1-1-2011

# Family-Supportive Supervisory Behaviors as a Moderator of the Relationship between Job Strain and Workers' Blood Pressure

Christopher Scott Harper
*Portland State University*



10.15760/etd.198

# Family-Supportive Supervisory Behaviors as a Moderator of the Relationship between Job Strain and Workers' Blood Pressure

by

Christopher Scott Harper

A thesis submitted in partial fulfillment of the
requirements for the degree of

Master of Science
in
Psychology

Thesis Committee:
Leslie B. Hammer, Chair
Todd Bodner
Robert Roeser

Portland State University

# Abstract

Cardiovascular disease is one of the leading causes of death in industrialized nations. Research indicates that job strain may be significantly related to cardiovascular disease in employees with little to no social support. Using the JDC-S model developed by Karasek (1979) and elaborated upon by Johnson and Hall (1988), the family-supportive supervisory behaviors (FSSB) measure created by Hammer et al., (2009), and the blood pressure wrist monitor device Omron317T, this study examined FSSB as a moderator of the relationship between job strain, job demands, job control and workers' blood pressure on work and non-work days. Sixty-nine grocery store workers from a Midwest grocery store chain participated in this study, fifty-six of which were included in the analyses. Though none of the interactions were significant at the .05 level, results indicate that FSSB is significantly related to a number of blood pressure readings at the grand centered mean of job strain, job control, and job demands.

Table of Contents

List of Tables

# List of Figures

# Chapter I

## Introduction

Cardiovascular disease is a major cause of death in the industrialized world and is projected to be the leading cause of death worldwide by 2020 (World Health Organization, 2009). In 2007, it was estimated that cardiovascular disease caused close to 36% of all deaths worldwide (World Health Organization, 2009).

Researchers have identified what are believed to be the major risk factors that contribute to cardiovascular disease – smoking, total cholesterol levels, elevated blood pressure (hypertension), weight, diabetes, and lack of exercise (Schnall, Belkic, Landsbergis, & Baker, 2000). However, high blood pressure, the leading cause of cardiovascular disease, has been linked to work stressors, and much remains to be learned from the role work plays in the development of cardiovascular disease (Landsbergis, Schnall, Belkic, Schwartz, Baker, & Pickering, 2008).

It is important to note that cardiovascular disease and hypertension appear to be of recent historical origin. A major cross-cultural study among farmers, herders and other non-industrialized populations found that there was no rise in hypertension with age (Waldron, Nowartarski, Friemer, Henry, Post, & Witten, 1982). This was a major discovery because researchers had previously assumed blood pressure rose in all individuals with age (Schnall et al., 2000). Waldron et al. (1982) also showed a significant correlation between blood pressure and a money economy versus those living in a trade economy. These are important factors as we investigate the role of work stress and cardiovascular disease.

The recent development of hypertension as a global epidemic has coincided with the rise of economic globalization and urbanization (Graziano, 2004). Graziano (2004) reported that in developing countries, hypertension has seen exponential growth among its population and is mostly attributed to work stress. Graziano (2004) also showed that trends in working conditions in the United States, including outsourcing, off-shoring, part-time and temporary work, loss of benefits, and overall work production increases, are putting more strain on the worker and causing more workers to feel 'stressed' at all socioeconomic levels.

Research has shown that socioeconomic and occupational status is significantly related to cardiovascular disease (Schnall et al., 2000). For example, the Whitehall Studies, explained in depth in a future section of this manuscript, showed that cardiovascular risk was much higher for those in the lowest levels of the British Civil Service – a highly stratified system (Kawachi & Marmot, 1998).

Many of the studies of job strain and cardiovascular disease published between 1980 and 2007 showed that workers facing high levels of job stress had much higher rates of cardiovascular disease (e.g., Belkic, Landsbergis, & Schnall, 2004; Landsbergis et al., 2008). In addition to the studies demonstrating that exposure to job strain plays a role in the development of cardiovascular disease, there have been a number of studies that examine the continued exposure to job strain after someone returns to work following a cardiovascular disease related incident (i.e., heart attack). Theorell, Perski, Orth-Gomer, Hamsten, and de Faire (1991) showed that Swedish men, who survived heart attacks before the age of 45 and returned to the same high-strain jobs, were six times more likely to die of a heart attack within the next five years than those who did not return to the same high-strain job.

The association between cardiovascular disease, hypertension, and job strain is prevalent throughout the literature (e.g., Uchino, Cacioppo, & Kiecolt-Glaser, 1996; Van der Doef & Maes, 1999; Brisson, Laflamme, Moisan, Milot, Masse, & Vezina, 1999). One mechanism shown to help buffer the relationship between job strain and cardiovascular disease and its risk factors is social support (e.g., Uchino et al., 1996; Brisson et al., 1999). The association between social support and physical health outcomes has been found in cardiovascular disease, cancer, and other infectious illnesses (Uchino et al., 1996). Uchino et al. (1996) have suggested, and others followed suit, that there are multiple physiological pathways by which social support may influence illness and the progression of disease. Building upon this, there are multiple types of social support that may influence illness - spousal support, co-worker support, and supervisor support. For the purposes of this discussion, we will focus on the construct developed by Hammer (2007) and colleagues coined, ‘family-supportive supervisory behaviors.’ Supervisor support is one source of social support from work and is also a form of informal organizational support (Hammer, Kossek, Zimmerman, & Daniels, 2007). Family-Supportive Supervisory Behaviors (FSSB) is a construct developed by Hammer et al. (2007) to address the lack of conceptual clarity in the measurement of informal supervisor support for family related issues (Hammer, Kossek, Yragui, Bodner, & Hanson, 2009).

This study fills the gap between the job strain, social support, and blood pressure literature. Using Karasek’s (1979) job strain model, Hammer et al.’s (2009) family-supportive supervisor behaviors measure, and grocery store worker's wrist monitor blood pressure readings, I investigated family-supportive supervisory behaviors as a moderator of the relationship between job strain and blood pressure. In this manuscript, I review the rationale for the use of the Job-Demands-Control-Support model, as well as review the supervisor support literature - more specifically Hammer et al.'s (2009) measure of family-supportive supervisory behaviors. I address the physical health outcomes associated with job strain and worker stress, and the research surrounding social support as a buffer of this relationship. I review key historical studies surrounding work, worker stress, work-family conflict and the physical health outcomes associated with work stress. Drawing upon this theoretical background, I provide the framework for the rationale of this study.

# Chapter II

## Stress

The word ‘stress’ originates from the field of physics where it refers to the amount of force being applied to something (Chrousos & Gold, 1992). In the 1930’s Hans Selye borrowed the term stress from the study of physics and applied it to actions that can occur within the body (Chrousos & Gold, 1992). Selye popularized the concept of stress within the human body by defining stress as the “nonspecific response of the body to any demand put upon it” (Selye, 1974). Selye further clarified ‘nonspecific’ to mean a set of shared responses within the body, regardless of the nature of the cause or stressor (Selye, 1974).

Selye (1974) proposed three universal stages of coping with a stressor – alarm, resistance, exhaustion. In the first response stage – alarm – the initial reaction occurs within the body, similar to ‘fight or flight’ syndrome (Chrousos & Gold, 1992). In this ‘alarm’ stage, physiological responses are aimed at boosting physical abilities while reducing activities that make the body vulnerable. In the alarm stage the body might be exposed to infection and disease, so the immune system kicks in and the body begins to fight back. As the body begins to fight back the ‘resistance’ stage begins. After the initial ‘alarm’ reaction to a stressor, the body’s defenses are prepared for a longer, more sustained attack against the stressor (Selye, 1974). However, the body can only ‘resist’ a stressor for a certain period of time and the body eventually submits to the third stage of Selye’s theory – exhaustion. During the exhaustion stage, physiological systems in the body, including the immune system, fail and eventually cause death (Selye, 1974).

Selye’s concept that prolonged stress can produce physical disease, death, and mental impairment is widely accepted (Thoits, 2010). Though Selye’s first experiments were done on laboratory rats, the physiological responses are similar in the human population. For example, both rats and humans have shown an enlargement of the adrenal glands, weakened lymphoid tissue in the thymus, spleen, and bleeding ulcers (Thoits, 2010). It has been demonstrated that these changes are associated with the activation of the hypothalamic-pituitary-adrenocortical (HPA) axis (Thoits, 2010). The HPA triggers a natural release of steroids within the body during the resistance stage for support. However, these steroids have been shown to be harmful after prolonged elevated levels within the body (Thoits, 2010).

Selye’s premise was that prolonged action of stress hormones within the body (i.e., cortisol) has a negative impact on health. Although stress hormones are essential to normal health, over the long term they are associated with such problems as increased blood pressure, cardiac disease, and diabetes (Pearlin, Lieberman, Menaghan, & Mullan, 1981).

The body’s response to physical and emotional stressors is designed to keep the body in a homeostatic state (Selye, 1974). Although homeostasis tends to suggest constant values for variables (such as blood pressure), ranges of those values are now recognized as acceptable (Goldstein & Kopin, 2007). For example, there are variations and ranges in body temperature, blood pressure, and heart rate when responding to a stressor. Sterling and Eyer (1988) introduced the term ‘allostasis’, to describe the attainment of stability by natural variations in acceptable ranges of variables within the cardiovascular system during rest and activity. Adaptations involving allostasis to cope with real, simulated, or imagined challenges are determined by genetic, developmental, and previous experience (Goldstein & Kopin, 2007). While these variations may be effective during the short term, over time the variations have been shown to have negative cumulative effects. For example, chronic elevation of blood pressure to ensure adequate levels of blood flow to the brain can lead to stroke and cardiovascular disease (Goldstein & Kopin, 2007).

Stress and negative emotions increase the risk of cardiovascular and coronary heart disease. Being overly stressed can cause heart problems in two ways. First, people often cope through behavioral strategies that are bad for health (i.e., smoking and overeating), but stress also produces direct physiological effects on the heart (Thoits, 2010). Chronic stress leads to an over-stimulation of the sympathetic nervous system, causing higher blood pressure, the constriction of blood vessels, elevated levels of cortisol, and buildup of plaque in the arteries (Thoits, 2010). These factors can lead to cardiovascular disease and death. Chronic levels of stress may be the consequence of environmental stress but may also be moderated by factors, including social support (Thoits, 2010). Recognizing that environmental factors (i.e., work) can cause stress and strain, researchers have focused attention on workplace stress and the issues surrounding this concept.

# Chapter III

## Job-Demands-Control Model

In 1979, Robert Karasek introduced a model that outlines the impact of adverse job characteristics on the health and well-being of workers called the ‘Job Demands-Control’ model (Karasek, 1979). Karasek (1979) identified job demands and job control as the fundamental job characteristics that influence the psychological well-being of workers. The Job-Demands-Control model poses that negative consequences of work, such as psychological and/or physiological strain on the worker, are related to the dimensions of job control and job demands (Karasek, 1979). Karasek (1979) operationalized job demands as those tasks of the worker that could be quantifiable, such as timing and production workloads. Job demands were further clarified by Karasek and his colleagues by defining demands as any task within the work context, with or without time constraints, including role conflict, as well as the physical and/or emotional demands of the job (Karasek, Brisson, Kawakami, Houtman, Bongers, & Amick, 1998).

The second characteristic of Karasek’s (1979) model is job control. Job control refers to the degree of control the worker has in completing the tasks of a job – including physical and/or emotional demands (Karasek et. al, 1998). This job characteristic is commonly referred to as ‘decision latitude’. Further clarifying this construct, job control is divided into two major categories – decision authority and skill discretion (Johnson & Hall, 1988). Decision authority refers to the flexibility a worker has in completing the tasks of the job (Johnson & Hall, 1988). In a comprehensive review of the Job Demands-Control model, Van der Doef and Maes (1999) simply defined decision authority as the amount of autonomy a worker has in completing the work required of them. Skill discretion refers to the flexibility a job offers in allowing workers the ability to use individual skills to complete specific tasks (Van der Doef & Maes, 1999).

Karasek (1979) stated that those workers experiencing high job demands with low levels of job control were at the greatest risk for injury, illness, and reduced psychological well-being. Karasek (1979) referred to these work situations as 'high-strain jobs' – also referred to as the 'strain hypothesis'. Karasek (1979) also noted that those workers who experience low demands with high level of job control show the least amount of risk of injury, illness, and well-being (Karasek, 1979). These jobs were referred to as 'low-strain jobs' (Karasek, 1979).

A second hypothesis, commonly referred to as the 'learning hypothesis,' states that those jobs high in demands and high in control will lead to increased learning, motivation, and skill development among workers (Karasek, 1979). Because this study focused on the well-being of workers and the strain hypothesis, the learning hypothesis is not be elaborated upon any further.

The strain hypothesis predicts an increase of injury, illness and reduced psychological well-being for those individuals working in high strain jobs (Karasek, 1979). Reduced well-being in high strain jobs, as predicted by the strain hypothesis, can be the result of both the main and the interactive effects of job demands and control (van Vegchel, de Jonge, & Landsbergis, 2005). The 'buffer hypothesis' refers to an interactive effect of demands and control, in which control buffers the negative impacts of job demands on the well-being of the worker, both psychologically and physically (Van der Doef & Maes, 1999). As Van der Doef and Maes (1999) alluded to, the buffer hypothesis should be viewed as a specific form of the strain hypothesis and not a separate hypothesis.

Karasek (1989) did not emphasize the distinction between the main and buffer effects of the model. However, Ganster (1989) maintained that this distinction was the driving force of the Job Demands-Control model. Ganster (1989) argued that the type of effect would lead to different workplace interventions to prevent strain among employees. Ganster (1989) claimed that if the buffer hypothesis is supported, increasing job control would buffer the negative effects of demands and workplace demands would not need to be decreased. This would not be the case if the buffering hypothesis was not supported. For example, job strain may be reduced by implementing more job control, but levels of job strain would still remain high as long as job demands were high (Ganster, 1989). Ganster's (1989) paper was influential in the sense that many researchers, and a number of large scale reviews of the Job Demands-Control model, make a distinction between the main and interactive (buffering) effects in their work and cite Ganster's (1989) paper (e.g., Belkic et al., 2004; Karasek & Theorell, 1990; Kivimaki, Virtanen, Elovainio, Kouvonen, Vaananen, & Vahtera, 2006; Kristensen, 1995; Landsbergis, Schnall, Dietz, Friedman, & Pickering, 1992; Schnall, Landsbergis, & Baker, 1994; Theorell & Karasek, 1996; Van der Doef & Maes, 1999, Hausser, Mojzisch, Niesel, Schultz-Hardt, 2010).

Due to its popularity, there have been a large number of studies examining the strain hypothesis – not all of which support the strain hypothesis. For example, in the review conducted by Van der Doef and Maes (1999) less than seventy percent of the studies examining the relationship between job demands/control and health supported the strain hypothesis. However, as noted by Kristensen (1995), reviews of the Job Demands-Control model did not take into account the methodological quality of the studies under review. Building upon the notion that method quality plays an important role in testing the strain hypothesis, de Lange, Taris, Kompier, Houtman, and Bongers (2003) reviewed the methodological quality of 45 longitudinal studies testing the strain hypotheses. de Lange et al. (2003) evaluated the methodological quality using five criteria – (1) study design, (2) argument for the time lags used, (3) measures quality, (4) analyses, and (5) non-response analyses. Of the 45 longitudinal studies reviewed, 19 of them obtained ratings high enough on the criteria set to be considered 'high-quality'. The major implication for their review was the fact that all the 'high-quality' studies provided some evidence to support the strain hypothesis (de Lange et al., 2003). de Lange et al. (2003) also showed that 8 of the 19 'high-quality' studies demonstrated a combination of both main and interactive effects of the job demands-control dimensions.

*Inclusion of Support to the JDC*

In the decade following the creation of the Job Demands-Control model, Johnson and Hall (1988) integrated social support into the model as an essential characteristic of the work environment. Not only did the addition of social support change the overall model, it also changed the model's name – Job Demands-Control-Support (Johnson & Hall, 1988). The Job-Demands-Control-Support model still aimed to explain the occurrence of strain in the workplace context, but now aimed to explain variance with a support dimension included (Johnson & Hall, 1988).

The Job Demands-Control model was extended by Johnson and Hall (1988) by integrating social support at the workplace as a third element of the model. The distinction between the main and buffering effects of work characteristics is still applicable in this model. The Job Demands-Control-Support model predicts work situations high in demands, low in control and low in social support will be the most detrimental physically and psychologically to workers. These effects may be the result of the main and the buffering effects of the three work elements – demands, control, support. According to the buffer hypothesis, social support will moderate the negative impacts of high strain jobs – those jobs low in control and high in demands (Johnson & Hall, 1988).

Karasek and Theorell (1990) agreed with Johnson and Hall's (1988) addition of social support to the Job Demands-Control model. In fact, Karasek and Theorell (1990) aimed to further clarify the definition of social support in the model. Karasek and Theorell (1990) defined social support as a worker's close personal and professional relationships with co-workers and supervisors within the organizational context (Karasek & Theorell, 1990).

Johnson and Hall's (1988) addition of social support as a third dimension to the Job Demands-Control model was a major contribution. However, it must be noted that in their study, work-related social support was measured using a scale consisting of five dichotomous items (Johnson & Hall, 1988). This scale measured two aspects of support: (1) opportunity to interact at work and (2) if co-worker interaction was carried over into nonwork life (Johnson & Hall, 1988). There are two noted flaws with this scale. First, the scale does not evaluate whether the contact with the co-worker was positive or negative (Johnson & Hall, 1988). Secondly, it makes no mention of whether or not the co-worker was a superior, an equal, or a subordinate (Johnson & Hall, 1988).

The Job Demands-Control-Support model can be seen as a three-way interactive model. Specifically, the model proposes that the highest strain in workers arise in the work environment where demands are high, control is low, and social support is low (Karasek & Theorell, 1990). The present study focused on family-supportive supervisory behaviors as a moderator of the relationship between job strain and physical health outcomes in workers (specifically blood pressure). This being stated, it is important to review recent comprehensive literature reviews of the Job Demands-Control-Support model.

*Van der Doef and Maes (1999)*

Van der Doef and Maes (1999) conducted an extensive, narrative review, of the empirical studies on the Job Demands-Control-Support model. This review included studies that met the following criteria: (1) publication in the period of 1979 – 1999; (2) reference to the Job Demands-Control-Support model; (3) inclusion of at least the two core dimensions of the model – job demands and job control; (4) examination of the combined effects of the demands, control, and support dimensions; (5) examination of subjects in a work setting and (6) examination of general psychological well-being as an outcome variable (Van der Doef & Maes, 1999). Using these criteria, Van der Doef and Maes (1999) were able to include 63 samples in their comprehensive review. Van der Doef and Maes (1999) were more specifically interested in reviewing studies that examined the ‘strain’ and/or ‘buffer’ hypothesis.

As reviewed, the strain hypothesis states that the highest level of ill health in a worker is expected when that worker experiences high demands, low job control and low social support (Theorell & Karasek, 1996). The buffer hypothesis predicts that high levels of job control and social support can ‘buffer’ the negative consequences of high demands on a worker’s health (Theorell & Karasek, 1996).

Studies examining the buffer hypothesis were defined as those studies that specifically targeted the interactive effects between the three dimensions of job demands, job control, and social support, in addition to the main effects (Van der Doef & Maes, 1999). Van der Doef and Maes (1999) defined studies examining the strain hypothesis as those that specifically compared high strain groups to low strain groups. The review revealed that the ‘strain’ hypothesis dominated studies involving cardiovascular disease related illness (Verhoeven, Maes, Kraaj, & Joekes, 2003). In contrast, the ‘buffer’ hypothesis proved to be most prevalent in research on self-reported complaints. Looking at both hypotheses, working in high strain (high demand) jobs appears to be associated with an elevated risk of cardiovascular disease and other negative health outcomes (Van der Doef & Maes, 1999). While the literature review conducted by Van der Doef and Maes (1999) provided considerable evidence for the strain hypothesis, support for the moderating influence of job control and social support was less consistent (Van der Doef & Maes, 1999).

*Hausser (2010)*

In the most recent review of the JDC-S, Hausser (2010) aimed to update Van der Doef and Maes’s 1999 review that included research dated from 1979 – 1999, to now include publications dated 1998 – 2007. In summary, Hausser (2010) concluded that the evidence for the main effects of the JDC-S model has been established beyond a reasonable doubt and there is no reason for future studies to evaluate the main effects of the model. On the other hand, similar to the findings of Van de Doef and Maes (1999), support for the interactive effects of the model is mixed. Of the 97 studies reviewed, 29 (30%) provided some support for the interactive effects of the JDC-S and only 3 studies (6%), provided full support of the interactive effects.

*Health Outcomes of Job Strain*

The Job-Demands-Control-Support model has played the role of a paradigmatic model in research studies investigating job strain, psychological factors and cardiovascular disease. A qualitative review of the epidemiologic studies measuring cardiovascular disease and job strain by Belkic, Landsbergis, Schnall, and Baker (2004) showed that job strain was linked to the prevalence of cardiovascular disease. In Johnson and Hall's (1988) groundbreaking study, the authors showed that not only should the Job Demands-Control model add a third dimension, support, but they also concluded that lack of social support at work further increases a worker's risk for cardiovascular disease. Two other studies in 1996, one by Uchino, Cacioppo, and Kiecolt-Glaser (1996), and another by Johnson, Stewart, Hall, Fredlund, and Theorell (1996), also concluded that the risk for cardiovascular disease among workers was much greater for those who felt low levels of social support.

As noted by Johnson et al., (1996), evidence suggests a causal effect of job strain on cardiovascular morbidity and mortality, but the mechanisms underlying this are poorly understood. For example, Karasek and Theorell (1990) note that job strain may influence the traditional cardiovascular risk factors such as smoking, lack of exercise, and poor diet. These factors, could in turn, be the underlying mechanism behind the risk of cardiovascular disease.

Of all the risk factors involved in cardiovascular disease, high blood pressure is the risk factor that has received the most attention in the literature. A prospective study conducted by Schnall, Schwartz, Landsbergis, Warren, and Pickering (1998) confirmed the effects of job strain on blood pressure by showing a significantly higher rise in blood pressure across a period of three years in workers with high levels of job strain. It is important to note that Uchino et al., (1996) found that social support was associated with lower levels of blood pressure in the majority of studies they reviewed. However, these effects only seemed to apply to social support received from family and friends, rather than job-related social support (Uchino et al., 1996).

The job-strain model has been the most widely used model for evaluating the work environment and its potential impact upon the cardiovascular system (Theorell & Karasek, 1996). Since the introduction of the model, many empirical investigations have been published concerning the relationship between job strain and cardiovascular disease outcomes, including coronary artery disease, and cardiovascular related death (Belkic et al., 2004). Schnall, Landsbergis, and Baker (1994) have noted that a large percentage of the studies they reviewed found a significant association with job strain and cardiovascular mortality or morbidity. Of the studies Schnall et al. (1994) reviewed, 16 of the 22 confirmed an association between job strain and cardiovascular disease symptoms. Generally speaking, studies of job strain and cardiovascular disease, as determined through coronary heart problems, have shown much more consistent results than studies of job strain and cholesterol levels, smoking, and diet – all risk factors for cardiovascular disease. In their comprehensive review, Schnall et al., (1994) found very little evidence to make an association between cholesterol levels, smoking, and diet, as they pertain to job strain.

In one of the most recent reviews of job strain and cardiovascular disease risk, Kivimaki et al. (2006) conducted a meta-analysis that summarized the results of 14 studies examining the prediction of heart disease using the JDC-S. It was reported that the highest level of cardiovascular morbidity and mortality in these studies was found when an individual's job was characterized as 'high-strain', with low levels of social support (Kivimaki et al., 2006). To further solidify these reported findings, Belkic et al. (2004) also reported that 17 of the longitudinal studies they reviewed reported high levels of cardiovascular disease risk with those individuals who showed high levels of job demands, coupled with low levels of support and control.

In a number of comprehensive reviews, (e.g., Belkic et al., 2004; Karasek & Theorell, 1990; Kivimaki et al., 2006; Kristensen, 1995; Landsbergis et al., 1992; Schnall et al., 1994; Theorell & Karasek, 1996) the evidence supports the job strain hypothesis, but it is apparent that the underlying mechanisms are poorly understood (Kristensen, 1995). Though there seems to be an association between job strain and cardiovascular disease, the pathway between job strain and cardiovascular disease remains less certain. One pathway that seems to receive much of the attention and is of primary interest in the present study is blood pressure, more specifically high blood pressure, as a result of job strain and a pathway to cardiovascular disease. The etiology of blood pressure, more specifically high blood pressure (hypertension), is reviewed in detail, along with influential research surrounding blood pressure and job strain as risk indicators for cardiovascular disease.

# Chapter IV

## Measures of Blood Pressure

A common health problem with widespread and sometimes devastating consequences, elevated blood pressure, also known as hypertension, often remains asymptomatic until late in its course (Rau, 2006). Hypertension is one of the most important risk factors in the development of both cardiovascular and coronary heart disease (Rau, 2006). The detrimental effects of blood pressure increase continuously as the pressure rises (Rau, 2006). There is no rigidly defined threshold of blood pressure above which an individual is considered safe (Schnall et al., 1994). Nevertheless, a sustained diastolic pressure greater than 90 mm Hg or a sustained systolic pressure in excess of 140 mm Hg is considered to constitute hypertension (Schnall et al., 1994). The prevalence of hypertension increases with age and reduction of blood pressure has striking effects on incidence and death rates for heart disease, heart failure, and stroke (Schnall et al., 1994).

In general, blood pressure has a daily pattern. In non-hypertensive patients, blood pressure tends to be lower at night and during sleep. When an individual first gets out of bed, blood pressure tends to rise and continues to do so until peaking in the middle of the afternoon – usually between 3 and 4 p.m. (Clark et al. 1987).

The technique for monitoring a patient's blood pressure has undergone tremendous change since its inception in the early 1900's. The standards continue to change and clinicians and researchers have relaxed their positions that only accurate measurements of blood pressure can be done by trained personnel in a clinical setting (Landsbergis, Schnall, Belkic, Baker, Schwartz, & Pickering, 2001). One of the greatest advancements in blood pressure monitoring was the development of ambulatory devices (Landsbergis et al., 2001). Ambulatory blood pressure monitoring involves measuring blood pressure as one goes about their daily activities and while sleeping (Landsbergis et al., 2001). An ambulatory measurement of blood pressure is when one constantly wears a monitoring device that takes blood pressure readings at regular intervals. The information is usually recorded on a chip in the device and allows the doctor or researcher to get a detailed picture of blood pressure variation in that person's daily environment (Landsbergis et al., 2001).

In most cases, hypertension remains at a modest level and fairly stable over years to decades and, unless heart failure intervenes, can be compatible with a long life (Viswesvaran, Sanchez, & Fisher, 1999). However, hypertension puts individuals at a greater risk for other ailments such as cardiovascular disease, renal failure, and stroke (Viswesvaran et al., 1999). The blood pressure level in any individual is a complex trait that is determined by the interaction of multiple genetic, environmental, and demographic factors. It should not be surprising that multiple mechanisms play a role in the development of hypertension. These mechanisms constitute abnormalities of the normal physiologic regulation of blood pressure (Schnall et al., 1994).

Two numbers are recorded when taking blood pressure - the systolic pressure and the diastolic pressure (Schnall, Pieper, & Schwartz, 1990). Two numbers are necessary because the pressure within blood vessels is not static - it changes dynamically each time the heart beats (Schnall et al., 1990). While the heart is actually beating, blood is forced out of the heart and into the blood vessels (Schnall et al., 1990). This instantaneously increases the pressure within the vessels. In between heart-beats, the pressure within the blood vessels becomes lower (Schnall et al., 1990).

The blood pressure recorded while the heart muscle is contracting is the systolic pressure (Schnall, Belkic, Landsbergis, & Baker, 2000). The blood pressure recorded in between heart muscle contractions is the diastolic pressure (Schnall et al., 2000). Both numbers are important, and when a person has hypertension, the elevated blood pressure can be seen with the systolic pressure (systolic hypertension,) with the diastolic pressure (diastolic hypertension,) or both (Schnall et al., 2000). As reviewed, a "normal" systolic pressure is considered to be less than 140 mm Hg and a "normal" diastolic pressure is considered to be less than 90 mm Hg (Schnall et al., 2000).

High blood pressure is seen as one of the underlying risk factors for cardiovascular mortality and morbidity.  When blood pressure levels become both elevated and chronic, the diagnosis of ‘hypertension’ is fulfilled (Rau, 2006).  Though the etiology of hypertension is debatable, there is one general consensus among all researchers and practitioners - there is no single cause for the development of hypertension (Schwartz, Pickering, & Landsbergis, 1996).  Hypertension is the end of result of a number of genetic and environmental factors, including work-related stress (Swartz et al., 1996).

Ambulatory blood-pressure monitoring was first used in the 1970’s (e.g., Schwartz et al, 1996; Landsbergis et al., 2001; Schnall et al., 1994).  Ambulatory blood pressure monitoring was originally developed to help curb the phenomenon of ‘white-coat’ hypertension, in which a patients’ blood pressure is significantly elevated by simply being in the doctor’s office (e.g., Schwartz et al, 1996; Landsbergis et al., 2001; Schnall et al., 1994). Ambulatory blood pressure monitoring is also useful to clinicians treating patients with blood pressure that fluctuates significantly on a daily basis (Schnall et al., 1994). Because researchers were seeing such large fluctuations in blood pressure readings throughout the day, more and more emphasis was put on devices that participants could administer to themselves to help better understand these daily fluctuations.

An increasingly popular and alternative practice to ambulatory blood pressure devices are ‘self-monitoring’ devices (Stergiou, Skeva, & Zourbaki, 1998). Self-monitoring devices are generally less expensive and more widely available to clinicians and practitioners than ambulatory devices (Stergiou et al., 1998). There is evidence to suggest that self-monitoring devices can be used as an alternative to ambulatory devices when trying to eliminate white-coat hypertension (Stergiou et al., 1998). Thomas Pickering (1991) recommended the use of self-monitoring blood pressure devices as a screening test in the detection of white-coat hypertension, followed with confirmation using ambulatory monitoring.

There is convincing evidence in clinical studies that multiple blood pressure measurements obtained by self-monitoring patients improve the precision and reproducibility of blood pressure measurements (Mengden, Medina, Beltran, Alvarez, Kraft, & Vetter, 1998). Furthermore, research involving both the soft and hard sciences has shown an increasing trend for the use of self-monitoring devices for measuring blood pressure (Mengden et al., 1998). Self-monitoring of blood pressure is useful because participants can use the devices in almost any setting in or out of the workplace.

One of the most commonly used self-monitoring blood pressure device is the wrist monitor. There was resistance to the use of wrist monitors when they first came on the market and some clinicians found them to be inaccurate (Stergiou et al., 1998). However, with the introduction of a heart positioning sensor in many of the newer devices, wrist monitors continually provide valid and reliable blood pressure measurements (Stergiou et al., 1998).

Wrist monitors require the participants to measure their own blood pressure readings throughout a given period of time. A typical scenario would require participants, at periodic intervals throughout the day or night, to put the wrist monitor on their wrist, follow the instructions of the given device and record the readings for that particular time of day into a journal – many of these devices also record each reading on a chip installed in the device that can be downloaded at a later time by the clinician or the researcher. Because wrist monitors are easy to use and relatively small to carry around, multiple self-measurements can be done during a 24 hour period, both at work and at home. Blood pressure measurement in the wrist provides several advantages for participants. For example, it does not require one to roll up their sleeves or remove a layer of clothing, and the readings are less sensitive to obesity because wrist size is typically not affected by obesity (Stergiou et al., 1998). Because this study was interested in employee blood pressure readings on work and non-work days, it made sense to use wrist monitors as the self-monitoring device because they are portable, easy to use, easy to handle, and easily interpreted by participants.

As mentioned, the cardiovascular risk factor that receives the most attention in the literature is blood pressure. As researchers gathered more information surrounding blood pressure, it was apparent that blood pressure was a key indicator for cardiovascular disease and death. Several large scale studies aimed to better understand this phenomenon.

*Key Historical Studies of BP and CVD*

The three most influential studies involving cardiovascular disease, blood pressure, occupational stress, and family are the Framingham Heart Study, The Whitehall Studies, and The Work Site Study. The National Heart Institute revolutionized the study of cardiovascular disease with the Framingham Heart Study in 1948. The National Heart Institute aimed to better understand the risk factors associated with cardiovascular disease. Over 5000 people from a town in Massachusetts were recruited and followed extensively over a number of years. Drawing upon this research, the Whitehall Study investigated occupational stress, employment grade levels, and worker health in the highly stratified British Civil Service beginning in 1967. The most recent of the three studies, the Work Site Study by Schnall et al. (1990), is an extensive study focusing on job strain and blood pressure in men.

*Framingham Heart Study*

The Framingham Heart Study began in 1948 and is an ongoing cardiovascular study of the residents of Framingham, Massachusetts (Franklin, Larson, Khan, Wong, Leip, Kannel, & Levy, 2001). Under direction of the National Heart Institute the objective of the Framingham Heart study was to identify risk factors that contribute to cardiovascular disease by following a large group of participants who had not developed any detectable symptoms common to cardiovascular disease and who had not yet suffered a heart attack or stroke (Franklin et al., 2001). The study began in 1948 with the recruitment of 5,209 adult participants, aged 28 to 62 (Franklin, 2001). Prior to the undertaking of this study, very little was known about the epidemiology of both cardiovascular disease and the association between blood pressure and cardiovascular disease (Franklin, 2001).

Researchers began the first set of extensive interviews and physical examinations in 1948 and the subjects have continued to return, every two years, for full physical, lab, and lifestyle tests, including 12-lead ECG heart monitoring and full blood lab make-up (Franklin, 2001). Because the National Heart Institute was interested in genetic factors as well as lifestyle choices, the study enrolled a second-generation of participants in 1971 consisting of 5,214 of the original participants' adult children and their spouses (Franklin, 2001). This second phase of the study was coined the Framingham Offspring Study (Franklin, 2001). In 2002, a third generation of over 4,000 participants was enrolled in the ongoing study and consists of the children and spouses from the 1971 phase (Franklin, 2001).

Since the inception of the Framingham cohort, researchers have been able to identify the major risk factors in the development of cardiovascular disease and coronary heart disease (Franklin, 2001). These risk factors include; high blood pressure, smoking, obesity, high cholesterol levels in the blood, and lack of exercise, along with risk factors for age, gender, and psychosocial discrepancies (Franklin, 2001). The Framingham Heart Study has been recognized as one of the greatest sources of information for cardiovascular disease research. Researchers continue to follow-up with participants and their families, and continue to map new directions for research in this area of study (Franklin, 2001).

*Whitehall Studies*

Another influential study involving occupational stress, employment grade levels, and worker health was the Whitehall I study (Jarrett, Shipley, & Rose, 1982). The Whitehall I study compared the death rates of people in the highly stratified environment of the British Civil Service (Jarret et al., 1982). The study investigated social determinants of health, specifically cardiorespitory and cardiovascular disease prevalence and mortality rates among 18,000 British civil servants between the ages of 20 and 64. The civil servants' health was followed for a period of 10 years starting in 1967 (Jarret et al., 1982)

The initial phase of the Whitehall study found that there was a significant difference in cardiovascular disease and mortality rates among those servants in the lower grades of the civil service (Jarret et al., 1982). It was a clear association between socioeconomic status and health. The Whitehall study showed an association between grade level and cardiovascular risk factors such as obesity, smoking, exercise, and the risk factor of primary importance to the present study – high blood pressure (Jarret et al., 1982). Even after researchers controlled for these risk factors, the lowest grade of civil servant has a relative risk for cardiovascular mortality that was two times greater than compared to the highest grade.

Twenty years later, the Whitehall II study painted a similar picture to the initial phase of the study (Yarnell, 2008)). The Whitehall II study was a longitudinal, prospective study of 10,308 men and women, all of whom were employed in the British civil service at the time of recruitment in 1985 (Yarnell, 2008). Though the Whitehall II study is currently ongoing, with the ninth wave of data collected in 2007, the study continues to release staggering findings with relation to employment grade status and negative health outcomes (Yarnell, 2008). Of particular importance is the clear association of the way work climate, social influences outside of work, and health behaviors all contribute to the social gradient of health (Yarnell, 2008). As the participants in this study continue through adult life, it has become increasingly clear that health behaviors and health outcomes can be directly influenced by both work and work status. This research continues to explore the pathways and mechanisms through which social positions influence health and aims to build a causal model leading from social position through psychosocial and behavioral pathways to risk factors for disease.

Currently, the literature does not seem to come to a universally accepted cause for the phenomenon brought to light by the Whitehall studies (Yarnell, 2008). Clearly, stress is associated with a high risk of coronary heart disease, but there are so many other factors that it is hard to be specific – if at all possible. Regardless of the exact reasons why heart disease is more prevalent in lower employment grades, the results of the Whitehall studies have significantly changed the way researchers, practitioners, and physicians approach the evaluation of cardiovascular disease risk (Yarnell, 2008). The recognition of psychosocial stressors in disease prevention is of utmost importance both globally, and to the present study.

*Work Site BP Study*

The most extensive study of job strain in relation to blood pressure in men has been the study of Schnall et al. (1990) in New York known as the Work Site BP Study. After screening more than 2,500 employed men at several work sites in New York, 87 cases of hypertension and 128 controls were examined. Schnall et al. (1990) found that self-reported job strain was significantly related to hypertension after adjusting for age, race, weight, personality, alcohol, smoking, work-site, education, and physical demands of the job. With the same controls in place, Schnall et al., (1990) also found that participants falling between the ages of 30 to 40 years of age with job strain had thicker heart muscles than those participants with little job strain. The thickening of the heart muscles is a risk indicator for cardiovascular disease (Schnall et al., 2000).

Because the Work Site BP Study was a longitudinal study, Schnall et al., (1990) were able to collect data at baseline and three years later. This meant it was possible to construct a measure of cumulative exposure to job strain (Landsbergis et al., 2001). The most important finding in the Work Site BP study as it relates to the current study, is that those men reporting job strain at Time 1, but no job strain at Time 2, exhibited a decrease in blood pressure at work and at home (Schnall et al., 1990). As stated in the Landsbergis et al., (2001) paper, the decrease in blood pressure, due to a decrease in job strain over time, suggests that detection and intervention strategies can be effective.

*Summary*

The Framingham, Whitehall, and Work Site studies were all influential in providing guidance for future researchers interested in blood pressure and social influences. Up until Brisson, Laflamme, Moisan, Milot, Masse, and Vezina's (1999) study, very little research had been conducted on the effects of family responsibilities and high job strain on blood pressure among white-collar women. Brisson et al. (1999) found a significant and positive association between large family responsibilities and blood pressure among white-collar women. In this study, it was found that a combination of large family responsibilities and high job strain had the greatest effect on blood pressure – rather than a single exposure to the factors (Brisson et al., 1999).

*Work-Family Conflict & Blood Pressure*

There is a growing body of evidence, accumulating over the last three decades, examining the relationship between the work and family roles (Eby, Casper, Lockwood, Bordeaux, & Brinley, 2005). With its foundation based in role theory (Kahn, Wolfe, Quinn, Snoek, & Rosenthal, 1964), work-family conflict is a type of interrole conflict in which pressures from the work role are not compatible with pressures from the family role.

Of the first studies of its kind, the Michigan Quality of Employment Survey (Quinn & Staines, 1979) reported that those women who were married with children showed much higher levels of conflict, than those women who did not have roles outside of work. However, this research seems to be quite dated and current research concludes otherwise. For example, Ruderman, Ohlott, Panzer, and King (2002) examined the benefits of multiple life roles for white-collar women in managerial positions. It was found that a combination of work and family roles were positively associated with self-esteem, life-satisfaction, and self-acceptance (Ruderman et al., 2002). Ruderman et al. (2002) also examined qualitative responses from women who had both work and family roles and results suggested that multiple roles provided many psychological benefits to woman including emotional support outside the home, interpersonal relationship skill building, and increased overall communication skills. However, it must be noted that role ‘fit’ played an important factor in the study. For example, woman who were experiencing conflict between one of their roles, had higher levels of negative qualitative responses than those woman who little or no conflict (Ruderman et al., 2002).

In a longitudinal survey, Frone et al., (1997) surveyed 1,933 adults in New York over a period of 4 years. Participants were employed at least 20 hours per week and had at least one child in the home. Frone et al., (1997) found that work family conflict was associated with elevated levels of blood pressure among employees. There is evidence to suggest that after leaving work, it is much easier on workers without family responsibilities to decompress. Goldstein, Shapiro, Chicz-DeMet, and Guthrie (1999) reported that there was a significant decrease in heart rate from work day to evening for those women without children than for those women with children. As mentioned previously, Brisson, Laflamme, and Moisan (1999) also found that white-collar women had a much higher incidence of elevated blood pressure when coupled with children in the home as compared to those women who did not have children. In a similar study, Thomas and Ganster (1995) reported a significant relationship between work-family conflict and blood pressure among health care professionals (N=398) in Nebraska.

*Supervisor Support*

Research has noted the importance of workplace support from one's supervisor. Thomas and Ganster (1995) described the supportive supervisor as one who" empathizes with an employee's desire to balance the demands and responsibilities of both work and family" (p.7). This support includes accommodating an employee's flexible schedule, being tolerant of short personal phone calls, granting shift trades with other employees so that new elder-care arrangements can be monitored, allowing a child to accompany an employee to work, or offer kind words or advice when family issues arise (Thomas & Ganster, 1995).

Research has shown that employees who have supportive supervisors experience less work-family conflict (e.g. Frone, Russell, & Cooper, 1997; Lapierre & Allen, 2006; Thompson, Andreassi, & Prottas, 2005), and reduced work distress (Frone et al., 1997). Frone et al. (1997) reported that supervisor support was indirectly related to work-family conflict.  Allen (2001), who introduced the concept of family-supportive organization perceptions, reported that employees, who felt their supervisors were supportive, also perceived their organization as ‘family-supportive’.  Allen (2001) also reported that social support from direct supervisors has been found to facilitate the reduction of work-family conflict in workers.

O’Driscoll et al. (2003) showed that work-family conflict was significantly and positively related to worker job strain and that supervisor support moderated this effect. Building upon this research, Wang and Walumbwa (2007) reported that a key moderating variable in the relationship between worker strain and work-family conflict is supervisor support.  Wang and Walumbwa (2007) suggested that future research needed to focus heavily on the moderating effects of supervisor support.

# Chapter V

## Family-Supportive Supervisory Behaviors

Supervisor support is one source of social support from work and is also a form of informal organizational support (Hammer et al., 2009). Family-Supportive Supervisory Behaviors (FSSB) is a construct developed by Hammer et al. (2009) to address the lack of conceptual clarity in the measurement of informal organizational support (Hammer, Kossek, Yragui, Bodner, & Hanson, 2009). Hammer et al. (2009), argued that the measures of informal organizational support, at times, cross contaminated one another and that items cut across different forms of informal support (Hammer et al., 2009).

Hammer et al., (2009) identified four dimensions in the concept of FSSB: (1) emotional support, (2) instrumental support, (3) role modeling behaviors, and (4) creative work-family management as being arranged hierarchically under the larger dimension of family supportive supervision. Hammer et al., (2009) further clarified the construct of FSSB as a multidimensional construct that is superordinate, as indicated by the four distinct subordinate constructs that encompass the overall measure of FSSB. Below I will further clarify each dimension of FSSB.

*Emotional support*, in general, is the perception that an individual is being cared for, that one's feelings are taken into consideration, and that an individual feels comfortable communicating with the source of the support (Hammer et al., 2009). An emotionally supportive supervisor is one who openly communicates with employees and is aware of their family and outside work commitments. Those supervisors who are supportive make employees feel comfortable discussing family-related concerns and concerns for how work responsibilities affect family (Hammer et al., 2009). In general, terms that have been consistently seen in the literature to describe an emotionally supportive supervisor are: sensitive, sympathetic, respectful, genuine, and understanding.

*Instrumental support* is a reactive supervisor behavior that addresses how a supervisor responds to an employee's work and family needs in the form of everyday interactions with that employee (Hammer et al., 2009). These reactions include such things as scheduling flexibility due to a childcare need, the interpretation of organizational policies, and setting workplace schedules so that an employees' job is completed (Hammer et al., 2009). Instrumental support is an overall measure of how a supervisor helps employees manage both their work and their family commitments and responsibilities. Hammer et al., (2009) stated, that in general, instrumental support is a "supervisors routine reaction to manage day-to-day employee scheduling conflicts" (p. 838).

*Role modeling* behaviors are defined as those behaviors exhibited by a supervisor demonstrating how to integrate both work and family responsibilities on the job (Hammer et al., 2009). The construct of role modeling is based on Bandura's (1977) social learning theory which states that human learning occurs through direct observation rather than direct experience. In this context, Hammer et al., (2009) defined role modeling as "the extent to which supervisors provide examples of strategies and behaviors that employees believe will lead to desirable work outcomes-life outcomes" (Hammer et al., 2009, pg. 5).

The fourth dimension of FSSB is *creative work-family management*. Creative work-family management is essentially a supervisors' ability to be proactive and innovative in the supervisory role. Hammer et al., (2009) defined creative work-family management "as managerial-initiated actions to restructure work to facilitate employee effectiveness on and off the job" (Hammer et al., 2009, p. 6). These types of behaviors are those that include a supervisor's ability and willingness to make major changes to the way jobs are structured to both enhance organizational effectiveness and employee effectiveness, on and off the job. A common example of this would be the supervisor's willingness to cross train employees in order to make scheduling conflicts due to family responsibilities easier to accommodate for both the organization and the employees. The conceptualization for creative work-family management was based upon the dual-agenda literature that illustrates the benefits of organizational change for employees at work and at home (Hammer et al., 2009).

There are a number of outcomes associated with the development of Hammer et al.'s (2009) construct of family-supportive supervisor behaviors. First and foremost, Hammer et al. (2009) determined that family-supportive supervisory behaviors are distinctly different from general supervisor support. It was mentioned that a supervisor may be openly supportive of at work-related behaviors, but not as openly supportive of non-work related issues, such as family (Hammer et al., 2009). Hammer et al. (2009) also clarified what supervisor behaviors are seen as family-supportive. This distinction is important for the training and development of family-supportive supervisors in organizations. Hammer et al. (2009) stated that 'managers and employers need tangible examples of how they can change supervision' (p.852). FSSB also helps draw a distinction between general organizational level family support and supervisor level support. Hammer et al. (2009) drew the distinction between having a work-family policy on paper and the actual implementation of the policy by the direct supervisor.

*Workplace and Blood Pressure*

Because the present study is interested in family-supportive supervisory behaviors as a moderator of the relationship between job strain, job demands, job control and workers' blood pressure, it is pertinent to report on key research that has evaluated similar relationships and discuss those findings. At home blood pressure monitoring is recognized as a valid and reliable way to measure a patient's blood pressure (Schwartz et al, 1996; Landsbergis et al., 2001; Schnall et al., 1994). As previously noted, the Work Site Blood Pressure Study in 1985 used ambulatory measures to predict worker job strain (Schnall et al., 1994). In one of the largest reviews of it's kind, Steenland, Fine, Belkic, Landsbergis, Schnall, Baker, Theorell, Siegrist, Peter, Karasek, Marmot, Brisson, and Tuchsen (2000) found that not only did ambulatory blood pressure monitoring predict higher blood pressure in workers experiencing high job strain, but blood pressure continued to be elevated in workers with high blood pressure during non-work hours. Steenland et al., (2000) also reported that low skill discretion, as a main effect, was a significant predictor of high ambulatory blood pressure in workers during work and non-work hours.

In another influential study, Blumenthal, Thyrum, and Siegel (1995) examined the relationship between job strain, occupation, and marital status on workers' blood pressure. It was reported that high levels of job strain were associated with higher levels of blood pressure among women, but not men (Blumenthal et al., 1995). It should also be noted, that single women with no family responsibilities, showed significantly lower ambulatory blood pressure levels than those women who were married (Blumenthal, 1995).

Brisson et al. (1999) conducted a study to determine if family responsibilities and job strain were associated with higher levels of blood pressure among working, white-collar woman. At the time of the study, there were only two other studies that had looked at this association. In 1982, Zimmerman and Hartley had shown that working women with children had significantly higher blood pressure than those working women who did not have children. Drawing upon this research, James, Cates, Pickering, and Laragh (1989) showed that working women with children had a higher prevalence of hypertension and that blood pressure levels remained elevated even while at home.

Because there is an increasing number of women in the workplace who assume both work and family roles, Brisson et al. (1999) wanted to evaluate the association between family responsibilities and blood pressure among working women. Brisson et al. (1999) recruited over 3,000 working women, from eight different organizations, and examined them for a period of two years. The women were split into two different groups – high job strain and low job strain (Brisson et al., 1999). Among these two groups, women were further stratified into two categories – children and no children (Brisson et al., 1999). The review of their results showed that those women who reported high levels of family responsibility, coupled with high levels of job strain, showed significantly higher levels of blood pressure (Brisson et al., 1999).

There is substantial evidence that the quality of social relationships is related to health risk, both on and off the job (House, Landis, & Umberson, 1988). Low social support at work has been shown to be associated with increased risk of cardiovascular disease (i.e., higher blood pressure) and with overall levels of impaired mental health (e.g., Johnson & Hall, 1988; Uchino et al., 1996). High blood pressure recordings in clinical settings have also been shown to be associated with low levels of outside social support (Uchino et al., 1996).

In a study of male workers it was found, after controlling for several major cardiovascular risk factors including age, gender and race that those workers who reported having supportive co-workers and supportive supervisors, had significantly lower blood pressures than workers who did not (Matthews, Cottington, Talbot, Kuller, & Siegal, 1987). As previously reviewed, The Work Site Blood Pressure Study (Schnall et al., 1985) showed that ambulatory blood pressure readings were much higher for those workers that had high strain jobs. Both of these studies are consistent with others' findings that high strain jobs predict higher blood pressure among workers (e.g., Theorell et al., 1991; Light, Turner, & Hinderliter, 1992).

A recent study conducted by Berkman, Buxton, Ertel, and Okechukwu (2010), (N=452), examined the relationship between supportive supervisors, as it pertains to work-family issues, and cardiovascular disease risk factors. Berkman et al. (2010) constructed a work-family balance survey and qualitatively scored managers in an extended care facility on 'openness' and 'creativity' when dealing with employee work-family responsibilities. Berkman et al. (2010) also examined employee cardiovascular disease risk factors – including blood pressure.

Berkman et al. (2010) concluded that a manager's score on the work-family balance survey was significantly related to an employee's cardiovascular risk factors. More specifically, employees with managers scoring low on the work-family balance survey were twice as likely to have two or more cardiovascular disease risk factors –

including high blood pressure.  These findings suggest that a manager's practices may significantly impact employee health.

# Chapter VI

## Present Study

For this study, I draw upon the research surrounding stress theory, the job-demands-control-support model, Hammer et al.'s (2009) work on family-supportive supervisory behaviors, and the numerous reviews associating job strain with negative health outcomes - specifically blood pressure (e.g. Frone et al., 2007; Thomas & Ganster, 1995; Brisson et al., 1999; Schnall et al., 1994). Hammer et al. (2009) called for future research to examine an array of outcomes of family-supportive supervisor behaviors, including worker health – this study does just that. Using archival data collected from grocery store workers in the Midwest, this study aimed to investigate family-supportive supervisory behaviors as a moderator of the relationship between job strain, job control, job demands and blood pressure.

*Hypotheses*

Based upon the current literature, it is my prediction that social support, specifically family-supportive supervisory behaviors, will moderate the relationship between worker job strain, job demands, job control and blood pressure at work and on non-work days, during working hours. As reviewed, blood pressure has a daily pattern. When an individual first gets out of bed, blood pressure tends to rise and continues to do so until peaking in the middle of the afternoon – usually between 3 and 4 p.m. Using the same timeframe (working hours) on a work and non-work day strengthens the consistency of the blood pressure readings by using a set daily pattern across the two days. The hypothesized relationships are represented visually in Figure 1. The hypotheses are as follows;

*Hypothesis 1:* There will be a positive relationship between perceptions of job strain and measurements of systolic and diastolic blood pressure on work and non-work days, during work hours. The outcomes examined will be represented separately in the analyses and are as follows:

H1a: systolic blood pressure, workday, work-hours

H1b: diastolic blood pressure, workday, work-hours

H1c: systolic blood pressure, non-workday, work-hours

H1d: diastolic blood pressure, non-workday, work-hours

*Hypothesis 2:* Family-supportive supervisory behaviors will moderate the relationship between job strain and measurements of systolic and diastolic blood pressure on work and non-work days during work hours such that at high levels of family-supportive supervisory behaviors, the relationship will be less positive compared to at lower levels of family-supportive supervisory behaviors. The outcomes examined will be represented separately in the analyses and are as follows:

H2a: systolic blood pressure, workday, work-hours

H2b: diastolic blood pressure, workday, work-hours

H2c: systolic blood pressure, non-workday, work-hours

H2d: diastolic blood pressure, non-workday, work-hours

*Hypothesis 3:* Family-supportive supervisory behaviors will moderate the relationship between job demands and measurements of systolic and diastolic blood pressure during working hours on work and non-work days such that at high levels of family-supportive supervisory behaviors, the relationship will be less positive compared to at lower levels of family-supportive supervisory behaviors. The outcomes examined will be represented separately in the analyses:

H3a: systolic blood pressure, workday, work-hours

H3b: diastolic blood pressure, workday, work-hours

H3c: diastolic blood pressure, non-workday, work-hours

H3d: systolic blood pressure, non-workday, work-hours

*Hypothesis 4:* Family-supportive supervisory behaviors will moderate the relationship between job control and measurements of systolic and diastolic blood pressure during working hours on work and non-work days such that at high levels of family-supportive supervisory behaviors, the relationship will be less positive compared to at lower levels of family-supportive supervisory behaviors. The outcomes examined will be represented separately in the analyses:

H4a: systolic blood pressure, workday, work-hours

H4b: diastolic blood pressure, workday, work-hours

H4c: systolic blood pressure, non-workday, work-hours

H4d: diastolic blood pressure, non-workday, work-hours

# Chapter VII

## Method

*Procedure & Participants*

This study used archival data from a larger study of the National Work, Family, and Health Network led by Leslie B. Hammer, Ph.D. and Ellen Ernst Kossek, Ph.D. Data were collected in 12 stores of a grocery store chain in the Midwestern United States. The number of employees per store varied, ranging from 30 – 90. Most of the employees in the sample worked as cashiers.

Surveys were administered individually to each participant in the workplace, during working hours, in a face-to-face interview style with interviews, on average, lasting between 35 – 50 minutes. Each participant was given a $25 gift card upon completion of the interview. A total of 360 workers participated in the survey, 27% or 97 were men and 73% or 262 were women. Approximately 92% were Caucasian with a mean age of 38 years.

After each interview was completed and the participant had consented to participation in the study, they were then asked to participate in the biodata collection portion of the study. At this time, employees were invited to provide information about sleep patterns and blood pressure. This involved each participant wearing a sleep watch for 3 days and a wrist blood pressure monitor for 2 days – one work day and one non-work day. A total of 69 workers, from 7 of the 12 stores, agreed to participate in the bio-data collection portion of the study. In this subset of the total sample, 17% or 12 were men, and 83% or 57 were women, with an average age of 38 years. Each employee who participated in the bio-data collection received an additional $25.00 in compensation.

*Measures*

*Blood Pressure*

The most commonly used cardiovascular measures include heart rate and blood pressure - both systolic (SBP) and diastolic (DBP) measurements. Blood pressure is typically measured as a continuous variable (Schwartz et al., 1996). Heart rate is a measure of cardiac rhythm and is most typically expressed in beats per minute (e.g., 65 bpm) (Uchino et al., 1996). Systolic and diastolic blood pressure are the measures of force exerted against arterial walls and lining of the vesicles (Uchino et al., 1996). Blood pressure is the standardized measurement for how effectively and efficiently blood is pumping through the human body (Uchino et al., 1996). Systolic pressure is the peak of the blood pressure in the arterial walls, and diastolic pressure is the lowest or relaxed state of the flow of blood (Uchino et al., 1996). Several investigators have proposed reference values for blood pressure based on cross-sectional data. Leading researchers including Landsbergis et al. (2008) and Celis, Hond, and Staessen (2005) have all proposed a reference point of 140 mm Hg for systolic and 90 mm Hg for diastolic as the cut-off for normal blood pressure. Any measurement at or above 140/90 mm Hg is considered high and (pre)hypertensive.

In the present study, a sub-sample of the total participants (*N=69*) wore a portable wrist blood pressure monitor – Omron 637IT. Each participant was given the portable wrist monitor, a fanny package for storing the monitor, a pre-set timer, a diary, and was instructed to put on the wrist monitor and self-trigger the device when the timer sounded an alarm and record the current blood pressure on the output screen. The timers were set to alarm once an hour for one full work and non-work day and participants were asked to take about 15 measurements per day, on both days. The monitors are programmed to store up to 90 blood pressure measurements, but participants were still asked to fill out the diary checklist indicating the time, place, and physical position (sitting, standing, or laying down) when the blood pressure measurement was taken. Physical position is extremely important when using a wrist monitor to measure blood pressure because measurements taken in the standing position have been deemed unreliable.

As noted by Landsbergis et al. (2008), it is important to clarify the position of a patient during a blood pressure reading because it may skew the results. It is widely supported that the two most reliable positions to measure blood pressure is having the patient sit in the upright position, or lying on ones back face-up (Landsbergis et al., 2008). Each participant met with a trained technician who demonstrated how to use the device. Participants were shown that they must position the wrist monitor at heart level with their elbow being supported by their other arm. Having the elbow supported is imperative for the accuracy of the device. If the device is not at heart level, it will not operate. Each participant was then instructed to practice using the monitor in front of the technician to help alleviate any confusion with the use of the device.

Following the recommendation of the *Subcommittee of Professional and Public Education of the American Heath Association Council on High Blood Pressure Research*, a participant must have at least 4 blood pressure measurements per day in order to be included in this study (Pickering, Hall, Appel, Falkner, Graves, Hill, Jones, Kurtz, Sheps, & Rocecella, 2005). The blood pressure measurements were downloaded from the devices into an excel spreadsheet where the data was analyzed for number of measurements per day for each participant. All participants had enough reliable data points to be included in the analyses.

For this study, the median score for each participant's systolic and diastolic blood pressure, both on a work day and non-work day during work hours were used. Using the median score helps to alleviate systolic or diastolic outliers within each participant's readings. The median score corresponds to the point at or below which fifty percent of the scores fall when the data are arranged in numerical order. Using the median score follows the recommendation of numerous studies involving blood pressure (e.g., Landsbergis et al., 2008).

The Omron 637IT passed reliability and validity tests for both systolic and diastolic blood pressure in four studies of adult populations (Topouchian et al., 2006; Altunken, Genc, & Altunken, 2007; Altunken, Oztas, & Altuken, 2006).

*Job Strain*

Perceived job demands and job control were measured using the *Job Content Questionnaire* -shown in Appendix A (Karasek, 1985). The job content questionnaire is a self-administered instrument designed to measure social and psychological characteristics of jobs (Karasek, Kawakami, Brisson, Houtman, Bongers, & Amick, 1998). The job content questionnaire was originally developed to investigate cardiovascular disease and work-related factors (Karasek, 1985). The job content questionnaire is a validated scale and has an overall alpha coefficient of .79 (Karasek et al., 1998).

Perceived job demands were measured on 5 items and perceived job control was measured using 9 items and is weighted equally. The job demands subscale measures perceived psychological workplace stressors such as workload. Perceived psychological demands were measured using the psychological demands subscale of the Job Content Questionnaire (Karasek, 1985) (see appendix A). The five items measuring job demands ($\alpha = .70$) are measured using a likert scale with responses ranging from 1 (strongly disagree) to 4 (strongly agree). The higher the score on the scale, the lower the overall perceived psychological workplace demands.

Perceived job control was measured using the decision authority and skill discretion subscales of the Job Content Questionnaire (Karasek, 1985) (Appendix A). The job control subscale is divided into two theoretically distinct sub-dimensions of decision latitude that are highly correlated with one another - (1) decision authority, $\alpha$=.69 and (2) skill discretion $\alpha$=.71 (Karasek et al., 1998). Skill discretion is measured by a set of 6 questions that assess the level of skill and creativity required on the job and the flexibility permitted to the worker in deciding what skills to employ (Karasek et al., 1998). Decision authority assesses the possibilities for workers to make decisions about their work, or job autonomy and is measured using three items (Karasek et al., 1998). Responses on both subscales ranged from 1 (strongly disagree) to 4 (strongly agree) on a likert scale.

Job Strain is typically calculated one of three ways. For this study, job strain was calculated following the guidelines of Landsbergis et al., (2008) and Belkic et al. (2004) and used the job strain formula created by Karasek et al., (1998). Karasek et al., (1998) devised a widely accepted formula to calculate job strain based upon the questions of the Job Content Questionnaire. Job strain is calculated using the scale scores of job demands and decision latitude from the Job Content Questionnaire to create a job strain ratio term. A score at or above 1.0 indicates job strain (see Appendix B for formula).

*Family-Supportive Supervisory Behaviors*

Family-supportive supervisory behaviors (FSSB) was measured using the 14-item scale developed and validated by Hammer et al., (2009) (see Appendix C). This scale was used to measure employees' perception of their supervisor's family-supportive behaviors. Participants indicated their level of agreement on the FSSB scale using a five point likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) – the higher the score, the greater the perceived support their supervisor shows on that particular behavior. The scale contains the four dimensions of family-supportive supervisory behaviors – emotional support, instrumental support, role modeling behaviors, and creative work-family management. Hammer et al., (2009) provided an overall reliability estimate of FSSB of .94, surpassing acceptable research levels for future use of the scale. The FSSB was also correlated with scores of general supervisor support and measures of supervisor support behaviors providing evidence of convergent validity (Hammer et al., 2009). Hammer et al., (2009) also showed evidence for criterion-related validity (after controlling for hours worked and number of children still living at home) by using five important work-family and job outcomes – work-family conflict, work-family positive spillover, family-work positive spillover, job satisfaction, and turnover intentions.

For analyses purposes, each participant's scores on the FSSB scales were tallied and averaged to give an overall estimate of the participant's perception of supervisor support. For example, a score of 4.5 out of possible 5 would indicate high levels of overall family-supportive supervisor behaviors.

*Control Variables*

As previously reported, there are many variables that can influence the regulation of blood pressure. Social, psychological, and physiological factors have been positively or negatively associated with the regulation of systolic and diastolic blood pressure in the adult population. With this, it was important to control a number of variables in this study to help strengthen the relationships investigated.

The first control variable in the analyses was ‘age’. Age is consistently linked to blood pressure and has been shown that as we age, our blood pressure tends to gradually rise. The Framingham Heart Study has reported that there is as much as a 15mmHg difference in systolic blood pressure between an individual at the age of 25 and the same individual at the age 45 (Franklin et al, 2001). Thus, it makes sense to control for age when examining blood pressure as an outcome variable.

The second control variable in this study is ‘body-mass index’. Body-mass index (see Appendix D for formula), in association with age, is the strongest indicator of blood pressure in humans (McCarron & Reusser, 1996). Body-mass index is a formula for measuring a person’s level of body-mass. The National Institute of Health uses the BMI formula and its tables to define an individual as underweight, normal weight, overweight, obese, and extremely obese (National Institute of Health, 2008). BMI is consistently linked to high blood pressure in the literature. Taking this into account, it is imperative to control for BMI.

The third control variable in this study is ‘blood pressure medication’. In general, blood pressure medications work to counter the effects of high force within the blood vessels. There are a number of types of medications used to help control blood pressure, all of which are prescribed according to one’s medical history. Because blood pressure medication directly affects the outcome variable in this study, it is important to control for medication consumption.

The fourth control variable included in the analyses is ‘gender’. It has been noted in numerous large-scale studies that men are generally at greater risk for cardiovascular disease than woman (e.g., Schnall et al., 1990; Reckelhoff, 2001). A recent meta-analysis found that ambulatory blood pressure monitoring among genders significantly varied, with men showing much greater risks for cardiovascular disease (Staessen et al., 1998). It was also noted that men showed much greater daily fluctuations in blood pressure than woman (Staessen et al., 1998). Noting these results, it was important to control for gender when examining the regression models.

The final control variable in this study is ‘store’. Because participants in the study work in a number of different store locations, all of which have different store level supervisors, controlling for store location is essential. Store was ‘dummy-coded’ for analyses. Six dummy-codes were created for the seven stores included in analyses.

*Analyses*

The first set of analyses conducted was to examine the participants’ responses to the demographic information, the survey scales, and the blood pressure readings in order to establish inclusion in the overall analyses. Missing responses on any of the survey measures would disqualify the participant from analysis. Of all the data points examined, the only missing responses involved the calculation of body-mass index. On the original surveys distributed to the employees during the bio-data collection, participant height and weight were not obtained. It was not until all the surveys were collected that researchers realized they had not obtained height and weight from the participants. After the discovery of this oversight, I personally called every participant to obtain their height and weight. I was able to obtain height and weight from 56 of the 69 bio-data participants. Unfortunately, because BMI is strongly associated with blood pressure, it was necessary to control for BMI in the analyses and exclude those participants whom I was unable to obtain height and weight from, thus bringing our final sample size to 56 participants.

Descriptive statistics were calculated for each of the variables in the dataset to identify anomalies and outliers within the dataset. Scatterplots were also created to help visually represent any irregularities within the data. A review of the descriptive statistics and the scatterplots showed no irregularities and the assumption of normality was met enabling the analysis to proceed.

Given the fact that this study was interested in family-supportive supervisory behaviors as a moderator of the relationship between job strain, job demands, and job control and worker’s blood pressure, the data were analyzed using hierarchical moderated multiple regression. Zedeck (1971) described a number of techniques that can be used to estimate the moderating effects of a variable – including moderated multiple regression. Zedeck (1971) described the scenario that *Z* is a moderator of the relationship between variables *X* and *Y* when the strength of this relationship varies across the different levels of *Z*. Moderated multiple regression is commonly used to interpret the effects of both dichotomous and continuous variables (Aguinis & Stone-Romero, 1997).

The variables in the current study – job strain, job demands, job control, FSSB, blood pressure – are all continuous variables and moderated multiple regression is the best technique to interpret the interaction effects of continuous variables. In a number of studies, moderated multiple regression analyses was considered the preferred statistical technique for identifying interaction (moderator) effects when the predictor and the moderator are both continuous variables (e.g., Stone-Romero, Alliger, & Aguinis, 1994; Aiken & West, 1991; McClelland & Judd, 1994). In this study, moderated multiple regression provided a straightforward method of testing whether the form of the relationship between job strain, job demands, job control and blood pressure – represented graphically – changes with the addition of the FSSB. To test for a moderating effect in this study, SPSS was used to create an interaction term between the variables of job strain ($X_1$), job demands ($X_2$), job control ($X_3$), and FSSB (Z) - blood pressure (Y) will be criterion in the equation. Control variables ($X_0$) were included and the final regression equation was:

$$Y = \alpha + \beta_1 X_{0,1,2,3} + \beta_2 X_{0,1,2,3} + \beta_3 X_{0,1,2,3} Z$$

In order to properly test the hypotheses using hierarchical moderated multiple regression, the four variables needed to be centered – (1) job demands, (2) job control, (3) job strain, (4) family-supportive supervisory behaviors. Centering the data created deviation scores by subtracting each variable’s mean from the individual observations (Bryk & Raudenbush, 1992). For example, a score of zero on job strain will signal that the participant has the mean level of job strain. Centering the data helps to reduce multicollinearity and to better facilitate a proper estimation since both main effects and interactive terms are present (Bryk & Raudenbush, 1992). Aiken and West (1991) suggest centering data any time there will be an interaction between variables. For this study, three centered interaction terms were created for the analyses – Job Strain x FSSB, Job Demands x FSSB, and Job Control x FSSB.

Other than hypothesis 1, which required a correlation matrix, all hypotheses were tested using moderated multiple regression analyses. When conducting the analyses, the first step was to look at the relationship between all the variables by creating a correlation matrix (see Table 1). Because hypotheses 1 was correlational, it was tested by default in the regression models examining the main effects of job strain on systolic and diastolic blood pressure both on a workday and a non-workday, during working hours. These hypotheses were accounted for in the correlation matrix presented in Table 1. Twelve separate regression analyses tested hypotheses 2, 3, 4. It was necessary to run twelve separate regression analyses due to the independent interaction terms created for this study (see Table 2 for a complete listing of the regression analyses).

Hypothesis 2 proposed that family-supportive supervisory behaviors moderated the relationship between job strain and blood pressure on a work and non-work day, during working hours. To test this relationship, four regression analyses were conducted to examine the main effects of job strain and family-supportive supervisory behaviors on blood pressure at work and on a non-work day during working hours, as well as the interactive effects of the two variables on blood pressure (see Table 3).

Hypothesis 3 proposed that family-supportive supervisory behaviors moderated the relationship between job demands and blood pressure on a work and non-work day, during working hours. To test this relationship, four regression analyses were conducted to examine the main effects of job demands and family-supportive supervisory behaviors on blood pressure on at work and a non-work day during working hours, as well as the interactive effects of the two on blood pressure (see Table 4).

Hypothesis 4 proposed that family-supportive supervisory behaviors moderated the relationship between job control and blood pressure on work and non-working days during work hours. To test this relationship, four regression analyses were conducted to examine the main effects of job control and family-supportive supervisory behaviors on blood pressure, as well as the interactive effects of the two variables on blood pressure (see Table 5).

The initial step in setting up the regression analyses was to enter the outcome variable and the control variables. In this case blood pressure for the outcome variable and age, gender, BMI, blood pressure medication, and store location as the control variables. The next step in setting up the regression equation was to enter the centered variables created to be used to test the main effects of the model (i.e., job strain and FSSB). The third and final step is to create an interaction term between the two centered variables used to test the main effects. Again, please refer to Table 2 to get a complete listing of the simple and interactive effects tested in this study, as well as the outcome variables assessed.

# Chapter VIII

## Results

As previously stated, table 1 is a complete listing of the intercorrelations, means, and standard deviations of all the variables assessed in this study. Statistical significance in this study was assessed at the $p<.05$ level. There was no cause for concern when examining the means and standard deviations of the variables. For example, average daily blood pressure while at work for participants was 121/76 mmHg and average daily blood pressure on a non-work day was 118/72 mmHg. As reviewed, 120/80 mmHg is considered average. The worker job strain scores ranged from .41 to 1.53 with an average job strain score of .094. Approximately fourteen of the fifty-six participants (24.5%) included in the analyses had job strain scores over 1.0 and would be classified as having ‘high job strain’. Karasek et al. (1998) stated the any score above 1.0 was considered to be ‘high’ strain and that an average job strain score should be roughly .090. These results give the appearance that the data are within acceptable levels of the national averages for the relationships being investigated.

*Hypothesis 1*

Hypothesis 1 proposed that there will be a positive relationship between perceptions of job strain and measurements of systolic and diastolic blood pressure on work and non-work days during working hours.

H1a: Systolic Blood Pressure (work). Systolic blood pressure at work during working hours, was not significantly related to job strain, $r=.124$, $p=.364$.

H1b: Diastolic Blood Pressure (work). Diastolic blood pressure at work during working hours, was not significantly related to job strain, $r=.170$, $p=.209$.

H1c: Systolic Blood Pressure (non-work). Systolic blood pressure on a non-work day, during working hours, was not significantly related to job strain, $r$=.052, $p$=.705.

H1d: Diastolic Blood Pressure (non-work). Diastolic blood pressure on a non-work day, during working hours, was not significantly related to job strain, $r$=.092, $p$=.499.

*Hypothesis 2*

Hypothesis 2 proposed that FSSB would moderate the relationship between job strain and blood pressure on a work and non-workday, during working hours. Four regression analyses were conducted to test the effects on systolic and diastolic blood pressure. Please refer to table 3 for a summary of the hierarchical multiple regression analysis for job strain and family-supportive supervisory behaviors.

H2a: A hierarchical moderated multiple regression was conducted to determine if FSSB moderated the relationship between job strain and systolic blood pressure on a workday, during working hours. Controls were entered in step 1, job strain and FSSB entered in step 2, and the interaction of job strain and FSSB entered in step 3 of the regression model. Results indicate that the control variables explained approximately 44% of the variance in systolic blood pressure, $F(10,45)=3.53$, p=.002. In subsequent steps, job strain and FSSB explained approximately 7% of the variance, $F(2,43)=2.90$, p=.066, and the interaction of job strain and FSSB explained less than 1% of the variance, $F(1,42)=.111$, p=.740. Results suggest that FSSB does not significantly moderate the relationship between job strain and systolic blood pressure on a workday during working hours, $\beta = .04$, $t(42)=.33$, p=.74. However, the simple effects of FSSB on systolic blood pressure on a workday during working hours was significant, $\beta= -.29$, $t(43)=-2.25$, p=.03

at the grand centered mean of job strain while controlling for age, gender, BMI, blood pressure medication, and store location indicating that those workers that perceived their supervisors as having family-supportive supervisory behaviors had significantly lower levels of systolic blood pressure while at work than those workers that did not perceive their supervisors as having family-supportive supervisory behaviors.

H2b: A hierarchical moderated multiple regression was conducted to determine if FSSB moderated the relationship between job strain and diastolic blood pressure on a workday, during working hours. Controls were entered in step 1, job strain and FSSB entered in step 2, and the interaction of job strain and FSSB entered in step 3 of the regression model. Results indicate that the control variables explained 34% of the variance in diastolic blood pressure, $F(10,45)=2.27$, $p=.03$. Additionally, job strain and FSSB explained 8% of the variance, $F(2,43)=3.01$, $p=.06$, and the interaction of job strain and FSSB explained less than 1% of the variance, $F(1,42)=.586$, $p=.448$. Results suggest that FSSB does not significantly moderate the relationship between job strain and diastolic blood pressure on a workday during working hours, $\beta=-.09$, $t(42)=-.77$, $p=.45$. The simple effects of FSSB on diastolic blood pressure on a workday during working hours was not significant at the .05 level, $\beta=-.287$, $t(43)=-2.249$, $p=.08$ at the grand centered mean of job strain while controlling for age, gender, BMI, blood pressure medication, and store location.

H2c: A hierarchical moderated multiple regression was conducted to determine if FSSB moderated the relationship between job strain and systolic blood pressure on a non-workday, during working hours. Controls were entered in step 1, job strain and FSSB entered in step 2, and the interaction of job strain and FSSB entered in step 3 of the regression model. Results indicate that the control variables explained approximately 34% of the variance in systolic blood pressure, $F(10,45)=2.30$, $p=.03$. Additionally, job strain and FSSB explained approximately 3% of the variance, $F(2,43)=.912$, $p=.41$, and the interaction of job strain and FSSB explained approximately 2% of the variance, $F(1,42)=1.40$, $p=.244$. Results suggest that FSSB does not significantly moderate the relationship between job strain and systolic blood pressure on a non-workday during working hours, $\beta = .15$, $t(42)=1.18$, $p=.24$. The simple effects of FSSB on systolic blood pressure on non-workday during working hours was not significant, $\beta=-.22$, $t(43)=-1.57$, $p=.13$ at the grand centered mean of job strain while controlling for age, gender, BMI, blood pressure medication, and store location.

H2d: A hierarchical moderated multiple regression was conducted to determine if FSSB moderated the relationship between job strain and diastolic blood pressure on a non-workday, during working hours. Controls were entered in step 1, job strain and FSSB entered in step 2, and the interaction of job strain and FSSB entered in step 3 of the regression model. Results indicate that the control variables explained approximately 22% of the variance in diastolic blood pressure, $F(10,45)=1.27$, $p=.28$. Additionally, job strain and FSSB explained approximately 1% of the variance, $F(2,43)=.282$, $p=.76$, and the interaction of job strain and FSSB explained less than 1% of the variance, $F(1,42)=.000$, $p=.988$. Results suggest that FSSB does not significantly moderate the relationship between job strain and diastolic blood pressure on a non-workday during working hours, $\beta=.002$, $t(42)=.02$, $p=.988$. The simple effects of FSSB on diastolic blood pressure on non-workday during working hours was also non-significant, $\beta=-.02$,

$t(43)=-.141$, $p=.89$ at the grand centered mean of job strain while controlling for age, gender, BMI, blood pressure medication, and store location.

*Hypothesis 3*

Hypothesis 3 proposed that FSSB would moderate the relationship of job demands and systolic and diastolic blood pressure on work and non-work days, during work hours. Please refer to table 4 for a summary of the hierarchical multiple regression analysis for job demands and family-supportive supervisory behaviors.

H3a: A hierarchical moderated multiple regression was conducted to determine if FSSB moderated the relationship between job demands and systolic blood pressure on a workday, during working hours. Controls were entered in step 1, job demands and FSSB entered in step 2, and the interaction of job demands and FSSB entered in step 3 of the regression model. Results indicate that the control variables explained approximately 44% of the variance in systolic blood pressure, $F(10,45)=3.53$, $p=.002$. Additionally, job demands and FSSB explained approximately 9% of the variance, $F(2,43)=3.91$, $p=.028$, and the interaction of job demands and FSSB explained approximately 2% of the variance, $F(1,42)=2.16$, $p=.15$. Results suggest that FSSB does not significantly moderate the relationship between job demands and systolic blood pressure on a workday during working hours, $\beta=.19$, $t(42)=1.47$, $p=.15$. However, the simple effects of FSSB on systolic blood pressure on a workday during working hours was significant, $\beta= -.31$, $t(43)=-2.61$, $p=.01$ at the grand centered mean of job demands while controlling for age, gender, BMI, blood pressure medication, and store location indicating that those workers that perceived their supervisors as having family-supportive supervisory behaviors had significantly lower levels of systolic blood pressure while at work than those workers that did not perceive their supervisors as having family-supportive supervisory behaviors.

H3b: A hierarchical moderated multiple regression was conducted to determine if FSSB moderated the relationship between job demands and diastolic blood pressure on a workday, during working hours. Controls were entered in step 1, job demands and FSSB entered in step 2, and the interaction of job demands and FSSB entered in step 3 of the regression model. Results indicate that the control variables explained approximately 34% of the variance in diastolic blood pressure, $F(10,45)=2.27$, $p=.03$. Additionally, job demands and FSSB explained approximately 8% of the variance, $F(2,43)=2.89$, $p=.07$, and the interaction of job demands and FSSB explained less than 1% of the variance, $F(1,42)=.565$, $p=.456$. Results suggest that FSSB does not significantly moderate the relationship between job demands and diastolic blood pressure on a workday during working hours, $\beta=-.11$, $t(42)=-.752$, $p=.456$. The simple effects of FSSB on diastolic blood pressure on a workday during working hours was not significant at the .05 level, $\beta=-.256$, $t(43)=-1.89$, $p=.07$ at the grand centered mean of job demands while controlling for age, gender, BMI, blood pressure medication, and store location.

H3c: A hierarchical moderated multiple regression was conducted to determine if FSSB moderated the relationship between job demands and systolic blood pressure on a non-workday, during working hours. Controls were entered in step 1, job demands and FSSB entered in step 2, and the interaction of job demands and FSSB entered in step 3 of the regression model. Results indicate that the control variables explained approximately 34% of the variance in systolic blood pressure, $F(10,45)=2.30$, $p=.03$. Additionally, job demands and FSSB explained approximately 3% of the variance, $F(2,43)=.89$, $p=.418$, and the interaction of job demands and FSSB explained approximately 2% of the variance, $F(1,42)=1.60$, $p=.212$. Results suggest that FSSB does not significantly moderate the relationship between job demands and systolic blood pressure on a non-workday during working hours, $\beta=.19$, $t(42)=1.27$, $p=.21$. The simple effects of FSSB on systolic blood pressure on a workday during working hours was not significant at the .05 level, $\beta= -.24$, $t(43)=-1.69$, $p=.09$ at the grand centered mean of job demands while controlling for age, gender, BMI, blood pressure medication, and store location.

H3d: A hierarchical moderated multiple regression was conducted to determine if FSSB moderated the relationship between job demands and diastolic blood pressure on a non-workday, during working hours. Controls were entered in step 1, job demands and FSSB entered in step 2, and the interaction of job demands and FSSB entered in step 3 of the regression model. Results indicate that the control variables explained approximately 22% of the variance in diastolic blood pressure, $F(10,45)=1.27$, $p=.28$. Additionally, job demands and FSSB explained less than 1% of the variance, $F(2,43)=.25$, $p=.78$, and the interaction of job demands and FSSB explained less than 1% of the variance, $F(1,42)=.241$, $p=.63$. Results suggest that FSSB does not significantly moderate the relationship between job demands and diastolic blood pressure on a non-workday during working hours, $\beta=-.02$, $t(42)=-.10$, $p=.92$. The simple effects of FSSB on diastolic blood pressure on a workday during working hours was not significant at the .05 level, $\beta= -.08$, $t(43)=-.491$, $p=.92$ at the grand centered mean of job demands while controlling for age, gender, BMI, blood pressure medication, and store location.

*Hypothesis 4*

Hypothesis 4 proposed that FSSB will moderate the relationship between job control and measurements of systolic and diastolic blood pressure during working hours, on work and non-work days, such that at high levels of family-supportive supervisory behaviors, the relationship will be less positive compared to at lower levels of family-supportive supervisory behaviors. Please refer to table 5 for a summary of the hierarchical multiple regression analysis for job control and family-supportive supervisory behaviors.

H4a: A hierarchical moderated multiple regression was conducted to determine if FSSB moderated the relationship between job control and systolic blood pressure on a workday, during working hours. Controls were entered in step 1, job control and FSSB entered in step 2, and the interaction of job control and FSSB entered in step 3 of the regression model. Results indicate that the control variables explained approximately 44% of the variance in systolic blood pressure, $F(10,45)=3.53$, $p=.002$. Additionally, job control and FSSB explained approximately 7% of the variance, $F(2,43)=2.95$, $p=.06$, and the interaction of job control and FSSB explained less than 1% of the variance, $F(1,42)=.19$, $p=.66$. Results suggest that FSSB does not significantly moderate the relationship between job control and systolic blood pressure on a workday during working hours, $\beta = .05$, $t(42)=.44$, $p=.66$. However, the simple effects of FSSB on systolic blood pressure on a workday during working hours was significant, $\beta=-.285$, $t(43)=-2.32$, $p=.03$ at the grand centered mean of job control while controlling for age, gender, BMI, blood pressure medication, and store location indicating that those workers that perceived their supervisors as having family-supportive supervisory behaviors had significantly lower levels of systolic blood pressure while at work than those workers that did not perceive their supervisors as having family-supportive supervisory behaviors.

H4b: A hierarchical moderated multiple regression was conducted to determine if FSSB moderated the relationship between job control and diastolic blood pressure on a workday, during working hours. Controls were entered in step 1, job control and FSSB entered in step 2, and the interaction of job control and FSSB entered in step 3 of the regression model. Results indicate that the control variables explained approximately 34% of the variance in diastolic blood pressure, $F(10,45)=2.27$, $p=.03$. Additionally, job control and FSSB explained approximately 9% of the variance, $F(2,43)=3.34$, $p=.05$, and the interaction of job control and FSSB explained approximately 2% of the variance, $F(1,42)=.000$, $p=.996$. Results suggest that FSSB does not significantly moderate the relationship between job control and diastolic blood pressure on a workday during working hours, $\beta = .00$, $t(42)=-.01$, $p=.97$. The simple effects of FSSB on diastolic blood pressure on a workday during working hours was not significant at the .05 level, $\beta=-.26$, $t(43)=-1.91$, $p=.06$ at the grand centered mean of job control while controlling for age, gender, BMI, blood pressure medication, and store location.

H4c: A hierarchical moderated multiple regression was conducted to determine if FSSB moderated the relationship between job control and systolic blood pressure on a non-workday, during working hours. Controls were entered in step 1, job control and FSSB entered in step 2, and the interaction of job control and FSSB entered in step 3 of the regression model. Results indicate that the control variables explained approximately 34% of the variance in systolic blood pressure, $F(10,45)=2.30$, $p=.03$. Additionally, job control and FSSB explained approximately 3% of the variance, $F(2,43)=.89$, $p=.42$, and the interaction of job control and FSSB explained less than 1% of the variance, *F*(1,42)=.32, p=.58. Results suggest that FSSB does not significantly moderate the relationship between job control and systolic blood pressure on a non-workday during working hours, β = -.08, *t*(42)=-.56, p=.58. The simple effects of FSSB on systolic blood pressure on a non-workday during working hours was not significant at the .05 level, β=-.18, *t*(43)=-1.27, p=.21 at the grand centered mean of job control while controlling for age, gender, BMI, blood pressure medication, and store location.

H4d: A hierarchical moderated multiple regression was conducted to determine if FSSB moderated the relationship between job control and diastolic blood pressure on a non-workday, during working hours. Controls were entered in step 1, job control and FSSB entered in step 2, and the interaction of job control and FSSB entered in step 3 of the regression model. Results indicate that the control variables explained approximately 22% of the variance in diastolic blood pressure, *F*(10,45)=1.27, p=.28. Additionally, job control and FSSB explained approximately 1% of the variance, *F*(2,43)=.29, p=.752, and the interaction of job control and FSSB explained less than 1% of the variance, *F*(1,42)=.23, p=.63. Results suggest that FSSB does not significantly moderate the relationship between job control and diastolic blood pressure on a non-workday during working hours, β=-.07, *t*(42)=-.48, p=.63. The simple effects of FSSB on systolic blood pressure on a non-workday during working hours was not significant at the .05 level, β=-.03, *t*(43)=-.17, p=.87 at the grand centered mean of job control while controlling for age, gender, BMI, blood pressure medication, and store location.

*Exploratory Analyses*

This is the first study to examine family-supportive supervisory behaviors as a moderator of the relationship between job strain, job demands, and job control on systolic and diastolic blood pressure both on a work and non-work day. Due to the seminal nature of this manuscript, it was important to explore relationships outside of the confines of the hypotheses. This being stated, and having disregarded statistical power and Type I error, I investigated a number of relationships I thought would be of particular interest for future research based upon literature reviews.

*Exploratory Question 1*

Current literature indicates the importance of examining blood pressure on a workday and on a non-work day to get an accurate picture of one's overall blood pressure. Results have been mixed. It is important to continue to add to this body of literature and examine differences between work and non-work blood pressure.

> Is there a significant difference between systolic and diastolic blood pressure on a workday versus a non-work day during work hours?

Paired samples *t* tests were conducted to evaluate whether systolic and diastolic blood pressures on a workday were significantly different than systolic and diastolic blood pressures on a non-work day. The results indicated that the mean overall systolic blood pressure on a workday was significantly greater than the mean overall systolic blood pressure on a non-work day, $t(55) = 2.075$, $p=.043$. Results also indicated that the mean overall diastolic blood pressure on a workday was significantly greater than the mean overall diastolic blood pressure on a non-work day, $t(55) = 3.89$, $p<.001$.

These results indicate that there is a significant difference between systolic and diastolic blood pressure on a workday and on a non-workday. Though outside the realm of this study, future research may wish to consider these results when examining constructs such as psychological detachment from work.

*Exploratory Question 2*

As previously reviewed, blood pressure tends to rise with age. Age is consistently shown to be significantly and positively related to both systolic and diastolic blood pressure. This study was no exception. Age was significantly related to systolic, $r=.44$, and diastolic, $r=.36$, blood pressure on a work day.

> To explore this relationship further, an exploratory analysis was conducted to determine if FSSB is a moderator of the relationship between age and blood pressure on a workday?

Systolic Blood Pressure: A hierarchical moderated multiple regression was conducted to determine if FSSB moderated the relationship between age and systolic blood pressure on a workday, during working hours. Controls were entered in step 1, age and FSSB entered in step 2, and the interaction of age and FSSB entered in step 3 of the regression model. Results indicate that the control variables explained approximately 34% of the variance in systolic blood pressure, $F(9,46)=2.60$, $p=.02$. Additionally, age and FSSB explained approximately 17% of the variance, $F(2,44)=7.57$, $p=.002$, and the interaction of age and FSSB explained less than 1% of the variance, $F(1,43)=.522$, $p=.48$. Results suggest that FSSB does not significantly moderate the relationship between age and systolic blood pressure on a workday during working hours, $\beta=-.06$, $t(43)=-.56$, $p=.58$, when controlling for BMI, store location, gender, and the blood pressure medication.

Diastolic Blood Pressure: A hierarchical moderated multiple regression was conducted to determine if FSSB moderated the relationship between age and diastolic blood pressure on a workday, during working hours. Controls were entered in step 1, age and FSSB entered in step 2, and the interaction of age and FSSB entered in step 3 of the regression model. Results indicate that the control variables explained approximately 26% of the variance in diastolic blood pressure, $F(9,46)=1.81$, $p=.09$. Additionally, age and FSSB explained approximately 15% of the variance, $F(2,44)=5.73$, $p=.01$, and the interaction of age and FSSB explained less than 1% of the variance, $F(1,43)=.317$, $p=.58$. Results suggest that FSSB does not significantly moderate the relationship between age and diastolic blood pressure on a workday during working hours, $\beta=.10$, $t(43)=-.83$, $p=.41$, when controlling for BMI, store location, gender, and the blood pressure medication.

*Exploratory Question 3*

Though there was no underlying theory to explore FSSB as a moderator of the relationship between job demands and job control, an exploratory analysis was conducted.

Is FSSB a moderator of the relationship between job demands and job control?

A hierarchical moderated multiple regression was conducted to determine if FSSB moderated the relationship between job control and job demands. Control and FSSB entered in step 1, and the interaction of job control and FSSB entered in step 2 of the regression model. Results indicate that job control explained approximately 3% of the variance in job demands, $F(2,53)=.77$, $p=.47$. The interaction of job control and FSSB explained less than 1% of the variance, $F(3,52)=.67$, $p=.57$. Results suggest that FSSB does not significantly moderate the relationship between job control and job demands, $\beta$=-.096, $t(52)$=-.70, p=.49.

*Exploratory Question 4*

Wright (2010) argues moving away from systolic and diastolic blood pressure measurements when examining cardiovascular risk factors involving the regulation of blood pressure. Wright (2010) contends that using the composite cardiovascular measure of ‘pulse product’ is much more effective when using the regulation of blood pressure as an outcome variable. Pulse product is the difference between systolic and diastolic blood pressure, multiplied by heart rate and divided by 100 (Wright, 2010). Wright (2010) has argued, and others are following suit, that using pulse product is the future of blood pressure research and gives a much more accurate picture of daily blood pressure.

The blood pressure device used in this study to collect readings also calculates heart rate variability in BPM (beats per minute). I was able to go back through the data originally downloaded from the devices to obtain each participant’s median score for BPM and calculate pulse product accordingly. This allowed exploratory analyses to be conducted using pulse product as the outcome variable for participant blood pressure. Please refer to tables 6, 7, and 8 for a summary of the hierarchical multiple regression analysis for job strain, job demands, job control and family-supportive supervisory behaviors.

> Are family-supportive supervisory behaviors a moderator of the relationship between job strain, job demands, and job control and measurements of blood pressure using the pulse product method on work and non-work days, during work hours?

Job Strain, Pulse Product (Workday): A hierarchical moderated multiple regression was conducted to determine if FSSB moderated the relationship between job strain and pulse product on a workday, during working hours. Controls were entered in step 1, job strain and FSSB entered in step 2, and the interaction of job strain and FSSB entered in step 3 of the regression model. Results indicate that the control variables explained approximately 12% of the variance in pulse product, $F(10,45)=.630$, $p=.78$. Additionally, job strain and FSSB explained approximately 2% of the variance, $F(2,43)=.56$, $p=.57$, and the interaction of job strain and FSSB explained less than 4% of the variance, $F(1,42)=1.89$, $p=.18$. Results suggest that FSSB does not significantly moderate the relationship between job strain and pulse product on a workday during working hours, $\beta=-.21$, $t(42)=-1.38$, $p=.18$. The simple effects of FSSB and pulse product on a workday during working hours was not significant, $\beta=.12$, $t(43)=.710$, $p=.48$, at the grand centered mean of job strain while controlling for age, gender, BMI, blood pressure medication, and store location.

Job Strain, Pulse Product (Non-Workday): A hierarchical moderated multiple regression was conducted to determine if FSSB moderated the relationship between job strain and pulse product on a non-workday, during working hours. Controls were entered in step 1, job strain and FSSB entered in step 2, and the interaction of job strain and FSSB entered in step 3 of the regression model. Results indicate that the control variables explained approximately 12% of the variance in pulse product, $F(10,45)=.590$, $p=.81$. Additionally, job strain and FSSB explained approximately 3% of the variance, $F(2,43)=.78$, $p=.47$, and the interaction of job strain and FSSB explained 4% of the variance, $F(1,42)=1.89$, $p=.17$. Results suggest that FSSB does not significantly moderate the relationship between job strain and pulse product on a non-workday during working hours, β=-.21, *t*(42)=-1.38, p=.18. The simple effects of FSSB on a non-workday during working hours was not significant, β=.004, *t*(43)=.03, p=.98, at the grand centered mean of job strain while controlling for age, gender, BMI, blood pressure medication, and store location.

Job Demands, Pulse Product (Workday): A hierarchical moderated multiple regression was conducted to determine if FSSB moderated the relationship between job demands and pulse product on a workday, during working hours. Controls were entered in step 1, job demands and FSSB entered in step 2, and the interaction of job demands and FSSB entered in step 3 of the regression model. Results indicate that the control variables explained approximately 12% of the variance in pulse product, *F*(10,45)=.630, p=.78. Additionally, job demands and FSSB explained less than 1% of the variance, *F*(2,43)=.03, p=.97, and the interaction of job demands and FSSB explained less than 1% of the variance, *F*(1,42)=.00, p=.99. Results suggest that FSSB does not significantly moderate the relationship between job demands and pulse product on a workday during working hours, β=-.00, *t*(42)=-.003, p=.99. The simple effects of FSSB on a workday during working hours was not significant, β=-.01, *t*(43)=-.04, p=.97 at the grand centered mean of job demands while controlling for age, gender, BMI, blood pressure medication, and store location.

Job Demands, Pulse Product (Non-workday): A hierarchical moderated multiple regression was conducted to determine if FSSB moderated the relationship between job demands and pulse product on a non-workday, during working hours. Controls were entered in step 1, job demands and FSSB entered in step 2, and the interaction of job demands and FSSB entered in step 3 of the regression model. Results indicate that the control variables explained approximately 12% of the variance in pulse product, $F(10,45)=.59$, p=.81. Additionally, job demands and FSSB explained approximately 1% of the variance, $F(2,43)=.31$, p=.73, and the interaction of job demands and FSSB explained less than 1% of the variance, $F(1,42)=.12$, p=.73. Results suggest that FSSB does not significantly moderate the relationship between job demands and pulse product on a non-workday during working hours, $\beta=-.061$, $t(42)=.349$, p=.73. The simple effects of FSSB on a non-workday during working hours was not significant, $\beta=-.14$, $t(43)=-.84$, p=.41 at the grand centered mean of job demands while controlling for age, gender, BMI, blood pressure medication, and store location.

Job Control, Pulse Product (Workday): A hierarchical moderated multiple regression was conducted to determine if FSSB moderated the relationship between job control and pulse product on a workday, during working hours. Controls were entered in step 1, job control and FSSB entered in step 2, and the interaction of job control and FSSB entered in step 3 of the regression model. Results indicate that the control variables explained approximately 10% of the variance in pulse product, $F(10,45)=.13$, p=.78. Additionally, job control and FSSB explained less than 1% of the variance, $F(2,43)=.23$, p=.79, and the interaction of job control and FSSB explained approximately 3% of the variance, $F(1,42)=.34$, p=.83. Results suggest that FSSB does not significantly moderate the relationship between job control and pulse product on a workday during working hours, $\beta=.19$, $t(42)=1.17$, p=.25. The simple effects of FSSB on a workday during working hours was not significant, $\beta=-.022$, $t(43)=-.15$, p=.88, at the grand centered mean of job control while controlling for age, gender, BMI, blood pressure medication, and store location.

Job Control, Pulse Product (Non-workday): A hierarchical moderated multiple regression was conducted to determine if FSSB moderated the relationship between job control and pulse product on a non-workday, during working hours. Controls were entered in step 1, job control and FSSB entered in step 2, and the interaction of job control and FSSB entered in step 3 of the regression model. Results indicate that the control variables explained approximately 9% of the variance in pulse product, $F(10,45)=.99$, p=.43. Additionally, job control and FSSB explained less than 1% of the variance, $F(2,43)=.72$, p=.44, and the interaction of job control and FSSB explained approximately 4% of the variance, $F(1,42)=.90$, p=.48. Results suggest that FSSB does not significantly moderate the relationship between job control and pulse product on a non-workday during working hours, $\beta=.23$, $t(42)=1.42$, p=.16. The simple effects of FSSB on a non-workday during working hours was not significant, $\beta=-.13$, $t(43)=-.90$, p=.37, at the grand centered mean of job control while controlling for age, gender, BMI, blood pressure medication, and store location.

# Chapter IX

## Discussion

In today's highly demanding society with increasing work and family demands, it is important to understand the tolls on the individuals experiencing such demands. With prolonged work hours, increased family responsibility, increased work productivity requirements, corporate downsizing, and overall stress increase, it is important to examine the role of social support as it relates to worker health. This study is the first to examine family-supportive supervisory behaviors as a moderator of the relationships between job strain, job control, job demands and blood pressure on a work and non-work day. Job strain, job demands, and job control have been linked to the elevation of blood pressure when measured using an ambulatory device (Schnall et al., 1994), but never before with incorporating FSSB as a moderating effect. Secondly, there is no study that examines the relationship between family-supportive supervisor behaviors and blood pressure readings on a work and non-work day.

There is much evidence that exposure to chronic job stress can increase one's risk for cardiovascular disease and hypertension. None of the work stress models has yet to consider the potential moderating effects of family-supportive supervisory behaviors in reducing employees' stress. Rather most empirical emphasis has been devoted to demonstrating the existence of an association between work and non-work demands and the adverse health outcomes on individuals or between job strain and cardiovascular disease (Schwartz et al., 1996).

In an attempt to better understand how organizations can positively enhance the psychological and physical well-being of employees a number of analyses were conducted to examine the relationships between family-supportive supervisory behaviors, job strain, job demands, job control, and blood pressure on a work and non-work day. Results supported that significant relationships exist between a number of the variables, as well as FSSB moderating the effects of job demands on systolic blood pressure at work. These results reinforce previously established relationships and call further attention to the importance of work and social support on the health of workers. The results also confirm previous research concluding that support from direct supervisors is instrumental in reducing the negative effects of both work and non-work stressors, enhancing job satisfaction, and reducing turnover rates (e.g., Cohen & Willis, 1985; Thomas & Ganster, 1995; Lapierre & Allen, 2006).

Hypothesis 1 examined the relationship between job strain and blood pressure. Results conclude that there was not a significant relationship between job strain and blood pressure on any level (e.g., systolic work, systolic non-work, etc.). This is surprising considering the results from previous reviews in this area of research that have concluded that there is a significant relationship between job strain and blood pressure (e.g., Van der Doef & Maes, 1999; Hausser et al., 2010).

Hypothesis 2 proposed that FSSB would moderate the relationship between job strain and blood pressure. Four separate hierarchical regression analyses did not support this relationship. Again, this is surprising considering that evidence exists of the buffering effects of the JDC-S. However, the simple effects of FSSB on systolic blood pressure on a workday during working hours was significant at the grand centered mean of job strain while controlling for age, gender, BMI, blood pressure medication, and store location. This indicates that those workers that perceived their supervisors as having family-supportive supervisory behaviors had significantly lower levels of systolic blood pressure while at work than those workers that did not perceive their supervisors as having family-supportive supervisory behaviors. This is an exciting finding and adds to previous research surrounding the benefits of supervisor support and employee well-being, and that family-supportive supervisors may be having a direct impact on employee health outcomes as measured through systolic blood pressure at work.

Though the simple effects of FSSB on systolic blood pressure on a workday was significant at the grand centered mean of job strain, the simple effects of diastolic blood pressure on a workday was not significant. One plausible explanation for this involves the biological make-up of the heart and the context – in this case, work. As discussed previously, systolic blood pressure is the amount of exertion on the heart while 'pumping' while diastolic blood pressure is the measurement of the heart in a state of rest. When the body and heart are under distress, systolic blood pressure may increase at a larger rate than diastolic blood pressure, simply because the body is pumping more blood during the stressful event (i.e., a racing heartbeat). The greater degree of variability between systolic blood pressure and diastolic blood pressure may cause larger swings when blood pressure is influenced by such things as a social support (i.e., FSSB's). It is not uncommon in the literature that systolic and diastolic vary in their degrees of sensitivity to an outcome variable. In fact, some researchers would argue that systolic blood pressure should be the only measurement of blood pressure investigated when researching stress (i.e., Schnall et al., 1994; Reckelhoff, 2001).

Hypothesis 3 proposed that FSSB would moderate the relationship between job demands and blood pressure. Of the four separate hierarchical regression analyses conducted, one regression provided some evidence that FSSB is moderating the relationship between job demands and systolic blood pressure at work. Though moderation was not significant at .05 level, there was evidence that moderation was occurring (see figure 2). This is a very important discovery. Previous research has indicated that job demands can affect the health of workers (e.g., Karasek et al., 1998; Kivimaki et al., 2006; Landsbergis et al., 2001). Employees experiencing high levels of workplace demands are at higher risk for illness and injury (e.g., Landsbergis, 2008).

Additionally, the simple effects of FSSB on systolic blood pressure on a workday during working hours was significant at the grand centered mean of job demands while controlling for age, gender, BMI, blood pressure medication, and store location. Again, this indicates that those workers that perceived their supervisors as having family-supportive supervisory behaviors had significantly lower levels of systolic blood pressure while at work than those workers that did not perceive their supervisors as having family-supportive supervisory behaviors. This result indicates family-supportive supervisors may be having a direct impact on an objective employee health outcome.

Hypothesis 4 proposed that FSSB would moderate the relationship between job control and blood pressure. Four separate hierarchical regression analyses did not support this relationship. Again, this is surprising considering the evidence of the buffering effects of the JDC-S. However, the simple effects of FSSB on systolic blood pressure on a workday during working hours was significant at the grand centered mean of job control while controlling for age, gender, BMI, blood pressure medication, and store location. Again, this indicates that those workers that perceived their supervisors as having family-supportive supervisory behaviors had significantly lower levels of systolic blood pressure while at work than those workers that did not perceive their supervisors as having family-supportive supervisory behaviors. Again, this result indicates family-supportive supervisors may be having a direct impact on an objective employee health outcome. This result also reiterates the previous discussion on the degrees of sensitivity differences between systolic and diastolic blood pressure and stress

Although none of the interactions in the hypotheses were significant at the .05 level, the results surrounding the simple effects of FSSB on employee blood pressure at the grand centered means of job strain, job demands, and job control is an exciting development. Linking FSSB to an objective health outcome (systolic blood pressure) strengthens previous literature surrounding the importance of social and supervisor support on employee health and well-being – in this case, specifically blood pressure. This study found that those employees with high levels of FSSB had significantly lower levels of systolic blood pressure readings at work than their workplace counterparts. In other words, the higher one perceived their supervisor on FSSB, the lower their overall systolic blood pressure at work.

In addition to the research questions proposed in this study, several exploratory analyses were conducted. Paired sample *t* tests were conducted to examine if there was a significant difference between workday and non-work day blood pressure. Results indicate that there is a significant difference between workday and non-work day systolic blood pressure, as well as a significant difference between workday and non-work day diastolic blood pressure. This finding, coupled with high levels of FSSB being significantly related to lower levels of systolic blood pressure at work is important and warrants further discussion. On one hand, we have high levels of FSSB being linked to lower levels of systolic blood pressure at work. On the other hand, we have significant differences between systolic and diastolic blood pressures at work and at home. So, in other words, blood pressure may be higher in the workplace in general, but FSSB can help to alleviate these higher levels.

Exploratory analyses were conducted on systolic and diastolic blood pressure using the pulse product formula developed by Wright (2007) and elaborated upon by Wright (2010). Wright (2010) argues moving away from systolic and diastolic blood pressure measurements when examining cardiovascular risk factors involving the regulation of blood pressure. Wright (2010) contends that using the composite cardiovascular measure of ‘pulse product’ is much more effective when using the regulation of blood pressure as an outcome variable because the measure includes heart rate as well as blood pressure. Though the exploratory analyses involving pulse product in this study were not significant, future research investigating FSSB as a moderator using blood pressure as an outcome variable may wish to consider using pulse product to help develop a body of work surrounding this construct. It makes sense conceptually that when investigating blood pressure and cardiovascular disease including heart rate variability is important. Wright (2010) points to several cases in his studies where individuals have seemingly ‘healthy’ systolic and diastolic blood pressure readings, but their heart rates are extremely high. Including systolic, diastolic and heart rate variability in one formula may provide a much more comprehensive look at the effectiveness of the heart.

Although the interactions proposed in this study were not statistically significant, it is important to mention interactions that indicated some level of moderation was occurring. The interaction between job demands and FSSB on systolic blood pressure on a workday, during working hours was not significant at the .05 level. However, Step 3 in the model summary confirmed an interaction was occurring indicating that the interaction between job demands and FSSB was explaining close to 3% of the variance in systolic blood pressure at work. The aim of this study was to examine the moderating effects of FSSB on job strain, job demands, and job control. This provides evidence that FSSB may be a moderator of the relationship between job demands and systolic blood pressure at work. Though the interaction was not significant the results help to support the seminal work of Cohen and Willis (1985) that provided evidence for social support buffering the negative effects work has on well-being.

Another interaction that warrants discussion is the interaction between job strain and FSSB on pulse product on a workday, during working hours. Although the interaction was not significant at the .05 level, step 3 in the model summary confirmed an interaction was occurring indicating that the interaction between job strain and FSSB was explaining close to 4% of the variance in blood pressure at work as measured by pulse product (see figure 3). This provides evidence that FSSB may be a moderator of the relationship between job strain and pulse product at work.

A third interaction that warrants discussion is the interaction between job strain and FSSB on pulse product on a non-workday, during working hours. Although the interaction was not significant at the .05 level, step 3 in the model summary confirmed an interaction was occurring indicating that the interaction between job strain and FSSB was explaining close to 4% of the variance in blood pressure on a non-workday as measured by pulse product (see figure 4). This provides evidence that FSSB may be a moderator of the relationship between job strain and pulse product on a non-workday.

Moving away from the interactions proposed in this study, there are a number of between variable correlations that warrant discussion. Family-supportive supervisory behaviors were significantly and negatively correlated with job strain. This is an important correlation. Those with higher levels of perceived family-supportive supervisory behaviors had significantly lower job strain scores. The negative consequences of job strain have been reviewed in detail in this manuscript. This finding adds to previous work providing evidence that social support, in and out of the workplace, reduces the amount of job strain a worker experiences and reduces the negative effects of job strain on health (e.g., Berkman et al., 2010; Landsbergis et al., 2008).

FSSB was significantly and positively correlated with job control. This supports previously established relationships in the literature (e.g., Berkman et al., 2010; Matthews et al., 1987). It is logical to assume that those workers who feel like they have high levels of job control also feel like they are supported by their supervisors at work and at home. In fact, one could argue that high levels of perceived FSSB may give employees the sense of ‘more’ control on the job and thus making them feel more empowered on the job.

Over the years, several mechanisms have been proposed of how work and non-work stress may cause hypertension, but very little work has been done on how to stop or reverse the trend. This study has provided evidence that FSSB moderates the relationship between job demands and systolic blood pressure at work. These results, along with the main effects linking FSSB and job strain, provide evidence for developing workplace interventions that properly assess a supervisors’ need for improving support of their subordinates.

*Contributions*

The present study offers a number of contributions to the Occupational Health Psychology field. First and foremost, this study is the first to establish a significant relationship between family-supportive supervisory behaviors as a moderator of the relationship between perceived job demands and an objective health outcome – systolic blood pressure at work. Though the relationship between job demands and worker health has been documented extensively, no single study has uncovered FSSB as a moderator of this relationship.

Another contribution is the use of lower-wage workers, in this case, grocery store employees. Much of the work done in the last 25 years involving job strain and health outcomes has been conducted on white-collar professionals and other privileged workers. Focusing our attention on an underrepresented and lower-wage worker class helps to provide a shift towards the low-wage worker. Research has demonstrated that high strain jobs are most likely to be found in lower-wage professions, yet much work continues to be conducted on a class of workers that is well compensated. I would argue that high strain jobs, coupled with low levels of social support and a low-wage would constitute the ‘highest strain job’.

*Suggestions for Future Research*

Future research should extend family-supportive supervisory behaviors as moderator of the relationship between perceived job demands, job control, and job strain on objective health outcomes other than blood pressure. There are many cardiovascular risk factors that this relationship could be extended to (i.e., cortisol or cholesterol). Blood pressure gives mixed results in the literature and moving to the pulse-product method implemented by Wright (2010) would be of utmost interest and importance. As previously stated, Wright (2010) argues moving away from systolic and diastolic blood pressure measurements when examining cardiovascular risk factors involving the regulation of blood pressure. Wright (2010) contends that using the composite cardiovascular measure of 'pulse product' is much more effective when using the regulation of blood pressure as an outcome variable. Though the exploratory analysis involving pulse product in this study was non-significant, future research investigating FSSB as a moderator using blood pressure as an outcome variable may wish to consider using pulse product to help develop a body of work surrounding this construct.

Post-hoc power analyses suggest having a sample size of 400 may yield beneficial results surrounding the JDC-S, FSSB, and pulse-product while still achieving a power level of .80. A number of post-hoc power analyses were conducted with GPower3 to determine the sample size needed to achieve a power level of .80. The hypothesis test of interest was the F-test for the change in $R^2$ when the interaction term was added to the multiple regression model. Based off the estimates of the change in $R^2$ for the interaction term in the data, I was able to obtain the effect size of $f^2$ and calculate the required sample size. As you can see from Table 10, located on next page, a sample size of 400 would achieve a power level of .80 while investigating both pulse product and systolic and diastolic blood pressure using the JDC-S model. It should also be noted that a sample size of 207 investigating job strain and pulse product is required to achieve a power level of .80 – a very reasonable sample size.

Future research would also benefit from examining the influences FSSB has on variables such as socioeconomic status and health outcomes. If FSSB could be shown to moderate the effects of low-wages and their negative impacts on health, it would benefit both organizations and individuals to implement interventions increasing levels of FSSB in the workplace. It would also be beneficial to include a subjective measuring of well-being in conceptual model with an objective health outcome. For example, future studies wishing to build off of this research may consider adding a subjective well-being component. It would be interesting to see how objective and subjective measures interact with FSSB.

There continues to be inconsistency in the interactive effects in the JDC-S. Future research needs to examine why these inconsistencies are occurring. de Jonge and Dorman (2006) argue that all variables being examined using the JDC-S theoretical framework must address the same domains. For example, addressing physical health outcomes may not be appropriate when looking at perceived job demands but instead must only look at 'physical' job demands. de Jonge and Dorman (2006) refer to this as the 'triple match principle'. This is an interesting concept and one worth exploring further.

Lastly, I believe it is important to examine FSSB as moderator between job strain, job demands, job control, and cardiovascular risk factors longitudinally. Ideally, exploring this relationship over a number of years, with interventions implemented

Table 10

*Sample Size Required to Achieve a Power Level of .80*

| | Job Strain | Job Demands | Job Control | Age |
|---|---|---|---|---|
| Systolic BP workday, work-hour | 7843 | 336 | 3919 | 168,704 |
| Diastolic BP workday, work-hour | 976 | 976 | 196,210 | 1704 |
| Systolic BP non-workday, work-hour | 387 | 336 | 1564 | |
| Diastolic BP non-workday, work-hour | 1,868,779 | 1957 | 1957 | |
| Pulse Product Workday | 207 | 261,631 | 309 | |
| Pulse Product non-Workday | 207 | 2611 | 201 | |

Note. Based off the estimates of the change in $R^2$ for the interaction term in the data I was able to obtain the effect size of $f^2$ and calculate the required sample size. All values are based off estimates given by GPower3.

throughout, would provide a depth of understanding one could only imagine.

*Limitations*

The results of this study strengthen the results of previous research. However, there are potential limitations one must consider when interpreting the results. First and foremost, the design of this study is cross-sectional. When employing cross-sectional designs it is difficult for researchers to draw conclusions regarding the relationships presented in the models.

Secondly, all of the data collected were self-reporting. Self-report methods have shown that variance in the constructs measured could be attached to the survey itself and not the construct of interest. In relation to this, the blood pressure monitors could have been misused by participants over the course of the study. For example, it is plausible that a person other than the participant could have taken blood pressure readings during the study.

A third limitation, and of great importance, is the sample size (N=56). The sample size in this study is small and drawing conclusions on a sample size of this magnitude is not advisable. In addition, with a sample size of N=56 statistical power will be a cause for concern and compounding that with 5 controls variables with such a small sample size is a limitation. It should be noted that the post hoc power analyses yielded sample size of approximately 200 participants to achieve the same level of power. This is a very reasonable sample size that should be considered for future research.

A fourth limitation involves part-time workers. Because the population used in this study is grocery store workers, many are part-time and/or have second jobs. The number of part-time workers or those with second jobs may be influencing the results. It is plausible that those that work full-time may have much greater job strain than those who only work part-time. One could also argue that part-time workers may not have enough information to properly assess the questions in the JCQ and FSSB scales.

Outside social support also presents a potential limitation. Not accounting for social support outside the workplace may significantly influence the results. For example, it is plausible that those with strong social networks outside of work may require less social support while working. It is also important to note that strong levels of social support in the home have been associated with lower levels overall blood pressure (Brownley, 1996).

The final limitation in this study involves the Job Content Questionnaire. The JCQ meets established guidelines for acceptable research reliability levels ($\alpha \geq .70$), however the reliability levels for the scales that construct the JCQ fall below the acceptable research reliability levels. For example, decision authority, a subscale for job control has an alpha-level of .69, but because skill discretion, the other subscale of job control has an alpha-level of .71 the criteria of $\alpha \geq .70$ is met (Stone-Romero et al., 1994). Although the alpha-levels are not optimal, the JCQ continues to be the most popular for encapsulating job strain in workers (Landsbergis et al., 2008).

*Summary*

Negative health outcomes caused from job strain, such as the temporary increases in blood pressure at work, over time, can increase cardiovascular risk and mortality (Schwartz et al, 1996; Landsbergis et al., 2001; Schnall et al., 1994). Therefore, uncovering FSSB as buffer between employee blood pressure and job demands may lead to interventions aimed at decreasing cardiovascular risk in employees through the facilitation of family-supportive supervisory behaviors training in supervisors.

This study provides further evidence of the relationship between social support, specifically FSSB, and job strain. Organizations continue to lose billions of dollars annually to absenteeism, turnover, and health related costs such as insurance premiums and workplace injury or illness. This study uncovered FSSB as a buffer between perceived job demands and an employee's systolic blood pressure at work. These results can give organizations some insight in how boosting workplace supervisor support, for work and family, can directly impact their bottom-line. In addition to the organizational insight, future researchers can use this study as a foundation for substantiating the role that family-supportive supervisory behaviors play in the workplace both as a moderator and as a predictor.

Table 1

*Intercorrelations, Means, and Standard Deviations of Study Variables* (N=56)

| Variable | *M* | *SD* | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Control | 64.29 | 10.88 | - | | | | | | | |
| 2. Demands | 29.46 | 3.74 | .029 | - | | | | | | |
| 3. FSSB | 3.35 | 0.79 | .309* | .149 | - | | | | | |
| 4. JobStrain | 0.94 | 0.21 | -.816** | .493** | -.304* | - | | | | |
| 5. SysBPwdwh | 121.11 | 11.52 | -.184 | .105 | -.293 | .124 | - | | | |
| 6. DiaBPwdwh | 75.74 | 8.74 | -.267* | -.006 | -.236 | .170 | .698** | - | | |
| 7. SysBPnwdwh | 118.81 | 14.22 | -.164 | -.051 | -.152 | .052 | .813** | .624** | - | |
| 8. DiaBPnwdwh | 72.71 | 9.70 | -.136 | .030 | -.012 | .092 | .636** | .777** | .800** | - |

*Note.* Control = Overall control score. Demands = Overall demands score. FSSB = Family supportive supervisory behaviors score. JobStrain = Job Strain score. SysBPwdwh = Systolic blood pressure, workday, work hour. Diawdwh = Diastolic blood pressure, work day, work hour. SysBPnwdwh = Systolic blood pressure, non-workday, work hour. Dianwdwh = Diastolic blood pressure, non-work day, work hour.

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

Table 2

*Details of Each Regression Analysis*

| Regression | Hypotheses Tested, terms included in each step: Store – dummy coded. | Dependent Variable |
|---|---|---|
| 1 | H2a | Systolic BP, workday work-hour |
| | 1. Meds, BMI, Store, Age, Gender | |
| | 2. cJS , cFSSB | |
| | 3. cJS x cFSSB | |
| 2 | H2b | Diastolic BP, workday work-hour |
| | 1. Meds, BMI, Store, Age, Gender | |
| | 2. cJS , cFSSB | |
| | 3. cJS x cFSSB | |
| 3 | H2c | Systolic BP, non-workday work-hour |
| | 1. Meds, BMI, Store, Age, Gender | |
| | 2. cJS , cFSSB | |
| | 3. cJS x cFSSB | |
| 4 | H2d | Diastolic BP, non-workday work-hour |
| | 1. Meds, BMI, Store, Age, Gender | |
| | 2. cJS , cFSSB | |
| | 3. cJS x cFSSB | |
| 5 | H3a | Systolic BP, workday work-hour |
| | 1. Meds, BMI, Store, Age, Gender | |
| | 2. cDemands , cFSSB | |
| | 3. cDemands x cFSSB | |
| 6 | H3b | Diastolic BP, workday work-hour |
| | 1. Meds, BMI, Store, Age, Gender | |
| | 2. cDemands , cFSSB | |
| | 3. cDemands x cFSSB | |
| 7 | H3c | Systolic BP, non-workday work-hour |
| | 1. Meds, BMI, Store, Age, Gender | |
| | 2. cDemands , cFSSB | |
| | 3. cDemands x cFSSB | |
| 8 | H3d | Diastolic BP, non-workday work-hour |
| | 1. Meds, BMI, Store, Age, Gender | |
| | 2. cDemands , cFSSB | |
| | 3. cDemands x cFSSB | |
| 9 | H4a | Systolic BP, workday work-hour |
| | 1. Meds, BMI, Store, Age, Gender | |
| | 2. cControl , cFSSB | |
| | 3. cControl x cFSSB | |
| 10 | H4b | Diastolic BP, workday work-hour |

| | | |
|---|---|---|
| | 1. Meds, BMI, Store, Age, Gender | |
| | 2. cControl , cFSSB | |
| | 3. cControl x cFSSB | |
| 11 | H4c | Systolic BP, non-workday work-hour |
| | 1. Meds, BMI, Store, Age, Gender | |
| | 2. cControl , cFSSB | |
| | 3. cControl x cFSSB | |
| 12 | H4d | Diastolic BP, non-workday work-hour |
| | 1. Meds, BMI, Store, Age, Gender | |
| | 2. cControl , cFSSB | |
| | 3. cControl x cFSSB | |

*Exploratory Regression Analyses*

| | | |
|---|---|---|
| 1. | Age, FSSB, BP | Systolic BP, workday work-hour |
| | 1. Meds, BMI, Store, Gender | |
| | 2. cAge, cFSSB | |
| | 3. cAge x cFSSB | |
| 2. | Age, FSSB, BP | Diastolic BP, workday work-hour |
| | 1. Meds, BMI, Store, Gender | |
| | 2. cAge, cFSSB | |
| | 3. cAge x cFSSB | |
| 3. | Age, FSSB, BP | Systolic BP, non-workday work-hour |
| | 1. Meds, BMI, Store, Gender | |
| | 2. cAge, cFSSB | |
| | 3. cAge x cFSSB | |
| 4. | Age, FSSB, BP | Diastolic BP, non-workday work-hour |
| | 1. Meds, BMI, Store, Gender | |
| | 2. cAge, cFSSB | |
| | 3. cAge x cFSSB | |
| 5. | Demands, FSSB, Control | Perceived Job Control |
| | 1. Meds, BMI, Store, Age, Gender | |
| | 2. cDemands, cFSSB | |
| | 3. cDemands x cFSSB | |
| 6. | Job Strain, FSSB, BP | Pulse Product Workday |
| | 1. Meds, BMI, Store, Age, Gender | |
| | 2. cJS, cFSSB | |
| | 3. cJS x cFSSB | |
| 7. | Job Strain, FSSB, BP | Pulse Product Non-workday |
| | 1. Meds, BMI, Store, Age, Gender | |
| | 2. cJS, cFSSB | |
| | 3. cJS x cFSSB | |
| 8. | Job Demands, FSSB, BP | Pulse Product Workday |

1. Meds, BMI, Store, Age, Gender
2. cJD, cFSSB
3. cJD x cFSSB

9. Job Demands, FSSB, BP Pulse Product Non-workday
    1. Meds, BMI, Store, Age, Gender
    2. cJD, cFSSB
    3. cJD x cFSSB

10. Job Control, FSSB, BP Pulse Product Workday
    1. Meds, BMI, Store, Age, Gender
    2. cJC, cFSSB
    3. cJC x cFSSB

11. Job Control, FSSB, BP Pulse Product Non-workday
    1. Meds, BMI, Store, Age, Gender
    2. cJC, cFSSB
    3. cJC x cFSSB

Table 3

*Summary of Hierarchical Multiple Regression Analysis for* ***Job Strain*** *and* ***Family-Supportive Supervisory Behaviors*** *on Systolic Blood Pressure (workday, work-hour), Diastolic Blood Pressure (workday, work-hour), Systolic Blood Pressure (non-workday, work-hour), Diastolic Blood Pressure (non-workday, work-hour, N=56.*

| | Systolic BP (workday) | | | Diastolic BP (workday) | | | Systolic BP (non-workday) | | | Diastolic BP (non-workday) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $R^2$ | $\Delta R^2$ | β | $R^2$ | $\Delta R^2$ | β | $R^2$ | $\Delta R^2$ | β | $R^2$ | $\Delta R^2$ | β |
| (*df*=45) | .440 | .440** | | .335 | .335* | | .338 | .338* | | .220 | .220 | |
| BMI | | | .182 | | | .001 | | | .219 | | | .098 |
| Age | | | .362* | | | .332* | | | .322* | | | .299 |
| Gender | | | -.188 | | | -.102 | | | -.159 | | | -.189 |
| Meds | | | .233 | | | .251 | | | .097 | | | .070 |
| (*df*=43) | .506 | .067 | | .417 | .082 | | .365 | .027 | | .230 | .010 | |
| JS | | | -.015 | | | .085 | | | -.060 | | | .096 |
| FSSB | | | -.287* | | | -.248 | | | -.223 | | | -.022 |
| (*df*=42) | .508 | .001 | | .425 | .008 | | .386 | .020 | | .230 | .000 | |
| JS x FSSB | | | .039 | | | -.096 | | | .153 | | | .002 |

*Note*. BMI=body-mass index. Meds=taking blood pressure medication. Gender = gender of participant. Age=age of participant. JS=centered job strain. FSSB=centered family-supportive supervisory behaviors. JS x FSSB= interaction between centered job strain and centered family-supportive supervisory behaviors. All standardized Beta weights are from final regression equation.

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

Table 4

*Summary of Hierarchical Multiple Regression Analysis for **Job Demands** and **Family-Supportive Supervisory Behaviors** on Systolic Blood Pressure (workday, work-hour), Diastolic Blood Pressure (workday, work-hour), Systolic Blood Pressure (non-workday, work-hour), Diastolic Blood Pressure (non-workday, work-hour), N=56.*

| | Systolic BP (workday) | | | Diastolic BP (workday) | | | Systolic BP (non-workday) | | | Diastolic BP (non-workday) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $R^2$ | $\Delta R^2$ | β | $R^2$ | $\Delta R^2$ | β | $R^2$ | $\Delta R^2$ | β | $R^2$ | $\Delta R^2$ | β |
| (*df*=45) | .440 | .440** | | .335 | .335* | | .338 | .338* | | .220 | .220 | |
| BMI | | | .150 | | | .019* | | | .196 | | | .118 |
| Age | | | .363* | | | .331* | | | .310* | | | .305 |
| Gender | | | -.150 | | | -.113 | | | -.136 | | | -.191 |
| Meds | | | .206 | | | .276 | | | .065 | | | .079 |
| (*df*=43) | .526 | .086* | | .414 | .079 | | .365 | .026 | | .229 | .009 | |
| Demands | | | .081 | | | .063 | | | -.068 | | | .113 |
| FSSB | | | -.313* | | | -.256 | | | -.237 | | | -.016 |
| (*df*=42) | .549 | .023 | | .422 | .008 | | .388 | .023 | | .233 | .004 | |
| Demands x FSSB | | | .186 | | | -.108 | | | .187 | | | -.081 |

*Note*. BMI=body-mass index. Meds=taking blood pressure medication. Gender = gender of participant. Age=age of participant. Demands=centered job demands. FSSB=centered family-supportive supervisory behaviors. Demands x FSSB= interaction between centered job demands and centered family-supportive supervisory behaviors. All standardized Beta weights are from final regression equation.

*p<.05.

Table 5

*Summary of Hierarchical Multiple Regression Analysis for* ***Job Control*** *and* ***Family-Supportive Supervisory Behaviors*** *on Systolic Blood Pressure (workday, work-hour), Diastolic Blood Pressure (workday, work-hour), Systolic Blood Pressure (non-workday, work-hour), Diastolic Blood Pressure (non-workday, work-hour), N=56.*

| | Systolic BP (workday) | | | Diastolic BP (workday) | | | Systolic BP (non-workday) | | | Diastolic BP (non-workday) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $R^2$ | $\Delta R^2$ | β | $R^2$ | $\Delta R^2$ | β | $R^2$ | $\Delta R^2$ | β | $R^2$ | $\Delta R^2$ | β |
| (*df*=45) | .440 | .440** | | .335 | .335* | | .338 | .338* | | .220 | .220 | |
| BMI | | | .168 | | | -.010 | | | .103 | | | .097 |
| Age | | | .364* | | | .320* | | | .023* | | | .285 |
| Gender | | | -.185 | | | -.111 | | | -.159 | | | -.197 |
| Meds | | | .220 | | | .258 | | | .090 | | | .086 |
| (*df*=43) | .507 | .068 | | .425 | .089* | | .365 | .026 | | .230 | .010 | |
| Control | | | .028 | | | -.120 | | | .015 | | | -.087 |
| FSSB | | | -.385* | | | -.255 | | | -.076 | | | -.026 |
| (*df*=42) | .510 | .002 | | .425 | .000 | | .370 | .005 | | .235 | .004 | |
| Control x FSSB | | | .052 | | | .000 | | | -.075 | | | -.071 |

*Note*. BMI=body-mass index. Meds=taking blood pressure medication. Gender = gender of participant. Age=age of participant. Control=centered job control. FSSB=centered family-supportive supervisory behaviors. Demands x FSSB= interaction between centered job control and centered family-supportive supervisory behaviors. All standardized Beta weights are from final regression equation.
*p<.05. **p<.01.

Table 6

*Summary of Hierarchical Multiple Regression Analysis for* ***Job Strain*** *and* ***Family-Supportive Supervisory Behaviors*** *on Pulse Product as outcome variable, N=56.*

| | Pulse Product Work | | | Pulse Product Non-Work | | |
|---|---|---|---|---|---|---|
| Predictors | $R^2$ | $\Delta R^2$ | β | $R^2$ | $\Delta R^2$ | β |
| Step 1 (*df=45)* | .123 | .123 | | .116 | .116 | |
| BMI | | | -.063 | | | -.092 |
| Age | | | -.063 | | | -.048 |
| Gender | | | -.127 | | | -.129 |
| Meds | | | .106 | | | .113 |
| Step 2 (*df=43)* | .145 | .022 | | .147 | .031 | |
| Job Strain | | | .213 | | | .204 |
| FSSB | | | .117 | | | .004 |
| Step 3(*df=42)* | .182 | .037 | | .184 | .037 | |
| Job Strain x FSSB | | | -.206 | | | -.206 |

*Note*. BMI=body-mass index. Meds=taking blood pressure medication. Age=age of participant. Gender=gender of participant. Job Strain = centered job strain. FSSB=centered family-supportive supervisory behaviors. Job Strain x FSSB= interaction between centered job strain and centered family-supportive supervisory behaviors. All standardized Beta weights are from final regression equation. *$p$<.05.

Table 7

*Summary of Hierarchical Multiple Regression Analysis for* ***Job Demands*** *and* ***Family-Supportive Supervisory Behaviors*** *on Pulse Product as outcome variable, N=56.*

| | Pulse Product Work | | | Pulse Product Non-Work | | |
|---|---|---|---|---|---|---|
| Predictors | $R^2$ | $\Delta R^2$ | β | $R^2$ | $\Delta R^2$ | β |
| Step 1 (*df=45)* | .123 | .123 | | .116 | .116 | |
| BMI | | | -.053 | | | -.091 |
| Age | | | -.122 | | | -.117 |
| Gender | | | -.132 | | | -.126 |
| Meds | | | .163 | | | .167 |
| Step 2 (*df=43)* | .124 | .001 | | .129 | .013 | |
| Job Demands | | | -.039 | | | -.071 |
| FSSB | | | -.007 | | | -.139 |
| Step 3(*df=42)* | .124 | .000 | | .131 | .003 | |
| Job Demands x FSSB | | | .000 | | | .061 |

*Note*. BMI=body-mass index. Meds=taking blood pressure medication. Age=age of participant. Gender=gender of participant. Job Demands = centered job demands. FSSB=centered family-supportive supervisory behaviors. Job Demands x FSSB= interaction between centered job demands and centered family-supportive supervisory behaviors. All standardized Beta weights are from final regression equation. *$p$<.05.

Table 8

*Summary of Hierarchical Multiple Regression Analysis for* ***Job Control*** *and* ***Family-Supportive Supervisory Behaviors*** *on Pulse Product as outcome variable, N=56.*

| | Pulse Product Work | | | Pulse Product Non-Work | | |
|---|---|---|---|---|---|---|
| Predictors | $R^2$ | $\Delta R^2$ | β | $R^2$ | $\Delta R^2$ | β |
| Step 1 (*df=45)* | .104 | .104 | | .090 | .090 | |
| BMI | | | -.081 | | | -.091 |
| Age | | | -.101 | | | -.117 |
| Gender | | | -.156 | | | -.126 |
| Meds | | | .126 | | | .167 |
| Step 2 (*df=43)* | .111 | .007 | | .094 | .004 | |
| Job Control | | | .204 | | | .228 |
| FSSB | | | .112 | | | .139 |
| Step 3(*df=42)* | .136 | .025 | | .132 | .038 | |
| Job Control x FSSB | | | .208 | | | .223 |

*Note*. BMI=body-mass index. Meds=taking blood pressure medication. Age=age of participant. Gender=gender of participant. Job Control = centered job control. FSSB=centered family-supportive supervisory behaviors. Job Control x FSSB= interaction between centered job control and centered family-supportive supervisory behaviors. All standardized Beta weights are from final regression equation. *$p$<.05. **p<.01.

Table 9

*Description of Support for Hypotheses in the Regression Analyses*

| Hypothesis (simple effects) | Results | Significant Predictors of Outcome Variable |
|---|---|---|
| H1a | Not supported | |
| H1b | Not supported | |
| H1c | Not supported | |
| H1d | Not supported | |
| H2a | Not supported | Meds, FSSB, Age, Gender |
| H2b | Not supported | Meds, Age |
| H2c | Not supported | Age, Gender |
| H2d | Not supported | |
| H3a | Not supported | Meds, FSSB, Age |
| H3b | Not supported | Meds, Age |
| H3c | Not supported | FSSB |
| H3d | Not supported | |
| H4a | Not supported | Meds, FSSB, Age, Gender |
| H4b | Not supported | Meds, Age |
| H4c | Not supported | Gender |
| H4d | Not supported | |

*Note*. Statistical significance was assessed at $p$<.05.

Figure 1. A visual representation of the hypothesized relationship between *Job Strain* (H1), *Job Demands (*H2), *or Job Control* (H3), *Blood Pressure*, and *Family-Supportive Supervisory Behaviors.*

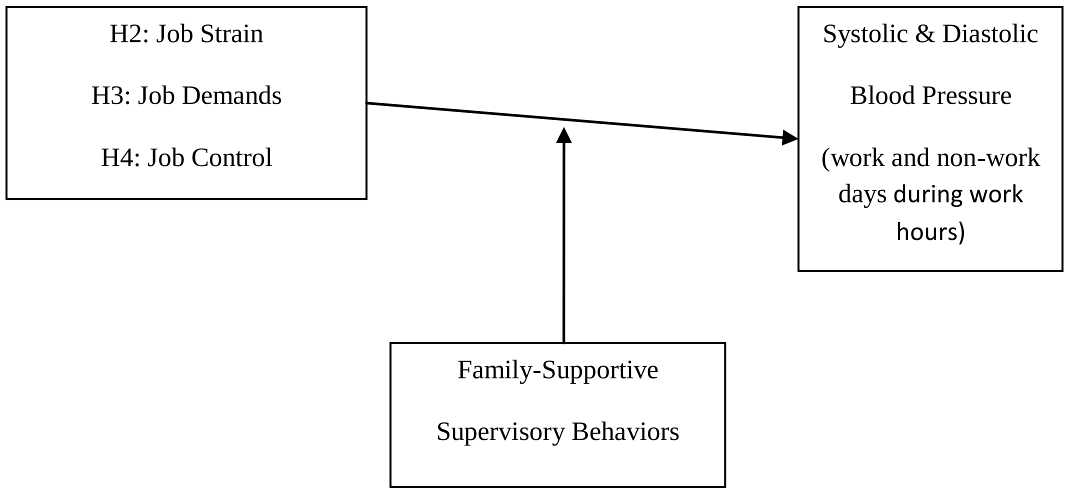

Figure 2. Interaction between Job Demands and FSSB on Systolic Blood Pressure at Work. *N=56*.

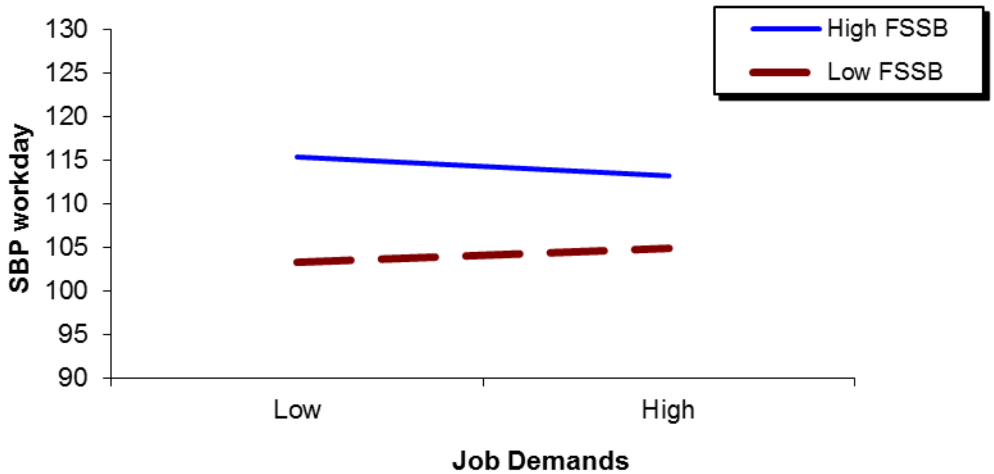


*Figure 2*. Levels of systolic blood pressure at work for individuals with high perceived job demands and individuals with low perceived job demands as a function of level of family-supportive supervisory behaviors. FSSB ranges from on SD above the mean of FSSB to one SD above the mean of FSSB. A high score of job demands is one SD above the mean of job demands and a low score of job demands is one SD below the mean *(df=42).*

Figure 3. Interaction between Job Strain and FSSB on Pulse Product at Work, *N=56*.

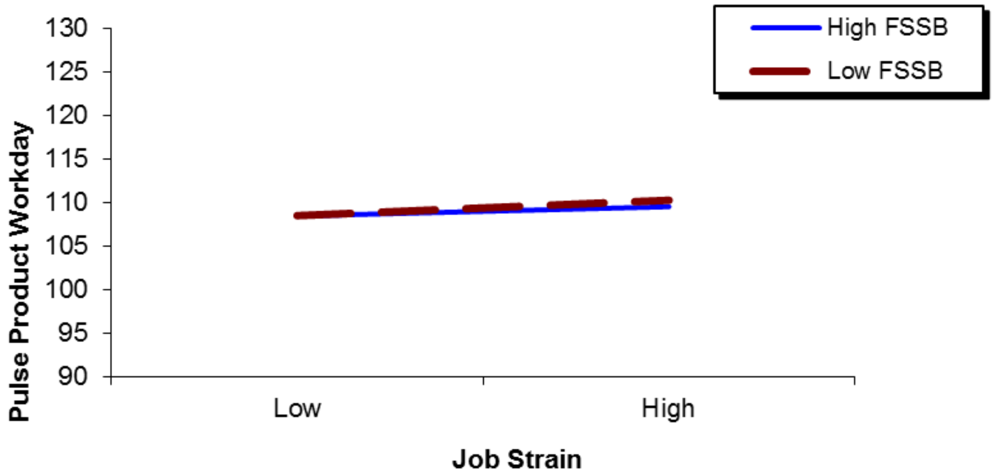


*Figure 3*. Levels of pulse product at work for individuals with high perceived job strain and individuals with low perceived job strain as a function of level of family-supportive supervisory behaviors. FSSB ranges from on SD above the mean of FSSB to one SD above the mean of FSSB. A high score of job strain is one SD above the mean of job strain and a low score of job strain is one SD below the mean *(df=42)*.

Figure 4. Interaction between Job Strain and FSSB on Pulse Product on a Non-workday, *N=56*.

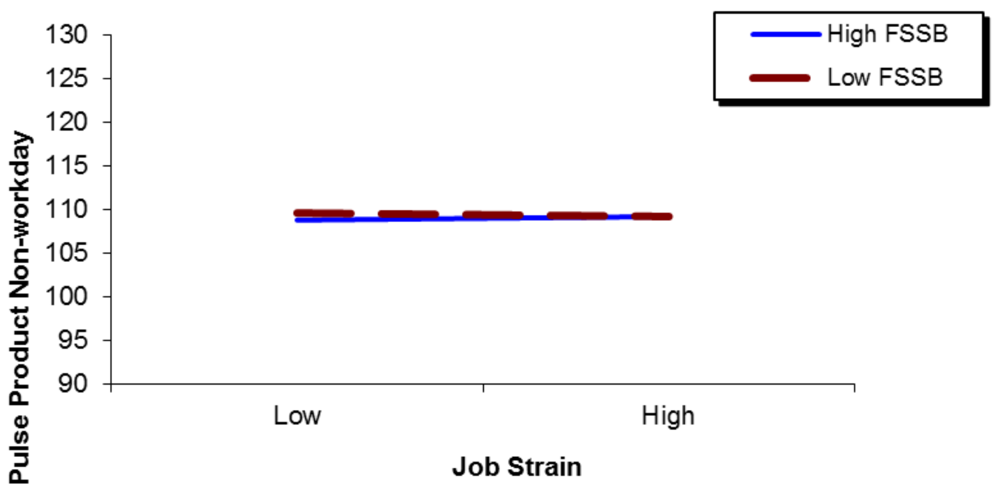


*Figure 4*. Levels of pulse product on a non-workday for individuals with high perceived job strain and individuals with low perceived job strain as a function of level of family-supportive supervisory behaviors. FSSB ranges from on SD above the mean of FSSB to one SD above the mean of FSSB. A high score of job strain is one SD above the mean of job strain and a low score of job strain is one SD below the mean *(df=42).*

References

Aguinis, H., & Stone-Romero, E. (1997). Methodological artifacts in moderated multiple regression and their effects on statistical power. *Journal of Applied Psychology*, 82, 192 – 206.

Aiken, L., & West, S. (1991). *Multiple regression: testing and interpreting interactions.* Newbury Park, CA: Sage.

Allen, T. (2001). Family-supportive work environments: The role of organizational perceptions. *Journal of Vocational Behavior*, 58, 414-435.

Altunkan, S., Genc, Y., Altunken, E. (2007). A comparative study of an ambulatory blood pressure measuring device and a wrist blood pressure monitor with a position sensor versus a mercury sphygmomanometer. *European Journal of International Medicine*, 18, 118-123.

Altunkan, S., Oztas, K., Altunken, E. (2006). Validation of the OMRON 637IT wrist blood pressure device with a position sensor according to the International protocol in adults and obese adults. *Blood Pressure Monitor*, 11, 79-85.

Bandura, A. (1977). *Social learning theory.* Englewood Cliffs, NJ: Prentice Hall.

Belkic, K. L., Landsbergis, P. A., Schnall P. L., Baker, D. (2004). Is job strain a major source of cardiovascular disease risk? A critical review of the empirical evidence, with a clinical perspective. *Scandinavian Journal of Work, Environment & Health*, 30, 85-128

Blumenthal, J. A., Thyrum, E. T., Siegel, W. C. (1995). Contribution of job strain, job status, and marital status to laboratory and ambulatory blood pressure in patients with mild hypertension. *Journal of Psychosomatic Research*, 39, 133-144.

Brisson, C., Laflamme, N., & Moisan, J. (1999). Effect of family responsibilities and job strain on ambulatory blood pressure among white-collar women. *Psychosomatic Medicine,* 61, 205-213.

Brownley, K. (1996). Social support and hostility interact to influence clinic, work, and home blood pressure in black and white men and women. *Psychophysiology,* 33, 434.

Bryk, A.S., & Raudenbush, S.W. (1992). *Hierarchical linear models: Applications and date analysis methods.* Newbury Park, CA: Sage.

Celis, H., Hond E., & Staessen, J. (2005). Self-measurement of blood pressure at home in the management of hypertension. *Clinical Medicine & Research,* 3, 19 – 26.

Clark, L., Denby, L., Pregibon, D., Harshfield, A., Pickering, T., Blank, S., & Laragh, J. (1987). *Journal of Clinical Epidiemology,* 7, 671 – 681.

Chrousos, G. P., & Gold, P.W. (1992). The concept of stress and stress systems disorders. *Journal of the American Medical Association*, 9, 1244 – 1252.

de Jonge, J., & Dormann, C. (2006). Stressors, resources, and strain at work: a longitudinal test of the triple-match principle. *Journal of Applied Psychology*, *5*, 1359-1374.

de Lange, A. H., Taris, T. W., Kompier, M. A., Houtman, I. L. D., Bongers, P. M. (2003). “The Very best of the millennium”: Longitudinal research and the demand-control-(support) model. *Journal of Occupational Health Psychology, 8,* 282-305.

Eby, L. T., Casper, W. J., Lockwood, A., Bordeaux, C., & Brinley, A. (2005). Work and family research in IO/OB: Content analysis and review of the literature (1980–2002). *Journal of Vocational Behavior, 66*(1), 124-197.

Franklin, S., Larson, M., Khan, S., Wong, N., Leip, E., Kannel, W., & Levy, D. (2001). Does the relation of blood pressure to coronary heart disease risk change with aging? *Circulation*, 1, 1245-1249.

Frimerman, A., Miller, H.I., Laniado, S., & Keren, G. (1997). Changes in hemostatic function at times of cyclic variation in occupational stress. *American Journal of Cardiology*, 79, 7-75.

Frone, M. R., Russel, M., & Cooper, M. L. (1992). Antecedents and outcomes of work-family conflict: Testing a model of the work-family interface. *Journal of Applied Psychology, 77*, 65-78.

Frone, M. R., Yardley, J. K., & Markel, K. S. (1997). Developing and testing an integrative model of the work-family interface. *Journal of Vocational Behavior, 50*, 145-167.

Frone, M. R., Russell, M. & Cooper, M. L. (1997). Relation of work-family conflict to health outcomes: A four-year longitudinal study of employed parents. *Journal of Occupational and Organizational Psychology, 70,* 325-335.

Ganster, D.C. (1989). Worker control and well-being: A review of research in the workplace. In S.L. Sauter, J.J. Hurrell, Jr., & C.L. Cooper (Eds.), *Job Control and Worker Health* (pp. 3-24). New York: Wiley.

Goldstein, D., & Kopin, I. (2007). Evolution of concepts of stress. *Stress*, 10, 109 – 120.

Goldstein, I.B., Shapiro, D., Chicz-DeMet, A., & Guthrie, D. (1999). Ambulatory blood pressure, heart rate, and neuroendocring responses in women nurses during work and off work days. *Psychosomatic Medicine*, 61, 387-396.

Graziano, J. Global Burden of Cardiovascular Disease, in *Heart Disease*, Zipes, D., P. Libby, R. Bonow, and E Braunwald (eds.), Elsevier, London, UK, pp. 1 – 19, 2004.

Greenhaud, J.H., & Parasuraman, S. (1986). A work-nonwork interactive perspective of stress and its consquences. *Journal of Organizational Behavior Management*, 8, 37-60.

Hammer, L.B., Kossek, E.E., Yragui, N.L., Bodner, T.E., & Hanson, G.C. (2009). Development and validation of a multidimensional measure of family supportive supervisor behavior (FSSB). *Journal of Management, 35*(2), 837-856.

Hammer, L. B., Kossek, E. E., Zimmerman, K., & Daniels, R. (2007). Clarifying the construct of family supportive supervisory behaviors: A multilevel perspective. In P. L. Perrewe & D. C. Ganster (Eds.), *Research in occupational stress and well-being* (Vol. 6, pp. 171-211). Amsterdam: Elsevier Ltd.

Hausser, J.A. (2010). "Ten years on: a review of recent research on the job demand-control (-support) model and psychological well-being". *Work and stress*, 24, 1-35.

House, J.S., Landis, K.R., & Umberson, D. (1988). Social relationships and health. *Science*, 241, 540-545.

James, G.D., Cates, E.M., Pickering, T.G., & Laragh, J.H. (1989). Parity and perceived job stress elevate blood pressure in young normotensive working women. *American Journal of Hypertension*, 2, 637-639.

Jarret, R.J., Shipley, M.J., & Rose, G. (1982). Weight and mortality in the Whitehall study. *British Medical Journal*, 285, 535-546.

Johnson, J.V., & Hall, E.M. (1988). Job strain, work place social support, and cardiovascular disease: a cross-sectional study of a random sample of the Swedish male working population. *American Journal of Public Health,* 78, 1336 – 1342.

Johnson, J.V., Stewart, W., Hall, E.M., Fredlund, P., & Theorell, T. (1996). Long-term psychosocial work environment and cardiovascular mortality among swedish men. *American Journal of Public Health,* 86, 324-331.

Kahn, R. L., Wolfe, D. M., Quinn, R. P., Snoek, J. D., & Rosenthal, R. A. (1964). *Organizational stress: Studies in role conflict and ambiguity:* New York: Wiley.

Karasek, R.A. (1979). Job demands, job decision latitude and mental strain: Implications for job redesign. *Administrative Science Quarterly,* 24, 285-307.

Karasek, R.A. (1989). Control in the workplace and its health-related aspects. In S.L. Sauter, J.J. Hurrell, & C.L. Cooper (Eds.), *Job Control and Worker Health* (pp. 129-160). Chichester:Wiley.

Karasek, R. A., Theorell, T., Schwartz, J. E., Schnall, P. L., Pieper, C. F., Michela, J. L. (1988). Job characteristics in relation to the prevalence of myocardial infarction in the US Health Examination Survey (HES) and Health and Nutrition Examination Survey (HANES). *Academic Journal of Public Health,* 78, 910-918.

Karasek, R. A., & Theorell, T. (1990). *Healthy work: Stress, productivity, and the reconstruction of working life*. New York: Basic Books.

Karasek, R. A. (1979). Job demands, decision latitude, and mental strain: Implications for job redesign. *Administrative Science Quarterly, 24,* 285-307.

Karasek, R. A. (1985) *Job Content Questionnaire and user's guide*. Lowell: University of Massachusetts Lowell, Department of Work Environment.

Karasek, R., Brisson, C. Kawakami, N., Houtman, I., & Bongers, P. (1998). The Job Content Questionnaire (JCQ): An instrument for internationally comparative assessment of psychosocial job characteristics.

Karasek R, Brisson C, Kawakami N, Brisson, C., Houtman, P., Bongers, P., & Amick, D. (1998). The Job Content Questionnaire (JCQ): An instrument for internationally comparative assessments of psychosocial job characteristics. *Journal of Occupational Health Psychology*, 3(4):322-355.

Kawachi, I. & Marmot, M. (1998). What can we learn from studies of occupational class and cardiovascular disease? *American Journal of Epidemiology,* 148, 160-163.

Khoury, S., Yarows, S., O'Brien, T., Sowers, J. (1992). Ambulatory blood pressure monitoring in a nonacademic setting: effects of age and sex. *American Journal of Hypertension,* 5, 616 – 623.

Kivimaki, M., Virtanen, M., Elovaino, M, Kouvonen, A., Vaananen, A., & Vahtera, J. (2006). Work stress in the etiology of coronary heart disease: a meta-analysis. *Scandinavian Journal of Work, Environment, and Health,* 32, 431-442.

Kristensen, T.S. (1995). The demand-control-support model: methodological challenges for future research. *Stress Medicine,* 11, 17-26.

Landsbergis, P. A., Schnall, P. L., Pickering, T. G., Warren, K., Schwartz, J. E. (2003). Lower socioeconomic status among men in relation to the association between job strain and blood pressure. *Scandinavian Journal of Work, Environment and Health*, 29, 206-215.

Landsbergis, P. A. (1988). Occupational stress among health care workers: A test of the job demands-control model. *Journal of Organizational Behavior, 9*, 217-239.

Landsbergis, P.A., Schnall, P.L., Dietz, D., Friedman, R., & Pickering, T. (1992). The patterning of psychological attributes and distress by 'job strain' and social support in a sample of working men. *Journal of Organizational Behavior,* 15, 379-405.

Landsbergis, P.A., Schnall, P.L., Deitz, D.K., Warren, K., Pickering, T.G., & Schwartz, J.E. (1998). Job strain and health behaviors: results of a prospective study. *Stress Management*, 12, 237-245.

Landsbergis, P.A., Schnall, P.L., Belkic, K., Baker, D., Schwartz, J., Pickering, T.G. (2001). Work stressors and cardiovascular disease. *Work,* 17, 191-208.

Landsbergis, P.A., Schnall, P.L., Schwartz, J.E., Friedman, R.F., Pieper, D., Pickering, T.G., & Gerin, W. (2001). Psychological variables in hypertension: relationship to casual or ambulatory blood pressure in men. *Journal of Biobehavioral Medicine*, 63, 19-31.

Landsbergis, P. A., Schnall, P. L., Belkic, K., Baker, D., Schwartz, J. E., Pickering, T. G., et al. (2002). The workplace and cardiovascular disease: Relevance and potential role for occupational health psychology. In Anonymous (Ed.), *Handbook of Occupational Health Psychology* (pp. 265-288). Washington, DC: American Psychological Association.

Landsbergis, P. A., Schnall, P. L., Belkic, K., Baker, D., Schwartz, J. E., & Pickering, T. G., (2008). Working conditions and masked (hidden) hypertension: insights into the global epidemic of hypertension. *Scandinavian Journal of Work Environment and Health*, 6, 41-51.

Lapierre, L.M., & Allen, T.D. (2006). Work-supportive family, family-supportive supervision, use of organizational benefits, and problem-focused coping: Implications for work-family conflict and employee well-being. *Journal of Occupational Health Psychology*, *11*, 169-181.

Matthews, K.A., Cottington, E.M., Talbot, E., Kuller, I.H., & Siegal, J.M. (1987). Stressful work conditions and diastolic blood pressure among blue collar factory workers. *American Journal of Epidemiology*, 126, 280-291.

McClelland, G., & Judd, C. (1993). Statistical difficulties of detecting interactions and moderator effects. *Psychological Bulletin,* 11, 376 - 390.

Mengden, T., Medina, H., Beltran B., Alvarez, E., Kraft, K., & Vetter, H. (1998). Reliability of reporting self-measured blood pressure values by hypertensive patients. *American Journal of Hypertension*, 11, 1413-1417.

O'Driscoll, M.P., Poelmans, S., Spector, P.E., Kalliath, T., Allen, T.D., Cooper, C.L., et al. (2003). Family-responsive interventions, perceived organizational and supervisor support, work-family conflict, and psychological strain. *International Journal of Stress Management*, 210, 326-344.

Pearlin, L., Lieberman, M., Menaghan, E., & Mullan, J. (1981). The stress process. *Journal of Health and Social Behavior*, 22, 337 – 356.

Pickering, T. (1991). *Ambulatory Monitoring and Blood Pressure Variability*. London, UK: Science Press.

Pickering, T., Hall, J., Appel, L., Falkner, B., Graves, J., Hill, M., Jones, D., Kurtz, T., Sheps, S., & Roccella, E. (2005). Recommendations for blood pressure measurement in humans and experimental animals, *Circulation*, 699 – 716.

Quinn, R. P., & Staines, G.L. (1979). Quality of Employment Survey, 1977: Cross Section. Ann Arbor, MI: Inter-university Consortium for Political and Social Research.

Rau, R. (2006). The association between blood pressure and work stress: the measuring of isolate systolic hypertension. *Work & Stress*, 20, 84-97.

Reckelhoff, J. (2001). Gender differences in the regulation of blood pressure. *American Journal of Hypertension*, 37, 1199 – 1208.

Ruderman, M., Ohlott, P., Panzer, K., & King, S. (2002). Benefits of multiple roles for managerial women. *Academy of Management*, 45, 369-386.

Schnall, P. L., Belkic, K. L., Landsbergis, P. A., Baker, D. B., eds: The Workplace and Cardiovascular Disease. Occupational Medicine, 15(1), 2000.

Schnall, P. L., Landsbergis, P. A., & Baker, D. (1994). Job strain and cardiovascular disease. *Annual Review of Public Health*, 15, 381-411.

Schnall, P. L., Pieper, C., Schwartz, J. E. (1990). The relationship between job strain, workplace diastolic blood pressure, and left ventricular mass index. *JAMA*, 263, 1929-1935.

Schnall, P.L., Schwartz, J.E., Landsbergis, P.A., Warren, K., & Pickering, T.G. (1998). A longitudinal study of job strain and ambulatory blood pressure: results from a three-year follow-up. *Psychosomatic Medicine*, 6, 697-706.

Schwartz, J.E., Pickering, T.G., & Landsbergis, P.A. (1996). Work-related stress blood pressure: current theoretical models and considerations from a behavioral medicine perspective. *Journal of Occupational Health Psychology*, 1, 287-310.

Selye, H. (1974). Stress without distress. New York: New American Library.

Siegrist, J., Peter, R., Junge, Astrid, Cremer, P., & Seidel, D. (1990). Low status control, high effort at work and ischemic heart disease: prospective evidence from blue-collar men. *Social Science & Medicine,* 10, 1127-1134.

Sonnentag, S. & Kruel, U. (2006). Psychological detachment from work during off-job time: The role of job stressors, job involvement, and recovery-related self-efficacy. *European Journal of Work and Organizational Psychology*, 15, 197-217.

Staessan, J., Fagard, R., Lijnen, P., Thijs L., Van Hoof, R., & Amery, A. (1998), Reference values for ambulatory blood pressure: a meta-analysis. *Journal of Hypertension*, 8, 57 – 64.

Steenland et al. (2000). Research findings linking workplace factors to cardiovascular disease outcomes. In P.L. Schnall, K. Belkic, & P. Landsbergis, (eds), The Workplace and Cardiovascular Disease (pp. 7-68). Philadelphia, PA: Hanley & Belfus, Inc.

Stergiou, G., Skeva, S., & Zourbaki, I. (1998). Self-monitoring blood pressure at home: how many measurements are needed? *Journal of Hypertension*, 6, 725-731.

Sterling, P., & Eyer, J. (1988). Allostasis: A new paradigm to explain arousal pathology. In: Fisher, J, Reason, J, eds. Handbook of Life Stress, Cognition, and Health. New York: Johns Wiley & Sons Inc., 629 – 649.

Stone-Romero, E., Alliger, G., & Aguinis, H. (1994). Type II error problems in the use of moderated multiple regression for the detection of moderating effects of dichotomous variables. *Journal of Management*, 20, 167 – 178.

Theorell, T., & Karasek, R.A. (1996). Current issues relating to psychosocial job strain and cardiovascular disease research. *Journal of Occupational Health Psychology,* 1, 9-26.

Theorell, T., Perski, A., Orth-Gomer, K., Hamsten, A., & Ulf de Faire (1991). The effects of the strain of returning to work on the risk of cardiac death after a first myocardial infarction before the age of 45. *Journal of Cardiology,* 30, 61-67.

Thoits, P. A. (2010). Stress and health: Major findings and policy implications. *Journal of Health and Social Behavior*, 51, 541 – 553.

Thomas, L.T. & Ganster, D.C. (1995). Impact of family-supportive work variables on work-family conflict and strain: a control perspective. *Journal of Applied Psychology,* 80, 6-15.

Thompson, C. A,, Andreassi, J. K., & Prottas, D. J. (2005). Work-Family Culture: Key to reducing Workforce-Workplace mismatch. In Bianchi, S. M., Casper, L. M., & King, R. B (Eds.). *Work, family, Health, and Well-Being.* (pp. 117-132). Mahwah: Lawrence Erlbaum Associates.

Topouchian, J., El Assad, M., Orobinskaia, L., El Feghali, R., & Asmar, R. (2006). Validation of two automatic devices for self-measurement of blood pressure according to the International Protocol of the European Society of Hypertension: the Omron M6 (HEM-7001-E) and the Omron R7 (HEM 637-IT). *Blood Pressure Monitoring. 11*(3), 165-171.

Uchino, B. N., Cacioppo, J. T., & Kiecolt-Glaser, J. K. (1996). The relationship between social support and physiological processes: A review with emphasis on underlying mechanisms and implications for health. *Psychological Bulletin, 119,* 488-531.

Van Burren, S. (1999). Multiple imputation of missing blood pressure covariates in survival analysis. *Stats in Medicine*, 18, 681.

Van der Doef, M., & Maes, S. (1999). The job demand-control (-support) model and psychological well-being: a review of 20 years of empirical research. *Work & Stress*, 13, 87-114.

van Vegchel, N., de Jonge, J., & Landsbergis, P. (2005). Occupational stress in (inter)action: the interplay between job demands and job resources. *Journal of Organizational Behavior*, 26, 535-560.

Verhoeven, C., Maes, S., Kraaj, V., & Joekes, K. (2003). Job conditions and wellness/health outcomes in dutch secondary school teachers. *Psychology & Health*, 18, 473-487.

Viswesvaran, C., Sanchez, J.I., & Fisher, J. (1999). The role of social support in the process of work stress: a meta-analysis. *Journal of Vocational Behavior*, 54, 314-334.

Waldron, I., Nowatarski, M., Friemer, J., Henry, P., Post, N., & Witten, C. (1982). Cultural variation in blood pressure: a qualitative analysis of the relationship of blood pressure to cultural characteristics, salt consumption and body weight. *Social Science and Medicine,* 16, 419 – 430.

Wamala, S.P., Wolk, A., & Orth-Gomer, K. (1997). Determinants of obesity in relation to socioeconomic status among middle-aged swedish women. *Preventive Medicine,* 26, 734-744.

Wang, P. & Walumbwa, F. (2007). Family-friendly programs, organizational commitment, and work withdrawal: the moderating role of transformational leadership. *Personnel Psychology*, 60, 397-427.

World Health Organization, *The Atlas of Heart Disease and Stroke*, World Health Organization, Geneva, Switzerland, 2009.

Wright, T. (2010). The role of psychological well-being in job performance, employee retention, and cardiovascular health. *Organizational Dynamics*, *1*, 13-23.

Yarnell, J. (2008). Stress at work – an independent risk factor for coronary hear disease? *European Heart Journal*, 29, 579-580.

Zedeck, S. (1971). Problems with the use of "moderator" variables. *Psychological Bulletin*, 76, 295 – 310.

Zimmerman, M.K. & Hartley, W.S. (1982). High blood pressure among employed women: a multi-factor discriminant analysis. *Journal of Health and Social Behavior*, 23, 205-220.

# Appendix A

Job Content Questionnaire

*Skill Discretion Subscale*

| In my job… | *Strongly Disagree* | *Disagree* | *Neutral* | *Agree* | *Strongly Agree* |
|---|---|---|---|---|---|
| My job requires that I learn new things | | | | | |
| I have an opportunity to develop my own special abilities | | | | | |
| My job requires a high level of skill | | | | | |
| I get to do a variety of things on my job | | | | | |
| My job requires a lot of repetitive work | | | | | |
| My job requires me to be creative | | | | | |

*Decision Authority Subscale*

| In my job… | *Strongly Disagree* | *Disagree* | *Neutral* | *Agree* | *Strongly Agree* |
|---|---|---|---|---|---|
| My job allows me to make a lot of decisions on my own. | | | | | |
| On my job, I am given a lot of freedom to decide how I do my work. | | | | | |
| I have a lot of say about what happens on my job. | | | | | |

*Psychological Demands Subscale*

| In my job… | *Strongly Disagree* | *Disagree* | *Neutral* | *Agree* | *Strongly Agree* |
|---|---|---|---|---|---|
| I am not asked to do an excessive amount of work. | | | | | |
| I am free from conflicting demands others make. | | | | | |
| I have enough time to get the job done. | | | | | |
| My job requires working very fast. | | | | | |
| My job requires working very hard. | | | | | |

# Appendix B

## Calculation of Job Strain

A job strain ratio term is created from the JCQ.

A score of 1.0 or above indicates job strain.

(Overall Job Demands*2) / (Decision-Latitude) = Job Strain ratio term

| Formulas for JCQ Scale | Possible Range |
|---|---|
| Job Skill Discretion = [q1+q3+q5+q7+q9+5-q2] * 2 | 12 – 48 |
| Job Decision-Making Authority [2*(q4+q6+q8)] * 2 | 12 – 48 |
| Decision Latitude = Skill Discretion + Decision-Making Authority | 24 – 96 |
| Job Demands = 3*(q10+q11) + 2*(15 – q13 – q -14 – q15) | 24 – 96 |

# Appendix C

## Family Supportive Supervisor Behaviors

*Emotional Support*

| | *Strongly Disagree* | *Disagree* | *Neutral* | *Agree* | *Strongly Agree* |
|---|---|---|---|---|---|
| My supervisor is willing to listen to my problems in juggling work and nonwork life. | | | | | |
| My supervisor takes the time to learn about my personal needs. | | | | | |
| My supervisor makes me fell comfortable talking to him or her about my conflicts between work and nonwork. | | | | | |
| My supervisor and I can talk effectively to solve conflicts between work and nonwork issues. | | | | | |

*Instrumental Support*

| | *Strongly Disagree* | *Disagree* | *Neutral* | *Agree* | *Strongly Agree* |
|---|---|---|---|---|---|
| I can depend on my supervisor to help me with scheduling conflicts if I need it. | | | | | |
| I can rely on my supervisor to make sure my work responsibilities are handled when I have unanticipated nonwork demands. | | | | | |
| My supervisor works effectively with workers to creatively solve conflicts between work and nonwork. | | | | | |

*Role Model*

| | *Strongly Disagree* | *Disagree* | *Neutral* | *Agree* | *Strongly Agree* |
|---|---|---|---|---|---|
| My supervisor is a good role model for work and nonwork balance. | | | | | |
| My supervisor demonstrates effective behaviors in how to juggle work and nonwork balance. | | | | | |
| My supervisor demonstrates how a person can jointly be successful on and off the job. | | | | | |

*Creative Work-Family Management*

| | *Strongly Disagree* | *Disagree* | *Neutral* | *Agree* | *Strongly Agree* |
|---|---|---|---|---|---|
| My supervisor thinks about how the work in my department can be organized to jointly benefit employees and the company. | | | | | |
| My supervisor asks for suggestions to make it easier for employees to balance work and nonwork demands. | | | | | |
| My supervisor is creative in reallocating job duties to help my department work better as a team. | | | | | |
| My supervisor is able to manage the department as a whole team to enable everyone’s needs to be met. | | | | | |

Appendix D

Formula to calculate Body-mass Index:

BMI = mass (lbs.) x 703 / (height in inches) $^2$