<td>Dog greater MAP than no dog.</td>
</tr>
<tr>
<td>Study</td>
<td>Evaluation</td>
<td>Men / Women</td>
<td>Task</td>
<td>Manipulation</td>
<td>DV</td>
<td>Results</td>
<td>Effect Size</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------</td>
<td>-------------</td>
<td>--------</td>
<td>--------------------</td>
<td>-------------</td>
<td>--------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Glynn et al., 1999</td>
<td>No</td>
<td>52/57</td>
<td>Speech</td>
<td>Supportive or Nonsupportive Confederate</td>
<td>HR, SBP, DBP</td>
<td>Female Non Support greater SBP, DBP than Support; Male Support Greater DBP than Female; Non Support greater HR than Support.</td>
<td>For female's Cohen's d for SBP = 0.61; DBP = 0.77. For female vs. male Cohen's d for DBP = 0.8. For support vs. no support Cohen's d = 0.45</td>
</tr>
<tr>
<td>Thorsteinson et al., 1998</td>
<td>Yes</td>
<td>20/20</td>
<td>CT</td>
<td>Supportive/ Nonsupportive Confederate</td>
<td>HR, SBP, DBP</td>
<td>Non Supportive greater HR than Support.</td>
<td>Cohen’s d = .76</td>
</tr>
</tbody>
</table>
Table 1 (continued)

*Laboratory Studies that Manipulated Social Support*

<table>
<thead>
<tr>
<th>Study</th>
<th>Evaluation</th>
<th>Men / Women</th>
<th>Task</th>
<th>Manipulation</th>
<th>DV</th>
<th>Results</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Craig &amp; Deichert 2002</td>
<td>No</td>
<td>31/0</td>
<td>MAT</td>
<td>Supportive Friend; Alone</td>
<td>HR, SBP, DBP, MAP</td>
<td>Alone &amp; emotional support greater DBP than instrumental support.</td>
<td>For support condition, Cohen's d for DBP = 0.8. Recovery Cohen's d not reported.</td>
</tr>
<tr>
<td>Uno et al., 2002</td>
<td>Yes</td>
<td>0/88</td>
<td>Speech</td>
<td>Support/ No Support Friend</td>
<td>HR, SBP, DBP, Impedance</td>
<td>Ambivalent greater DBP, TPR, PEP than positive friend; No support (purely positive) greater CO than emotional support.</td>
<td>Ambivalent vs. others, Cohen's d for DBP = 0.68; TPR = 0.56; PEP = 0.87. Purely positive vs. no support Cohen's d for CP = 0.5</td>
</tr>
</tbody>
</table>
Table 1 (continued)

**Laboratory Studies that Manipulated Social Support**

<table>
<thead>
<tr>
<th>Study</th>
<th>Men/Women</th>
<th>Task</th>
<th>Social Support</th>
<th>Manipulation</th>
<th>DV</th>
<th>Results</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hilmert et al., 2002a</td>
<td>No 0/62</td>
<td>Speech</td>
<td>Supportive/Nonsupportive</td>
<td>HR, SBP, DBP</td>
<td>Support greater SBP, DBP (no exp.) than nonsupport; Nonsupport greater SBP, DBP (with exp.) than support.</td>
<td>No experimenter: SBP and DBP $\eta^2 = .14$. Experimenter: SBP and DBP $\eta^2 = .19$.</td>
<td></td>
</tr>
<tr>
<td>Hilmert et al., 2002b</td>
<td>No 0/64</td>
<td>MAT; Speech</td>
<td>Supportive/Nonsupportive</td>
<td>HR, SBP, DBP</td>
<td>Low self-efficacy greater SBP, DBP, HR than high self-efficacy w/expert audience.</td>
<td>Cohen’s $d$ for SBP = 0.69; DBP = 0.64; HR = 0.89</td>
<td></td>
</tr>
</tbody>
</table>
### Table 1 (continued)

**Laboratory Studies that Manipulated Social Support**

<table>
<thead>
<tr>
<th>Study</th>
<th>Evaluation</th>
<th>Men / Women</th>
<th>Task</th>
<th>Manipulation</th>
<th>DV</th>
<th>Results</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smith et al., 2004</td>
<td>Yes</td>
<td>41/41</td>
<td>Speech</td>
<td>Perceived</td>
<td>HR, SBP, DBP</td>
<td>Acquaintance greater HR , SBP, DBP than supportive; Acquaintance (low hostile) greater DBP than supportive.</td>
<td>HR $\eta^2$=.06; SBP $\eta^2$=.06; DBP $\eta^2$=.08</td>
</tr>
<tr>
<td>Westmass&amp; Jamner, 2006</td>
<td>No</td>
<td>0/176</td>
<td>Speech</td>
<td>Supportive Tie/ Acquaintance</td>
<td>HR, MAP</td>
<td>High defensive greater MAP than low defensive (support condition).</td>
<td>$R^2$=.14</td>
</tr>
</tbody>
</table>

*Note.* Cohen (1992) suggests that for Cohen’s d effect sizes of .20 are small, .50 are medium, and .80 are large. Cohen’s $f$ effect sizes of .10 as small, .25 as medium and .40 as large. $\eta^2$ effect sizes of .01 as small, .06 as medium, and .14 as large. $R^2$ effect sizes of .010 as small, .059 as medium and .138 as large. CF = Concept Formation; MTT = Mirror-tracing Task; CT = Computer task; TAT = Thematic Apperception Task; MAT = Mental Arithmetic Task; Imp. = Impedance Cardiography; NR = Not Reported.
Support from a stranger was also examined in the following study, and there was evidence in support of the buffering hypothesis. Lepore, Mata-Allen, and Evans (1993) were interested in gender differences when engaging in a speech task either with a supportive confederate, a neutral confederate, or alone. Results revealed that participants had lower SBP and DBP reactivity when they were alone compared to when an unsupportive stranger was with them, suggesting that participants were uncomfortable being observed by a neutral-acting stranger while performing a speech. On the other hand, when a supportive confederate observed the participant, participants exhibited significantly smaller SBP (but not DBP) reactivity than participants who were alone in the room; so while an unsupportive stranger elicited greater SBP and DBP reactivity, a supportive stranger attenuated SBP. There were no physiological differences between men and women in the three conditions, but in general men displayed significantly higher levels of SBP and DBP than women. Results in this study of men and women are similar to the Gerin et al. (1992) study that looked only at women in that systolic blood pressure reactivity was attenuated when social support was provided by a stranger compared to when a stranger was neutral and unresponsive towards the participant. It is possible that Gerin et al. (1992) were able to detect DBP and HR differences between social support conditions because they used a more naturalistic task than Lepore et al. (1993) and were therefore able to have a stronger social support manipulation.

As opposed to the studies just mentioned, the following study (Glynn, Christenfeld, & Gerin, 1999) did reveal significant gender differences in reactivity when social support was received by a confederate during a stress task. Glynn et al. (1999) specifically did not match gender in this study. When compared to other studies, the conflicting findings could be due to the gender of the participant and confederate not being matched. Results revealed a main effect for heart rate; participants provided with social support by a confederate had lower HR reactivity compared to participant’s who were in a room with a confederate that acted in a neutral manner.
In addition, SBP and DBP reactivity were attenuated significantly more for both men and women when women provided social support than when men provided social support. Not surprisingly, supportive women also attenuated BP reactivity more than unsupportive men and women. However, unsupportive men and women influenced reactivity similarly, suggesting that one gender was not more likely than the other one was to increase participants’ reactivity.

It is interesting that even though all confederates were trained to give the same responses, male confederates were not able to attenuate reactivity in participants when they provided social support; there were no differences in participants’ reactivity when men provided support compared to when they did not. When taken together, the results suggest that support from a woman, not a man, was effective in reducing reactivity for both male and female strangers, and they also lend support to the buffering hypothesis.

One criticism of this study is that married couples were not examined though they were the target population, and it is possible that responses elicited by a stranger are different from those elicited by a spouse, making it unwise to conclude that wives are better at providing support than husbands.

Up until this point only confederates were used to provide social support, more than likely because of convenience, and as a result, there was a need to examine provisions of social support given by a close tie compared to a stranger. Christenfeld et al. (1997) had women engage in a speech task while either a female friend or confederate provided social support or while a female confederate remained neutral. Supportive friends proved to be even better at buffering stress than supportive confederates; friends had lower SBP reactivity compared to the supportive confederate condition. Similar to other studies mentioned thus far (Gerin et al., 1995; Gerin et al., 1992; Lepore, 1995; Lepore et al., 1993), supportive confederates proved to be better at buffering SBP reactivity compared to unsupportive, neutral confederates. But unlike these
studies, there were no significant differences between groups for DBP or HR reactivity despite there being 30 participants per each group.

One considerable difference from the other studies is that both the observer and the experimenter were present in the room during the speech task. Having the experimenter present could have changed the dynamic of the situation; a study examining the effects of experimenter presence on cardiovascular reactivity revealed that experimenter presence increased participants’ reactivity during a stress task (Gendolla & Richter, 2006). Therefore, it is possible that experimenter presence created a different situation than studies that did not have the experimenter present.

Hilmert, Kulik and Christenfeld, (2002a) conducted research specifically examining the effects of having both confederates and an experimenter present in a social support paradigm. They found that, when the experimenter was present, SBP and DBP reactivity were lower as a result of the confederates providing social support to the participant. Contrary to previous studies (Christenfeld et al., 1997; Gerin et al., 1992; Glynn et al., 1999; Lepore, 1995), when the experimenter was not present, participants experienced greater SBP and DBP reactivity when they received support from the confederates compared to when the confederate was neutral.

The researchers posited that the characteristics of the support providers may influence reactivity and conducted an additional study (Hilmert et al., 2002b) that revealed that women who gave a speech to a supposed expert panel of listeners had greater SBP, DBP and HR reactivity compared to when they gave a speech to a novice panel, suggesting that the qualifications of the listener did indeed have a direct influence on participants’ reactivity. In addition, they examined the interacting role of self-efficacy, and found that when an expert panel of confederates was present, low self-efficacy women had higher reactivity than high self-efficacy women, but self-efficacy made no difference in reactivity when there was a novice panel of confederates.
The work, conducted by Hilmert et al. (2002a, 2002b), is an excellent example of research systematically done to understand the interacting effects of the person and environment when social support is provided. Not only did they examine the effects of social support on reactivity, but they also examined the effects of environmental differences in the provider (i.e. listener expertise) and individual differences in the recipient (i.e. self-efficacy) of social support.

In stark contrast to the other studies mentioned thus far, Sheffield and Carroll (1994) found no support for the buffering hypothesis when they assigned 120 men and women to similar conditions as the other studies: alone, friend present, stranger present. All participants performed a MAT and vocabulary task alone and then again in one of the three conditions. Despite that the friend and stranger were encouraged to support the participant nonverbally, there were no significant differences between any of the groups. One concern I have with this study is that the support providers were told to provide support in whatever way they wanted, and some support providers may have been very responsive and comfortable while others may have felt uncomfortable and uncertain of what was expected of them. As a result, the level of standardization of the social support manipulation is called into question.

In addition, there were some slight differences in this study compared to ones that found support for the buffering hypothesis; unlike other studies, Sheffield and Carroll (1994) employed a within subjects design to increase power. They used a MAT and vocabulary task instead of a speech task, and in addition, they did not use confederates for the stranger condition, but rather recruited strangers from the same pool as the participants. I would argue that mental arithmetic and vocabulary tasks are not as ecologically valid as speech tasks when examining social support’s influence because people are probably more likely to seek social support in social situations as opposed to situations that are done alone and test specific skills. In addition, having the participant perform in all conditions may have led to carryover effects that diluted the results. A final explanation for the null findings is that studies that used trained confederates to provide
social support found effects, whereas, the stranger condition in this study was performed by a peer that was not extensively trained to provide social support, and may have felt uncomfortable in this contrived situation. Taken together, all of these differences may have contributed to the null findings.

Perhaps one of the best examples of potential evaluative threat is in the following study (Gerin et al., 1995) that looked at the effects of having a new roommate provide social support to the participant while the participant engaged in a stress task. Self-presentation and evaluative threat were naturally a factor in this study because participants had only met their new roommates once before. Unlike other studies that have used a speech or MAT, they had women engage in a videogame task. Besides playing the video game, the level of stress was varied by the experimenter who either harassed or did not harass the participant during the videogame. The presence of the roommate was also varied, and unlike any of the other studies mentioned thus far this within-subjects design had women participate in all four of the conditions.

One debatable statement made in this study was that the roommate posed no evaluative threat potential because the experimenter told the roommate very specific instructions on how to provide social support to the participant. I would argue that their attempt did not minimize evaluative threat because both the experimenter and the roommate were still observing the participant and considerable amounts of self-presentation concerns in regards to the roommate had to be present. Regardless of the possible confounds, results revealed that in the high stress condition (harassment by experimenter) social support by a roommate was able to buffer DBP responses, and social support had little effect on reactivity in the low stress condition (no harassment by experimenter). This is the first study in this review that found DBP attenuation in the absence of SBP or HR attenuation, which could be due to the unique task the experimenters used and the unique acquaintance condition that was used. The results are interesting because, in general, the temporal stability of DBP reactivity is much lower compared to SBP and HR
reactivity, and one would expect if there were to be significant results they would be related to SBP and HR (Kelsey et al., 2007). In addition, the use of a video game stressor is not typically used in social support studies, and the intertask consistency of cardiovascular responses (e.g. math task vs. video game vs. cold pressor) have shown there to be less reliability than if one were to look at within task responses (Kelsey et al., 2007). Thus, comparing the results of this study to other social support studies should be done with caution because stress tasks can have varying effects on cardiovascular reactivity.

The use of video-relayed social support is unique to social support paradigms but provides a method of providing support without the provider being present in the room. Thorsteinsson, James, and Gregg (1998) had equal numbers of men and women participate in a demanding computer task while a confederate either supported the participant or remained silent (neutral condition) via a TV monitor; participants actually were viewing a videotape of the confederate. Participants were led to believe the same-sex confederate was experienced at playing the computer task and could see the participant’s performance; thus, the video-relayed social support was not used as an attempt to minimize evaluative threat. HR, SBP, and DBP measures were collected during the task, but only HR was attenuated by the social support manipulation. As mentioned, participants were led to believe their performance was being observed by an experienced confederate, and the lack of significant findings for blood pressure may be a result of confounding from the evaluative threat potential of the social support provider.

Until this point, social support studies focused primarily on emotional support. Craig and Deichert (2002) argued that men might not have always benefited from support in laboratory studies because focus has been on emotional support only; they posited that instrumental support may be more beneficial to men than emotional support because of societal rules that discourage men from seeking and receiving emotional support from people other than their significant other. Emotional support is thought to communicate love and liking and bolster self-esteem, while
instrumental support provides resources (e.g. money; information) needed to cope with stressor (Craig & Deichert, 2002). In order to examine the effects of receiving social support from other men, Craig and Deichert (2002) compared emotional and instrumental support and also included a condition whereby no support was provided by an experimenter. To test their hypothesis, men were given instructions during a 3-minute MAT either by a male experimenter (no support condition) or by a male friend; the friend was given guidelines for providing either emotional or instrumental support prior to the task. In the emotional support condition, male friends were trained to provide supportive and engaging gestures (e.g. smiling and nodding) and verbal praise (e.g. good job). In the instrumental condition male friends were trained to provide useful information during the task (i.e. the correct answer) if the participant gave an incorrect response. As put forward, instrumental support was able to lower cardiovascular reactivity significantly more than emotional support; men receiving instrumental support had lower increases in DBP reactivity compared to men receiving emotional or no support. The instrumental support condition also had lower DBP during recovery compared to the other two groups. The findings suggest that support is beneficial to men when the appropriate form of support is provided.

With the exception of Sheffield and Carroll (1994), the studies mentioned have thus far provided evidence that social support from a confederate reduced at least one cardiovascular measure of reactivity in participants compared to alone or nonsupportive confederates. However, Anthony and O’Brien (1999) also found no differences in reactivity between participants (men and women) who were alone, with a supportive same-sex confederate, or with a nonsupportive same-sex confederate during a speech task, despite the authors attempt towards construct validity of their social support manipulation through a pilot study.

One major oversight in this study that could account for the null findings is that participants were told repeatedly that the confederate would be rating their “personal appearance, speaking style, poise, intellectual quality, social skills, verbal ability, and logic” during the
speech. The fact that there were no differences in self-reported stress or physiological reactivity between the supportive and nonsupportive conditions speaks to there being a similarity in the two conditions, specifically a high amount of evaluative threat potential.

Many studies have used a nonsupportive condition claiming the benefits of social support can then be compared to “neutral” behaviors. However, the descriptions of the neutral confederate’s behaviors seem easily interpreted as negative (Anthony & O’Brien, 1999). Glynn et al. (1999), for example, described their unsupportive confederate as never giving positive feedback, with neutral expressions and a general inattentive demeanor. Westmaas and Jamner (2006) similarly described their neutral confederates as instructed not to nod, smile, initiate conversation, and act ambivalent when participants sought support. The questions become: what is the goal of having a neutral/nonsupportive confederate, and what are these confederate’s behaviors actually being interpreted as by the participant? There is a possibility that the studies incorporating a neutral/nonsupportive condition may not be revealing the buffering effects of social support but of neutral/nonsupportive confederates eliciting anxiety (Anthony & O’Brien, 1999).

Improving upon their design, Anthony and O’Brien (1999) replicated and extended their prior study by including a second support condition (high social support); they increased the amount of supportive comments given by the confederate during a speech task because they considered the null findings from the prior study may have been due to a weak social support manipulation. In addition, the researchers looked specifically at women because there is evidence that men and women react differently to emotional support. Evaluative threat was also minimized this time; social support was still provided by a confederate but under the guise of being a research assistant who merely was there to time the tasks during the study, rather than observe their performance. Results revealed that participants reported similar perceived support from the high and low support confederates, though all groups reported feeling the same level of stress
during the task, and similar to the previous study, there were no significant differences in cardiovascular reactivity among the groups. Taken together, these two studies challenge past studies by suggesting that an unfamiliar person providing social support may not decrease participants’ cardiovascular reactivity to a stressful task.

To sum up the studies thus far, manipulating social support has produced a variety of findings, with some researchers being able to demonstrate an attenuation of all cardiovascular measures for those in a social support condition while other researchers have demonstrated attenuation of only one of their measures, and still a few researchers finding null results. Therefore, it is difficult to make a global statement that social support attenuates physiological reactivity to laboratory stress. A more accurate conclusion would be that social support appears to have varying effects on individuals depending on who the support is provided to, and while some researchers have examined individual differences in social support studies, there is a need to further examine individual differences and account for the mixed results. The following studies have specifically considered one potential confound in laboratory studies, evaluative threat of the support provider.

With the exception of Anthony and O’Brien (1999), I would argue that the studies mentioned up to this point did not explicitly consider the possible confound of having an observer present while the participant performed a stress task. The following studies exemplify the need to consider evaluative threat and later highlight the lack of consideration of other factors that may interact with the situation such as personality characteristics.

To understand the evaluative threat potential of an observer, Allen et al. (1991) examined the effects of social support from a friend versus a pet on blood pressure and heart rate reactivity. Female pet-owners engaged in a MAT either alone with an experimenter present in a laboratory, or in the woman’s home with an experimenter and a supportive friend or the participant’s dog. Consistent with the hypothesis that an observer elicits threat (Geen, 1983), women in the pet
condition showed the least SBP reactivity compared to the other conditions, and the friend condition showed substantially greater SBP reactivity compared to the experimenter-only condition; there were no differences between groups in DBP or HR reactivity. However, a visual inspection of DBP revealed a similar pattern in reactivity to SBP. The supportive friend participants also performed worse on the MAT compared to the other two conditions. The results suggest that pets provided the greatest buffering effects because they were the least evaluative threat. A possible concern with this study deals with issues of measurement reliability; blood pressure was only taken once at the end of baseline and once at the beginning of each task, instead of multiple times throughout. Also, there were no self-report data on the amount of evaluative threat the person perceived during the study; it was assumed that the pet condition was the least evaluative, but it is unclear how threatening the experimenter only condition and the friend condition were.

The possibility that animals can attenuate people’s reactivity to stress is intriguing, but as Craig, Lynch, and Quartner (2000) discovered, the bond between the person and the pet may be the key reason attenuation of reactivity occurred. They examined the affects of social support on men and women who had experienced a coronary event (i.e. heart attack or coronary bypass surgery). Participant engaged in a stress task while alone or with a novel, friendly dog sitting beside them. During the task, participants looked at an ambiguous scene and were asked by a male experimenter to answer a variety of questions about the scene. HR and blood pressure measures were assessed during the task, which was performed twice, once with the dog present, once without the dog. Following the counterbalanced tasks, a brief perceived social support questionnaire was filled out to assess perceptions of support in one’s life.

Consistent with past research (Tardy et al., 1989), results indicated that participants high in amounts of perceived availability of social support had lower MAP and DBP than those low in amounts of perceived availability of support. The opposite effects were found in this study.
compared to Allen et al.’s (1991) study. The presence of the dog was meant to attenuate reactivity but appeared to increased MAP reactivity; a possible explanation for the increased reactivity is that participants reported in a follow-up that the dog was a novel stimulus in the setting. The main difference between Allen et al.’s (1991) study and this one is that Craig et al.’s (2000) study use a dog that was not the participant’s own dog and therefore did not have a bond with the participant. In addition, it is quite unusual to perform a laboratory task with an animal sitting next to the participant, and this may have distracted the participant and increased their anxiety.

As far back as 1990, some social support researchers have recognized the possible confound in having an observer present in the room that could possibly increase participants’ anxiety. The first study, to my knowledge, to minimize the possible effects of evaluative threat by a support provider was in 1990 (Kamarck, Manuck, & Jennings, 1990). Female participants performed a three minute mental arithmetic task either alone in a room or with a silent, supportive female friend touching their wrist; headphones were worn by the friend during the task to reassure the participant that their friend could not evaluate their performance. In partial support of the buffering hypothesis, results revealed that the supportive-touch condition had smaller increases in SBP and HR than the alone condition during the MAT.

Kors et al. (1997) replicated Kamarck et al.’s (1990) study and improved upon it by adding an evaluative threat condition to see if differences found between friends and being alone were due to minimized evaluation of the friend. There were three conditions in this study: alone, with a friend present and observing (evaluative threat), with a friend present and not observing (non-evaluative). Friends in the evaluative threat condition were able to see the participant’s performance, while friends in the non-evaluative condition were unable to see the participant’s performance; one difference in this study compared to Kamarck et al.’s (1990) is that the friends in this study did not touch the participant during the task.
In spite of the possibly relevant difference mentioned above, this study replicated Kamarck et al.’s (1990) SBP findings; SBP was significantly lower in the non-evaluative condition compared to the alone condition. Importantly, though they found no other significant differences between groups. A visual inspection of the means suggested that there were differences between the alone and nonevaluative support condition when evaluative threat was minimized; the alone condition had the greatest increase in SBP, followed by the evaluative support condition, and lastly the nonevaluative support condition. There were no differences in DBP or HR between the three groups, which is inconsistent with many of the previously mentioned studies in this paper.

A potential confound of Kors et al.’s (1997) study is that the alone condition participants brought their friend to the experiment; the friend was asked to wait out in the hall during the study. It is possible that the mere knowledge of knowing their friend was waiting in the hallway helped people to cope with the stress task by activating perceptions of support, and that may be why there were no DBP and HR differences between groups. Regardless, there were significant differences between groups in SBP, which lends some support to the buffering hypothesis and partially replicates Kamarck et al.’s (1990) study.

The following study lends some support to the possibility that knowing a supportive person is in the hallway may attenuate reactivity. This study is slightly different from other studies mentioned because actual support was never provided during the task; the availability of support was manipulated. Uchino and Garvey (1997) recruited men and women and matched the gender of the participant with that of the experimenter. The participant was asked to give a speech and was either told or not told that the experimenter would be on the other side of the door if they needed anything during their speech. This seemingly weak manipulation of social support appeared to be enough to attenuate reactivity during a speech task; the availability of significantly attenuated SBP and DBP reactivity compared to the no support condition. Hence, the availability
of social support appears to have buffered reactivity to the speech task in this study. While the results of this study suggest that availability of support by the experimenter attenuated reactivity, it does not specifically address whether having a friend waiting in the hallway accounts for Kors et al.’s (1997) null findings. Future studies should address the possibility that awaiting friends prime thoughts of social support and are enough to attenuate reactivity.

Edens, Larken, and Abel (1992), similarly to Kamarck et al. (1990), compared the effects of touch and no touch by friends and strangers during a stress task. Women performed stress tasks in one of the following conditions: alone, with stranger-touch, with stranger-no touch, with friend-touch, with friend-no touch. Similar to Kamarck et al. (1990), the observer in the touch conditions placed their hand on the participant’s wrist during the tasks; all observers wore headphones and read magazines to help minimize evaluative threat. Inconsistent with Kamarck et al. (1990), results indicated that there were no differences between the friend touch and alone condition. The friend no-touch condition, on the other hand, had lower SBP reactivity than the alone condition. In general, touch conditions had greater HR, SBP, and DBP reactivity during the task than the no-touch conditions, and participants paired with strangers had higher HR and DBP reactivity than when they were with friends. No comparisons were mentioned between strangers and alone conditions. The study contradicts Kamarck et al.’s (1990) claim that touch is important when providing social support, and also contradicts studies that have found no differences between confederate and friend support (see Sheffield & Carroll, 1994; Fontana et al., 1999). Rather the results of this study suggest that touch increases reactivity, and when minimizing evaluative threat, support from a friend is more beneficial than support from a confederate.

The following researchers (Fontana et al., 1999), like Edens et al. (1992), in addition to having a friend and alone condition, added a supportive stranger condition to examine whether strangers were as effective at attenuating reactivity as friends when evaluation was minimized. They had female participants perform two stress tasks (MAT & speech) alone or in the presence
of a supportive friend or stranger. When an observer was present, they were instructed not to interact with the participant but to provide silent support. As an extra precaution, observers wore headphones that made them unable to hear the participant’s performance. Similar to other studies (Kamarck et al., 1990; Kors et al., 1997), the results revealed that both the supportive friend and stranger groups had attenuated HR and SBP reactivity compared to the alone condition, suggesting that a supportive, nonevaluative stranger was as capable at lowering participants’ reactivity as a supportive friend. Compared to similar studies (Edens et al., 1992; Christenfeld et al., 1997; Sheffield & Carroll, 1994), this study did show that when evaluative threat was reduced participants were equally benefitted (i.e. attenuated HR and SBP) by supportive friends and strangers.

While many of the articles reviewed thus far focused on varying the support provider to assess effects of social support, some researchers have considered other factors that could influence the effects of social support. For example, Uno, Uchino, and Smith (2002), because there is evidence to suggest that ambivalent friends may increase cardiovascular reactivity (Uchino, Holt-Lunstad, Uno, & Flinders, 2001), investigated the interacting effects of type and quality of relationship as well as gender of the support provider in a laboratory setting; they argued that many researchers in the past focused only on the positive aspects of social support while ignoring the equally important negative aspects. There were three social support conditions: emotional support, instrumental support, no support. A unique social support design was used in this study; in order to reduce evaluative threat potential of the friend, they sat in an adjacent room and wrote notes to the participant during the study instead of sitting in the same room as the participant; the notes were transferred to the participant by the experimenter before each one-minute speech.

Another unique aspect of the Uno et al. (2002) study was the incorporation of impedance cardiography technology in conjunction with blood pressure measures to distinguish between
underlying myocardial and vascular activity. Key measures included cardiac output (CO), the amount of blood outputted by the heart with each ventricular contraction; pre-ejection period (PEP), a measure of contractile force of the heart; and total peripheral resistance (TPR), an index of vasoconstriction in peripheral (as opposed to cardiac) blood vessels.

PEP is an index of sympathetic myocardial drive. In other words, increased PEP shortening indicates that there is an increase in sympathetic nervous system activation which partly contributes to increases in HR (heart rate is also influenced by the PNS). By measuring changes in CO and TPR, the underlying mechanisms involved in blood pressure changes can be examined. For example, an increase in blood pressure could be a result of increases in CO, TPR, or both; an increase in CO indicates an increase in myocardial activity, whereas, an increase in TPR indicates an increase in vascular constriction, and when both are elevated is termed a “mixed hemodynamic profile” (Gregg, Matyas, & James, 2005). While overtime increased vascular responding and mixed hemodynamic profiles are considered more detrimental to health than increased myocardial responding, they all could be detrimental to health (Gregg et al., 2005).

Results revealed that the women with ambivalent female friends did indeed have greater increases in reactivity (DBP, TPR, and PEP) compared to women with purely positive friends, suggesting that perceptions of the friend were important in how the participant reacted to social support. The underlying increase in TPR suggests that there was a vascular basis for the DBP increases, and the increased shortening of PEP suggests that there was an increase in sympathetic nervous system activity, which is typical in active coping tasks. In regards to women accompanied by a purely positive friend that received emotional support had lower CO reactivity (myocardial responses) compared to women that received no support from a positive friend. For women with ambivalent friends there were some marginally significant effects; CO reactivity (i.e. myocardial) was greater and TPR reactivity (vascular) lower for women who received emotional support from ambivalent friends compared to receiving no support from ambivalent friends.
Contrary to past research, there was no main effect of social support, but it is worth restating that the social support manipulation in this study is very different from the other studies mentioned in this review because the friend was in another room when providing support, and this could have contributed to the differing findings. Overall, these data suggest that the type of social support as well as the type of relationship with the support provider can have varying effects on cardiovascular reactivity to the stressors, and also suggest that more consideration should be had in regards to the negative aspects of social support.

In conclusion, the latter studies in this section provide evidence that: minimizing evaluative threat of the support provider and understanding some of the underlying characteristics of the relationship between the participant and the support provider may well explain some of the inconsistencies in the social support and acute stress reactivity literature. The following section considers one more factor that could contribute to the mixed findings in the social support literature by focusing on personality characteristics.

**Social Support and Personality**

The idea that individual differences in response to stress explain differences in cardiovascular reactivity is not a new one. Cassel (1976) suggested that when considering the effects of stress on health it was also important to consider the vulnerability of the person to the stress and said that these variations in responses could explain discrepancies in stress studies. Cassel (1976) further suggested that both coping ability and social support influence a person’s ability to resist stress.

When creating an acute stress study examining the effects of social support then, it may be beneficial to consider individual differences; more recently it was posited that each person has learned and inborn abilities that they bring to the environment, and each environment demands certain skills and abilities (Martin & Swartz-Kulstad, 2000). When there is a person-environment “mismatch”, meaning that a person is in an environment that they are not properly able to cope
with, there is a potential for psychological distress (Martin & Swartz-Kulstad, 2000). Based on this reasoning, it follows that physiological responses to the mismatch may simultaneously be buffered or enhanced through the provisions of social support.

However, personality traits are often overlooked in social support studies, with only a handful of physiological studies targeting personality and social support interactions. The majority of these studies have been concerned with hostility (Chen, Gilligan, Coups, & Contrada, 2005; Smith et al., 2004; Gallo, Smith, & Kircher, 2000); or variations of hostility (cynicism, Lepore, 1995; defensiveness, Westmaas & Jamner, 2006) which are associated with cardiovascular disease (House et al., 1988). Only one study examined a trait that may be activated during laboratory speech tasks, self-efficacy (Hilmert et al., 2002a).

When personality traits and social support have jointly been examined in cardiovascular reactivity research, compelling findings suggest that incorporating a person-situation paradigm into reactivity studies may dampen inconsistent findings. For example, one study found that women who were high in hostility were unaffected by the provisions of mentally activated support, but women low in hostility had lower cardiovascular reactivity to a speech task (Smith et al., 2004), suggesting that social support was only effective in buffering stress in low-hostile women. Another study revealed that high-hostile participants had greater SBP and DBP reactivity when they also had high perceptions of social support in their life, but high-hostile participants had lower reactivity when they had lower amounts of perceived support in their life (Chen et al., 2005). Similar to Smith et al. (2004), this study suggests that social support may not be beneficial to those high in hostility, and taken together these studies suggest that examining the benefits of social support without considering the impact the person has on the situation can impede our understanding of why some people develop cardiovascular disease and others do not.

A number of researchers have posited that there may be varying results in studies because perceptions of social support can vary among individuals (Pierce, Lakey, Sarason, Sarason, &
Joseph, 1997). The following study, for example, found that examining a personality trait in addition to self-reported perceptions of social support revealed a significant interaction. Chen et al. (2005) examined the role of hostility in modifying social support’s physiological buffering effects.

For some background, researchers suggest that given the nature of high hostile people, having more perceived support may result in greater cardiovascular reactivity because of their fear of being emotionally dependent and negatively evaluated by others (Chen et al., 2005). In order to test this hypothesis, men and women engaged in a MAT and speech task and completed hostility and social support questionnaires following the stress tasks. The results were consistent with their hypothesis; while there were no main effects of hostility or social support on cardiovascular reactivity, there was an interaction between the two variables. People reporting higher hostility scores and high perceptions of social support had greater SBP and DBP reactivity during the speech than people who were high in hostility but low in perceived support. This study is important because it illuminated the need to consider personality traits. Nevertheless, it contributes to the inconsistent findings in the literature because there were no differences in reactivity between those high or low in perceptions of social support. The correlational nature of this study called for further examination of the effects of social support and personality on health.

Smith et al. (2004) expanded research on thoughts of social support and also examined chronic hostility; past research has shown that social support may have a negative impact on hostile people due to them having negative interpretations of social support (Lepore, 1995). Unlike any other paradigm, Smith et al. (2004) manipulated thoughts of social support; some researchers suggest that perceptions of availability of social support may be more important to health outcomes than actual support (Krause, 1997). The manipulation involved participants classified as either high or low in hostility to write about a supportive person or an acquaintance to prime thoughts of either a neutral or supportive person in one’s life. During the subsequent
speech task, participants who thought about a supportive person versus those who thought about an acquaintance reported lower increases in state anxiety and also displayed lower HR, SBP, and DBP reactivity, though the effects were small ($\eta^2 = .06-.08$). Consistent with research on actual support (Lepore, 1995), a closer examination of the social support condition revealed that women low in hostility had smaller DBP reactivity than participants high in hostility, suggesting that thoughts of social support were more beneficial to people who were not hostile; there were no differences between low and high-hostile people who wrote about an acquaintance, which suggests that thoughts of social support uniquely affects people. In addition, women low in hostility had significantly lower DBP reactivity when they wrote about a supportive tie compared to writing about an acquaintance. While not significant, there was a visible difference among high-hostile women; the supportive tie participants had greater reactivity than the acquaintance group. These findings suggest that those low in hostility benefited more from thoughts of social support than those high in hostility, but support for the buffering hypothesis is weakened because the interaction between hostility, gender, and social support was not significant for HR or SBP.

As a whole, the last two studies reviewed supply compelling evidence that research regarding social support must expand to incorporate other possible factors that could interact with social support’s effects on cardiovascular reactivity.

Lepore (1995) manipulated actual social support and examined the possible moderating influence cynicism may have on the relationship between social support and cardiovascular reactivity. Lepore (1995) suggested that cynicism, defined as a “general mistrust in others” (p. 210), which is also a major element of the trait hostility, may partly explain why some individuals react negatively to social support and others react positively. Dropping a nonsupportive condition, Lepore (1995) replicated an earlier study (Lepore et al., 1993) and added a self-report measure of cynicism. Neither Lepore (1995) nor Lepore et al. (1993) found an interaction between gender and social support. However, results revealed that participants
supported by strangers during the speech task displayed lower HR, SBP and DBP reactivity compared to the alone condition, whereas Lepore et al. (1993) only found attenuation of SBP. As mentioned, cynicism was examined as a possible moderating influence, and indeed there was a significant interaction between cynicism and social support. The results revealed that those low in cynicism had the lowest SBP and DBP reactivity when with a supportive confederate compared to when they were alone, and they also had lower blood pressure reactivity compared to high cynicism-alone participants and high cynicism-social support participants. Taken together these results suggest that social support was able to buffer stress, especially for people who were low in cynicism. Notably, Lepore is one of only a handful of researchers to consider personality characteristics as possible moderators for the relationship between social support and cardiovascular reactivity. Yet there is ample evidence suggesting that chronic conditions, such as being hostile, can have detrimental effects on the body in the long term because of it creating greater reactivity to acute stressors in daily life.

Social support is thought to be less effective in buffering stress for people who possess negative traits such as defensiveness (Westmaas & Jamner, 2006), hostility (Chen et al., 2005), and cynicism (Lepore, 1995). Gallo et al. (2000) were interested in how hostility interacted with perceived social support because of research suggesting a possible link between hostility and cardiovascular disease and social support and cardiovascular disease (Adler & Matthews, 1994). Audiotaped supportive, neutral, or provoking comments were played while women engaged in a speech task; the use of standardized, audiotaped comments in this study is unique to social support studies. Participants also filled out questionnaires assessing hostility and perceived social support in their life. Contrary to the researchers’ hypothesis, there were main effects for both perceived social support and hostility but there was not an interaction between social support and hostility; based on this study it appears that in regards to reactivity the two constructs worked independently from one another.
A more recent study examined the effects of the interaction between the personality trait defensiveness and social support on stress; the following researchers suggest that social support may elicit defensiveness and reactivity rather than decrease reactivity because defensive people may believe the support provider must think them incompetent. Westmaas and Jamner (2006) had a large sample of women complete a speech task alone or in the presence of a supportive or neutral confederate. HR and MAP were assessed, and results indicated an interaction between defensiveness and social support. As expected by the experimenters, in the support condition women who were more defensive had greater MAP reactivity than women who were less defensive; HR was not significantly different among these groups. However, HR reactivity was significantly higher when confederates gave neutral responses compared to when they gave supportive comments. This study provides evidence that social support buffers stress and social support interacts with defensiveness. In addition, by considering personality traits, this study provides an explanation for the mixed findings in the social support literature.

Five of the six studies in this section have examined hostility or a derivative of hostility (cynicism, defensiveness) because it is associated to cardiovascular health, but only one social support study has considered a trait specific to the context of the laboratory situation. Hilmert et al. (2002a) looked at the influence of high and low self-efficacy on reactivity when positive or negative feedback was given from a panel of listeners (either public speaking experts or novice listeners). Self-efficacy was considered because research suggests that people’s reactivity to stress is influenced by their perceptions of their ability to perform the task (Hilmert et al., 2002a). The researchers found that when an expert panel of confederates was present, low self-efficacy women had higher reactivity than high self-efficacy women, but self-efficacy made no difference in reactivity when there was a novice panel of confederates. Therefore, both the self-efficacy of the participant and the characteristics of the listeners influenced the participant’s reactivity.
There is scant research examining personality traits that interact with the kinds of laboratory stressors used in social support studies. The following section explores a personality trait, social anxiety, which is highly likely to be elicited by stress tasks.

**Speech Anxiety as a Potential Moderator of Social Support’s Effects**

Social anxiety may interact with social support during laboratory stress tasks, especially since it has been argued that speech tasks are an excellent choice when examining those who have public speaking anxiety because they allow for control over the situation and have a high degree of external validity (Moscovitch & Hoffman, 2006). Along this line of thinking, people with a high level of speech anxiety may be reacting significantly more during a study than those who do not have speech anxiety which could possibly confound results when looking at the effects of social support. Social anxiety is conceptualized here using Schlenker and Leary’s (1982) definition of social anxiety: “a state of anxiety resulting from the prospect or presence of interpersonal evaluation in real or imagined social settings” (p. 642). Situations that provoke social anxiety differ from person to person (Leary, 1983b); some people may fear public speaking but have no problem having a conversation on a date, and vice versa. Types of social anxiety have been differentiated using numerous terms such as dating anxiety, stage fright, interaction anxiety, and audience anxiety. In sum, not all individuals experience social anxiety in the same context. Those who do experience social anxiety may also experience cardiovascular reactivity, and perceptions of social support may be able to buffer the affects of the social anxiety.

Research comparing reactivity of those with social anxiety and those without social anxiety during evaluative threat has produced varying results. Many studies have shown that those with social anxiety have higher reactivity than those without social anxiety (Feldman, Cohen, Hamrick, & Lepore, 2004; Larkin, Semenchuk, Frazier, Suchday, & Taylor, 1998; Turner, Beidel, & Larkin, 1986). Other researchers have found that there is no difference in reactivity between those with and without social anxiety (Grossman, Wilhelm, Kawachi, &
And surprisingly, there is evidence that those with social anxiety have less reactivity to evaluative stressors than those without social anxiety (Gramer & Sprintschnik, 2008). Gramer and Sprintschnik (2008) argued that people with high social anxiety have less engagement in tasks that they feel exceed their coping resources resulting in less reactivity.

However, because the buffering hypothesis states that individuals who need support will benefit from support, it is proposed here that those people who are high in speech anxiety will benefit more from social support than less socially anxious individuals in an evaluative situation because the social support will provide anxious individuals with the necessary tools needed to cope with the situation.

**Purpose of the Current Research**

**Overview**

Past studies regarding the effects of social support have produced mixed results, and there is a need to find possible factors that interact with social support and the situation. Few social support studies have looked at personality characteristics that may interact with social support during acute stress tasks, and most traits that have been examined do not appear to have immediate relevance to the task. When there is a person-environment “mismatch”, meaning that a person is in an environment that they are not prepared for, there is a potential for heightened psychological and physiological responses (Martin & Swartz-Kulstad, 2000) to the mismatch that may be buffered by social support. The purpose of the current study was to expand upon previous research regarding the relationship between social support and cardiovascular reactivity to stress by using a trait by situation approach (Caplan & Van Harrison, 1993; Kristof, 1996). Specifically, the current study examined social anxiety, an individual difference that is likely important to the social context of laboratory stressors characterized by evaluative threat (Moscovitch & Hoffman,
and one that may interact with social support in producing buffering effects on cardiovascular reactivity.

In addition, there have been many studies that have looked at laboratory analogues of actual support, but only one (Smith et al., 2004) has manipulated thoughts of support, controlling for both the potential evaluative threat inherent in having a person physically present during an evaluative task, and the complications of having a friend unnecessarily accompany a participant to the study; when participants are assigned to an “alone” condition, it could create a supportive environment because the friend still came to the study and the presence of the friend in the waiting room could be supportive, complicating the interpretation of results. While mental activation of supportive ties obviously is not the same as having a supportive tie present during a study, the essence of the mental activation is the same; both thoughts of supportive ties and the physical presence of supportive ties ultimately leave the recipient with a sense of being valued, cared for, and comforted. The proposed study used this mental activation paradigm to examine the effects thoughts about supportive ties have on participants while engaging in a stressful task and minimize evaluative threat potential of the supportive tie.

Finally, impedance cardiography and blood pressure measures were used in combination to determine social anxiety and social support’s interactive effects on both cardiac and vascular performance. The majority of social support studies have used SBP, DBP, and HR as the primary dependent variables, and only a few studies (Anthony & O’Brien, 1999; Uno et al., 2002) have used more advanced methods for examining cardiovascular function through the use of impedance cardiography. The physiological dependent variables for the current study were HR, SBP, DBP, TPR, CO and PEP. Exaggerated HR responses and abnormal vasoconstriction responses (i.e. TPR) are thought to be risk factors for coronary artery disease (Kaplan & Manuck, 1998), and sympathetically mediated SBP and DBP have predicted future hypertension (Krantz &
Manuck, 1984). PEP indicates sympathetic activation on cardiac contractility and blood pressure (Brownley, Hurwitz, & Schneiderman, 2000).

The specific aim of the proposed study was to examine whether individual differences in speech anxiety moderated the effect of social support on cardiovascular reactivity to social evaluative threat. High and low speech anxiety participants were randomly assigned to priming conditions where they wrote about an acquaintance or a supportive person in their life and then performed either a socially evaluated speech task (evaluation condition) or a minimized-evaluation task (minimized-evaluation condition). Cardiovascular reactivity was assessed during the baseline, speech preparation, speech task and recovery. Following are the primary and secondary hypotheses.

*Hypothesis One*

Participants high in speech anxiety will have greater cardiovascular reactivity including: greater increases in HR, SBP, DBP, CO, and TPR, and shorter PEP from baseline during a speech task compared to those low in speech anxiety.

*Hypothesis Two*

Participants in the evaluation condition will have greater cardiovascular reactivity including: greater increases in HR, SBP, DBP, CO, and TPR, and shorter PEP from baseline during the speech task compared to those in the minimized-evaluation condition. Increasing the amount of evaluative threat has been shown to increase reactivity in past studies, and minimizing evaluative threat has been shown to decrease reactivity (Kamarck et al., 1990).

*Hypothesis Three*

It was predicted that among participants high in speech anxiety, mental activation of a supportive tie prior to giving an evaluated speech would result in lower HR, SBP, DBP, TPR, CO, and PEP responses during the speech compared to mental activation of an acquaintance (planned comparison one). It was predicted that when threat was minimized, there would be no
differences between participants high in social anxiety in the acquaintance and supportive tie conditions (planned comparison two). It was predicted that there would be no differences between the acquaintance and supportive tie conditions among participants low in social anxiety in the evaluation condition (planned comparison three) nor would there be any differences between the acquaintance and supportive tie conditions in the minimized evaluation condition (planned comparison four). Because providing support to a person may only be beneficial when the person is in need of the support being provided (Cohen, 2004), high speech anxiety people should benefit more from support than low speech anxiety people because they need support more in the presence of evaluative threat.

Secondary Hypotheses

The Secondary hypotheses paralleled the directions of the primary hypotheses except rather than focusing on reactivity during the speech task, the same pattern of differences was hypothesized for speech preparation and recovery from the speech task. Many social support studies have not included a recovery period, and few of the studies reviewed included examination of an anticipatory period prior to the stressor. Both recovery and anticipatory stress, such as waiting to give an impromptu speech, may have implications for health; anticipation of stress and slow recovery from stress have been found to predict disease states, though there are not many studies to support this claim (Brosschot, Pieper, & Thayer, 2005). Likewise, some authors suggest that recovery from a stressor is as important for health as reactivity (Linden, Earle, Gerin, & Chritenfeld, 1997).

Methods

The study employed a three-way, between-groups design: 2 (speech anxiety group: high vs. low) x 2 (priming condition: supportive tie vs. acquaintance) x 2 (evaluative threat condition: evaluation vs. minimized-evaluation); there were multiple dependent variables (HR, SBP, DBP, PEP, TPR, CO).
Study sessions were conducted at Ohio University. Participants from the Psychology Experiment Pool who completed a measure of public speaking anxiety were invited to participate. Participants were randomly assigned to one of two support conditions (supportive tie vs. acquaintance) and to an evaluative threat condition (evaluation vs. minimized-evaluation). After a ten minute rest period, participants either prepared for an impromptu speech, taking notes if they wanted, or they transcribed a pre-scripted speech. Then, while being video-recorded, the participants either gave the impromptu speech (evaluation condition) they prepared for or they read a scripted speech while not being recorded (minimized-evaluation). A ten minute recovery period followed.

Participants

Men and women from the Ohio University Psychology pool were recruited for this study, and each person received one credit hour for their participation. Volunteers were restricted to men and women who (a) completed the speech anxiety questionnaire during an online-pretest session and met the criteria for high or low speech anxiety (b) were between the ages 18-33, (c) did not have a history of heart problems, (d) did not have high blood pressure (e) were not currently taking cardiovascular medication (f) and who self-reported being in generally good health. Prior to signing up for the study, participants filled out an online questionnaire that indexed their level of speech anxiety. Only people who scored in the upper or lower third of the distribution of speech anxiety scores were allowed to sign-up for this study in order to maximize the differences between speech anxiety groups (see Table 2).
Table 2

Confidence as a Speaker Anxiety Descriptives by Quarter

<table>
<thead>
<tr>
<th>Descriptives</th>
<th>Fall 2006</th>
<th>Winter 2007</th>
<th>Spring 2007</th>
<th>Fall 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>46.12</td>
<td>45.84</td>
<td>46.66</td>
<td>45.88</td>
</tr>
<tr>
<td>SD</td>
<td>7</td>
<td>7.27</td>
<td>7.34</td>
<td>7.37</td>
</tr>
<tr>
<td>N</td>
<td>983</td>
<td>965</td>
<td>536</td>
<td>901</td>
</tr>
<tr>
<td>Minimum</td>
<td>31</td>
<td>30</td>
<td>30</td>
<td>31</td>
</tr>
<tr>
<td>Maximum</td>
<td>59</td>
<td>59</td>
<td>59</td>
<td>59</td>
</tr>
</tbody>
</table>

The determination of the speech anxiety cut-offs was based on the data obtained from the first quarter of data collection with the assumption that subsequent quarters would have similar distributions. Indeed, the subsequent quarters’ distributions had near identical standard deviations and means compared to the first quarter (see Table 3).

To determine the sample size needed for the current study, effect sizes from similar studies were considered. Two studies examining social support and personality characteristics have reported effect sizes ranging from medium to large effects (Chen et al., 2005; Smith et al., 2004). Smith et al. (2004) reported medium effect sizes for a 2 (priming condition) x 3 (hostility group) x 2 (sex) mixed ANCOVA for DBP ($\eta^2 = .06$). Chen et al. (2005) reported large effect sizes in a hierarchical mixed-model multiple-regression analysis for a hostility x support interaction for SBP, Cohen’s $f = .62$ ($R^2 = .28$) and DBP, Cohen’s $f = .47$ ($R^2 = .18$). Based on these studies, a power analysis using a conventional, moderately large effect size ($f = .40$; (Cohen, 1988)) and an $\alpha$-level of .05 indicated that 104 participants were needed to achieve 80% power of detecting differences for the highest order interaction (priming condition x speech anxiety x evaluative threat).
Table 3

Confidence as a Speaker Anxiety Descriptives by Condition.

<table>
<thead>
<tr>
<th>Anxiety Level</th>
<th>Priming Manipulation</th>
<th>Evaluative Threat</th>
<th>Mean</th>
<th>SD</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Acquaintance</td>
<td>Evaluation</td>
<td>37.52</td>
<td>2.93</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Minimized</td>
<td>38.12</td>
<td>2.34</td>
<td>17</td>
</tr>
<tr>
<td>Supportive Tie</td>
<td></td>
<td>Evaluation</td>
<td>36.89</td>
<td>2.54</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Minimized</td>
<td>38.29</td>
<td>2.35</td>
<td>21</td>
</tr>
<tr>
<td>High</td>
<td>Acquaintance</td>
<td>Evaluation</td>
<td>54.50</td>
<td>2.52</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Minimized</td>
<td>53.52</td>
<td>2.20</td>
<td>21</td>
</tr>
<tr>
<td>Supportive Tie</td>
<td></td>
<td>Evaluation</td>
<td>53.06</td>
<td>2.58</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Minimized</td>
<td>54.58</td>
<td>2.50</td>
<td>19</td>
</tr>
</tbody>
</table>

Psychosocial Measures

Trait Speech Anxiety. The Personal Report of Confidence as a Speaker (PRCS) contains 30 true/false questions that assess affective and behavioral responses to public speaking (see Appendix A for a copy of the questionnaire). The range of possible scores on the PRCS is 0-30, with 0 indicating no fear, and 30 indicating extreme fear of public speaking. Paul (1966) reported an internal consistency of alpha = .91; with a three month test-retest reliability of .61. The PRCS correlates with many other related measures, ranging from 0.31-0.94 (Paul, 1966). While the criterion for what constitutes clinical speech anxiety has been rather arbitrary (Phillips, Jones,
Rieger & Snell, 1997), Paul (1966) designated a score of 16 or greater as people with clinical speech anxiety. Others have used the upper third of the distribution, or cutoffs of 17 or 20 (Phillips et al., 1997). In the current study, the upper and lower thirds of the psychology pool distribution were used to designate high and low speech anxiety.

Demographics and Health. The Personal Data and Health questionnaire asks general demographic and health questions including: age, race, relationship status, cardiovascular problems and/or illnesses, current medication status, pregnancy status, exercise activities, and intake of food, caffeine, vegetables, and fruits that may relate to their physiological responses during the study (see Appendix C for a copy of the questionnaire).

Social Relationships Index (SRI; modified). The modified SRI contains four questions about the assigned person (acquaintance or supportive tie) the participant wrote about during the social support manipulation, and two of these questions were used to assess the degree of perceived social support received by the individual by summing the participant’s responses to the following questions: How important is this person to you?; How likely are you to go to this person for support? The two questions were forced-choice Likert scale questions ranging from 1 = not at all, to 6 = extremely, and they were summed together to get an index of perceived social support (see Appendix D for a copy of the questionnaire). Uchino et al. (2001) reported that the internal consistencies of the intact scale (which assesses support from multiple network members) ranged from 0.76-0.87; with a 2-week test-retest reliability ranging from 0.51-0.75 ($ps < 0.001$), depending on the network member category.

Stress Appraisal Questionnaire. Questions were asked before and after the stress task to determine the participant’s appraisal of stress (see Appendix E for a copy of the questionnaire). Three questions were summed to index the level of anxiety participants felt immediately prior to preparing their speech. The questions were on a seven-point Likert scale, 1 = not at all to 7 = extremely, and were as follows: How threatening do you expect the upcoming task to be? How
demanding do you expect the upcoming task to be? How stressful do you expect the upcoming task to be? How stressful is the task?

*Physiological Measures*

Following published guidelines (Sherwood et al., 1990), impedance cardiography and electrocardiography (EKG) were used to assess cardiac output (CO; for the derivation of TPR), HR, and PEP with a HIC-2000 Bio-electric Impedance Cardiograph (Instrumentation for Medicine, Inc). A total of four tetrapolar aluminium/mylar disposable tape electrodes were used. For the neck, one band electrode was placed at the base of the neck (internal lead) and the second was placed approximately 3 cm above it (external lead). For the torso, one band electrode was placed on the mid-axillary line at the level of the xiphoid process (internal lead) and the other was placed 3 cm below it (external lead). A 4-mA, 100-kHz alternating current was passed through the two external electrodes, while the two internal electrodes measured $Z_0$ (thoracic impedance) and $dZ/dt$ (change in thoracic impedance on a given heart beat). The BIOPAC MP100 system for Windows converted the analog signals into digital signals that were collected on a Windows XP computer using the software package AcqKnowledge (Biopac Instruments, Inc), and Mindware software (Mindware Technologies, LTD).

A Colin Press Mate blood pressure monitor (Colin Medical Instruments, Inc) was used to assess SBP and DBP in mmHg. An occluding cuff was placed on the participant’s non-dominant arm and was inflated every two minutes of the baseline and recovery, and the beginning of and ninety seconds into the speech preparation and speech tasks.

*Procedures*

*Initial Contacting and Scheduling.* Individuals who completed the speech anxiety questionnaire (PRCS) questionnaire and fell in the upper or lower third of the distribution of scores had the opportunity to enroll in the study. Interested individuals signed-up for a timeslot
on the Ohio University psychology online sign-up system. The online sign-up contained a brief
description and restrictions of the experiment.

Settings. All study sessions took place in the Social Psychophysiology Lab located in
Anderson Building. The participant sat on a comfortable chair adjacent to a table containing an
intercom, speakers, and a clipboard with paper. Directly behind the participant was a two-way
mirror that allowed for observation of the participant from the control room. The female
experimenter, when not interacting with the participant, sat in the control room with another
female or male experimenter who monitored the physiological equipment. Each session lasted
approximately 60 minutes.

Session. When a participant arrived for the session, all procedures were explained to her
or him, and they were then asked to sign an informed consent form (see Appendix B). All
participants agreed to participate in the study. Once informed consent was obtained, the
experimenter attached the electrodes, blood pressure cuff, and respiratory transducer. The
transducer was included to measure respiration rate and depth (which is outside the scope of the
current project and is not discussed in this paper).

Next, the participant was asked to sit quietly and relax for 10 minutes to establish
baseline physiological measures. Immediately following the baseline, Eprime (Psychology
Software Tools, Inc.) randomly selected the priming and evaluative threat conditions and played
corresponding audio taped instructions over speakers placed in the participant room.

Priming. The priming methods were adopted from Smith et al. (2004). The purpose of
the support manipulation was two-fold. The manipulation was meant to simulate the effects of
having a supportive person present in the room while the participant engaged in the study, and the
manipulation was meant to reduce the perceived evaluative threat of the support provider. The
basis for the buffering hypothesis is that social support provides necessary resources needed to
cope with stressors; ultimately, both actual support and thoughts of social support can lead to feeling comforted and therefore more able to cope.

For the **supportive tie condition**, participants were asked to select “someone who has been supportive and helpful to you in important ways- a specific person you are currently close to, who you can rely on or turn to when you need help, advice, or encouragement.” They were then presented with the following questions, each separated by 30 seconds, and were asked to write their responses to each during the 30-second time period:

1. Briefly describe what you value or appreciate most about this person.
2. Briefly describe what this person values or appreciates most about you.
3. Describe what this person does for you that is supportive or helpful.
4. Describe how you feel when you see this person, after being away from them for a few hours or days.

For the **acquaintance condition**, participants were asked to select someone “you know well enough to say hello to when you see them, but not well enough to think of them as a real friend. . . someone you see fairly often. . . with whom you are cordial or friendly, . . . but not a close friend.” Then they were asked to write responses to the following questions:

1. Briefly describe how you know this person and what they seem like to you.
2. Describe what you think this person thinks about you, what you seem like to them.
3. Describe what this person does when you see them. . . What do they usually talk about?
4. When you see this person after not seeing them in a while, how do you feel? . . . What do you say?

Participants then were asked to review their written responses to the four questions and were given one minute to do so.

Once the writing task was completed the participants were asked to complete the modified version of the Social Relationships Index (Uchino et al., 2001), and depending on the
evaluative threat condition assigned, the experimenter explained the subsequent speech task to the participant. The experimenter while in the participant room verbally instructed participants regarding the upcoming tasks. The participants were then given a pre-task questionnaire assessing perceived stress of the task before they began the preparation task.

*Evaluative Threat Manipulation.* The evaluative threat manipulation was modified using methods from Saab, Matthews, Stoney, and McDonald (1989) and Uchino and Garvey (1997). For participants assigned to the **evaluation condition**, the experimenter provided instructions while standing in the room, emphasizing the use of a video camera and subsequent comparisons of their speech to other participants. Participants were given instructions to prepare and perform a speech. The participant was asked to imagine that they have been wrongly accused of stealing a belt from a store. He or she was then asked to prepare a three minute speech on these specific points and were told they could make notes but would not be able to use them during the actual speech: a) tell their side of the story, b) tell the manager what the security guard did wrong and why the security guard may have suspected them of shoplifting, c) say how they can prove they did not steal the item, d) specify what should happen to the security guard for the mistake, and e) summarize their points. During the instructions, participants were asked to give intelligent and well-thought out answers because their speech would be video recorded and compared to other participants’ speeches. After the speech preparation, the experimenter re-entered the room, gave a brief reminder that they had to talk the entire three minutes and started the video camera. The participant was then left alone to perform the speech for three minutes while being recorded. If they stopped talking for longer than ten seconds, they were prompted over an intercom to continue speaking.

For participants in the **minimized-evaluation condition**, the verbal instructions provided by the experimenter were meant to limit evaluation (Feldman et al., 2004). The experimenter casually sat while explaining the task and emphasized that they would not be evaluated in any
way during the task. The experimenter casually asked the participant to transcribe a speech for three minutes that the experimenter provided to them so that physiological changes due to movement could be controlled. The provided speech had been compiled using pilot arguments from previous participants. The pilot was conducted to test the procedures of the current study, and the speeches provided by the participants in the pilot were used to formulate the scripted speech for the current study. They were then asked to read the speech aloud for three minutes and were reminded that they would not be evaluated in any way during the speech task period (see Appendix F). Participants in the minimized-evaluation condition were asked to transcribe the speech because participants in the evaluation condition assembling their speech during this task. Therefore, participants in the minimized-evaluation condition read aloud a speech provided to them about the same topic as those in the evaluation condition.

In order to assess the amount of time it took for physiological measures to return to baseline levels, immediately after the speech task the video camera was turned off for those in the evaluation condition, and all participants was asked to relax for ten minutes. Following the recovery period, the participant filled out both a post-task questionnaire assessing perceived stress of the speech task and the Personal Data and Health Questionnaire. Physiological apparatus was then removed, height and weight were measured, and the participant was thanked and debriefed (see Appendix G for debriefing form).

Data Reduction

Trait Anxiety. The Personal Confidence as a Speaker scale was scored by summing the number of endorsed anxiety items (True = 1, False = 2) reported on an online pretesting session, with a possible range of 30-60 points. The upper third of the distribution of scores from the initial fall quarter pretest dataset was designated as high speech anxiety and the lower third low speech anxiety.
Social Support Manipulation. Two items from the modified version of the Social Relationship Index (SRI; Fiore, Becker, & Coppel, 1983) were summed to determine a social support score for the individual about whom participants wrote. The questions were: How important is this person to you?; How likely are you to go to this person for support? The scale ranges from 1 = not at all, to 6 = extremely. Higher scores on the scale, therefore, indicated greater feelings of perceived support from the person.

Physiological Data. The synchronized EKG, $dZ/dt$, $Z_0$, were saved directly on the hard drive of the Windows XP computer used during the experiment. As a result of data loss, sample sizes for the six dependent variables ranged from 118 - 157 (see Table 4).

Table 4

Sample Sizes for each Dependent Variable during each Task

<table>
<thead>
<tr>
<th>Variables</th>
<th>Baseline</th>
<th>Preparation</th>
<th>Speech</th>
<th>Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBP</td>
<td>157</td>
<td>156</td>
<td>153</td>
<td>157</td>
</tr>
<tr>
<td>DBP</td>
<td>157</td>
<td>156</td>
<td>153</td>
<td>157</td>
</tr>
<tr>
<td>HR</td>
<td>142</td>
<td>141</td>
<td>139</td>
<td>137</td>
</tr>
<tr>
<td>PEP</td>
<td>118</td>
<td>121</td>
<td>119</td>
<td>116</td>
</tr>
<tr>
<td>CO</td>
<td>140</td>
<td>138</td>
<td>137</td>
<td>135</td>
</tr>
<tr>
<td>TPR</td>
<td>140</td>
<td>138</td>
<td>133</td>
<td>135</td>
</tr>
</tbody>
</table>

Note. There was no systematic data loss by condition.

The data were scored using MindWare Technologies, Ltd software by a single, trained researcher to increase reliability. Data were examined on a beat-to-beat basis in 20-s intervals to obtain ensemble one minute averages that were aggregated across each event. The mean interval between R-R waves was used to derive HR in beats per minute (bpm). PEP (in milliseconds) was
determined as the onset of the R-wave (ventricular depolarization) to the B-point (opening of the aortic valves) of the EKG (Bernston, Lozano, Chen, & Cacioppo, 2004). CO (L/min) was derived from the product of HR and the ensemble average of stroke volume (SV) and was used to calculate total peripheral resistance (TPR). The calculation of TPR was (mean arterial pressure/CO) X 80 in dyne-s/cm\(^5\) (Sherwood et al., 1990); mean arterial pressure was calculated using the following formula: \(((2*\text{average DBP}) + \text{average SBP})/ 3\).

SBP and DBP were measured during minute six and eight of baseline, fifteen and ninety seconds into the preparation and speech tasks, and every two minutes of the recovery period; TPR was calculated for these epochs. Because impedance variables can be collected more precisely, HR, CO, and PEP were collected during minutes six, seven and eight of the baseline period and each minute of the speech preparation, speech, and recovery periods. The data collected during baseline, preparation and speech tasks were averaged across the task in order to increase reliability. Following past recommendations (Llabre, Spitzer, Saab, & Ironson, 1991), change scores were calculated for each dependent variable for the speech preparation and speech tasks (e.g. average task minus average baseline).

Data Analysis

For the primary analyses of the speech task and secondary analyses of the preparation and recovery tasks, analysis of variance tests (ANOVAs) were conducted for the three-way between groups design: 2 (priming condition: supportive tie vs. acquaintance) x 2 (speech anxiety: high vs. low) x 2 (evaluative threat condition: evaluation vs. minimized-evaluation). Separate ANOVAs were used to test for baseline differences between groups for each dependent variable. Because all participants were treated equally until after the baseline period, and prior studies have found no baseline differences related to social anxiety (Mauss et al., 2004; Movius & Allen, 2005), it was anticipated that no differences between speech anxiety groups, or any other groups, would exist at baseline because of the use of random assignment. Any significant differences between
groups, however, prompted the use of appropriate baseline values as covariates in analysis of
covariation (ANCOVA) to control for their influence (Benjamin, 1967). Effect sizes are reported
as eta squared ($\eta^2$), interpreted as the proportion of overall variance accounted for. Effect sizes of
.04, .25, and .64 refer to small, medium, and large effects, respectively (Cohen, 1992).

**Manipulation Checks.** As a manipulation check for the writing task, an independent
samples t-test was performed on the social support score obtained from the SRI between the
acquaintance and support group to ensure that the support group found their supportive person
more supportive than those who wrote about an acquaintance.

For both the evaluation and minimized-evaluation conditions, an independent samples t-
test was performed on the sum of items on a pre-task questionnaire that was given immediately
before the speech preparation task to check that participants high in speech anxiety perceived the
speech task as more stressful, threatening, and demanding than those low in speech anxiety. An
independent samples t-test was also performed using the pretask scores to check that participants
in the evaluation condition rated the task as more stressful than those in the minimized-evaluation
condition. In addition, paired-samples t-tests were used to examine change from baseline to each
time period (i.e. preparation, speech, recovery) for the evaluative threat conditions to ensure that
the speech task elicited a stress response.

**Hypothesis One Analyses (high vs. low anxiety):** To test hypothesis one, univariate two-
way ANOVAs (evaluative threat x speech anxiety) were conducted for each dependent variable
(HR, CO, TPR, PEP, SBP, and DBP reactivity).

**Hypothesis Two Analyses (evaluation vs. minimized-evaluation):** To test hypothesis two,
a univariate ANOVA with evaluative threat (evaluation vs. minimized-evaluation) as the between
groups factor was conducted for each dependent variable (HR, CO, TPR, PEP, SBP, and DBP
reactivity).
Hypothesis Three Analyses (support x anxiety x threat): A 2 (social support condition: supportive tie vs. acquaintance) x 2 (anxiety group: high vs. low) x 2 (evaluative threat condition: threat vs. no threat) ANOVA was conducted for each dependent variable (HR, RSA, TPR, PEP, and SBP change from baseline); and an ANCOVA was performed for DBP. Significant three-way interactions were followed by exploratory contrasts using Tukey’s HSD adjustments for multiple comparisons to determine differences between groups. Significant three-way interactions were also followed by four planned comparisons in order to test a priori predictions, and they were conducted using uncorrected alpha levels, as suggested by Anderson (2001). Unadjusted planned comparisons were conducted for a couple of reasons: first, it is reasonable to conduct planned comparisons using unadjusted alphas because the planned comparisons were based on theory (i.e. the buffering hypothesis) and a priori predictions (Anderson, 2001), and second, the magnitude of effect was unknown because this is the first study of its kind, and therefore it was impossible to know for certain that a moderate effect would be present. Using unadjusted planned comparisons allowed for finding effects that were of smaller magnitude.

Secondary Hypotheses Analyses. The secondary analyses for the speech preparation and recovery task mirrored the analyses for the speech task. In addition, because swiftness of recovery from stressful tasks may be important to health (Linden et al., 1997), further analyses were performed for the recovery period with repeated-measures ANOVAs, collapsed across groups, with eleven levels (i.e. baseline average and each minute of recovery) and appropriate statistical adjustments (Greenhouse & Geisser, 1959) to test for change over time. Univariate ANOVAs were then conducted to test for differences between groups during the first minute of recovery.
Results

Sample Characteristics

The sample consisted of 160 undergraduate participants who were in generally good health and had refrained from caffeine, alcohol, and exercise within at least the two hours prior to participation. Three participants were not included in analyses for the following reasons: one participant declined to participate, and two participants were excluded because of Eprime (Psychology Software Tools, Inc.) software malfunction. The final sample consisted of 157 participants (21 low anxiety, evaluation, acquaintance; 18 low anxiety, evaluation, support; 17 low anxiety, minimized-evaluation, acquaintance; 21 low anxiety, minimized-evaluation, social support; 22 high anxiety, evaluation, acquaintance; 18 high anxiety, evaluation, social support; 21 high anxiety, minimized-evaluation, acquaintance; and 19 high anxiety, minimized-evaluation, social support). They had the following characteristics: age ($M = 19.21$ years, $SD = 1.50$ years, range 18-33), low anxiety participants determined by Confidence as a Speaker Scale ($n = 77, M = 37.71$ points, $SD = 2.57$ points, range 32-41), and high anxiety participants ($n = 81, M = 59.93$ points, $SD = 2.47$ points, range 49-58). (However, the number of participants varied for individual dependent variables because of data collection issues (e.g. participant moved around too much creating noisy data, impedance box malfunction)).

Manipulation Checks

Independent samples t-test analyses of the priming manipulation, speech anxiety scores, evaluative threat conditions, and stress appraisals all revealed significant effects. As expected, results from the social relationships index (SRI) revealed that participants in the acquaintance condition ($n = 81, M = 5.04, SD = 2.39$) reported significantly less perceived social support from
the person they wrote about compared to those who wrote about a supportive tie \((n = 76, M = 11.5, SD = 1.16)\), \(t(155) = -21.46, p < .0001\).

Participants classified as high in speech anxiety, according to the PRCS scale, did have significantly higher self-reports of speech anxiety \((n = 81, M = 53.93, SD = 2.47)\) than those classified as low in speech anxiety \((n = 77, M = 37.71, SD = 2.57)\), \(t(156) = -40.41, p < .0001\).

The internal consistency (alpha = .94) of the PRCS in this sample was comparable to past studies; Paul (1966) reported an internal consistency of alpha = .91.

Participants in the evaluation condition reported significantly more stress and anxiety about the upcoming speech task \((n = 79, M = 13.10, SD = 4.00)\) than participants in the minimized-evaluation condition \((n = 77, M = 7.21, SD = 3.63)\), \(t(154) = 9.63, p < .0001\). Within the minimized-evaluation condition, as expected, there were no significant differences between high \((n = 40, M = 7.03, SD = 3.37)\) and low \((n = 37, M = 7.41, SD = 3.93)\) speech anxiety participants in their stress appraisals \(t(75) = .457, p = .649\); they reported the same levels of anxiety about the upcoming task. But in the evaluation condition, the low speech anxiety participants unexpectedly reported higher levels of stress and anxiety immediately before the preparation task \((n = 39, M = 14.23, SD = 3.18)\) compared to those high in speech anxiety \((n = 40, M = 12.0, SD = 4.42)\), \(t(77) = 2.57, p < .01\).

**Baseline Assessments**

Three-way (Speech anxiety x Priming x Evaluative threat) ANOVAs of baseline HR, SBP, DBP, PEP, TPR, and CO revealed only one marginally significant two-way interaction for diastolic blood pressure (Priming x Evaluative threat), \(F(1, 152) = 3.503, p = .063, \eta^2 = .0003\) (see Table 5). As a result, baseline DBP was used as a covariate in subsequent analyses involving DBP.
Change from Baseline

Results of paired samples t-tests on baseline and preparation period and on baseline and speech task SBP, DBP, HR, PEP and TPR revealed significant results for both of the evaluative threat conditions (evaluation and minimized-evaluation); all dependent variables evoked a significant change from baseline (see Figure 1). Cardiac output, however, increased for only those in the evaluation condition; there was no significant change in CO from baseline to preparation task or baseline to speech task for those in the minimized-evaluation condition. Results comparing baseline to recovery revealed that all six dependent variables’ values returned to baseline for the minimized-evaluation condition, as well as HR and TPR for the evaluation condition; SBP, DBP, CO and PEP were significantly higher during the recovery period compared to the baseline for the evaluation condition.

Cardiovascular Responses to the Speech Task

In support of hypothesis two, which predicted that those in the evaluation condition would have greater reactivity than those in the minimized-evaluation condition, 2 (speech anxiety) x 2 (priming condition) x 2 (evaluative threat) ANOVAs revealed significant main effects of evaluative threat for all dependent variables (see Table 9), with the exception of TPR; follow-up analyses indicated that the evaluative threat conditions had similar increases in TPR. No other main effects or two-way interactions (Speech Anxiety x Evaluative Threat) were significant; therefore, hypothesis one, which predicted that those high in speech anxiety would have greater reactivity than those low in speech anxiety, was not supported. However, in partial support of hypothesis three, there was a marginally significant three-way interaction for TPR
Figure 1. Cardiovascular activity for evaluative threat x speech anxiety conditions.
Table 5

*Baseline Levels for each Dependent Variable by Condition*

<table>
<thead>
<tr>
<th>DV’s</th>
<th>Low Anxiety</th>
<th></th>
<th>High Anxiety</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimized Evaluation</td>
<td>Evaluation</td>
<td>Minimized Evaluation</td>
<td>Evaluation</td>
</tr>
<tr>
<td></td>
<td>Acquaintance</td>
<td>Support</td>
<td>Acquaintance</td>
<td>Support</td>
</tr>
<tr>
<td>SBP (mmHg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>110</td>
<td>110</td>
<td>110</td>
<td>112</td>
</tr>
<tr>
<td>SD</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>n</td>
<td>20</td>
<td>18</td>
<td>22</td>
<td>18</td>
</tr>
<tr>
<td>DBP (mmHg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>60</td>
<td>62</td>
<td>59</td>
<td>61</td>
</tr>
<tr>
<td>SD</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>n</td>
<td>20</td>
<td>18</td>
<td>22</td>
<td>18</td>
</tr>
<tr>
<td>HR (BPM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>70</td>
<td>76</td>
<td>68</td>
<td>68</td>
</tr>
<tr>
<td>SD</td>
<td>8</td>
<td>7</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>n</td>
<td>15</td>
<td>17</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>DV’s</td>
<td>Acquaintance</td>
<td>Support</td>
<td>Acquaintance</td>
<td>Support</td>
</tr>
<tr>
<td>--------</td>
<td>--------------</td>
<td>---------</td>
<td>--------------</td>
<td>---------</td>
</tr>
<tr>
<td>TPR (dyne-cm^5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>1110</td>
<td>1143</td>
<td>1072</td>
<td>1238</td>
</tr>
<tr>
<td>SD</td>
<td>190</td>
<td>266</td>
<td>285</td>
<td>349</td>
</tr>
<tr>
<td>n</td>
<td>18</td>
<td>17</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>CO (L/min)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>5.64</td>
<td>5.65</td>
<td>6</td>
<td>5.36</td>
</tr>
<tr>
<td>SD</td>
<td>1.01</td>
<td>1.12</td>
<td>1.32</td>
<td>1.3</td>
</tr>
<tr>
<td>n</td>
<td>18</td>
<td>17</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>PEP (ms)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>108</td>
<td>102</td>
<td>104</td>
<td>107</td>
</tr>
<tr>
<td>SD</td>
<td>14</td>
<td>10</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>n</td>
<td>13</td>
<td>15</td>
<td>17</td>
<td>12</td>
</tr>
</tbody>
</table>
Table 6

*Preparation Task Change Scores for Each Dependent Variable by Condition*

<table>
<thead>
<tr>
<th>DV’s</th>
<th>Low Anxiety</th>
<th></th>
<th></th>
<th></th>
<th>High Anxiety</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimized Evaluation</td>
<td>Evaluation</td>
<td>Minimized Evaluation</td>
<td>Evaluation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acquaintance</td>
<td>Support</td>
<td>Acquaintance</td>
<td>Support</td>
<td>Acquaintance</td>
<td>Support</td>
<td>Acquaintance</td>
<td>Support</td>
</tr>
<tr>
<td>SBP (mmHg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>12.48</td>
<td>3.32</td>
<td>12.28</td>
<td>4.64</td>
<td>10.24</td>
<td>4.31</td>
<td>12.78</td>
<td>5.37</td>
</tr>
<tr>
<td>SD</td>
<td>10.25</td>
<td>5.28</td>
<td>7.2</td>
<td>6.11</td>
<td>9.04</td>
<td>6.95</td>
<td>8.81</td>
<td>4.84</td>
</tr>
<tr>
<td>n</td>
<td>20</td>
<td>17</td>
<td>18</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>DBP (mmHg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>8.78</td>
<td>0.529</td>
<td>7.19</td>
<td>6.62</td>
<td>6.69</td>
<td>4.17</td>
<td>5.28</td>
<td>3.45</td>
</tr>
<tr>
<td>SD</td>
<td>7.1</td>
<td>8.45</td>
<td>5.23</td>
<td>4.45</td>
<td>8.57</td>
<td>7.93</td>
<td>4.87</td>
<td>6.57</td>
</tr>
<tr>
<td>n</td>
<td>20</td>
<td>17</td>
<td>18</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>HR (BPM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>15.04</td>
<td>3.77</td>
<td>9.55</td>
<td>6.13</td>
<td>9.86</td>
<td>8.56</td>
<td>9.27</td>
<td>4.93</td>
</tr>
<tr>
<td>SD</td>
<td>10.44</td>
<td>4.06</td>
<td>6.5</td>
<td>4</td>
<td>6.32</td>
<td>9.6</td>
<td>4.75</td>
<td>3.81</td>
</tr>
<tr>
<td>n</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>19</td>
<td>20</td>
<td>18</td>
<td>18</td>
<td>16</td>
</tr>
</tbody>
</table>
Table 6 (continued)

Preparation Task change scores for each Dependent Variable by Condition

<table>
<thead>
<tr>
<th>DV’s</th>
<th>Low Anxiety</th>
<th></th>
<th>High Anxiety</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimized Evaluation</td>
<td>Evaluation</td>
<td>Minimized Evaluation</td>
<td>Evaluation</td>
</tr>
<tr>
<td>TPR (dyne-cm^5)</td>
<td>Acquaintance</td>
<td>Support</td>
<td>Acquaintance</td>
<td>Support</td>
</tr>
<tr>
<td>M</td>
<td>28</td>
<td>47.2</td>
<td>48.3</td>
<td>42.3</td>
</tr>
<tr>
<td>SD</td>
<td>126</td>
<td>142</td>
<td>95.4</td>
<td>311</td>
</tr>
<tr>
<td>n</td>
<td>18</td>
<td>14</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>CO (L/min)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>0.60</td>
<td>-0.12</td>
<td>0.39</td>
<td>0.00</td>
</tr>
<tr>
<td>SD</td>
<td>1.05</td>
<td>0.67</td>
<td>0.60</td>
<td>0.64</td>
</tr>
<tr>
<td>n</td>
<td>18</td>
<td>14</td>
<td>16</td>
<td>19</td>
</tr>
<tr>
<td>PEP (ms)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>-6.63</td>
<td>-2.26</td>
<td>-5.82</td>
<td>-1.61</td>
</tr>
<tr>
<td>SD</td>
<td>9.09</td>
<td>3.91</td>
<td>6.01</td>
<td>5.26</td>
</tr>
<tr>
<td>n</td>
<td>13</td>
<td>13</td>
<td>15</td>
<td>19</td>
</tr>
</tbody>
</table>
### Table 7

*Speech Task change scores for each Dependent Variable by Condition*

<table>
<thead>
<tr>
<th></th>
<th>Low Anxiety</th>
<th></th>
<th>High Anxiety</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimized Evaluation</td>
<td>Evaluation</td>
<td>Minimized Evaluation</td>
<td>Evaluation</td>
</tr>
<tr>
<td>Acquaintance</td>
<td>M</td>
<td>18.89</td>
<td>21.76</td>
<td>20.93</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>15.14</td>
<td>13.44</td>
<td>11.29</td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>19</td>
<td>17</td>
<td>20</td>
</tr>
<tr>
<td>Support</td>
<td>M</td>
<td>7.35</td>
<td>9.67</td>
<td>7.76</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>8.15</td>
<td>7.32</td>
<td>9.32</td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>17</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>DBP (mmHg)</td>
<td>M</td>
<td>9.61</td>
<td>11.85</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SD</td>
<td>9.46</td>
<td>10.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>n</td>
<td>19</td>
<td>17</td>
</tr>
<tr>
<td>HR (BPM)</td>
<td>M</td>
<td>22.8</td>
<td>16</td>
<td>17.6</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>14.79</td>
<td>9.02</td>
<td>7.93</td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>15</td>
<td>17</td>
<td>20</td>
</tr>
</tbody>
</table>
Table 7 (continued)

*Speech Task change scores for each Dependent Variable by Condition*

<table>
<thead>
<tr>
<th></th>
<th>Low Anxiety</th>
<th>High Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimized Evaluation</td>
<td>Evaluation</td>
</tr>
<tr>
<td>Acquaintance Support</td>
<td>Acquaintance Support</td>
<td>Acquaintance Support</td>
</tr>
<tr>
<td><strong>TPR (dyne·cm²)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>23.6</td>
<td>112</td>
</tr>
<tr>
<td>SD</td>
<td>230</td>
<td>154</td>
</tr>
<tr>
<td>n</td>
<td>16</td>
<td>14</td>
</tr>
<tr>
<td><strong>CO (L/min)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>0.834</td>
<td>-0.199</td>
</tr>
<tr>
<td>SD</td>
<td>1.22</td>
<td>0.613</td>
</tr>
<tr>
<td>n</td>
<td>17</td>
<td>14</td>
</tr>
<tr>
<td><strong>PEP (ms)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>-11.73</td>
<td>-5</td>
</tr>
<tr>
<td>SD</td>
<td>15.09</td>
<td>6.07</td>
</tr>
<tr>
<td>n</td>
<td>13</td>
<td>13</td>
</tr>
</tbody>
</table>
Table 8

*Recovery Period change scores for each Dependent Variable by Condition*

<table>
<thead>
<tr>
<th></th>
<th>Low Anxiety</th>
<th></th>
<th>High Anxiety</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimized Evaluation</td>
<td>Evaluation</td>
<td>Minimized Evaluation</td>
<td>Evaluation</td>
</tr>
<tr>
<td></td>
<td>Acquaintance</td>
<td>Support</td>
<td>Acquaintance</td>
<td>Support</td>
</tr>
<tr>
<td><strong>SBP (mmHg)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>3.9</td>
<td>1.56</td>
<td>4.89</td>
<td>2.52</td>
</tr>
<tr>
<td>SD</td>
<td>6.48</td>
<td>5.04</td>
<td>4.94</td>
<td>5.56</td>
</tr>
<tr>
<td>n</td>
<td>20</td>
<td>17</td>
<td>18</td>
<td>21</td>
</tr>
<tr>
<td><strong>DBP (mmHg)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>1.45</td>
<td>1.84</td>
<td>2.94</td>
<td>2.06</td>
</tr>
<tr>
<td>SD</td>
<td>4.08</td>
<td>6.39</td>
<td>3.54</td>
<td>4.08</td>
</tr>
<tr>
<td>n</td>
<td>20</td>
<td>22</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td><strong>HR (BPM)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>2.37</td>
<td>-0.604</td>
<td>0.405</td>
<td>-0.497</td>
</tr>
<tr>
<td>SD</td>
<td>4.62</td>
<td>3.26</td>
<td>4.05</td>
<td>4.07</td>
</tr>
<tr>
<td>n</td>
<td>15</td>
<td>15</td>
<td>16</td>
<td>19</td>
</tr>
</tbody>
</table>
Table 8 (continued)

*Recovery Period change scores for each Dependent Variable by Condition*

<table>
<thead>
<tr>
<th></th>
<th>Low Anxiety</th>
<th></th>
<th></th>
<th>High Anxiety</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimized Evaluation</td>
<td>Evaluation</td>
<td>Minimized Evaluation</td>
<td>Evaluation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acquaintance</td>
<td>Support</td>
<td>Acquaintance</td>
<td>Support</td>
<td>Acquaintance</td>
</tr>
<tr>
<td>TPR (dyne-cm³)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>12.3</td>
<td>-13.2</td>
<td>5.07</td>
<td>8.77</td>
<td>26.5</td>
</tr>
<tr>
<td>SD</td>
<td>204</td>
<td>108</td>
<td>118</td>
<td>95.5</td>
<td>83</td>
</tr>
<tr>
<td>n</td>
<td>18</td>
<td>14</td>
<td>15</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>CO (L/min)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>0.188</td>
<td>0.047</td>
<td>0.287</td>
<td>0.079</td>
<td>0.083</td>
</tr>
<tr>
<td>SD</td>
<td>0.793</td>
<td>0.515</td>
<td>0.536</td>
<td>0.368</td>
<td>0.464</td>
</tr>
<tr>
<td>n</td>
<td>18</td>
<td>14</td>
<td>15</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>PEP (ms)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>-4.14</td>
<td>-2.54</td>
<td>-4.6</td>
<td>-2.53</td>
<td>-1.74</td>
</tr>
<tr>
<td>SD</td>
<td>3.93</td>
<td>5.51</td>
<td>2.8</td>
<td>4.55</td>
<td>3.21</td>
</tr>
<tr>
<td>n</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>19</td>
<td>15</td>
</tr>
</tbody>
</table>
Table 9

*Speech Reactivity: Comparing Evaluative Threat Conditions*

<table>
<thead>
<tr>
<th>DV’s</th>
<th>Mean</th>
<th>SD</th>
<th>n</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBP (mmHg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluation</td>
<td>20.75</td>
<td>12.54</td>
<td>74</td>
<td>51.41*</td>
</tr>
<tr>
<td>Mini-Evaluation</td>
<td>8.41</td>
<td>8.06</td>
<td>78</td>
<td></td>
</tr>
<tr>
<td>DBP (mmHg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluation</td>
<td>11.69</td>
<td>9.22</td>
<td>74</td>
<td>25.9*</td>
</tr>
<tr>
<td>Mini-Evaluation</td>
<td>5.14</td>
<td>7.00</td>
<td>78</td>
<td></td>
</tr>
<tr>
<td>HR (BPM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluation</td>
<td>18.32</td>
<td>10.30</td>
<td>68</td>
<td>58.38*</td>
</tr>
<tr>
<td>Mini-Evaluation</td>
<td>7.17</td>
<td>6.41</td>
<td>68</td>
<td></td>
</tr>
<tr>
<td>TPR (dyne-cm²)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluation</td>
<td>93.50</td>
<td>173</td>
<td>63</td>
<td>0.02</td>
</tr>
<tr>
<td>Mini-Evaluation</td>
<td>94.06</td>
<td>168</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td>CO (L/min)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluation</td>
<td>0.54</td>
<td>0.93</td>
<td>66</td>
<td>15.46*</td>
</tr>
<tr>
<td>Mini-Evaluation</td>
<td>0.02</td>
<td>0.52</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td>PEP (ms)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluation</td>
<td>-9.54</td>
<td>11.05</td>
<td>54</td>
<td>7.04*</td>
</tr>
<tr>
<td>Mini-Evaluation</td>
<td>-5.02</td>
<td>5.53</td>
<td>59</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* *p < .01.
Follow-up Tukey’s HSD contrasts were performed and revealed no significant results. Planned comparisons were then performed on the marginally significant three-way interaction for TPR using unadjusted comparisons to detect small effects, and they also demonstrated no significant results. No other dependent variable demonstrated a significant three-way interaction (see Table 7).

**Cardiovascular Responses to the Preparation Task**

Results for the preparation task were very similar to the speech task. Hypothesis two, which predicted that those in the evaluative threat condition would have greater reactivity than those in the minimized-evaluation condition, was supported for all dependent variables with the exception of TPR; as with the speech task, the evaluation and minimized-evaluation conditions displayed similar increases in TPR. No other main effects or two-way interactions were significant, therefore hypothesis one, which predicted that high speech anxiety participants would have greater reactivity than low speech anxiety participants, was not supported. The three-way Speech Anxiety x Priming x Evaluative Threat interaction was significant for HR, $F(1, 131) = 5.90, p = .02, \eta^2 = .02$ (see Figure 3 and Table 6). Follow-up post hoc tests with adjustments for multiple comparisons revealed that those in the evaluative threat condition who were low in speech anxiety and primed with thoughts of an acquaintance exhibited greater reactivity ($n = 15, M = 15.04, SD = 10.44$) compared to three groups in the minimized-evaluation condition: low speech anxiety, acquaintance prime ($n = 16, M = 3.77, SD = 4.06$); low speech anxiety, support prime ($n = 19, M = 6.13, SD = 4.00$); high speech anxiety, support prime ($n = 16, M = 4.93, SD = 3.81$). Unadjusted planned comparisons for HR revealed unexpected results; for those in the evaluation condition, low speech anxiety, supportive tie participants ($n = 17, M = 9.55, SD = 6.50$) had significantly lower heart rate reactivity than acquaintance participants ($n = 15, M = 15.04, SD = 10.44$) while preparing their speeches. No other planned comparisons were significant for HR.
Figure 2. Total peripheral resistance reactivity (+/- SE) during the speech task.  
Note: *p < .05
Figure 3. Heart rate reactivity (+/- SE) during preparation and speech tasks.

Note. *p < .05
Cardiovascular Recovery

Similar to the speech and speech preparation task, results will be presented describing change score data examining the first three minutes of the recovery period (see Table 8). Hypothesis two, which predicted that those in the evaluative threat condition would have greater reactivity than those in the minimized-evaluation condition, was supported for both SBP, $F(1, 148) = 12.94, p < .01$, and DBP, $F(1, 148) = 5.97, p < .01$. No other main effects or interactions were significant, therefore hypothesis one, which predicted that high speech anxiety participants would have greater reactivity than low speech anxiety participants, was not supported, furthermore, the predicted three-way interaction was not supported.

In addition to change from baseline analyses for the recovery period, further analyses were performed to assess both changes over time and differences between groups. Collapsing across all groups, repeated-measures ANOVAs revealed that recovery period SBP remained higher than baseline levels for the first two minutes of recovery, $F(6, 139) = 8.26, p < .01, \eta^2 = .06$, and DBP for the first minute of recovery, $F(6, 139) = 4.60, p < .01, \eta^2 = .03$. With the exception of minute nine of the recovery period, shortening of PEP was greater than baseline levels, suggesting that the sympathetic nervous system continued to influence heart performance throughout the recovery period, $F(10, 94) = 8.134, p < .01, \eta^2 = .08$. HR, CO and TPR returned to baseline levels immediately. Additional univariate ANOVAs revealed that there were no significant differences between the eight conditions (Speech Anxiety x Priming x Evaluative Threat) at any time during recovery (for any dependent variable), suggesting that groups recovered similarly from the speech task.

In sum, the underlying mechanisms that influenced blood pressure reactivity for the first two minutes of the recovery period are unknown; two mechanisms, CO, which would suggest myocardial influence, and TPR, which would suggest vascular influence, both returned to baseline levels at the start of the recovery period. However, there is some evidence that there was
an increase in PNS influence over the heart that led to the decrease in heart rate. PEP, an indicator of SNS influence, remained relatively higher than baseline levels throughout the recovery period, yet heart rate levels returned to baseline immediately. By deduction, the PEP and HR results suggest that there was an increase in PNS influence that counteracted the SNS activation, and therefore heart rate was tempered.

Discussion

This study attempted to investigate the interaction between a person and environment when relevant stress was present in addition to thoughts of social support. To the knowledge of the author this study is one of only two studies (see Smith et al., 2004) to manipulate thoughts of social support and examine physiological reactions to stress in a laboratory setting. Past studies have either used self-report data to determine how global perceptions of social support influence laboratory stress reactivity or manipulated the presence of a support provider to examine their influence over reactivity.

Perceptions of social support are equivalent in importance to actual social support (Pierce et al., 1997) because quite possibly it is the combination of how one interprets actual support and perceives their social support availability that determines how one reacts to a stressful situation. Often, people are faced with challenges in their lives when actual support is not available but thoughts of support are easily accessible, making it important to examine the effects of activated thoughts of social support in addition to the effects of actual support in the laboratory setting. Additionally, results from acute laboratory stress studies pertaining to the effects of social support are inconclusive, and the current study examined possible reasons for these discrepancies (i.e. evaluative threat of support provider, personality traits) by abolishing the presence of a support provider and, in addition, examining the joint influence of social anxiety and social support on reactivity. However, the findings of this study further add to the inconsistencies in the literature,
were unexpected, and only partially replicate Smith et al.’s (2004) findings. Following is a
discussion of the results per each hypothesis proposed in the study.

The hypothesis that high speech anxiety participants have greater reactivity compared to
those low in speech anxiety during an evaluative task was not supported in this study. High and
low speech anxiety participants displayed congruent increases in cardiovascular reactivity during
preparation and performance of their speeches and also in recovery from the stress task
suggesting that trait speech anxiety by itself is not a predictor of cardiovascular reactivity.

There are several possibilities for why this hypothesis was not supported. Despite the
attempt to maximize differences between speech anxiety groups by using the upper and lower
tertiles of the distribution of scores, it is possible that those categorized as low in speech anxiety
actually were on the low end of being high in speech anxiety, and therefore many more
participants found the laboratory situation to be anxiety provoking than anticipated. If true, there
may have been a decreased range in scores, and the ability to detect differences between speech
anxiety groups may have been more difficult to detect. Visual inspection of a histogram for high
speech anxiety participants revealed a relatively normal distribution, but the distribution for low
speech anxiety participants revealed that the distribution was negatively skewed, suggesting that
fewer people were at the extreme low-end of the low speech anxiety distribution. A further look
into typical scores on the PRCS for high and low anxiety participants indicated that participants
in this study had similar mean scores on the PRCS as those reported by other researchers with
similar sample sizes (Moscovitch & Hoffman, 2006). However, the mean for those high in
anxiety was one point higher in the current study than in Moscovitch and Hoffman (2006). More
importantly, the mean for the low anxiety participants in the current study was two points higher
than that of Moscovitch and Hoffman’s (2006) study, suggesting that the low anxiety participants
were not as low in anxiety in the current study as similar samples. Unfortunately, there is no
convention for designating individuals low or high in speech anxiety for the PRCS, and cutoffs
are typically made arbitrarily (Moscovitch & Hoffman, 2006), so it is unclear what constitutes high or low speech anxiety.

Another explanation for the null findings is that the topic of the speech stressor may have unexpectedly confounded results; defending oneself from being wrongfully accused of stealing a belt is an out of ordinary experience that may have elicited other forms of anxiety in people. For example, speaking about being accused of stealing may have elicited some kind of confrontation anxiety rather than the desired speech anxiety, thereby diluting the results and making it more difficult to detect differences between groups. In the future, when looking at speech anxiety more thought should be had in picking a more trait-specific topic.

The second hypothesis, that evaluative threat during preparation and performance of a speech would increase reactivity more than a minimized-evaluative threat situation would, was supported by this study; the evaluation condition had higher reactivity compared to the minimized-evaluation condition for five of the six dependent variables (HR, SBP, DBP, PEP, CO), suggesting that the evaluation condition was indeed more stressful than the minimized-evaluation condition. In addition, typically in active coping tasks such as the speech task in this study, we would expect to see increases in CO and PEP coupled with the increases in BP and HR while TPR remained relatively constant. TPR, though, increased for both the evaluation and minimized-evaluation conditions similarly during the speech and preparation tasks which would be considered a mixed hemodynamic response (Gregg et al., 2005), suggesting that there was some level of threat occurring in each condition (i.e. vascular responding) in addition to the myocardial responses. TPR reactivity for the minimized-evaluation condition though was not substantial enough to increase blood pressure reactivity to comparable levels of that in the evaluation condition, which could be a result of the minimized-evaluation task being a less stressful active coping task, and therefore possessing less CO influence. Both repeated vascular and mixed hemodynamic responding can have detrimental health outcomes. For example,
repeated vascular responding can lead to vascular hypertrophy, and repeated mixed hemodynamic responding may lead to vascular changes that are risk factors for hypertension (Gregg et al., 2005). In sum, the evaluative threat manipulation was successful, and inline with the physiological results, self-reports indicated that those in the evaluation condition felt more anxiety and stress than those in the minimized-evaluation condition.

The third hypothesis, that during increased evaluative threat those high in trait speech anxiety would benefit from thoughts of a supportive tie and that those low in speech anxiety would have less reactivity than high anxiety participants, was not supported by this study; the results do not support the buffering hypothesis in the sense that those who were considered to be in need of social support did not apparently benefit from it; in the evaluative threat condition, there were no significant differences between high and low speech anxiety participants in reactivity to the speech stressor.

Notwithstanding, there was one exception; during the speech preparation task, there was a significant three-way interaction for heart rate. Nearly the opposite of what was predicted occurred; when in the acquaintance condition, the low-trait speech anxiety participants displayed significantly greater heart rate reactivity compared to the low-trait speech anxiety participants in supportive tie condition. Unexpectedly, there was no significant difference between high anxiety participants in the evaluation condition, suggesting that priming thoughts of an acquaintance or supportive tie had no effect on participants high in speech anxiety but may have had an influence on HR for those low in speech anxiety. In addition, visual inspection of the data suggested that those low in speech anxiety who wrote about an acquaintance had even greater reactivity than people who were high in speech anxiety.

A possible reason for the results may be found within the stress appraisal findings. Self-report data regarding level of stress and anxiety immediately prior to the speech preparation task
somewhat mirrors the physiological findings; those low in trait-speech anxiety reported significantly higher state-speech anxiety compared to those high in trait-speech anxiety.

The reactivity and stress appraisal findings appear to be counterintuitive, and go against findings in many other studies that have found socially anxious individuals to react more than less-socially anxious individuals (Feldman et al., 2004; Larkin et al., 1998; Turner et al., 1986). However, one camp of researchers has specifically examined the effects of social anxiety on cardiovascular reactivity and has demonstrated that blood pressure and heart rate reactivity for low social anxiety participants in some cases may be greater than reactivity for high social anxiety participants (Gramer & Sprinsechnik, 2008). The authors attribute these effects to the level of task engagement, stating that people high in social anxiety because they perceive the demands of the situation to outweigh their coping resources are less engaged in the task than those low in social anxiety. Participants high in social anxiety in the current study, in addition to possibly being less engaged in the speech task, may have been influenced by the priming manipulation to a lesser extent than those low in social anxiety as a result of high speech anxiety participants cognitively attending to more in the laboratory situation compared to participants low in speech anxiety. It is possible that participants high in speech anxiety were therefore less influenced by outside forces.

The underlying mechanisms responsible for the heart rate difference during the preparation task between priming groups for the low speech anxiety participants is unclear. Heart rate increases were due to three possible patterns of SNS and PNS activity; a decrease in PNS activity only, an increase in SNS activity only, or an increase in SNS and decrease in PNS (Brownley et al., 2000). The latter two patterns are both possibilities in this study because PEP, an index of SNS activity, increased significantly from baseline for both groups. Future studies should consider the assessment of both PNS and SNS influence on the heart to determine the
underlying mechanisms involved in HR reactivity by including the measurement of respiratory sinus arrhythmia.

Lastly, all of the null findings and unexpected findings may be a matter of possibly having unreliable data due to unequal sample sizes across cells. There were a number of extenuating circumstances that resulted in fewer sample sizes in some cells and more in others. For example, blood pressure data were the most reliable measures and therefore had the highest sample sizes. To detect a significant three-way interaction, a power analysis was conducted and a minimum of 104 participants was thought to be needed to detect a moderately large effect. Therefore, when data collected using impedance cardiography was deemed unusable (e.g. too much static), more participants were needed to reach the 104 participant goal for some of the variables resulting in much higher sample sizes for other dependent variables. Sample sizes within dependent variables varied slightly as well as a result of more high speech anxiety participants signing up for the study than low speech anxiety participants in general, but specifically in spring quarter. As a result, the needed cell sizes were not met in spring quarter and additional testing was resumed the following fall quarter to fill any remaining cells. In the future, closer monitoring of the number of participants in each cell will be a top priority.

Given that there were unexpected findings in stress appraisals, exploratory planned comparisons were conducted for all of the dependent variables and results revealed that during both the preparation and speech tasks, heart rate was significantly higher in the evaluation condition for low anxiety participants that wrote about an acquaintance compared to a supportive tie. Future studies should examine the possible influence priming has on those low in anxiety to see whether priming thoughts of social support lowers reactivity in these individuals or if thoughts of an acquaintance increase reactivity. There is evidence that mismatched support, support given by ambivalent persons, and negative interactions with others can cause increases in reactivity (Reynolds & Perrin, 2004). Perhaps low anxiety participants, though they were not in
need of social support, were negatively affected by writing about an acquaintance because the priming task resulted in reduced thoughts of social support and increased thoughts of ambivalent, unsupportive ties; what is more, participants writing about an acquaintance were asked about the amount of support provided by this person, as a manipulation check, immediately before the speech task instructions which may have further primed thoughts of being unsupported; they reported lower perceived levels of social support from this person on the social relationship index compared to those who wrote about a supportive tie.

Lastly, during the recovery period there was a main effect of evaluative threat but only for SBP and DBP. Additionally, results revealed that all groups displayed higher than baseline levels of SBP and DBP during the beginning of the recovery. All other variables, though they were significantly higher than baseline during the preparation and speech tasks, were back to baseline levels at the start of data collection for the recovery period, and SBP and DBP returned to resting levels after one to two minutes, suggesting that on average all participants recovered very quickly from the speech task. This is not surprising because past researchers have found similar results when using this kind of stressor (Linden et al., 1997).

Limitations of the Present Study

In addition to limitations already mentioned, another limitation to this study is in the manipulation of thoughts of supportive ties. At this time, it is unknown whether the manipulation was successful in priming thoughts that would carryover to the preparation and performance of the speech because the hypotheses were not supported and the validity of the manipulation has not been assessed. However, our manipulation check did show that participants were thinking about supportive ties as more supportive and acquaintances as less supportive. The ecological validity of the priming might also be called into question because participants were not explicitly asked to think about their supportive tie immediately before the preparation and performance of the stressful task. In real life situations people may actively bring to mind their supportive person
prior to engaging in stressful speeches as a way to calm themselves. In this study, it was assumed that the priming task would be strong enough to influence participants unconsciously and without prompts because Smith et al. (2004) were able to produce significant findings in support of the buffering hypothesis. Future studies should further examine the priming manipulation to test its validity.

Another concern is in regards to the pretest questionnaire that assessed participant’s level of speech anxiety (i.e. Personal report of confidence as a speaker scale). Participant’s level of trait speech anxiety was assessed only one time, which calls into question the reliability of the participant’s responses and therefore the reliability of categorizing participants into high and low speech anxiety groups. It is possible that the lack of significant differences between high and low speech anxiety participants resulted because the speech anxiety groups were not valid. However, when a cronbach’s alpha was performed to assess the internal consistency of the questionnaire it proved to be to be highly reliable (alpha = .94).

After the speech task, due to the experimenter having to enter the room to turn the video camera off, there usually was about a minute lag between the time the speech ended and the time the physiological measures were recorded for the recovery period. Thus, the time between the speech task and recording of the recovery period varied among participants. It is therefore possible that other differences existed among groups --, besides SBP and DBP differences in the evaluative threat conditions -- that were not captured immediately following the speech task. Some researchers suggest that the first one to two minutes following a speech task is the crucial time period to find differences in recovery from tasks such as the one used in this study (Linden et al., 1997). As a result, differences between groups may not have been found because of the unavoidable lag in data collection at a possibly crucial time.

A final note about this study is in regards to the high amounts of unexpected data loss due to equipment malfunction. As a result, error was introduced into the study because there was a
necessary increase in the number of experimenters that interacted with the participant. In general, it is important to minimize the number of different experimenters interacting with participants because of possible differences in the way experimenters interact with participants. In social support studies it is especially important that all of the experimenters remain consistently neutral towards the participants to ensure that the social support manipulation is not confounded. Scripted protocols helped reduce experimenter differences, but the resulting increase in different experimenters naturally introduced error into the study.

Conclusion and Future Studies

The present study investigated the effects of primed social support on acute stress for individuals high or low in trait speech anxiety. The principal finding of this study was that participants high in speech anxiety were not buffered by thoughts of social support during a stressful situation, but rather low anxiety participants produced significantly larger increases in heart rate reactivity when primed with thoughts of less supportive, acquaintances compared to low anxiety participants that thought about a supportive person during anticipation of the speech task.

Future studies should examine the validity of this relatively new priming paradigm in order to be certain that it is indeed simulating the benefits of an actual observer. While Smith et al. (2004) were able to find significant differences between priming conditions in their study as well as an interaction with trait-hostility, it is possible that the priming manipulation in the current study was not as strong; even though those in the supportive tie group reported feeling more support by the person they wrote about compared to those in the acquaintance group, there is no way to know whether the priming manipulation carried over to the speech task, and therefore the power to detect differences may be smaller than originally anticipated.

As mentioned, Smith et al. (2004) found a significant personality trait (i.e. hostility) x priming manipulation interaction in addition to a main effect of the priming manipulation. One
difference in the Smith et al. (2004) compared to the current study is that high-hostile people tend to react very negatively to provisions of social support and thus Smith et al. (2004) were able to look at a trait that had polar extremes; high-hostile people who did not want social support versus low-hostile people who would be more open to provisions of social support. On the other hand, the current study examined the trait speech anxiety. Even though participants were designated high or low in speech anxiety, it is unlikely that any of these people would have had the aversive reactions that high-hostile people may have towards social support because of the differing nature of the traits. Thus, one possible explanation for the failed replication of Smith et al’s (2004) study is that power may have been reduced as a result of having less-polar participants than Smith et al. (2004).

Gender was also not addressed in this study and should be looked at in the future. As with any study that uses an introductory psychology student pool, there was a larger amount of women available to participate than there were men; in total, there were 101 women (60 low anxiety; 41 high anxiety) and 57 men (17 low anxiety; 40 high anxiety) that participated in the study. Past research has indicated that men and women sometimes respond differently to emotional social support and that men may benefit more from informational support than emotional support (Craig & Deichert, 2002). There was a higher proportion of men in the high speech anxiety condition compared to the low speech anxiety condition, and because there is evidence that men do not benefit as much as women from emotional support, it is possible that the results of this study would be different if gender had been considered.

In the future, investigators should also examine and determine the PRCS criteria for designating people with or without speech anxiety. In addition, it may be important to specifically compare trait and state anxiety because results of the current study suggest that there is a discrepancy between how people might be classified based on the trait versus state self-reports. It is possible however that this discrepancy was a result of administering the trait anxiety
measure only at one time point and therefore it may not have been a valid measure of anxiety; in
the future, steps should be taken to ensure that participants are classified correctly. And finally,
more considerations should be taken in picking trait-specific topics for speech tasks in order to
minimize the likelihood of eliciting other traits and maximize our understanding of the person-
environment interaction.

As a final note, this study was designed in an attempt to find support for the buffering
hypothesis and to understand why there are conflicting findings in the social support-
cardiovascular reactivity literature. However, this study further added to the mixed findings and
called into question whether social support universally buffers individuals from the
physiological effects of acute laboratory stress.
References


Appendix A: The Personal Report of Confidence as a Speaker (PRCS)

Note that the researcher will be able to tie the information you provide here to your Oak ID.

Please read over each statement and then indicate whether “true” or “false” most represents your feelings associated with your most recent speech.

<table>
<thead>
<tr>
<th>Statement</th>
<th>True</th>
<th>False</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.) I look forward to an opportunity to speak in public.</td>
<td>☑️</td>
<td>☐️</td>
</tr>
<tr>
<td>2.) My hands tremble when I try to handle objects on the platform.</td>
<td>☑️</td>
<td>☐️</td>
</tr>
<tr>
<td>3.) I am in constant fear of forgetting my speech.</td>
<td>☑️</td>
<td>☐️</td>
</tr>
<tr>
<td>4.) Audiences seem friendly when I address them.</td>
<td>☑️</td>
<td>☐️</td>
</tr>
<tr>
<td>5.) While preparing a speech I am in a constant state of anxiety.</td>
<td>☑️</td>
<td>☐️</td>
</tr>
<tr>
<td>6.) At the conclusion of a speech I feel that I have had a pleasant experience.</td>
<td>☑️</td>
<td>☐️</td>
</tr>
<tr>
<td>7.) I dislike to use my body and voice expressively.</td>
<td>☑️</td>
<td>☐️</td>
</tr>
<tr>
<td>8.) My thoughts become confused and jumbled when I speak before an audience.</td>
<td>☑️</td>
<td>☐️</td>
</tr>
<tr>
<td>9.) I have no fear of facing an audience.</td>
<td>☑️</td>
<td>☐️</td>
</tr>
<tr>
<td>10.) Although I am nervous just before getting up I soon forget my fears and enjoy the experience.</td>
<td>☑️</td>
<td>☐️</td>
</tr>
<tr>
<td>11.) I face the prospect of making a speech with complete confidence.</td>
<td>☑️</td>
<td>☐️</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>12.) I feel that I am in complete possession of myself while speaking.</td>
<td>☑ TRUE</td>
<td>☑ FALSE</td>
</tr>
<tr>
<td>13.) I prefer to have notes on the platform in case I forget my speech.</td>
<td>☑ TRUE</td>
<td>☑ FALSE</td>
</tr>
<tr>
<td>14.) I like to observe the reactions of my audience to my speech.</td>
<td>☑ TRUE</td>
<td>☑ FALSE</td>
</tr>
<tr>
<td>15.) Although I talk fluently with friends I am at a loss for words on the platform.</td>
<td>☑ TRUE</td>
<td>☑ FALSE</td>
</tr>
<tr>
<td>16.) I feel relaxed and comfortable while speaking.</td>
<td>☑ TRUE</td>
<td>☑ FALSE</td>
</tr>
<tr>
<td>17.) Although I do not enjoy speaking in public I do not particularly dread it.</td>
<td>☑ TRUE</td>
<td>☑ FALSE</td>
</tr>
<tr>
<td>18.) I always avoid speaking in public if possible.</td>
<td>☑ TRUE</td>
<td>☑ FALSE</td>
</tr>
<tr>
<td>19.) The faces of my audience are blurred when I look at them.</td>
<td>☑ TRUE</td>
<td>☑ FALSE</td>
</tr>
<tr>
<td>20.) I feel disgusted with myself after trying to address a group of people.</td>
<td>☑ TRUE</td>
<td>☑ FALSE</td>
</tr>
<tr>
<td>21.) I enjoy preparing a talk.</td>
<td>☑ TRUE</td>
<td>☑ FALSE</td>
</tr>
<tr>
<td>22.) My mind is clear when I face an audience.</td>
<td>☑ TRUE</td>
<td>☑ FALSE</td>
</tr>
<tr>
<td>23.) I am fairly fluent.</td>
<td>☑ TRUE</td>
<td>☑ FALSE</td>
</tr>
<tr>
<td>24.) I perspire and tremble just before getting up to speak.</td>
<td>☑ TRUE</td>
<td>☑ FALSE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>----------------------------------------------------------------</td>
<td>---</td>
</tr>
<tr>
<td>25.)</td>
<td>My posture feels strained and unnatural.</td>
<td></td>
</tr>
<tr>
<td>26.)</td>
<td>I am fearful and tense all the while I am speaking before a group of people.</td>
<td></td>
</tr>
<tr>
<td>27.)</td>
<td>I find the prospect of speaking mildly unpleasant.</td>
<td></td>
</tr>
<tr>
<td>28.)</td>
<td>It is difficult for me to search my mind calmly for the right words to express my thoughts.</td>
<td></td>
</tr>
<tr>
<td>29.)</td>
<td>I am terrified at the thought of speaking before a group of people.</td>
<td></td>
</tr>
<tr>
<td>30.)</td>
<td>I have a feeling of alertness in facing an audience</td>
<td></td>
</tr>
</tbody>
</table>
Appendix B: Ohio University Consent to Participate in a Research Study

Title of Research: Social Factors Relating to Physiological Reactivity
Principal Investigator: Amy R. Borchardt B.S.
Department: Psychology

Federal and university regulations require signed consent for participation in research involving human subjects. After reading the statements below, please indicate your consent by signing this form.

Explanation of Study

Purpose of the research: The purpose of this research is to examine how social factors influence physiological responses during a moderately engaging task.

Procedures to be followed: To be eligible to participate, you must: be a male or female between the ages of 18 and 35; have no history of heart problems; have no high blood pressure; not be taking cardiovascular medication, such as beta blockers, calcium channel blockers or ace inhibitors; and be generally in good health. If you choose to participate, physiological measures will be recorded throughout the experiment. We will attach disposable, adhesive electrodes to your neck and torso and a blood pressure sensor to your wrist for cardiovascular measures. You will be asked to complete some questionnaires, engage in a writing task, and perform a moderately engaging task meant to increase physiological responses over resting levels. Portions of this session will be videotaped for research purposes. Some of your responses to questions you answered during the Psychology pre-test will be matched to your data that we collect in this study.

Duration of subject's participation: This experiment lasts 1 hour.

Identification of specific procedures that are experimental: n/a

Risks and Discomforts
There is minimal risk associated with the cardiovascular assessment procedures. You may experience discomfort during the removal of the adhesive electrodes; the experimenter will use care when removing them or you may choose to remove them yourself.

Benefits
You will learn about research in psychophysiological mechanisms related to stress and health and through the debriefing procedures, you will be made aware of existing knowledge regarding associations among social support and health.

This research will improve our understanding of social support’s effects on physiological reactivity to stress. In turn, we will gain a better picture about the associations between social support and health.

Confidentiality and Records
All information and data collected from you, including completed questionnaires and writings, and physiological data, as well as any data we obtain from your Psychology pre-test responses,
will be identifiable only by a numeric code; no identifying information will be tied to the raw
data. **Data we obtain from the Psychology pre-test is identified by your Oak ID.**

**In order to obtain these data, we ask that you provide us with your Oak ID:**

________________________________________

**Once we obtain the relevant pre-test data, we will identify it only by the numeric code that identifies all of your data. Your Oak ID will not be tied to your data in any way.**

Videotaped material of this session will only be accessible to the researchers, will be identified by number only, and will be destroyed upon completion of this research.

All of your information obtained from this research will be kept strictly confidential and maintained in locked files, accessible only to the Principle Investigator. However, if the data resulting from this study are published, members of the scientific community are, in accordance with policies of several government and scientific agencies (including the National Institutes of Health), privy to the computer version of the data. Again, there would be no identifying information in this version of the data and the Primary Investigator will keep the copies of the raw data. Your name will be in no way tied to these data.

**Compensation**

You will be compensated 1 credit hour to fulfill research requirements as part of the Introductory Psychology class or to receive extra credit for other classes offering research credits. You may withdraw at any time without penalty.

**Contact Information**

If you have any questions regarding this study, please contact **Ms. Amy Borchardt, email: ab103004@ohio.edu, phone number: 593.0413.**

If you have any questions regarding your rights as a research participant, please contact Jo Ellen Sherow, Director of Research Compliance, Ohio University, (740)593-0664.

I certify that I have read and understand this consent form and agree to participate as a subject in the research described. I agree that known risks to me have been explained to my satisfaction and I understand that no compensation is available from Ohio University and its employees for any injury resulting from my participation in this research. I certify that I am 18 years of age or older. My participation in this research is given voluntarily. I understand that I may discontinue participation at any time without penalty or loss of any benefits to which I may otherwise be entitled. I certify that I have been given a copy of this consent form to take with me.

Signature_________________________________________ Date________

Printed Name_________________________________________
Appendix C: Personal Data and Health Questionnaire

Please respond to the questions below as accurately as you can. All of your responses are completely confidential and will be identified only by your participant ID number. As with all of the information we will collect today, your name and identity will not in any way be tied to your responses.

1. Gender (circle one): Male  Female

2. Age ____________________

3. Are you Hispanic or Latino?:
   Yes_____   No_____

4. Which of the following would you say is your race? (Please mark all that apply):
   _____White
   _____ Black or African American
   _____ Asian
   _____ Native Hawaiian or other Pacific Islander
   _____ American Indian, Alaska Native
   _____ Other: Please specify: ____________________________
   _____ Don’t know/Not sure

*If you chose more than one option above, please answer question 3a. If not, please go to question 4.*

3a. Which of these groups would you say **best** represents your race? (Please mark only one response):
   _____White
   _____ Black or African American
   _____ Asian
   _____ Native Hawaiian or other Pacific Islander
   _____ American Indian, Alaska Native
5. What is your relationship status (please check one)?

- [ ] single
- [ ] in a dating relationship
- [ ] cohabitating with my partner
- [ ] married
- [ ] common law marriage
- [ ] separated
- [ ] divorced
- [ ] widowed

6. Do you have a heart murmur?

Yes_____  No_____

7. Do you have high blood pressure?

Yes_____  No_____

8. Have you had any heart or blood vessel disease such as heart attack or stroke?

Yes_____  No_____

9. Are you taking beta blockers or other heart or blood pressure medication?

Yes_____  No_____

If YES, please indicate type of medication: ________________________________

10. Have you had surgery in the past 3 months?

Yes_____  No_____

If YES, please indicate type of surgery: ________________________________

11. To the best of your knowledge, do you have or have ever had any hormone or immunological problems?

Yes_____  No_____

If YES, please explain: ________________________________

Do you have any of the following conditions?

12. Rheumatoid arthritis  Yes_____  No_____

13. Asthma  Yes_____  No_____
14. Heart trouble    Yes_____  No_____
15. Diabetes    Yes_____  No_____
16. Cancer within the past 5 years    Yes_____  No_____
17. Thyroid problems    Yes_____  No_____
18. Other chronic condition    Yes_____  No_____

If Yes, please indicate chronic condition_______________________________________
19. Do you take oral contraceptives (i.e., the pill) or use some other type of birth control hormone therapy (e.g., Depo-Provera or similar injections)?

Yes_____  No_____
20. Please list any other medications you are taking, especially for any conditions above (for example, asthma or arthritis medications):
21. Are you pregnant or nursing at the present time?

Yes_____  No_____

For the following questions, use your best estimate:

22. **When was the last time you had anything to eat? Please indicate the time:**
   ____:______  am  pm
23. On average, how much caffeine do you consume each day?
   Caffeinated coffee/tea: ________________ cups
   Caffeinated soda: _______________ cups
   Other caffeinated beverage: ________________ cups

   **Have you had any caffeinated beverages today?** Yes________   No________

   **If Yes, what time did you consume your last caffeinated beverage?**
   ____:_______ am   pm
24. On average, how much of the following do you consume each day?
   Fruit: ________________ cups
   Vegetables: ________________ cups
25. Do you exercise regularly?

Yes _____ No _____

If yes, approximately how much time per week do you spend on the following activities? (please specify minutes or hours)

Walking/jogging: ________________ (do not include walking to classes)
Walking/jogging to classes: ________________
Swimming: ________________
Weight Lifting: ________________
Aerobics: ________________
Other (please specify) ________________________________
Appendix D: Social Relationships Index (Revised)

Please complete the scale below with reference to the person that you wrote about. Remember, all of your answers are confidential.

<table>
<thead>
<tr>
<th>Approximately length of time you have known this person: (years or months)</th>
<th>Average number of times per week you have contact with this person:</th>
<th>HOW IMPORTANT is this person to you?</th>
<th>HOW LIKELY are you to go to this person for support?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1=Not at all</td>
<td>1=Not at all</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2=A little</td>
<td>2=A little</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3=Somewhat</td>
<td>3=Somewhat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4=Moderately</td>
<td>4=Moderately</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5=Very</td>
<td>5=Very</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6=Extremely</td>
<td>6=Extremely</td>
</tr>
<tr>
<td></td>
<td>(circle one number)</td>
<td>(circle one number)</td>
<td>(circle one number)</td>
</tr>
<tr>
<td>1 2 3 4 5 6</td>
<td>1 2 3 4 5 6</td>
<td>1 2 3 4 5 6</td>
<td>1 2 3 4 5 6</td>
</tr>
</tbody>
</table>
# Appendix E: Stress Appraisal Questions

## Pre-task

1. **How threatening do you expect the upcoming task to be?**
   - 1 Not at All
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7 Extremely

2. **How demanding do you expect the upcoming task to be?**
   - 1 Not at All
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7 Extremely

3. **How stressful do you expect the upcoming task to be?**
   - 1 Not at All
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7 Extremely

4. **How able will you be to cope with the upcoming task?**
   - 1 Not at All
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7 Extremely

5. **How well do you think you will perform on the task?**
   - 1 Not at All
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7 Extremely
### Post-task

1. How threatening was the task you just performed?

<table>
<thead>
<tr>
<th>Not at All</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Extremely</th>
</tr>
</thead>
</table>

2. How demanding was the task you just performed?

<table>
<thead>
<tr>
<th>Not at All</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Extremely</th>
</tr>
</thead>
</table>

3. How stressful was the task you just performed?

<table>
<thead>
<tr>
<th>Not at All</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Extremely</th>
</tr>
</thead>
</table>

4. How able were you to cope with the task you just performed?

<table>
<thead>
<tr>
<th>Not at All</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Extremely</th>
</tr>
</thead>
</table>

5. How well do you think you performed on the task?

<table>
<thead>
<tr>
<th>Not at All</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Extremely</th>
</tr>
</thead>
</table>
Appendix F: Minimized-evaluation Scripted Argument

I was walking out of the store with my friends at the same time a crowd of people were walking out when an alarm went off. I had been looking for a new belt.

The security guard must have been stereotyping because my friends and I were the only ones out of the crowd of people who were stopped. I don’t understand why we were the only ones stopped, it doesn’t seem fair.

Yes, I was wearing a belt when I left the store, but I was wearing it when I entered the store too. I would suggest examining the security cameras closely to see if I had a belt on when I entered the store. Plus, you can see some wear on my belt, suggesting that it is not brand new. This is one of my favorite stores and I shop here often, so naturally I would be wearing items from this store when I go shopping here. It must have been my unlucky day though because the security guard thought I had stolen the belt.

The security guard should be told that when an alarm sounds, all people leaving should be stopped and questioned; customers should not be stopped arbitrarily. It goes to show that stopping only us was a bad decision because someone else in the crowd stole had to of stolen something and got away with it because of this mix up.

Besides being picked from the crowd unfairly, I guess the security guard handled the rest of the situation well. Thankfully, he listened to my arguments and realized that I could not have stolen the belt.

I must admit that I’m unsure about coming back to this store again for fear that something like this will happen again. I don’t like being wrongfully accused of shoplifting. I’d like some sort of retribution, maybe a gift card or something. Otherwise, I’m going to be sure to tell my friends about what happened and stop shopping here.

So, to repeat my argument…. I went to the store to shop for a new belt. When the alarm sounded, I must have looked suspicious because I was wearing a belt from this store that I had previously purchased. The security guard must have noticed that I was wearing the belt, and when the alarm sounded he only stopped my friends and me. However, there were many other people who were leaving when I was, and I think they all should have been stopped. Once the security guard saw how old my belt was he knew I could not have stolen it, and because of his stereotyping my friends and me, someone else got away with shoplifting. I am unhappy with the security guard’s choice to only stop me and my friends and I think there should be some sort of retribution for the embarrassment and time this all has cost me.
Appendix G: Debriefing Form

Thank you very much for participating in this study. Your participation is extremely valuable for our understanding of the ways stress influences health. The purpose of this study is to examine how social support and social anxiousness influence the way people respond physiologically to social evaluation. Studies show that having supportive people in our lives helps us to cope with stress better. In some studies, people respond in physiologically healthier ways to stress when they perceive themselves as being supported by other people, but not all studies have provided consistent results. We are examining whether certain people who find themselves in certain situations may be more or less benefited by social support. For instance, someone who may be more nervous about preparing and giving a speech may benefit more from social support in that situation than someone who is less nervous about giving a speech.

To address this, some participants are randomly assigned to a social support condition where they write about a supportive person in their life to activate thoughts about their social support. In a control condition, participants write about an acquaintance. We will examine whether people made aware of their social support will have reduced physiological responses to the speech. In addition, all participants provided information about their nervousness regarding social and speaking situations during the Psychology pre-test. Thus, we will examine the extent to which being nervous about social and speaking situations influences physiological responses during the speech, as well as whether social support is more beneficial for individuals who are more nervous about social and speaking situations compared to those who are less nervous about these situations.

If you have any questions, please feel free to contact us (see informed consent form for contact information).