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Addictions and the Criminal Justice System, What Happens on the Other Side? Post-traumatic Stress Symptoms and Cortisol Measures in a Police Cohort

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The Buffalo Cardio-metabolic Occupational Police Stress study, an occupational cohort study of police officers, was conducted to evaluate physiologic and stress measures in a high-risk occupation where occupational exposure to difficult criminal situations can lead to physiologic and psychological health consequences among those who enforce the law. The chronic exposure to human tragedy may place police officers at special risk for mental health disorders and the potential for misuse of alcohol or drugs. While exact etiologies of post-traumatic stress were not determined by this study, overall post-traumatic stress (PTS) prevalence rates among the police officers was 35%, with 10% of individuals demonstrating severe PTS symptomatology. Waking cortisol measures tended to be higher among officers with more PTS symptomatology, with some gender related differences noted. Given the increase in incarcerations for addictions related offenses over the past 20 years and the chronic exposure to human suffering and tragedy, early recognition of PTS symptoms is essential in making the diagnosis of post-traumatic stress in high-risk occupational cohorts. Providing early entry into treatment and subsequently attempting to eliminate or minimize long-term consequences of post-traumatic stress can have a significant impact on the prevention of long term sequelae of chronic stress, such as the use or misuse of drugs or alcohol.

Keywords Post-traumatic stress, cortisol, occupation cohort, criminal justice

INTRODUCTION

Post-traumatic stress disorder (PTSD), often noted to be one of the more severe psychiatric disorders (Bobo, Warner, & Warner, 2007) is frequently under-recognized and under-treated in health care settings. This chronic, disabling condition that affects 8–9% of the general population ranks second among the prevalent anxiety disorders in the United States (Connor & Butterfield, 2003). Certain occupational groups are more regularly exposed to stressors in the work place, as is the case of the active duty police officer. Experiencing post-traumatic stress can be a life-altering condition that has been well documented within the police occupation (Darensburg et al., 2006; Neylan et al, 2005; Pole et al., 2001; Violanti, 2004; Violanti et al., 2006). PTSD can leave an individual susceptible to suicidal ideation, and perhaps the most devastating consequence of the perceived stress, a successful suicide attempt (Violanti, 2004). The Buffalo Cardio-Metabolic Occupational Police Stress (BCOPS) study, a population based occupational cohort study of Upstate New York police officers, was undertaken to evaluate the psychological and physiological health of the officers (Violanti et al., 2006).

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Those who work in the helping professions, such as police officers, often experience stressful and/or traumatic events on a day-to-day basis, with some days on duty bringing several stressful or traumatic events to the workday. These events can have both acute and chronic effects on the emotional, physical, and psychological health of those who experience them (Mitchell & Everly, 2001). Unresolved stressors can lead to a variety of physiological and psychological conditions, such as excess production of cortisol, post-traumatic stress, or the development of additional co-morbid psychiatric conditions such as depression or substance abuse. Cross and Aschley (2004) examined the relationships among trauma, addictions, and police work, finding that coping with stressful events is highly variable among officers. This variability was related to how individuals had coped with such events in the past as well as whether or not the individuals possessed appropriate coping skills. Long-term sequelae of chronic stress can lead to changes in cortisol responses, which in turn permit allostatic overload to occur within the body and the brain (McEwen, 1998; McEwen, 2004).

Neurobiologically, PTSD represents a dysregulated stress response and is influenced by neurochemical and neuroanatomic abnormalities controlled by the central nervous system (CNS) and the Hypothalamus-Pituitary-Adrenal (HPA) axis. Cortisol levels have been reported as uncharacteristic or dysregulated among those with PTSD. Individuals with lower cortisol levels prior to an inciting stressful event have been postulated to be at greater risk for the development of PTSD after a traumatic incident, as pre-incident dysregulated cortisol is a presumed risk factor (Cohen et al., 2006).

REVIEW OF LITERATURE

Cortisol and the HPA Axis: A Brief Review

Cortisol is a central component of the HPA axis response system within the body. Changes in cortisol production within the body occur through an internal chemical interpretation of a perceived stimulus within the hypothalamus. The stimulus can be an external triggering event or an internal response that has triggered the CNS. The stressor is identified and interpreted by the individual, with each individual offering a unique internal response to the stressor. The stressor can be any event or experience that has the potential to affect the individual in a negative way. The interpretation of the stimulus causes hypothalamic arousal, initiating a chemical signal to the adrenal gland which results in the adrenal gland responding with cortisol production.

Corticotropin releasing hormone (CRH) is secreted by the hypothalamus in response to stimulation which sets in a motion a chain of events that leads to the production of cortisol. CRH induces the pituitary gland to secrete adrenocorticotropic hormone (ACTH), which in turn stimulates the secretion of cortisol from the cortex of the adrenal gland. As an end product of the HPA axis, cortisol is often measured through surrogate means, which is the preferred methodology for free-living populations (Theorell, 2003). These non-intrusive methodologies include the collection of saliva or urine because it does not involve the collection of blood which is often perceived by an individual as a stressful event (Levine, Zagoory-Sharon, Feldman, Lewis, & Weller, 2007). The inter-relationship between the hormonal responses of the HPA axis, while seemingly simple and straightforward, is much more complex given that the mechanism by which these hormones operate is through a negative feedback loop.

PTSD

PTSD has been associated with high levels of co-morbidity, social and occupational impairment, and increased health care costs when compared to other mental disorders (Connor & Butterfield, 2003). The National Co-morbidity Survey reports a lifetime history of at least one traumatic event in men at 61% and 51% in women, with many individuals (up to 50%) experiencing two or more traumas (Stein, Walker, Hazen, & Forde, 1997). Gender differentials also exist in the type of PTSD stressors that an individual might report. The most common community-based reporting of PTSD stressors among men includes a threat from a weapon, being held captive or kidnapped, physical assault, and combat. Women more frequently report rape and sexual molestation in community-based PTSD surveys (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Studies utilizing the general population have found that women and ethnic minorities demonstrate higher rates of PTSD than men and European-Americans (Pole et al., 2001).

The Diagnostic and Statistical Manual IV (DSM-IV) describes PTSD symptoms through a division of diagnostic categories and clinical domains. The diagnostic categories include the traumatic stressor, re-experiencing the trauma, hyper-arousal, numbing of affect, and avoidance of trauma-related stimuli. Table 1 outlines the criteria that are considered in the clinical definition of post-traumatic stress. Lethality and coping skills also need to be strongly considered when assessing an individual with suspected PTSD. Diagnosing PTSD entails first screening for the condition. While self-report screening instruments can accurately detect PTSD symptomatology, they do not provide a definitive clinical diagnosis of PTSD. It is recommended that once PTSD is identified through utilization of a symptom screening tool, a more thorough history of the event, lifetime trauma/psychiatric history, and perceived impact of the stressful event be obtained from a structured, diagnostic interview.

PTSD and the Criminal Justice System

PTSD is a condition that is prevalent in the general population, has the potential to impact quality of life for the individual with the condition, and early detection has been found to decrease mortality and morbidity when the individual is identified and appropriate treatment is undertaken (Ouimette, Wade, Prins, & Schohn, 2008). Police and criminal encounters related to addictions have risen significantly in the past several

TABLE 1
DSM-IV (Adapted from DSM-IV, 2000) Diagnostic Criteria for PTSD

Criterion A: Traumatic Stressor	An event, or events, in which an individual experiences, witnesses, or is confronted with life endangerment, death, or serious injury or threat to self or others; and the individual responds to the experience with feelings of intense fear, horror, or helplessness.
Criterion B: Re-experiencing Symptoms (one or more)	Intrusive recollections; distressing dreams; flashbacks; dissociative phenomenon; psychological and physical distress with reminders of the event.
Criterion C: Avoidance or Numbing Symptoms (three or more)	Avoidance of thoughts, feelings, or conversations associated with the event; avoidance of places, situations, or people that are reminiscent of the event; inability to recall important aspects of the event; diminished interest; estrangement from others; restricted range of affect; sense of a foreshortened future.
Criterion D: Hyperarousal symptoms (two or more)	Sleep disruption; impaired concentration; irritability or anger outbursts; hypervigilance; exaggerated startle reflex.
Criterion E	Minimum symptom duration of 1 month.
Criterion F	Symptoms cause distress or functional impairment.

Specifiers:
Acute: Symptom duration 1 to 3 months.
Chronic: Symptom duration greater than 3 months.
Delayed Onset: Symptom onset at least 6 months after the stressor.
(Adapted from DSM-IV-TR, 1980)

decades, largely in part to prosecutions for drug-related crimes and drug-addicted offenders. The National Institute of Health (2010) reports that criminal offenders have rates of substance abuse and dependence that are four times that of the general public, while further suggesting that addicted offenders are not getting the treatment they need while incarcerated. This situation is compounded by the presence of co-occurring mental illness in approximately 45% of individuals who are housed in local and state prisons (NIH, 2010).

When considering the behaviors of an alcohol or drug dependent offender, recidivism rates have been shown to be higher in this population than those without addictive behaviors. The United States Department of Justice (2010) reported that over 80% of arrestees had been arrested at least once prior to the study arrest, and among those who reported using illegal drugs up to 26% reported that they had been arrested two or more times in the past year. Fals-Stewart (2003) found that alcohol use by batterers was a significant factor in recidivism rates as well as assaults upon the spouse happening on the same day as the drinking. Crime scene behavior can also be influenced by addictive behaviors (Hammond, Bond, Phil, & Grant, 2009). Hammond and colleagues found that significant predictors of acquisitive crimes included lack of preparation by the offender, irrational behaviors, and certain items were more often sought out for stealing when the crime was motivated by addictive behavior. Stolen items were often property items that were of large monetary value and could be easily sold (Hammond et al., 2009).

Given the relatively high recidivism rates and the general lack of preparation for criminal behaviors spurred by the addiction, these individuals come into frequent contact with law enforcement. With the addition of mental illness into the picture, new models of collaboration should be considered between the addiction treatment and law enforcement communities in an attempt to achieve successful health and criminal outcomes. Until these successful collaborations take a strong hold within the criminal justice system, not only offenders need to be monitored for the co-occurrence of mental health disorders, but also the police officers who deal with these offenders pre and post arrest, as well as during the probationary phases of the criminal justice encounter.

METHODS

One hundred randomly selected officers who participated in the Buffalo Cardio-Metabolic Occupational Police Stress pilot study were included in this investigation of post-traumatic stress symptomatology (PTS) and salivary cortisol as a physiologic biomarker. The National Institute for Occupational Safety and Health (NIOSH) funded the pilot study with Internal Review Board approval at both the University at Buffalo, The State University of New York as well as the funding institution, NIOSH. All subjects provided informed consent for participation in the study. The study design and methods have been summarized elsewhere (Violanti et al., 2006). Baseline clinical examinations, psychosocial standardized rating scales, and personal demographic data collection were included and 100% of the individuals who were invited to participate in the study responded. Cross-sectional analyses were utilized to investigate the relationships between post-traumatic stress and salivary cortisol levels.

The Horowitz Impact of Events Scale (IES) was employed to assess PTS symptoms in general and not in reference to a specific incident (Sundin & Horowitz, 2002). Seven of the items on the questionnaire measure intrusive symptoms

(intrusive thoughts, nightmares, intrusive feelings, and imagery), and the remaining eight items measure avoidance symptoms (numbing of responsiveness, avoidance of feelings, situations, ideas), and combination of these provide a total subjective score of traumatic stress symptomatology. The IES was completed by the participants during the clinical examination.

PTS was then categorized based upon the obtained total IES score. Those individuals who score 0-8 on the scale were categorized as having subclinical PTS symptomatology, while those with scores in the 9–25 range were described as exhibiting mild PTS symptomatology. IES scores of 26 or greater were categorized as having high level symptomatology.

Salivary Cortisol Measures

Salivary cortisol levels and PTS screening data were collected during the same study period. Each participant received instruction and demonstration of proper collection technique as well as written directions on the saliva collection technique. A commercially available salivary collection device, *Salivette,* was utilized for the BCOPS study. A total of 13 salivary samples were requested from the participants at scheduled time increments. Reported here were the salivary cortisol samples collected at home immediately upon awakening and subsequently at 15, 30, 45, and 60 minutes after awakening, prior to lunch, dinner, and bedtime for each day of the sampling period. This methodology works well for police because of the high variability in sleep-wake times (Neylan et al., 2005). Adequate salivary samples were reviewed, stored, and subsequently sent to the Technical University of Dresden for laboratory analysis which involved a commercially available chemiluminescence immunoassay (IBL, Hamburg, Germany).

In order to provide the most accurate characterization of cortisol levels over time, area under the curve (AUC) measures were calculated for different HPA axis patterns measured over the course of 3 full days. AUC cortisol measures are typically calculated using the trapezoidal rule for numerical integration with the area defined as that under the curve above a baseline measurement or the area defined as that under the curve from the zero axis (Fekedulegn et al., 2007). Four consecutive morning cortisol samples were used to calculate the waking AUC, with the participant collecting samples at 15 minute intervals from awakening. Diurnal AUC includes those measures obtained as part of the waking AUC measure in addition to repeated measurements of cortisol obtained throughout the remainder of the day, as well as a final measure obtained just before evening retirement. The diurnal AUC measure is utilized to characterize the natural diurnal cortisol secretion pattern for each participant.

Salivary cortisol samples were available for 83 of the 100 officers in the study, however the number of completed samples varied by participant. Waking area under the curve (AUC) samples were available for 68 of the participants with reported IES scores, with 8 females and 7 males not providing all of the required samples to complete the AUC calculation. Demographic characteristics (not reported here) for those officers with missing samples were reviewed in detail and found to not be significantly different from those who provided full sets of cortisol samples.

Analysis Plan

Descriptive statistics, analysis of variance (ANOVA), as well as AUC cortisol measures, were utilized to determine the relationship between IES scores and salivary cortisol measures. ANOVA were reported as F ratios and utilize a 0.05 level of significance.

RESULTS

Demographic characteristics of the BCOPS cohort are summarized in Table 2. The majority of the officers were Caucasian (76%) with nearly half of the officers reporting their age as 40–49. Officers 50 years of age or older tended to be male. Patrol officers represented 51% of the total sample. This gender finding is reflective of those males who have been on the police force for many years before female officers were considered for employment by the police force. The average number of years in service to the City of Buffalo, New York, police force was 14.9 years.

The overall prevalence of PTS, as defined by those who demonstrate an IES score of 26 or more, was 35.3%. The mean IES score for the entire cohort was 21.17 (SD 14.6). Additional lifestyle and demographic characteristics of the cohort across varying categories of PTS are presented in Table 3. While not statistically significant, 8.6% of participants in the high PTS symptomatology category report themselves as current smokers, while $\sim$ 43% within this category reported themselves as never smoking (Table 3). Self-reported weekly alcohol consumption did not differ significantly across PTS symptomatology categories.

Among those with mild PTS symptomatology, the gender proportions were nearly equal (Table 3). Of those with IES scores reflective of subclinical symptomatology, 30% were female and 69% were male. Those with high PTS symptomatology were more often represented by males (57.1%). The Center for Epidemiologic Study Depression score was also available for this cohort. As the PTS symptomatology worsened, so too did the depression index. This trend reached statistical significance.

The mean waking salivary cortisol level for the entire group of officers was 14.04 nmol/L (SD $\pm$ 10.39). First waking salivary cortisol results are presented in Figure 1. The gender differences between mean waking cortisol values were statistically significant ($F\,[1, 81] = 5.910, p = 0.017$). While mean waking salivary cortisol values do differ between the levels of PTS, and increases in waking cortisol are evident across PTS categories, the differences were not statistically significant ($p = 0.46$). When gender differences across PTS sub-categories were examined, gender had a significant main effect on waking salivary cortisol measures [$F(1, 80) = 5.35, p = 0.02$].

TABLE 2
Prevalence of Descriptive Characteristics of Participants by Age BCOPS Study, 2001–2003

Characteristics	Age (years) ≤39 $n = 29$	40–49 $n = 45$	≥50 $n = 26$	Total	p-value**
Gender					
Female	9 (21.4)	26 (61.9)	7 (16.7)	42	
Male	20 (34.4)	19 (32.8)	19 (32.8)	58	0.02
Ethnicity					
African-American	6 (31.6)	12 (63.2)	1 (5.2)	19	
Hispanic	1 (20.0)	2 (40.0)	2 (40.0)	5	
Caucasian	22 (28.9)	31 (40.8)	23 (30.3)	76	0.20
Education					
≤ High School	3 (18.8)	6 (37.5)	7 (43.7)	16	
College < 4 yrs	8 (27.6)	14 (48.3)	7 (24.1)	29	
College ≥ 4 yrs	18 (32.7)	25 (45.5)	12 (21.8)	55	0.30
Marital Status					
Single	11 (55.0)	7 (35.0)	2 (10.0)	20	
Married	17 (26.3)	27 (41.5)	21 (32.2)	65	
Divorced	1 (6.7)	11 (73.3)	3(20)	15	0.04
Rank					
Patrol Officer	23 (45.1)	24 (47.1)	4 (7.8)	51	
Administrative	3 (13.0)	16 (69.6)	4 (17.4)	23	
Detective	1 (7.0)	3 (20.0)	11 (73.0)	15	
Other	2 (18.2)	2 (18.2)	7 (63.6)	11	<0.01
Years of Service					
0–10	19 (61.3)	11 (35.5)	1 (3.2)	31	
11–20	10 (21.7)	30 (65.2)	6 (13.1)	46	
21 or more	0	4 (17.4)	19 (82.6)	23	<0.01

*results are n(%)
**p-value based on X^2 for categorical variables

Waking AUC salivary cortisol levels by PTS subcategory are presented in Figure 2. Two-way ANOVA was utilized to examine waking AUC salivary cortisol across PTS categories by gender. The ANOVA results demonstrated significant gender findings $F(1, 66) = 13.61$, $p < 0.001$. While the ANOVA findings do not point to where the differences are between the genders, the results do demonstrate that differences exist between the genders when considering waking AUC measures and the level of self-reported PTS.

Diurnal area under the curve analysis of salivary cortisol measures and IES sub-categories demonstrated statistically significant findings (F [2, 60] = 3.134, $p = 0.05$). Bonferroni's post-hoc test of diurnal cortisol measures across PTS categories was conducted to determine which PTS groups were significantly different in diurnal cortisol levels. Results revealed subclinical PTS was different from mild PTSD ($p = 0.05$). Differences between subclinical and high PTS symptom levels, when diurnal AUC was examined in post-hoc analysis, did not provide significant results ($p = 0.23$).

DISCUSSION

The overall prevalence of PTS symptomatology among police officers in Buffalo, NY (~35%) is greater than that found in the general population (8–9%). By gender, high PTS symptomatology was found in 36.6% of the female participants, while 34.5% of males fell into this category. Salivary cortisol measures produced mixed results in relation to the categorical presence of PTS symptoms. What appears to be consistent is that there are differences, although not all statistically significant, in the levels of measurable cortisol present across the varying levels of PTS symptomatology. As the IES scores change, so too does the cortisol response when comparing categories of IES scores. The co-morbidity of PTS and depression has been noted by others (Conner & Butterfield, 2003; Franklin & Zimmerman, 2001; Kurina, Schneider, & Waite, 2004). This finding was also noted in the BCOPS Study, with the mean score of the depression index (CES-D) also increasing significantly across PTS categories.

The alcohol "misuse" theory among individuals with PTS which surmises that alcohol is used to self-medicate to relieve

TABLE 3
Lifestyle and Demographic Characteristics by PTS Symptom Severity, BCOPS Study, 2001–2003

Variable	PTS Subcategory Based on IES Score			*p-value*
	Subclinical (IES 0–8)	Mild (IES 9–25)	High (IES 26 or >)	
Age yrs*	43.8 (8.03)	43.0 (7.90)	45.0 (6.90)	0.49
CES-D Score*	4.81 (4.2)	6.61 (5.3)	13.87 (9.0)	0.01
Years of Service*	15.8 (9.20)	13.8 (9.50)	15.4 (8.9)	0.62
Gender+				
Male	18 (31.0)	20 (34.5)	20 (34.5)	
Female	8 (19.5)	18 (43.9)	15 (36.6)	0.41
Education+				0.88
≤ High School	3 (20.0)	6 (40.0)	6 (40.0)	
< 4 yrs. College	20 (25.7)	31 (39.7)	27 (34.6)	
> Baccalaureate	3 (50.0)	1 (16.7)	2 (33.3)	
Race+				0.18
Caucasian	20 (26.7)	32 (42.6)	23 (30.7)	
Non-Caucasian**	6 (25.0)	6 (25.0)	12 (50.0)	
Cigarette smoking+				
Never	7 (18.4)	16 (42.1)	15 (39.5)	0.43
Former	12 (35.2)	11 (32.4)	11 (32.4)	
Current	4 (28.6)	7 (50.0)	3 (21.4)	
Missing	3 (23.0)	4 (30.8)	6 (46.2)	
Alcohol Intake+				
None	3 (15.8)	11 (57.9)	5 (26.3)	0.36
< 1/wk	7 (33.3)	5 (23.8)	9 (42.9)	
1–6/wk	8 (25.8)	11 (35.5)	12 (38.7)	
> 6/wk	5 (33.3)	7 (46.7)	3 (20.0)	
Missing	3 (23.0)	4 (30.8)	6 (46.2)	

Note: PTSD = post-traumatic stress disorder; IES = Impact of Events; CES-D = Center for Epidemiologic Study Depression Scale;
*Continuous variables: reported as mean(SD) with *p* values from linear trend testing across PTSD severity;
+Categorical variables: reported as n(%) with *p* values are from the X^2 test of independence;
**Non-Caucasian includes Hispanic and African-American subgroups.

the PTS symptomatology has been postulated in the stress literature (Chilcoat & Breslau, 1998; Sims & Sims, 1998). From an epidemiologic perspective any self-reported histories present some degree of uncertainty as to the validity of the findings. While the officers in this study were provided with guarantees of confidentiality, they may not have felt comfortable enough to provide a fully accurate recounting of their alcohol consumption history and patterns given that

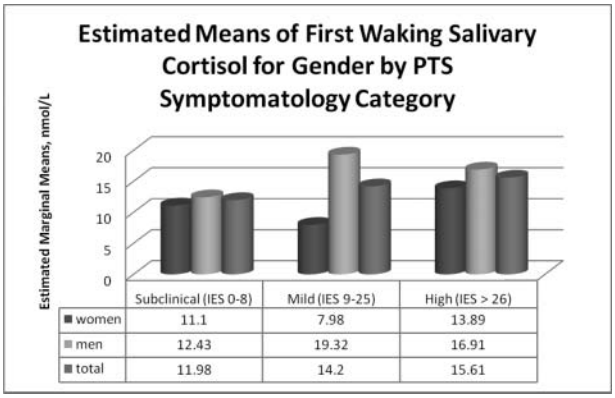

FIGURE 1. Estimated marginal means of first waking salivary cortisol for gender by PTS symptomatology category.

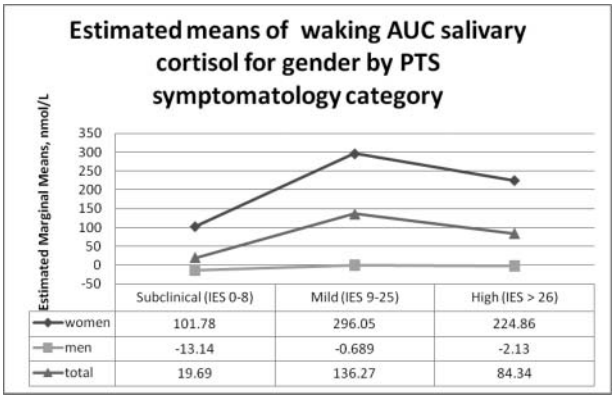

FIGURE 2. Estimated marginal means of waking AUC salivary cortisol for gender by PTS symptomatology category.

many officers fear departmental discipline and therefore will not officially report alcohol use (Violanti, 2003). The BCOPS Study found that nearly one-third of male participants and 17% of females within the occupational group report never consuming alcohol which is dissimilar to prior studies which have demonstrated higher rates (90%) of alcohol use among police officers (Richmond, Wodak, Kehoe, & Heather, 1998).

The policing occupation is an at-risk group for substance abuse or misuse. Cross and Aschley (2004) suggest that substance use and misuse among law enforcement officers is an under-reported experience within the occupation. Alcohol use among law enforcement is often viewed as a "social event" which starts out innocently enough as an accepted practice of "a few beers after work" and subsequently can evolve into a coping mechanism to deal with the tragedy and stress that are all too frequent within the occupation. Violanti (2003) reported that when assessing mortality risk for officers, at least one quarter of officers queried had reported utilizing alcohol as a result of on-the-job stress. Coping with occupational stressors can also result in illicit drug use or abuse given the frequency of occasions that police are in contact with drug dealers and the drugs that those individuals are trafficking.

The results of first waking cortisol measures demonstrated a wide dispersion of values. Of interest was that in the female grouping with mild PTS, cortisol levels were lower in this category than the remaining two categories, while within the male grouping, the mild PTS mean waking cortisol is higher than in the other two categories (Figure 1). Our findings may point to a trauma more proximal to the time of the cortisol measure where increased cortisol output may still be occurring in response to the external threat or stimulus.

The gender differences in cortisol production, as well as cortisol responses are not yet fully understood in the human species. Kirschbaum and colleagues (1992) in a review of the literature on gender and cortisol responses contend that gender differences in cortisol response have not been adequately studied in human beings and that human results differ from that of the rodent models. Kirschbaum concluded that the observed differences between the genders may be related to cognitive differences in how the genders interpret and respond to a perceived stressful life event. The interpretation and response of a stressful situation in turn influences the extent to which the HPA axis is activated, as well as the eventual amount of cortisol produced in relation to the stressful event. A limitation that Kirschbaum alludes to is that in cortisol studies which involve a time sequence, such as the BCOPS Study, overall results may produce insignificant findings because of the small number of subjects involved.

Waking AUC measures are represented in Figure 2. Male participants demonstrated a diminished, more flattened response which is characteristic of a moderate and perhaps more rapid decline in cortisol levels from the first awakening measure and is not typical of what the expected characteristic waking rise that should normally occur. The female participants demonstrated a larger mean AUC which is more characteristic for the 60 minute time interval encompassed in the waking AUC measure.

From the officer's standpoint, with the increasing prevalence of substance use and misuse, as well as the high recidivism rates exhibited among criminal offenders with substance abuse issues, advising their healthcare provider of potential PTS symptoms plays a pivotal role in the diagnosis and treatment of PTS. The officer and the healthcare provider also need to consider social stressors when examining a law enforcement officer for physical and psychological complaints, as these stressors may add additional burden to the occupational stressors that influence overall health and mortality. If post-traumatic stress is suspected, a referral to a psychiatrist or psychologist should be initiated to facilitate early diagnosis and treatment. Even those individuals with subclinical post-traumatic stress measures must be considered for formal diagnosis and treatment given the chronicity with which the officers are exposed to stressful situations. The sub-clinical state may progress to post-traumatic stress disorder if the underlying stress issues are not identified and adequately resolved (Cross & Aschley, 2004).

As in any cross-sectional study, limitations exist. The sample size in this study was small (N = 100) with 83 of those within the sample providing adequate salivary samples for cortisol analysis. Cross-sectional studies examine only a "snapshot" in time and therefore cannot assess the temporality of the exposure and the outcome. This study reflects an urban police force, and therefore generalizability of the findings is limited to a polic force of similar size and composition in an urban area with similar policing activities to that of Buffalo, NY.

In summary, post-traumatic stress appears to be more prevalent within this police cohort compared to reported general population rates (Connor & Butterfield, 2003; Franklin & Zimmerman, 2001; Kessler et al., 1995). Females demonstrated a slightly larger rate of high PTS symptomatology than their male counterparts with similar symptomatology. The health effects and potential co-morbidities of PTS, such as substance abuse or depression, need to be considered not only in the offender but also in those individuals on the "other side of the law" that deal with the apprehension, arrest, recidivism, and parole issues of those who are found to be in violation of the law.

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