Salivary Cortisol, Rank, and Perceived Control

Among Law Enforcement Personnel

by

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DISSERTATION

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Dedication

This dissertation is dedicated to my loving husband, Sergeant George Kozieradzki.

Shortly after I started graduate school you presented me with a card depicting a ladder as a representation of steps I would climb toward my goal of attaining a doctorate in clinical psychology. I am grateful that you extended your hand, taking mine in yours and climbing that ladder with me, sometimes next to me, and sometime pushing me from behind. It is your strength, determination, patience, and generosity that helped me attain each rung on that ladder. You inspire me everyday and have been instrumental in every one of my achievements. I cannot imagine putting on a bulletproof vest and a gun in a holster to go to work every night as you have for the last 26 years. Your dedication, selflessness, compassion for others, and love of the job is inspiring. I know there is a hero in all of us, but few can step up to the challenge, thanks for being my hero, and a hero to thousands of strangers for the past 26 years.

I could not have done this without you. I love you. (1010)

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Table of Contents

List of Tables

List of Figures

Abstract

This exploratory secondary analysis examined rank (position on occupational hierarchy), perceived control, and salivary cortisol (biomarker for stress) using archival data from the Buffalo Cardio-Metabolic Occupational Police Stress (BCOPS) study (Violanti et al., 2006). It was expected that higher-ranking officers (detective, sergeant, lieutenant, and captain) would have more perceived control, and would have lower waking cortisol values than lower-ranking officers (patrol officer/police officer). Perceived control was assessed using the control facet of the Short Hardiness Scale (Dispositional Resilience Scale, DRS-15) developed by Paul T. Bartone (1995). Awakening salivary cortisol (AC) samples include samples immediately upon waking (AC0), with repeated measures 15 (AC 15), 30 (AC 30), and 45 (AC 45) minutes thereafter. The awakening cortisol response (ACR) was computed by using the mean increase (MnInc) in cortisol levels (AC 15 + AC 30 + AC45)/3-AC0). There were no statistically significant findings; however, there are a number of implications to be derived from this analysis for future research.

Keywords: cortisol, law enforcement, stress, rank, perceived control, allostasis, allostatic load

"True heroism is remarkably sober, very undramatic. It is not the urge to surpass all others at whatever cost, but the urge to serve others at whatever cost." (Arthur Ashe)

Introduction

In the United States, the number of law enforcement officers who risk their lives to protect millions of people, many of whom are strangers, exceeds 800,000 (Bureau of Labor Statistics, 2008). On a daily basis, officers face the potential of being involved in emotionally and physically demanding situations, violent encounters, or even life threatening situations with any number of citizens and under various circumstances. The duties officers perform range from something as benign as helping someone with directions, to critical incidents involving deadly force.

In essence, police officers are expected to be superhuman individuals; that is, they are expected to take incredible amounts of verbal abuse, approach unpredictable strangers, stand between quarreling domestic partners, drive cars at high rates of speed while keeping others and themselves safe, be exposed to blood borne pathogens and other potentially harmful bodily fluids, face deadly weapons in the hands of unpredictable individuals, and be witness to life's most violent and tragic moments. The reality is, behind those bulletproof vests and badges are humans—humans required to push their psychological, physical, and physiological capabilities above and beyond normal limits in their daily occupational lives, while at the same time not being affected by the tragedies of others. Bravery, honor, devotion, and heroism come at a cost. Consider the experiences of the following officers.

In the very early morning hours, Officer Johnson pulled a vehicle over due to a traffic violation. As he exited his cruiser, he observed the individual inside the vehicle moving

excessively. Officer Johnson then approached the vehicle with his hand on his gun in preparation for more than just a traffic stop. Fortunately for this officer the occupant was simply looking for his required documentation (license, registration, and proof of insurance) to give to the officer.

A few months later, within the same department, Officers Smith and Thomas had just completed a call and were standing by their cruisers conversing. Officer Thomas observed a vehicle being driven erratically at a high rate of speed approaching the officers. Just prior to the vehicle slamming into the rear of the cruisers, Officer Thomas grabbed Officer Smith, and the two jumped to safety and were unharmed. The individual driving the vehicle was deemed intoxicated.

In the third scenario, Officer Harvard was dispatched to a call that involved individuals loitering on a front porch of a private residence. When he arrived, things quickly took a drastic turn. As the officer approached a group of males, one individual pulled out a gun and shot the officer in his dominant hand. The suspect then put his gun to Officer Harvard's head while he lay on the ground and pulled the trigger. Luckily for this Officer, the gun jammed. The suspect and the officer began to roll around on the ground as the suspect attempted to remove the officer's firearm from his holster. Officer Harvard was able to prevent the individual from doing so by using his other hand, and rolling over onto his holster. At the same time, neighbors attempted to help the officer by pulling the suspect off of him just as help arrived.

These stressors (external demands), which are inherent in the job, included both psychological and physical demands. But stress is not limited to the street, critical incidents, or exposure to human suffering. Decades of previous law enforcement stress research have established a number of other stressors that contribute to officer stress. These include but are not limited to, the organization (Aaron, 2000; Anshel, 2000; Collins & Gibbs, 2003; Finn & Tomz,

1997; Gershon, Barocas, Canton, Li, & Vlahov, 2009; Kroes, 1985), administrative policies and inadequate equipment (Liberman et al., 2002), negative public perception and criminal justice system (Aaron, 2000; Finn & Tomz, 1997; Kroes, 1985), lack of supervisory support (Anshel 2000; Finn & Tomz, 1997; Kroes, 1985), and lack of input into policy and decision making (Finn & Tomz, 1997; Kroes, 1985).

Stress can be defined in a multitude of ways. For this project, stress is defined as occurring when "environmental demands tax or exceed the adaptive capacity of an organism, resulting in psychological and biological changes that may place persons at risk for disease" (Cohen, Kessler, & Underwood Gordon, 1997, p. 24).

In the previously described scenarios, all four officers were very lucky, as any one of these situations could have turned deadly. In Officer Johnson's case, he interpreted an action by the driver as a potentially dangerous situation and prepared himself to take defensive action if necessary. In the second case, Officer Thomas made a split second decision that saved both officers' lives. In Officer Harvard's situation, despite his injuries, he worked to save his own life, while protecting the citizens nearby. The external demands (stressors) experienced by these officers set into motion a stress response that included behavioral and physiological changes, which, according to Robert Sapolsky can be "induced by physical, psychological, or the mere anticipation of physical or psychological stressors" (Sapolsky, 2004a, p. 7). In other words, in an effort to adapt, overcome, and meet the demands placed on them, these officers experienced the same physiological changes, or *allostasis*, regardless of the type of stressor they encountered.

Allostasis, a term proposed by Sterling and Eyer (1988) to describe the stress response, means, "to maintain stability an organism must *vary* all of the parameters of its internal milieu and match them appropriately to environmental demands" (p. 636). This response includes the

autonomic nervous system (sympathetic) and the hypothalamic-pituitary-adrenal (HPA) axis (McEwen, 2007).

Though allostatic responses are essential when adapting to various environmental demands and are considered to be protective in the short term (McEwen, 2007; Sapolsky, 2004a; Stewart, 2006), the cost of eliciting allostatic responses chronically, or for prolonged periods of time, takes a toll and can result in *allostatic load* (McEwen & Lasley, 2002; Schulkin, 2003). Allostatic load is the "wear and tear that results from chronic over activity or under activity of allostatic systems" (McEwen, 1998, p.171). This wear and tear increases an individual's vulnerability to developing a number of health problems such as obesity, hypertension, insulin resistant diabetes mellitus, ulcers, coronary heart disease, stroke, immune disorders, kidney disease (Charmandari, Tsigos, & Chrousos, 2005; Sapolsky, 2000; Sterling and Eyer, 1981, 1988; Walker, 2007), depression, and anxiety (McEwen & Lasley, 2002; Sapolsky, 2004a), while also fueling the risk of exacerbating preexisting illnesses (McEwen & Lasley 2002; Sapolsky, 2005). Therefore allostatic load is a measure of cumulative stress (Stewart, 2006) as indicated by physiological dysregulation across various systems (e.g., immune system and cardiovascular system, Rabin, 1999; Sapolsky, 2004a). Just as in allostasis, the HPA axis is also a preeminent player in allostatic load.

One of the key physiological indicators of the effects of chronic stress on individuals is cortisol (Kirshbaum & Hellhammer, 1989; McEwen & Lasley, 2002), a hormone that is regulated by the HPA axis. The more dysregulated the cortisol, the more possible harm to allostasis and vulnerability to disease states (J. M. Violanti, personal communication, September 14, 2009).

Unfortunately four decades of law enforcement stress research have failed to significantly

reduce stressors and the negative psychological and physical health outcomes associated with being a law enforcement officer. Today, many of the same stressors identified in the 1970s still exist, with new ones emerging (e.g., terrorism/loss of job security due to economy). Additionally, health problems that have been documented in law enforcement officers have remained constant, and in some cases have become worse (Collins & Gibbs, 2003). Moreover, Violanti, Vena, and Petralia (1998) have reported increased mortality rates in one police cohort. Though identifying factors that lead to or contribute to stress within law enforcement is important, especially when developing interventions, it may not be sufficient because some elements are not discernible. One element may be perceived control.

Karasek's (1979) job demand-control model of occupational stress, which is a frequently cited influential work, adds merit to control playing an important part in experiencing and reducing psychosocial stress. One aspect of the model states that high-strain jobs (high demand/low control) impose the "most adverse reactions of psychological strain and physical illness" (Van Der Doef & Maes, 1999, p. 89). The premise is that control acts as a buffer to reduce stress.

In addition to control, Robert Sapolsky's work with nonhuman primates, and the Whitehall studies conducted with British civil servants, identified position within a hierarchy to be critical mediating factors. Sapolsky noted that higher-ranking baboons had less stress as indicated by lower levels of cortisol, and the Whitehall studies found that rank within the occupational hierarchy determined level of stress (National Geographic, 2008). More specifically, the lower ranking the civil servant was, the higher the risk for coronary artery disease and other diseases (National Geographic, 2008). Furthermore, Bosma et al. (1997) found control mediated the amount of stress experienced by the individual, and noted that increasing control over one's job

decreased the risk of coronary heart disease. Given that law enforcement stress research often identifies cardiac-related diseases (i.e., atherosclerosis, coronary artery disease, carotid artery disease, heart attack, and high blood pressure) as a common negative health outcome, it would make sense to examine the relationship of occupational rank, control, and stress among law enforcement officers.

Rationale

As previously described, there are a number of physical and psychological stressors encountered by law enforcement officers on a daily basis. Given the numerous expectations, range of duties, and multitude of scenarios officers contend with, the activation of the HPA axis can occur numerous times during a single shift, remain elevated, or fail to return to baseline. Doing so chronically day in and day out for years on end potentially increases an officer's vulnerability to allostatic load and an array of illnesses. Understanding the physiological adjustments required to meet both physical and psychological demands, along with the role rank and control play within an occupational hierarchy as possible mediating factors, will help in the development of interventions and improve officer health. Furthermore, this study will add to future research by identifying areas of further inquiry that may offer an effective avenue for change.

Purpose

The present study used allostasis, allostatic load theory, and the job demand-control model as a foundation for exploring if there was a relationship between rank and control as it pertains to level of stress measured using waking salivary cortisol (biomarker for stress) among law enforcement personnel. This was a secondary analysis of archival data from the Buffalo Cardio-Metabolic Occupational Police Stress (BCOPS) Pilot Study (Violanti et al., 2006).

Research Questions

The following four questions were of interest: (a) Is there a relationship between level of officer rank and stress as assessed by the awakening cortisol response (ACR)?; (b) Is there a relationship between level of officer rank and level of perceived control as assessed by the control facet of the Short Hardiness Scale (Dispositional Resilience Scale, DRS-15) developed by Paul T. Bartone (1995)?; (c) Is there a relationship between level of perceived control as assessed by the control facet of the Short Hardiness Scale (Dispositional Resilience Scale, DRS-15) developed by Paul T. Bartone (1995); and ACR? and (d) Does the combination of level of officer rank and level of perceived control have a stronger relationship with ACR than either variable considered alone?

Literature Review

In an effort to elucidate how the area of stress research has evolved, this chapter begins with a historical examination of the evolution of stress physiology and the pathology of chronic psychosocial stress with an introduction of new terms. This section also discusses the job-demand-control theory with special attention given to the construct of control. Furthermore, consideration of the connection between occupational status (hierarchy) and aspects of psychological stress will be examined within the occupation of law enforcement.

History

Historically, research on physiological changes that occur in an effort to maintain internal stability, health, and life have most commonly been associated with Claude Bernard and Walter Cannon. Though Walter Cannon is probably the most frequently cited, it was Claude Bernard in the 1850s who first proposed the "*milieu interieur,* or internal physiological equilibrium"

(Chrousos & Gold, 1992, p. 1245) through his research on organ tissues and fluids (Schulkin, 2003). In the 1900s, Walter Cannon expanded on Bernard's concept and introduced the term homeostasis (Chrousos & Gold, 1992; McEwen & Lasley, 2002; Schulkin, 2003; Selye, 1976). Homeostasis or "remaining stable by staying the same" (McEwen & Lasley, 2002, p. 5), relates to internal conditions that must be maintained within a specific range, such as body temperature, blood oxygen, glucose, sodium, and acidity to name a few (McEwen, 1998; McEwen & Lasley, 2002; Sapolsky, 2004a; Schulkin, 2003; Sterling & Eyer, 1988). This process relies on a negative feedback system that self corrects. In other words, when something falls below or goes above a set point of functioning, the organism works to return the level to a designated parameter.

Cannon broadened the concept of homeostasis when he delineated an adaptive process known as the "fight-or-flight" syndrome, or the stress response, which included the sympathetic nervous system and the role epinephrine and norepinephrine played in the process (Chrousos & Gold, 1992; Sapolsky, 2004a).

In the 1930s, while conducting research on rats, Selye observed a similar phenomenon to the one observed by Cannon. Selye discovered how chronic physical and psychological strain (environmental) negatively impacted the health of his rats, particularly on the stomach, immune system, and adrenal glands, at which time he described what he had documented as *stress,* resulting from internal and environmental insults (Selye, 1976). Most importantly, he discovered that internally the rats reacted similarly regardless of the range of stressors they encountered, and under certain conditions this resulted in illness.

In its original definition, the "fight or flight" response is considered a survival mechanism that helps the body in preparing for some type of acute and major use of energy (Sapolsky, 2004a) due to some form of physical threat. In other words, in order to face a challenge head on,

or be able to run the other way and save one's self when a physical threat is imminent, a number of biological physiological changes need to occur. Important in this process is that these changes should be enacted in the short-term. The problem with using the term "flight or fight" today, is that the stress response is solicited more commonly in association with psychological stress (Sapolsky, 2004a), and less commonly with acute physically threatening environmental demands. Common modern stressors include the economy, job loss, occupational stress, relationship problems, and financial difficulties just to name a few.

Furthermore, since the time of Bernard and Cannon, research has generated a shift from what once "viewed the body as operating almost independently of the brain" (Sterling & Eyer, 1988, p. 631) to acknowledging the major role the central nervous system imparts as a leading "regulatory influence on somatic physiology" (Sterling & Eyer, 1988, p. 631). Additionally, in the last thirty years or so, research has discovered that homeostasis and its negative feedback mechanisms do not apply to all aspects of internal regulation. According to Sterling and Eyer (1988):

> In homeostasis, negative feedback mechanisms, uniformed as to need, force a parameter to a specific "setpoint." If blood pressure were actually determined in this way, that is, set to an average, "normal" value, it would almost invariably be too high or too low for whatever was going on at the moment. (p. 637)

Therefore to better account for the role of the brain, regulatory systems in which there are no set points, (McEwen & Stellar, 1993), and "*anticipating* altered need and achieving the necessary adjustments in advance" (Sterling & Eyer, 1988, p. 637), Sterling and Eyer proposed the term allostasis to describe the stress response. Allostatic responses involve activation of the sympathetic nervous system and the HPA axis, with cortisol being a major player (McEwen &

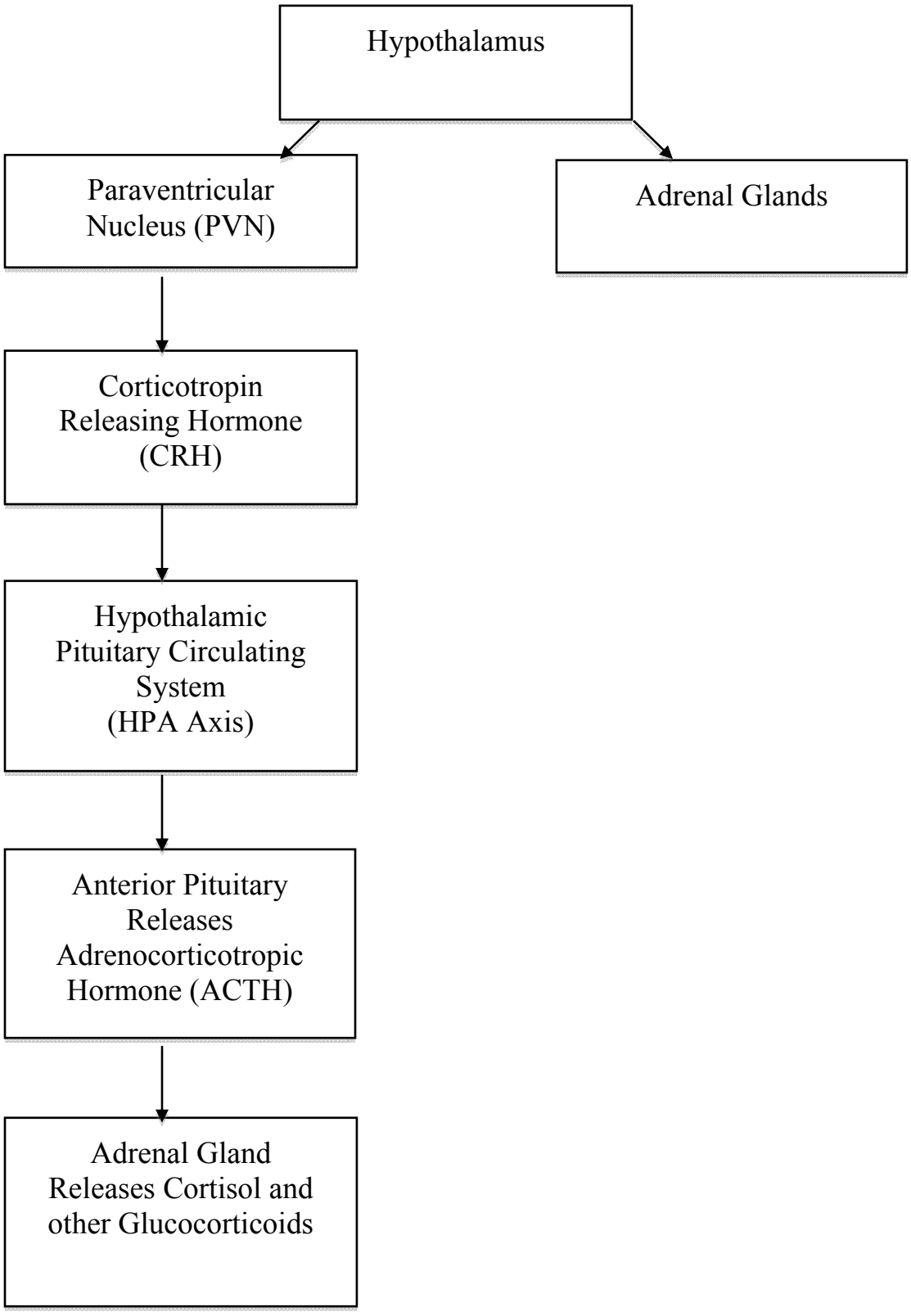
Lasley, 2002; Sapolsky, 2004a). The main premise of allostasis is that change must occur in order for stability to be achieved.

Allostatic Responses to Stress/Allostatic Load

The autonomic nervous system consists of the sympathetic and parasympathetic nervous systems. During an encounter with a stressful situation (or during excitement), or when a stressful thought is evoked (Sapolsky, 2004a), the sympathetic nervous system is activated, while the parasympathetic nervous system is restrained (Sapolsky, 2004a). Some results are that energy, cardiovascular tone, and blood pressure increase, and thyroid function, reproduction, gastrointestinal function, immune function, and digestion are suppressed (Charmandari et al., 2005; Sapolsky, 2004a).

When the stress response or allostasis is set into motion, the initial response is activated by the hypothalamus signaling the adrenal glands to release adrenaline (epinephrine), which in turn increases heart rate, pulse, blood to muscles and organs, and increases oxygen. Additionally, glucose is released to assist in increasing energy, and endorphins are released to assist in pain management if required. Next, the paraventricular nucleus (PVN) of the hypothalamus emits corticotropin-releasing hormone (CRH) into the hypothalamic-pituitary circulating system (Hypothalamic-Pituitary-Adrenal axis or HPA), which within seconds directs the anterior pituitary to release adrenocorticotropic hormone (corticotropin or ACTH) into the bloodstream where it reaches the adrenal gland, and within minutes activates the release of cortisol and other glucocorticoids (McEwen & Lasley, 2002; Miller, Chen, & Zhou, 2007; Sapolsky, 2004a; Wilson, 2001).

Figure 1. *Physiological Response to a Stressor*



This is a complex naturally occurring system that works to monitor external demands and invoke the response of numerous physiological systems to meet those demands. A close relationship exists between the activity of the HPA axis, cortisol, and stress related negative health outcomes. In its simplest form, the HPA axis works to adjust cortisol levels throughout the day to meet a multitude of daily life events (e.g., waking, walking, exercising, and eating). Cortisol also assists in glucose production; fat metabolism; anti-inflammatory actions; and immune, renal, and muscle function regulation (Baum & Grunberg, 1997). Therefore, under acute conditions this process is protective, but the door to pathology is opened when stressors are chronically experienced, and "physiological mediators, such as cortisol, are over expressed for long periods of time" (Schulkin, 2003, p. 22). Chronically elevated cortisol impacts tissue and can result in dysregulation across systems, especially the HPA axis. This dysregulation or wear and tear on allostatic systems has been termed allostatic load by Bruce McEwen (1998). Allostatic load is the result of "cumulative physiological burden enacted on the body through attempts to adapt to life's demands" (Seeman, McEwen, Rowe, & Singer, 2001).

Allostatic load can result when an individual faces frequent stressors, fails to adapt to the same stressor when encountered frequently, fails to shut off an allostatic response when the stressor has ended, or when an inefficient response sets off an elevated reaction by other allostatic systems (McEwen, 1998; McEwen & Lasley, 2002).

Cortisol

One way of assessing the impact chronic psychological stressors impart on this complex system, and measuring dysregulation of HPA activity, is through measuring cortisol (a glucocorticoids), which is considered a reliable biomarker for stress (Baum & Grunberg, 1997; Hellhammer, Wust, & Kudielka, 2009; Pruessner et al., 1997; Schulz, Kirschbaum, Prubner, &

Hellhammer, 1998; Theorell, 2003). Though cortisol can be measured in plasma and urine samples, today the preferred and most widely used method uses saliva. This method is used because it is cost effective, less invasive and reactive, lacks the ethical problems associated with plasma and urine sampling, and yields results comparable to serum levels (Kirschbaum & Hellhammer, 1989).

In the bloodstream, cortisol is both bound (bound to a protein) and unbound (free), with unbound representing 5-10% (Kirschbaum & Hellhammer, 1989). In saliva, cortisol is found in the unbound form. Cortisol has an approximate half-life of 70 minutes (Baum & Grunberg, 1997), and follows a diurnal rhythm (highest in the early morning, lowest around midnight or 3-5 hours after sleep) (Kirschbaum & Hellhammer, 1989). Pruessner et al. (1997) found within 30 minutes of waking, free cortisol levels increased 50-75%, with a distinguishable decrease starting within the next 30 minutes, and a baseline value reestablished approximately 60 minutes after waking.

Therefore according to Pruessner et al. (1997), waking measures (as opposed to subscribing to a fixed time of sampling) of salivary cortisol with continued assessment at multiple intervals for at least 60 minutes are more stable and reliable measures of HPA dysregulation. Theoretically alterations in the expected normal pattern after awakening would suggest dysregulation in HPA activity, and an indication of chronic or prolonged stress.

During an encounter with one perceived major stressor, and knowing that the half-life of cortisol is approximately 70 minutes, it could potentially take hours for cortisol levels to return to baseline providing an additional stressor is not encountered. Therefore, taking into account that during a single shift, law enforcement officers encounter multiple stressors associated with tasks due to various calls and organizational stressors, hypothetically an officer's cortisol levels might

not return to baseline for the entire shift if they were to encounter multiple stressors.

Increased secretion of cortisol has also been associated with having reduced control (Kirschbaum & Hellhammer, 1989). The theoretical frame most widely used in occupational research that takes into account control in the work place, is the job demand-control theory (Karasek, 1979).

Job Demand-Control Model

The job demand-control (JDC) model of occupational stress (Karasek, 1979) considers two aspects of the work environment: psychosocial demands of the job, and decision latitude (job control). Within this model, Karasek and Theorell (1990) describe four psychosocial work experiences: High-Strain jobs (high demand/low control), Active jobs (high demand/high control), Low-Strain jobs (low demands/high control), and Passive jobs (low demand/low control), however, it is the High-Strain jobs (high demand/ low control) that impose the "most adverse reactions of psychological strain and physical illness" (Van Der Doef & Maes, 1999, p. 89) which has been referred to as the job *strain hypothesis* (De Jong, Dollard, Dormann, Le Blanc, & Houtman, 2000). Control acts as a buffer between high demands and negative health outcomes based on what is referred to as the *buffer hypothesis* (Van Der Doef & Maes, 1999). Karasek and Theorell (1990) note that it is the organizational structure that imposes the greatest strain on the worker.

According to Karasek and Theorell (1990), an interaction occurs between demands and decision latitude (job control) in the work environment that increases vulnerability of developing stress-related illnesses when demands are perceived to exceed an individual's level of control. However, the interaction described has not been consistently supported (De Jong et al., 2000; Van Der Doef & Maes, 1999).

Wall, Jackson, Mullarkey, and Parker (1996) noted that one reason the predicted interaction between job demands and decision latitude has not been consistently demonstrated is partially due to a failure to clearly operationalize independent variables. Specifically, decision latitude, which is often referred to as control, has been broadly defined as task variety, skill usage, intellectual responsibility, or learning opportunities, while demand is often referred to as pace and quantity of work expected of the individual. Clearly pace and quantity of work may not be applicable across occupations, and because control and demands both have an element of complexity (De Jung et al., 2000), these issues may have contributed to the reported mixed results in the literature.

Karasek and Theorell (1990) acknowledge the confusion surrounding clarification of demands and decision latitude, noting that these constructs can be too broadly defined, include extraneous elements, and include both control and demand within a single measure. Though Karesek and Theorell (1990) purport an interaction model, and suggest demand and control should be examined together, there is support in the literature for assessing these constructs independently (Bond & Bunce 2003; De Lange, Taris, Kompier, Houtman, & Bongers, 2003).

Bond and Bunce (2001), using self-report measures on a sample of civil servants in the United Kingdom, found those individuals who reported mental health issues, high absenteeism, physical health problems, and low job satisfaction also had low levels of job control. Following a work reorganization intervention to increase workers level of control, there was significant improvement in mental health, absence due to sickness, and self-rated performance.

In a sample of British civil servants, Marmot and Theorell (as cited in Bosma et al., 1997) found low control to be a better predictor of mortality than high demands. Moreover, Bosma et al. (1997) found low job control had a predictive value when assessing for new reports of

coronary heart disease in the Whitehall II cohort (British civil servants).

Mixed results of an interaction have also been cited in the limited amount of law enforcement research using the job demand control theory. For example, using self-report measures, Noblet, Rodwell, and Allisey (2009) did not find an interaction effect between job demands and control, but noted high levels of job control "were associated with higher levels of well-being, satisfaction, and affective commitment" (p. 116).

However, Bishop et al. (2003) assessed momentary experience of demand and control through ambulatory blood pressure monitoring and self-report of demands and control over a single shift of male patrol officers. They found that under high demand and low control situations, officers' heart rate increased indicating an interaction effect between job demands and control. Additionally, they reported a significant effect for control indicated by diastolic blood pressure decreasing under increasing levels of control. Bishop et al. acknowledged the use of a self-report measure as a limitation in their study and included an objective measure to enhance their results. Additionally, the definition of control used in this study was decisional control, which was one type of control discussed by Averill (1973).

Even with narrowing a construct like control into types (i.e., behavioral, cognitive, and decisional) as Averill (1973) described, it is still difficult to measure because one or more may be enacted at the same time. This could be especially true for law enforcement because of the variety of tasks that may be required within a moments notice, possibly requiring all three types of control to be enacted simultaneously. Regardless, it appears as though a common factor where change can be effective in reducing stress and possibly negative health outcomes is control. Another interesting aspect of control noted by Sapolsky (2004a), is that "the exercise of control is not critical; rather, it is the belief that you have control" (p. 261).

Hierarchy/Rank

One area that is closely related to control and is often cited is position or rank within a hierarchy. Animal studies have long since explored and confirmed the effects of rank in animal hierarchies, and the role rank and control play in influencing the stress response and subsequent diseases states (Dickerson & Kemeny, 2004; National Geographic, 2008; Sapolsky, 2004a; Sapolsky, 2005; Selye, 1976; Sterling & Eyer, 1981).

According to Robert Sapolsky (2004b), applying or translating results from animal studies to human studies with regard to rank has proven difficult because humans have multiple affiliations with various groups (i.e., occupational, religious, social, athletic, and familial), which have varying hierarchies impacting ones position within a particular group. Additionally, in humans there is a greater psychological component associated with the assessment and development of stressors than in animals. Factors associated with psychological stress may include lack of predictability, control, and or restrained release of frustrations (Sapolsky, 2004b).

Studies that have assessed occupational grade include Mustard, Vermeulen, and Lavis (2003) and the Whitehall studies (Bosma et al., 1997; Marmot & Bosma, 1997). All three studies indicated that negative health outcomes were associated with low position and low job control in an occupational hierarchy.

Law enforcement. For law enforcement personnel, both position within a hierarchy, and psychological factors are involved in one form or another, but hierarchical definitions are even more complicated because multiple hierarchies exist within this occupational cohort and the organization itself.

Law enforcement is a complex occupational social system that is rooted in a paramilitary system with an established top-down hierarchy. Within this hierarchy, differentiations between

levels of rank are clear, with smaller hierarchies established within those ranks. For example, the rank of patrol officer includes rookies who are considered the lowest ranking officers within that group (patrol officers), and overall in the department. Additionally, officers are often considered ranking (higher) on each shift based on time on that shift, their level of actual rank (e.g., patrol, sergeant, lieutenant), and overall ranking within the department based on years of service. Therefore an officer may be considered higher ranking than another officer on a particular shift because he or she is a sergeant. Additionally that sergeant may be ranked number one out of all the sergeants on that particular shift because he or she has been on that shift as a sergeant the longest. However, if he or she rotates to a different shift, that individual may be ranked number three out of the sergeants on that shift because he or she was the last to arrive and therefore becomes the lowest ranking sergeant on that shift. Taking it one step further, that same sergeant may be ranked number one out of all law enforcement personnel in a particular police department based on overall years of service in that police department.

Therefore, when a shift occurs within each of these hierarchies, a shift in position occurs for that individual and the group as a whole. This shifting can create short-term instability while the individual and group attempt to reestablish positions. According to Sapolsky (2004a), in some animals, as evidenced by increases in cortisol, this instability in and of itself becomes a stressor. Given this, hypothetically it would make sense that this same instability may be associated with frequent shift changes in law enforcement, which have been cited as a stressor by officers (Violanti & Aron, 1995) and could potentially impact cortisol levels and level of stress.

The lack of predictability, control, or restrained release of frustrations noted by Sapolsky (2004b) is also evident within this occupational cohort. For example, there is diminished predictability from call to call (in content, time, and volatility), supervisor to supervisor

(management styles), and shift to shift (high activity/low activity). Additionally, policies often change without notice or input from those officers the policies impact most.

Furthermore, officers are not allowed to release their frustrations on the general public, but are expected to take high levels of verbal abuse from citizens. For example, one officer recounted a story about stopping an individual who had an expired motor vehicle registration. Normal protocol is to issue a ticket and have the vehicle towed, which would have cost the individual a sizable amount of money. The woman only lived four houses from the vehicle stop, and pleaded with the officer to give her a break. The officer felt empathy for the woman, did not have the vehicle towed, but instead followed her to her home allowing her to park the vehicle in her driveway. The officer at that point was required to take the plates off of the vehicle. When he started to remove the plates, she became irate and accused the officer of racism and profiling her. She then demanded his name and declared she was going to file a complaint against him. All this officer could do was hand her the ticket, remove the plates, give his name, and move on to the next call. Beyond showing great restraint when dealing with the public, officers are also expected to do so with their superior officers by following direct orders without question or comment.

Law enforcement supervisor. One of the most frequently cited types of stressors in law enforcement causing the most distress for officers is organizational stress (Brown & Campbell, 1990; Norvell, Belles, & Hills, 1988; Violanti & Aron, 1995). Research specifically examining supervisory officers (rank) and stress also indicates organizational stressors as a major factor.

Kroes, Hurrell, and Margolis (1974) interviewed 30 police administrators (18 lieutenants, 12 Captains) from the Cincinnati police department in an effort to identify stressors that impact police administrators. The majority of psychological stress endorsed by these administrators had to do with being accountable to the community and the administration, as well as being

accountable for subordinates. Furthermore, lack of say in decisions and policies, work ambiguity, negative feedback from the public and supervisors, and equipment deficiencies were also cited.

Fourteen years later Norvell, Bell, and Hills (1988) set out to investigate if a relationship existed between physical illness and perceived stress in supervisory law enforcement personnel. They noted that the officers who were described as middle-level supervisors, not only experienced similar stressors as described by Kroes et al. (1974) in their study (e.g., conflicting pressures and responsibilities from above and below them), but they were also confronted with daily aspects of frontline duties. This may be because the supervisors in this study also worked on the street, as appose to the officers in the Kroes et al. study who strictly had administrative duties, though this was not clear. Norvell et al. used both self-report measures and a measure of resting blood pressure. Though they found a relationship existed between stress and physical symptoms, they did not find the supervisors experienced more stress than nonsupervisory personnel.

Brown and Campbell (1990) used self-report measures to query 954 police officers in a large nonmetropolitan district in the United Kingdom. Officers of different ranks (probationer, constable, sergeant, inspector, chief inspector, superintendent, chief superintendent, assistant deputy, and chief constable) were asked what they deemed stressful during their daily work, and how frequently they were exposed to the stressors. Additionally, the officers were asked to describe how often and what level of stress they felt when they encountered operational police stressors and organizational/management stressors. The levels of rank were grouped as probationers and constables; sergeants; and inspector and above. Sergeants were considered middle rank and inspector and above were considered senior rank. The results indicated when compared to other ranks, sergeants endorsed the highest exposure to stressors from all sources,

but experienced *felt stress* from "having to manage or supervise, working in isolation, and lack of consultation" (p. 314), while inspectors and higher, endorsed experiencing felt stress from the media. Overall, stressors stemming from the organizational and management categories were found to be most stressful.

Twenty-one years after Kroes et al. (1974), Violanti and Aron (1995) identified and rank ordered perceived stressors according to occupational rank in a large police department in the northeast. Using a self-report measure (Police Stress Survey [PSS]), 103 officers responded. Patrol officers endorsed killing someone in the line of duty and an officer being killed in the line of duty as most stressful, with the highest organizational stressor being shift work. Additional organizational stressors cited by the officers were inadequate support, incompatible partner, lack of personnel, excessive discipline, and inadequate support of supervisors. Desk sergeants (in charge of substations), line sergeants, and investigative detectives all rated organizational stressors as being most stressful.

In contrast, Johnson et al. (2005) examined a large United Kingdom database consisting of 26 occupations and 25,000 individuals, and found within the occupation of law enforcement, senior police officers, through self report, indicated they were less stressed and more satisfied than lower ranking officers. Johnson et al. speculate these results might be due to senior officers having fewer encounters with the public than patrol officers.

Statement of the Problem

More than 30 years following Kroes et al. (1974) initial investigation of stress among law enforcement officers, research in law enforcement stress continues to point to organizational stressors as contributing greatly to the distress among law enforcement personnel, yet progress in ameliorating these types of stressors has thus far not been significant. Furthermore, continued

reports about chronic stress, illnesses commonly associated with stress, and higher than expected mortality rates among some police departments, including suicides (Violanti et al., 1998) when compared to the general public leads one to wonder what is missing. Changing direction and moving away from just identifying stressors to exploring possible mediating factors may hold the key.

As described in the literature review, control and position in a hierarchy, especially an occupational hierarchy, potentially have both mediating and deleterious effects on individuals and groups, particularly in the field of law enforcement. Therefore, combining a self-report measure of perceived control, and a physiological measure of stress (salivary cortisol), the purpose of this study was to investigate if a relationship existed between rank, control, and level of stress (salivary cortisol). Ultimately this project may draw attention to an area that has been overlooked, and yield information that can help us improve the lives of many officers. Furthermore, this project may help inspire future research, and contribute to the development of interventions.

Method

Study Design

The purpose of this study was to explore if a relationship existed among perceived control, officer rank, and salivary cortisol levels (awakening cortisol response). This study was a secondary analysis of archival data collected as part of the Buffalo Cardio-Metabolic Occupational Police Stress (BCOPS) study. The data were part of an original pilot study that was completed to establish validity of methodology for use in a future longitudinal study (Violanti et al, 2006), and was funded by the National Institute for Occupational Safety and Health (NIOSH, contract number HELD01B0088).

Sample

As described in Violanti et al. (2006), using a computer-generated random number table, a stratified sampling technique on gender was used to select officers from the Buffalo, NY Police Department (a midsized urban police department in the northeast) resulting in 100 police officers (42 females, 58 males) agreeing to participate. According to Violanti et al., the only inclusion criteria were that participants had to be sworn law enforcement officers, and willing to participate. Though Violanti et al. report inclusion criteria related to a number of medical procedures, these are not relevant to this study and therefore will not be discussed.

Prior to NIOSH releasing the data for analysis, 18 participants were removed due to missing data in some or all of the requested variables, resulting in a final sample of 82 law enforcement officers. In an effort to ascertain if all required salivary cortisol samples were submitted for each participant, further examination of the data was completed prior to calculating the awakening cortisol response (ACR). It was determined that 20 officers (approximately 24%) failed to produce all four samples for examination, and were therefore removed from the analyses resulting in 62 participants with completed samples available for analysis. An additional 3 (4.8%) participants were removed from the analysis because they endorsed the category "other" under officer rank, which could not be defined and therefore it could not be determined to which category these officers should be assigned.

The final sample consisted of 59 law enforcement officers, which was comprised of 23 females (39%), and 36 males (61%). There were 29 officers (49.2%) below the age of 40, 23 officers (39%) between the ages of 40 and 49, and 7 officers (11.9%) over the age of 50. Of these officers, 72.9% (n=43) were Caucasian, 20.3% (n=12) were African American, and 6.8% (n=4) were Hispanic. More than 80% of the officers had some level of college education. There were 39 officers (66.1%) that were married, 11 officers (18.6%) were single, and 9 officers (15.3%)

were divorced. Years of service consisted of 13 officers (22%) serving less than 5 years, 7 officers (11.9%) serving between 6 and 10 years, 15 officers (25.4%) serving 10-15 years, and 24 officers (40.7%) serving 15 or more years. There were 38 lower-ranking officers (patrolmen), who accounted for 64.4% of the sample, and 21 higher-ranking officers, which comprised 35.6% of the sample. Higher-ranking officers consisted of 11 sergeant/lieutenant (18.6%) and 10 captain/detective (16.9%).

Procedure

This writer contacted Dr. John Violanti, the chief researcher on the BCOPS project, and requested access to the database. Dr. Violanti assisted this writer in obtaining the data from the National Institute for Occupational Safety and Health (NIOSH, contract number HELD01B0088, which is the entity that funded the original research and currently holds the data. The original collection of data was performed at The Center for Preventive Medicine, State University of New York at Buffalo, School of Public Health and Health Professions in Buffalo, New York.

Measures

Demographic questionnaire. All data were archival, having been gathered as part of the original BCOPS project. Participants completed a demographic questionnaire that included date of birth, age, gender, ethnicity, level of education, marital status, previous military status, years employed in law enforcement, rank, years at current rank, duty assignment, level of activity in current precinct/district, current shift, order of shifts, and rotation cycle. For this project only the level of rank for each participant was utilized.

Control measure. As stated previously, given the multitude of tasks required at any one time, the construct of control is difficult to define and measure in law enforcement. Therefore, a general measure of control was utilized using the control facet of the Short Hardiness Scale

(Dispositional Resilience Scale, DRS-15) developed by Paul T. Bartone (1995).

Participants in the initial pilot study completed the Short Hardiness Scale (SHS), which is a 15-item hardiness measure that includes both positive and negatively keyed items. This scale consists of three facets, commitment, control, and challenge, each addressed by 5 questions rated on a scale of 0 to 3 for each statement (0 = not at all true, 1 = a little true, 2 = quite true, and 3 = completely true). A total hardiness measure, as well as individual measures for each facet can be derived from this scale (see Table 1 for control facet questions). The Cronbach's alpha coefficient is .83 for the total measure, and .71 for the control facet (Bartone, 1995). As stated previously, only the score derived from the control facet will be utilized. According to Bartone, Rolans, Picano, and Williams (2008) this scale has been used in both the U.S. military and in non-military populations.

Table 1

Control Facet Questions

Item no.	Text
2	Planning ahead can help avoid most future problems
6	By working hard you can nearly always achieve your goals
8	If I'm working on a difficult task, I know when to ask for help
9	I don't think there's much I can do to influence my own future
15	When I make plans I'm certain I can make them work

Note. Number 9 is a negatively keyed item.

Physiological measure. The awakening cortisol response (ACR) was examined to assess alterations in the expected normal pattern of cortisol after awakening. Clow, Thorn, Evans, and Hucklebridge (2004) examined methodological issues in assessing the ACR, and reported on a number of methods, all of which are interpretable on their own. Therefore, for this project, the dynamic increase in cortisol secretion, which is the mean increase (MnInc), was calculated for analysis. Awakening salivary cortisol (AC) samples included samples immediately upon waking (AC0), with repeated measures 15 (AC 15), 30 (AC 30), and 45 (AC 45) minutes thereafter. The mean increase in cortisol levels (MnInc) was calculated as the mean of levels taken 15, 30, and 45 minutes after awakening, minus the level taken immediately at the time of awakening (MnInc = AC 15 + AC 30 + AC45)/3-AC0). See Violanti et al. (2006, 2007), for a detailed description of the collection and assay of saliva sampling.

Cautionary Statement

It should be clearly stated that the results of this project are not meant to determine cause and effect, but are simply an exploratory analysis of a possible relationship among variables as a

stepping-stone to future research.

Ethical Considerations

This dissertation project is a secondary analysis of archival data. Dr. John Violanti confirmed that there is a data-sharing plan in place for the BCOPS pilot work and the data can be used for secondary analysis (personal communication, February 13, 2011). The data did not contain identifying information in an effort to maintain the privacy and anonymity of the participants, and were reported in such a manner as to prevent deductive disclosure. Furthermore, because this dissertation project is a secondary analysis of archival data, and does not contain identifying information (e.g., names, addresses, etc.) that could be used to ascertain the identity of the individual participants, this project was exempt from IRB procedures.

Hypotheses

This study was intended to examine if there was a relationship among level of perceived control, officer rank, and stress (salivary cortisol). I hypothesized higher-ranking officers (detective, sergeant, lieutenant, and captain) would have more perceived control than lower ranking officers (patrol officer/police officer) and that higher-ranking officers would have lower stress as measured by awakening cortisol response (ACR). The main questions were: (a) Is there a relationship between level of officer rank and stress as assessed by the awakening cortisol response (ACR)? (b) Is there a relationship between level of officer rank and level of perceived control as assessed by the control facet of the Short Hardiness Scale (Dispositional Resilience Scale, DRS-15; Bartone, 1995)? (c) Is there a relationship between level of perceived control as assessed by the control facet of the Short Hardiness Scale (Dispositional Resilience Scale, DRS-15) and ACR? and (d) Does the combination of level of officer rank and level of perceived control have a stronger relationship with ACR than either variable considered alone? The

following hypotheses were developed to assist in answering these questions:

1. It was hypothesized there is a relationship between level of officer rank and ACR. Specifically, as officer rank goes up, ACR would go down. Therefore, there would be a significant negative relationship between officer rank and ACR.
2. It was hypothesized a relationship exists between level of officer rank and level of perceived control. Specifically, as level of officer rank increases, level of perceived control would also increase. Therefore, there would be a significant positive relationship between officer rank and perceived control.
3. It was hypothesized a relationship exists between level of perceived control and ACR. Specifically, as perceived control increases, ACR would decrease. Therefore, there would be a significant negative association between perceived control and ACR.
4. It was hypothesized the combination of officer rank and perceived control would enhance the relationship with ACR. Specifically, the combination of officer rank and perceived control would result in a stronger relationship with ACR than either officer rank or perceived control alone. As officer rank and perceived control increase, ACR would decrease.

Results

Analyses

Point–biserial correlations, a Pearson correlation, and a Multiple Regression analysis were conducted to examine the relationships among awakening cortisol response (ACR), perceived control, and officer rank (For a detailed description of the data analyses, see Table 2). An alpha level of .05 was used for all statistical tests. The software program IBM SPSS version 19.0 for Mac was used to conduct the analyses.

Descriptive Variables

The overall mean score on the control facet of the short hardiness scale for lower-ranking officers was 10.11(SD = 1.72), and for higher-ranking officers the overall mean was 9.38 (SD = 1.74). The ACR mean score for lower-ranking officers was 2.13 nmol/L (SD = 7.51), and for higher-ranking officers the overall mean was 1.33 nmol/L (SD = 5.66).

Table 2

Data Analyses

	Variable	Analysis
Hypothesis 1. There would be a significant negative relationship between officer rank and ACR.	Predictor Variable (Dichotomous) Officer rank, with two levels, 1= Lower Ranking, 2 = Higher Ranking. Outcome Variable (Continuous) Awakening Cortisol Response (ACR)	Point-biserial Correlation (r_{pb})
Hypothesis 2. There would be a significant positive relationship between officer rank and perceived control.	Predictor Variable (Dichotomous) Officer rank, with two levels, 1= Lower Ranking, 2 = Higher Ranking. Outcome Variable (Continuous) Perceived control	Point-biserial Correlation (r_{pb})
Hypothesis 3. There would be a significant negative relationship between perceived control and ACR.	Predictor Variable (Continuous) Perceived control Outcome Variable (Continuous) Awakening Cortisol Response (ACR)	Pearson Product-Moment Correlation (r)
Hypothesis 4. The combination of officer rank and perceived control would enhance the relationship with ACR.	Predictor Variables Officer Rank (Dichotomous) Perceived control (Continuous) Outcome Variable (Continuous) Awakening Cortisol Response (ACR)	Multiple Regression (R^2)

The relationship between officer rank and ACR was analyzed through the use of a Point biserial correlation. The correlation was not statistically significant, r_{pb} (57) = -.056, p = .672, two-tailed.

To examine if an association existed between officer rank and perceived control, a Point-biserial correlational analysis was used. The correlation was not statistically significant, and produced r_{pb} (57) = -.200, p = .129, two-tailed.

Pearson correlation analysis was used to examine the relationship between perceived control and ACR. The correlation was not statistically significant, r(57) = -.058, p = .662, two-tailed.

In an examination of whether the combination of officer rank and perceived control strengthened the relationship with ACR above and beyond what could be explained by officer rank or perceived control alone, a multiple regression (enter method, listwise) was performed. The overall regression produced an R^2 of .008, F(2,56) = .231, p = .795. Neither perceived control b = -.07, t(56) = -.531, p = .597, 95% CI [-1.35, .785], nor officer rank indicated a statistically significantly association with ACR, b = -.07, t(56) = -.521, p = .605, 95% CI [-4.87, 2.86].

As indicated above, there were no statistically significant relationships derived from the correlation analyses or the multiple regression analysis. In other words, perceived control and officer rank did not show a statistically significant relationship with the awakening cortisol response on their own or in combination.

Discussion

This exploratory analysis of archival data from the Buffalo Cardio-Metabolic Occupational Police Stress (BCOPS) study (Violanti et al., 2006) examined whether there was a

relationship among level of perceived control, officer rank, and stress as measured by ACR. Though no statistically significant associations were derived from the analyses, there are important implications to be distilled from the results.

While the possibility of no association is plausible, a number of factors may have contributed to the results. The complexity of defining a construct such as control has been discussed in previous literature as well as in this study. As stated previously, given the diversity and range of tasks required of law enforcement officers at any one time, all or some combination of the types of control Averill (1973) has described (behavioral, cognitive, decisional) may be enacted simultaneously. Therefore, it was decided for this study to assess a general sense of perceived control. The measure utilized to assess this type of control in this study is a widely used and validated measure. However, it is possible that the type of control measured is a very different and distinct construct than the type of control required while at work. Therefore, the form of control being measured may have played a significant role in the lack of statistically significant findings.

Furthermore, it is conceivable that individuals who are drawn to the occupation of law enforcement may possess some unique qualities or characteristics that prevents or impacts an instrument from measuring what would normally be measured.

Another factor that should be considered is participants maintaining strict compliance with saliva collection procedures (Clow et al., 2004; Kudielka, Broderick, & Kirschbaum, 2003). Given that the normal expected pattern of cortisol at the time of awakening has a distinct rise and fall within the first 60 minutes, any deviation from the protocol (e.g., taking the first sample after getting out of bed, falling back to sleep between samples, late sampling) can significantly impact the obtained values. For example, a late sample may miss the early morning peak and as a result

falsely indicate a low or blunted ACR, which would have a detrimental impact on the study.

Other factors that can lower ACR and result in an inadequate response include burnout (Pruessner, Hellhammer, Kirschbaum, 1999), posttraumatic stress disorder (Wessa, Rohleder, Kirschbaum, & Flor, 2006), and depression (Huber, Issa, Schik, &Wolf, 2006), which were not accounted for. Furthermore, Fries, Hesse, J. Hellhammer & Hellhammer (2005) noted that individuals can initially have increased cortisol levels associated with stress (hypercortisolism), but as stress becomes more chronic the body begins to "self-adjust" and move into a protective mode against elevated glucocorticoids, the cortisol response lowers and results in hypocortisolism. Failing to initiate a response is a sign of HPA dysregulation and is considered one type of allostatic load (McEwen, 1998) that may be evident in this group of law enforcement officers.

Additionally, given the small sample size, and the small numbers of ranking officers in each category (sergeant, lieutenant, detective, captain), the higher-ranking officers were combined into one group. It is probable that some officers within one or more of the levels of rank had higher ACR values, but lower ACR values, or negative ACR values of others impacted the overall group. Moreover, Brown and Campbell (1990) found in their sample, that when compared to other ranks, sergeants endorsed the most stressors. If this was evident in the current sample, the other ranking officers' scores may have masked this effect.

Furthermore, number of years of service has been shown to impact an officer's level of stress, which was not accounted for in this study. Research has shown that the first five years are the most stressful, with stress leveling out around 13 years and decreasing after that (Violanti, 1983). In addition, time at each level of rank is also important. This is key because the initial novelty and unpredictability of a new position can increase stress regardless of time on the force.

Therefore, fully assessing years of service, as well as time spent at the individual officers rank should be a consideration in the future.

Limitations

This study utilized archival data from a midsized urban police department in the northeast. Therefore, a limitation of this study is that the results may not be representative of all law enforcement departments or officers.

Another limitation involves sample size. This study utilized archival data that had a fixed sample size that was reduced due to missing cortisol samples. Given the small sample size (N=59), it is highly probable there was insufficient statistical power to detect a difference. A larger sample in future research would help to alleviate this problem. Furthermore, only having two levels of the rank variable did not allow the data to move, or allow for detecting a difference at multiple points. Therefore future research should include and assess all levels of rank if the sample size allows for this.

Future Directions

In an effort to fully assess control, future research utilizing this construct may be strengthened if level of perceived control, job control, behavioral, cognitive, and decisional control are measured. Doing so may help to narrow what type of control is most important to reducing stress. In addition, having to restrain one or more of these types of control has the potential to increase stress. Therefore, it would also be important to identify the types of control (e.g., behavioral, decisional) that an officer may have to restrain in order to do his or her job. Fully understanding both the use and restraint of types of control used by law enforcement officers would increase our knowledge of stress in law enforcement.

Given that there is some question as to whether or not characteristics or unique qualities

may exist in this occupational group that might impact measures used, further exploration into this likelihood should occur.

As discussed previously, compliance with saliva collection may have been a factor. Research suggests that measuring saliva samples on two consecutive days and comparing the ACR for stability (Clow et al., 2004) would help to detect noncompliant participants and nonresponders (individuals who fail to initiate a response). Examining both responders and those who fail to initiate a response may greatly enhance future research. In addition to a multiday comparison, Kudielk et al. (2003) suggest the use of an electronic monitoring devise to help improve compliance. Therefore incorporating one or both of these techniques to address adherence to salivary collection protocols and identify possible nonresponders may enhance future research.

In addition, previous research has indicated that burnout, posttraumatic stress disorder, and depression can impact cortisol levels. Therefore, future research should assess for these disorders when examining ACR.

Finally, longitudinal studies beginning at the start of an officer's career would help to examine patterns of stress, control, and ACR that were not feasible in this study. Longitudinal studies can also exam a number of other variables such as length of service, organizational stress, shift changes, physical health problems, demand of the department (quantity of activity from shift to shift), and supervisor management styles to name a few.

Final Thoughts

In this exploratory analysis there was no statistically significant evidence indicating a relationship among officer rank, perceived control, and ACR. However, stress in the occupation of law enforcement, and negative psychological as well physical health problems have been well

documented in previous research. The results of this study may very well be an indication that not only is there no difference between levels of rank and experienced stress, but that in this group of officers the cost of chronically eliciting allostatic responses has impacted their ability to initiate a normal awakening cortisol response. Clearly further research on how stress impacts law enforcement officers, and what can be done to reduce stress is needed.

Stress research, especially within the occupation of law enforcement is a complicated endeavor. As stated previously, officers face a multitude of stressors that if encountered chronically can result in negative psychological as well as physical health outcomes. The results of this project suggest level of rank and perceived control are not associated with level of stress, and therefore, are not indicative of who would be at risk for stress and stress related problems. Therefore, as stated previously, if there is no difference in stress between levels of rank, this would suggest clinically that officers of all ranks may be experiencing stress at varying levels for a variety of reasons.

Clinically, practitioners working with law enforcement officers must be aware that individuals differ in how they perceive and respond to stressors. Furthermore, it is important to understand how chronic stress impacts officers mentally and physiologically because chronic stress has the potential to result in negative psychological and physical health problems.

Additionally, if officers present with stress related health problems such as obesity, hypertension, insulin resistant diabetes mellitus, ulcers, coronary heart disease, and immune disorders, a full assessment into possible stressors in the individual officer's work and life should be paramount. Furthermore, given that depression, anxiety, and PTSD are often cited as impacting this occupational cohort, special attention in assessing for these disorders should also occur.

Given that stress impacts multiple areas of an individual's life, officers should be educated on the impact of stress, and how to deal with the multitude of stressors they face. Encouraging officers to incorporate regular exercise and good nutrition would be a good start. Clinically there is a lot to be aware of when working with law enforcement officers. Failure to understand this unique population and the stressors that both the officer and his or her family face would be detrimental to helping individuals in this occupational cohort.

Additionally, it is important to remember that educating individual officers about the effects of stress, and what can be done to reduce potential negative health outcomes is only part of the puzzle. Placing the onus on the individual officer has been common practice for decades, resulting in little if any reduction in law enforcement stress. Given that the organization itself is often cited as a major stressor, future research should examine what aspects of the organization are imparting the most stress, and help to develop proactive solutions. In addition, the culture of police departments may need to be addressed, so that acknowledging and seeking help for stress are not seen as an indication of weakness.

In conclusion, the goal of this study was to explore the possibility that an association existed among officer rank, perceived control, and stress using salivary cortisol as a biomarker. There were no statistically significant relationships derived from the analyses. However, decades of research on stress in law enforcement have identified numerous stressors and stress related illnesses that continue to burden officers today. This is a very complicated occupational cohort to study; nevertheless, there is more work to be done to untangle causes and solutions, an endeavor worth continuing.

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