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Introduction to Special Issue: Stress and Health in Law Enforcement

John M. Violanti – Guest Editor
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There are approximately 765,000 sworn police officers in the United States, represented by 17,784 agencies. Despite the large size of this workforce and the strain of this occupation, the police are understudied in terms of the influence that the workplace has on work's psychological well-being and physical health. Policing is a psychologically stressful work environment filled with danger, high demands, ambiguity in work encounters, human misery, and exposure to death.

In 2004, the Buffalo Cardio-Metabolic Occupational Police Stress (BCOPS) study was initiated in collaboration with the National Institute for Occupational Safety and Health (NIOSH) along with contributions from the National Institute of Justice. The study was completed in 2009 and was among one of the first structured scientific attempts to gather both psychological and physiological data on a large sample of police officers. Four hundred and sixty-four police officers participated in the BCOPS study. The study provided an opportunity to investigate associations between stress, traumatic incidents lifestyle (smoking, diet, exercise, sleep), stress biomarkers, body measures physical activity , shift work, and subclinical metabolic and cardiovascular disease outcomes in police officers.

This special issue of the International Journal of Emergency Mental Health is only a partial representation of the extensive amount of investigation resulting from the BCOPS study. As an introduction, the first paper provides an overview of health disparities in the police compared to other major health studies in the U.S. population. Findings indicate that the prevalence of depressive symptoms in police officers was nearly double (11.3% vs. 6.8%) that of the general population. Over 25% of police officers had the metabolic syndrome, a constellation of factors which are believed to increase the risk of heart disease, compared to 18.7% of the U.S. employed population. Officers also appeared to have less sleep, as they were nearly four times more likely to sleep less than six hours in a 24-hour period than the employed general population (31.4% vs. 8.0%).

There exists a general conception that retired officers are more likely to commit suicide due to the strain of separation from police work. The second paper in this issue examines this assumption by assessing the risk of suicide between working and retired police officers. A 55-year retrospective cohort mortality study was conducted, consisting of 3,228 officers who worked between 1950 and 2005. Adjusted for age and years of service, suicide rates were 8.4 times higher in working officers vs. separated/retired officers. Previous research indicated that the majority of suicides in working officers occur in the five years just prior to retirement eligibility, suggesting a period of decision anxiety. This finding does not negate the need for suicide prevention efforts in both working and retired officers. Retirement preparation seminars are important to help officers in the transition to civilian life.

Police officers report more stress and less sleep than the general population. The third paper in this issue explores the association between perceived stress and sleep duration among officers. Prevalence of poor sleep quality increased with increasing levels of perceived stress; the trend was significant among male officers, and gender significantly

modified this association. Compared to those in the first quartile of perceived stress, women in the fourth quartile were almost four times and men almost six times more likely to have poor sleep quality. Perceived stress was inversely associated with sleep duration and positively associated with poor sleep quality.

The fourth paper returns to a more in-depth examination of the metabolic syndrome and its association with stress in police officers. There are five components that are considered part of the metabolic syndrome: (1) abdominal obesity, (2) hypertension, (3) reduced high density lipoprotein cholesterol (HDL-C), (4) elevated triglycerides, and (5) glucose intolerance. The multivariate-adjusted number of metabolic syndrome components increased significantly in women across tertiles of police officer stress, including administrative and organizational pressure and lack of support indices for the previous month. No association was found among male officers. Abdominal obesity and reduced HDL-C levels were consistently associated with police stress in women. Police stress, particularly organizational pressure and lack of support, was associated with metabolic syndrome among female but not male police officers.

Previous research suggests that obesity is a health problem among police officers. Stress is also a concern in police work and can lead to depression. The fifth paper addresses the association between obesity and depression. Measures of obesity included body mass index (BMI), abdominal height, waist circumference, and depressive symptoms. Significant positive trends were observed in multivariate-adjusted mean depression symptom scores across increasing tertiles of BMI and abdominal height for men officers. No significant associations were found between depression symptoms and obesity in women officers. Additional factors that might influence this association should be examined prospectively in future work to help clarify causal direction.

Poor sleep quality has been shown to adversely affect emotional regulation, including an increase in depression symptoms. Police officers are at increased risk of poor sleep quality due to occupational factors. Paper six addresses the association between poor sleep and depressive symptoms in police officers. As sleep quality worsened, depressive symptom scores increased significantly. This trend held for both male and female officers, although the association was slightly weaker in women. Sleep quality was significantly and independently associated with depressive symptoms as evidenced by a trend of increasing depressive symptom scores with decreasing sleep quality in both male and female officers.

Police officers not only deal with stress and trauma in their work, they are also exposed to occupational hazards and materials which may be carcinogenic (e.g. clandestine labs, chemical spills) which may put them at increased risk of cancer. Paper seven looks at the incidence of cancer among a cohort of 2,234 police officers. Four hundred and six officers (18.2%) developed cancer between 1976 and 2006. The risk of overall cancer among police officers was found to be similar to that of the U.S. general white-male population. An elevated risk of Hodgkin's lymphoma was observed relative to the general population. The risk of brain cancer, although only slightly elevated relative to the general population, was significantly increased with 30 years or more of police service.

Information gained through the BCOPS study may be useful not only to aid further investigation of the health status of the police, but may also be generalizable to other high stress occupations as well. Examples are firefighters, EMTs (emergency medical technicians), nurses, physicians, air traffic controllers, and the military. In general terms, results found in this study may add to existing knowledge of associations between psychological and physiological disease outcomes in first responder occupations.

Were it not for the cooperation of Buffalo police administration, the Police Benevolent Association, and the exceptional men and women of the Buffalo Police Department, this study would not have been possible. Our sincere thanks to them, as we look forward to our follow-up study.

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Health Disparities in Police Officers: Comparisons to the U.S. General Population

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Abstract: Police officers have one of the poorest cardiovascular disease (CVD) health profiles of any occupation. The goal of this study was to determine if police officers in the Buffalo Cardio-Metabolic Occupational Police Stress (BCOPS) Study (between 2004 and 2009) had a more adverse CV profile than the general U.S. employed population. Nearly one-half (46.9%) of the officers worked a non-day shift compared to 9% of U.S. workers. The percent of officers with depression was nearly double (12.0% vs. 6.8%) and officers were nearly four times more likely to sleep less than six hours in a 24-hour period than the general population (33.0% vs. 8.0%). A higher percentage of officers were obese (40.5% vs. 32.1%), had the metabolic syndrome (26.7% vs. 18.7%), and had higher mean serum total cholesterol levels (200.8 mg/dL vs. 193.2 mg/dL) than the comparison employed populations. In addition to having higher levels of traditional CVD risk factors, police officers had higher levels of non-traditional CVD risk factors. These findings highlight the need for expanding the definition of a health disparity to include occupation. Future studies should expand this comparison to additional traditional and non-traditional CVD risk factors and to other occupational groups. [International Journal of Emergency Mental Health, 2011, 13(4), pp. 211-220].

Key words: *law enforcement, cardiovascular disease, risk factors, health disparity, epidemiology*

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In the United States, cardiovascular disease (CVD) mortality declined considerably (by 65%) from 1968 to 2006, yet heart disease remains the leading cause of death for adults (National Heart, Lung, and Blood Institute [NHLBI], 2009). Consistent with this, the prevalence of key CVD risk factors (e.g. obesity, high blood pressure, high cholesterol,

and diabetes) have also decreased over time but in more recent years these trends have leveled off or actually reversed (Gregg et al., 2005). These recent trends can have important implications for the workplace, as heart disease is the third leading activity-limiting chronic condition behind arthritis and back and neck conditions (NHLBI, 2009).

Policing is an occupation that requires unpredictable and stressful bursts of intense and strenuous physical activity, placing high demand on the cardiovascular system (Kales, Tsismenakis, Zhang & Soteriades, 2009). In an earlier study, Vena and colleagues (1986) found that white male police officers died on average seven years earlier than the general U.S. white male population (Arias, 2010). This finding led to numerous subsequent studies to identify specific risk factors and conditions for this disparity. Police officers exhibit some of the poorest CVD health profiles of any occupation, including higher rates of CVD risk factors (Franke, Ramey & Shelley, 2002; Ramey, Downing, & Franke, 2009; Hartley et al., 2011; Ramey, Perkhounkova, Downing & Culp, 2011; Wright, Barbosa-Leiker, & Hoekstra, 2011), overt CVD (Franke et al., 2002; Ramey et al., 2009), and on-duty CVD events (Kales et al., 2009).

Compounding this issue is the well-known fact that police officers experience high levels of job-related stress, frequently attributed to shift work, the potential for witnessing or experiencing violent events, and organizational pressure (Chen et al., 2006; Franke et al. 2002; Gershon, Lin & Li, 2002; Kales et al., 2009). The effects of job stress are well studied and include increased levels of psychological disorders such as anxiety, depression, and post-traumatic stress disorder (Gershon et al., 2002), and physiological conditions including hypertension (Franke et al., 2002; Ramey, 2003), and CVD (Backe, Seidler, Latza, Rossnagel & Schumann, 2011).

A health disparity is a "chain of events signified by a difference in environment, access to, utilization of, and quality of care, health status or a particular health outcome that deserves scrutiny" (Carter-Pokras & Baquet, 2002, p. 427). Health disparities are generally thought of as existing in differing groups, such as racial/ethnic groups, between men and women, or within social classes. However, health disparities may also exist in groups that are strongly influenced by the context of their occupation. This paper compares data on health disparities between participants in an epidemiologic study of police officers from a large Northeastern city with similar estimates from large epidemiologic population-based studies of primarily U.S. employed adults. The goal of this analysis is to determine if this cohort of police officers has a more adverse cardiovascular profile than the general U.S. employed population.

METHOD

Study Population

Data for the police officers came from the Buffalo Cardio-Metabolic Occupational Police Stress (BCOPS) Study conducted between 2004 and 2009. The overall objective of this cross-sectional study was to examine the association between psychological stress and subclinical CVD among 464 police officers. Each reported value for the variables of interest are taken or derived from findings in published manuscripts from the BCOPS Study (Hartley et al., 2011; Ma et al., 2011; Hartley et al., 2012; Slaven et al., 2012). All four studies excluded from the analyses 33 retired police officers who participated in the BCOPS Study.

Values for each of the variables of interest were obtained from peer-reviewed publications or from data available in U.S. Government reports or Web sites. Data for the general population estimates are primarily from large epidemiological studies of U.S. adults, including the U.S. Centers for Disease Control and Prevention's National Health and Nutrition Examination Survey (NHANES) and the National Health Interview Survey (NHIS), the U.S. Bureau for Labor Statistics' Current Population Survey (CPS), and the Multi-Ethnic Study of Atherosclerosis (MESA). For most of these study populations it was possible to restrict the comparison to employed adults (McMenamin, 2007; Davila et al., 2010; U.S. Bureau for Labor Statistics, 2011; Fujishiro et al., 2011). The estimates for depression and glucose intolerance are from U.S. adult populations not restricted by employment status (Ervin, 2009; U.S. Centers for Disease Control and Prevention, 2011). Table 1 describes these comparison studies and study populations by variable of interest.

Study Measures

Demographics

Sex and ethnicity were obtained from a self-reported demographics questionnaire for the BCOPS Study (Hartley et al., 2011) and from the 2010 U.S. Bureau for Labor Statistics Current Population Survey for the general U.S. employed population (U.S. Census Bureau, 2006). The percent

of women in each study is reported with the corresponding variable of interest. The mean age of the participants in each study is also reported. Fujishiro and colleagues (2011) reported the mean age using data from employed participants in the MESA Study. For the remaining studies, age was reported by categories and the mean age for these studies was calculated using a weighted average. An upper age limit of 85 was assumed for data from the NHIS and NHANES except for Ervin (2009) where 59 was the upper limit. The upper age limit of 75 was assumed for data from the Current Population Survey.

Shift Type

For the BCOPS Study participants, daily payroll records were obtained from 1994 to date of examination (between 2004 and 2009) and used to calculate the shift most frequently worked (day, afternoon, midnight). A detailed description of

Table 1.
Origin of general population estimates for key comparison characteristics

Variable	Reference Study	Study Population
Demographics and Workplace		
Sex	U.S. Current Population Survey (CPS), 2010	Full-time employed persons age ≥20
Race/Ethnicity	U.S. CPS, 2010	Full-time employed persons age ≥20
Shift Work	U.S. CPS Supplement, 2004	All employed persons age ≥20
Psychosocial Measures		
Depression	National Health and Nutrition Examination Survey (NHANES), 2005-2008	Adults age ≥18
Lifestyle Behaviors		
Smoking Status	Multi-Ethnic Study of Atherosclerosis (MESA), 2000-2002	2,801 employed adults age 45-84
Hours of Sleep	National Health Interview Survey, 2004-2007	66,099 employed adults age ≥18
Cardio-Metabolic Risk Factors		
Body Mass Index	MESA, 2000-2002	2,801 employed adults age 45-84
Serum Cholesterol Levels	MESA, 2000-2002	2,801 employed adults age 45-84
Hypertension	MESA, 2000-2002	2,801 employed adults age 45-84
Glucose Intolerance	NHANES, 2003-2006	3,423 adults age ≥20
Metabolic Syndrome	NHANES, 1999-2004	8,457 employed adults age ≥20
Caritud Untima Media Thickness	MESA, 2000-2002	2801 employed adults age 45-84

the methods used to determine the most frequently worked shift has been reported (Ma et al., 2011). Shift type was determined for the employed comparison population using questions from the 2004 U.S. Bureau for Labor Statistics' Current Population Survey (McMenamin, 2007) as this was the most recent year available.

Psychosocial Measures

Depressive symptoms were measured in the BCOPS Study using the Center for Epidemiologic Sudies--Depression (CES-D) Scale. Details of the CES-D are reported (Radloff, 1977, Slaven, et al., 2012). For this study, a cutoff score of 16 or higher was used to identify officers with depression (Radloff, 1977). For the comparison population, depressive symptoms were measured using the Patient Health Questionnaire-9 (PHQ-9) (CDC, 2011) and for this study a cutoff score of 10 or greater was used to identify participants with depression (Kroenke, Spitzer, & Williams, 2001).

Lifestyle Behaviors

For both groups, smoking status was derived from self-reported questionnaires and participants were classified as never smokers, former smokers, or current smokers. Hours of sleep was defined for the BCOPS Study participants using the Pittsburgh Sleep Quality Index (PSQI) question "During the past month, how many hours of actual sleep did you get at night?" (Slaven et al., 2012). For the comparison population, participants responded to the question "On average, how many hours of sleep do you get in a 24-hour period?" (Luckhaupt, Tak, & Calvert, 2010).

Cardiometabolic Risk Factors

Cardiometabolic risk factors (i.e. body mass index, total serum cholesterol, blood pressure, glucose intolerance, metabolic syndrome, common carotid intima media thickness) were obtained using the same procedures for the BCOPS Study participants (Hartley et al., 2011; Hartley et al., 2012) and the comparison participants (Ervin, 2009; Davila et al., 2010; Fujishiro et al., 2011). Body mass index (BMI) was used to define the percent of participants who were overweight or obese; a BMI between 25 and 29.9 kg/m2 is considered overweight and a BMI of 30 kg/m2 or greater is considered obese. Total serum cholesterol levels (mg/dL) were obtained from a 12-hour fasting blood sample. Resting systolic blood pressure was measured three times with a standard sphygmomanometer and reported values are the average of the second and third readings. Glucose intolerance was defined as a fasting serum glucose level of 100 mg/dL or greater, or self-reported diabetes and taking hypoglycemic medication.

The metabolic syndrome (MetSyn) was defined using the modified version of the 2001 Third Report of the National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Grundy et al., 2005). MetSyn was considered present in individuals with 3 or more of the following components: hypertension, reduced high density lipoprotein cholesterol, abdominal obesity, glucose intolerance or hypertriglyceridemia.

Common carotid intima media thickness (IMT) measurements were obtained via ultrasound scans using standardized protocols. Details of the scan have been previously reported (Fujishiro et al., 2011; Hartley et al., 2011). Briefly, standardized longitudinal images were acquired of the near and far walls of the distal 10 mm portion of the common carotid artery (CCA) on both the right and left sides.

RESULTS

The comparison between the BCOPS Study participants and the general U.S. employed population can be found in Table 2. In general, just over 25% of the BCOPS Study participants were women (range 25.9% - 28.6%) compared to nearly 50% of the comparison study participants (range 42.4% - 50.6%). The mean age for the BCOPS Study participants across the studies was approximately 41 years (range 40.7 – 41.5). There was considerable variation in the mean age for the comparison study participants. The weighted mean age ranged from 39.5 years for the 2003 – 2006 NHANES population to 56.4 years for the employed participants of the MESA Study.

Focusing on the specific variables of interest, slightly more than one-quarter of the BCOPS Study participants were women compared to 42% of U.S. workers. Twenty percent of the officers were black compared to only 11% of U.S. workers; only 1.8% of officers were Hispanic compared to 14.3% of U.S. workers. Nearly one-half (46.9%) of the police officers worked a non-day shift compared to 9% of

Table 2.
Health disparities between BCOPS Study participants compared to the general U.S. employed population estimates.*

Variable	BCOPS			General Employed Population Estimate		
	N or %	Mean Age	% Women	N or %	Mean Age	% Women
Demographics and Workplace Characteristics						
Men, %	73.8[a]	41.5	-	57.6[b]	43.1	-
Women, %	26.2[a]	41.5	-	42.4[b]	43.1	-
White, %	76.7[a]	41.5	26.2	81.4[b]	43.1	42.4
Black, %	20.3[a]	41.5	26.2	11.2[b]	43.1	42.4
Hispanic**, %	1.8[a]	41.5	26.2	14.3[b]	43.1	42.4
Day Shift, %	53.1[c]	41.2	28.6	84.0[d]	40.5	48.2
Afternoon Shift, %	26.3[c]	41.2	28.6	3.1[d]	40.5	48.2
Night Shift, %	20.6[c]	41.2	28.6	5.6[d]	40.5	48.2
Psychosocial Measures						
Depression, %	12.0[e]	40.7	27.4	6.8[f]	48.3	50.6
Lifestyle Behaviors						
Current Smokers, %	16.7[a]	41.5	26.2	13.6[g]	56.4	46.9
Sleep < 6 hours/24 hour period, %	33.0[e]	40.7	27.4	8.0[h]	41.5	50.1
Cardio-Metabolic Risk Factors						
Overweight (BMI 25-29.9 kg/m²), %	41.5[a]	41.5	26.2	40.0[g]	56.4	46.9
Obese (BMI ≥ 30 kg/m²), %	40.5[a]	41.5	26.2	32.1[g]	56.4	46.9
Total Cholesterol, mg/dL	200.8[i]	41.1	25.9	193.2[g]	56.4	46.9
Systolic Blood Pressure, mm Hg	120.9[i]	41.1	25.9	121.6[g]	56.4	46.9
Glucose Intolerance, %	23.6[a]	41.5	26.2	32.4[j]	39.5	47.6
Metabolic Syndrome, %	26.7[a]	41.5	26.2	18.7[k]	41.0	46.5
Carotid Intima Media Thickness, mm	0.62[i]	41.1	25.9	0.82[g]	56.4	46.9

Data Sources. a: Hartley, 2012; b: U.S. Bureau of Labor Statistics Household Data; c: Ma, 2011; d: McMenamin, 2007; e: Slaven, 2012; f: MMWR, 2011; g: Fujishiro, 2011; h: Luckhaupt, 2010; i: Hartley, 2011; j: Ervin, 2009; k: Davila, 2010

** The study populations for depression and glucose intolerance were not restricted by employed status.*

*** Hispanic race or ethnicity. In BCOPS, Hispanic was collected as "Race". In BLS, Hispanic was collected as "Ethnicity". A person could then list "Race" as "White" and also list "Ethnicity" as "Hispanic". As a result, the BLS percentages will not sum to 100 like those for BCOPS.*

U.S. workers. The percent of officers with depression (police officers: CES-D ≥ 16; comparison group: PHQ-9 ≥ 10) was nearly double that of the general population (12.0% vs. 6.8%).

A slightly higher percent of officers were current smokers compared to the employed population (16.7% vs. 13.6%). Police officers were four times more likely to sleep less than six hours in a 24-hour period than the employed population (33.0% vs. 8.0%). The percentage of officers who were overweight was similar to the employed population (41.5% vs. 40.0%); the percent obese was higher for the officers compared to the employed population (40.5% vs. 32.1%).

Mean serum total cholesterol levels were slightly higher for officers compared to the employed population (200.8 mg/dL vs. 193.2 mg/dL), while systolic blood pressure levels were similar for both groups (120.9 mm Hg, 121.6 mm Hg, respectively). The percent of police officers who were glucose intolerant was lower than the general population (23.6% vs. 32.4%). However, nearly 27% of police officers had MetSyn, which includes glucose intolerance and hypertension, compared to 18.7% of the employed population. The mean common carotid intima media thickness for the police officers was 0.62 mm compared to 0.82 mm for the employed population.

CONCLUSIONS

In the current study we compared levels of traditional and non-traditional CVD risk factors between participants in the BCOPS Study with estimates from the general U.S. employed population. Nearly three-quarters of the police officers were men compared to about 58% of U.S. workers. This discrepancy was consistent throughout each of the comparisons of the variables of interest. Policing is a male dominated occupation where women account for just over 10% of all sworn law enforcement personnel in the U.S. (National Center for Women and Policing, 2002). Ethnicity also varied between the two groups. Just over 20% of police officers were black compared to 11% of all U.S. workers. There were a very small percentage of Hispanic police officers compared to 14% of U.S. workers.

Nearly half of the police officers worked a non-day shift compared to less than 10% of the U.S. workforce. Policing is a 24-hour occupation and shift work is a necessity. However, night shift work can have considerable consequences on health and safety. Shift work has been associated with CVD, obesity, MetSyn, diabetes, and mood and anxiety disorders, most likely as a result of circadian rhythm disruption (Shift work and sleep, 2011).

One-third of police officers reported sleeping less than six hours in a 24-hour period; this finding was four times higher than employed workers completing the National Health Interview Survey. Sleep loss can be a consequence of shift work, and has been associated with higher levels of perceived stress in male police officers and among those with higher police ranks and greater workloads (Charles et al., 2012). Chronic sleep loss can lead to excessive fatigue and impaired alertness. These outcomes can have immediate consequences for police officers as the nature of their job requires them to function in a hypervigilant state (Shift work and sleep, 2011).

The prevalence of depression was nearly twice as high for the police officers as the general population. This finding is somewhat surprising given that the comparison study sample was not restricted to employed adults, included a higher percentage of women, and possibly included a higher percentage of persons who have chronic medical conditions and those who are unemployed. Depression is known to be higher among women, those with chronic medical conditions, and those who are unemployed (Marcotte, Wilcox-Gok, & Redmon, 1999; National Institute of Mental Health; U.S. Department of Health and Human Services, 1999). However, age is also a significant risk factor for depression. According to the National Health Statistics Report (Pratt & Brody, 2008), persons between 40-59 years of age have the highest prevalence of depression compared to teens, young adults, and older adults. Roughly 60% of the BCOPS Study participants fall into this working age category (Hartley et al., 2011). Workers in this age category may also be providing child care and/or elder care in addition to their responsibilities as a police officer. And as previously indicated, policing itself is considered to be a high stress occupation (Gershon et al., 2002) and job strain and low social support at work have been significantly associated with major depressive disorder (MDD; Blackmore et al., 2007).

With regard to the cardio-metabolic risk factors, police officers had a similar percentage of participants who were overweight (BMI 25-30 kg/m2), similar levels of systolic blood pressure, and lower levels of glucose intolerance compared to the respective comparison population. Yet the prevalence of MetSyn, which includes these three risk factors in addition to hypertriglyceridemia and reduced HDL-C, was approximately 8% higher for police officers than workers in

the comparison study. The MetSyn component hypertension includes three items: systolic blood pressure ≥ 130 mm Hg, diastolic blood pressure ≥ 85 mm Hg, and antihypertensive treatment. Relying solely on systolic blood pressure levels may represent an underestimation of hypertension as successful treatment for hypertension should reduce levels of systolic blood pressure. As we have reported, the MetSyn component hypertension is high among these police officers with 39% meeting at least one of the three component criteria (Hartley et al., 2011; Hartley et al., 2012).

The percentage of officers currently smoking was 3.1% higher at 16.7%, obesity was 8.4% higher at 40.5%, and the serum total cholesterol levels were approximately 7.6 mg/dL higher at 200.8 mg/dL, than the employed MESA Study participants. These values for the police officers fall well short of the U.S. Healthy People 2010 recommendations: reduction in mean total blood cholesterol to 199 mg/dL, smoking to 12% of the population, and obesity to 15% of the population (U.S. Department of Health and Human Services, 2000). The higher values are not entirely attributable to age as the mean age of the police officers is notably 15 years younger than the employed comparison study participants. This makes these differences more striking given that obesity and total cholesterol typically increase from young adulthood to retirement age (Mizuno, Shu, Makimura & Mobbs, 2004; National Center for Health Statistics, 2009) and are often higher in women than in men regardless of ethnicity or educational level (Mensah, Mokdad, Ford, Greenlund & Croft, 2005; Wang & Beydoun, 2007). One possible explanation for these differences is that police officers spend a considerable amount of on-duty time being relatively inactive (Kales et al., 2009) and physical inactivity is a risk factor for both obesity and hypercholesterolemia (Pate et al., 1995).

Common carotid IMT values were much lower for police officers compared to the employed MESA Study participants. This finding is somewhat surprising given the difference in the percentage of women between the BCOPS Study and the MESA Study participants (25.9% vs. 46.9%, respectively). Women typically have lower carotid IMT than men (Howard et al., 1993; Hartley et al., 2011). However, the BCOPS Study participants were about 15 years younger than the MESA Study participants which may explain most of the difference between the two groups; carotid IMT increases at approximately 0.01 mm per year (Howard et al., 1993).

Previous studies have found police officers to have higher rates of CVD risk factors and CVD morbidity than other groups (Franke et al., 2002; Ramey et al., 2009; Ramey et al., 2011). In the current study, we compared police officers with reported results from studies including mostly employed adults. Our findings are consistent with those previously reported: a higher percentage of police officers were obese and had the MetSyn. In addition to these more traditional CVD risk factors, we found a higher prevalence of depression, and a higher percentage of police officers who work a non-day shift and sleep less than six hours a night compared to other employed adults. Previous research has reported that police officers are a known high stress occupational group (Collins & Gibbs, 2003) and that the stress associated with policing may predispose officers to higher rates of CVD morbidity and mortality (Franke, Collins & Hinz, 1998). Importantly, stress initiates an inflammatory process that may attribute to the CVD observed in 40% of atherosclerotic patients who lack traditional CVD risk factors (Black & Garbutt, 2002). This pathway may be supported by the findings in the current study.

This study has several noteworthy limitations. First, variables were selected based on their availability in published findings. Information on other key demographic variables, lifestyle variables, and CVD risk factors would be beneficial in providing a more comprehensive understanding of the health disparities of police officers. Second, there may be key differences in the demographic profile of the BCOPS Study participants and each of the comparison groups. The comparison groups were carefully selected based on the following criteria: 1) publication of findings in the scientific literature, 2) studies were conducted in the United States, 3) study participants were adults (≥ 18 or ≥ 20, depending upon the individual study), and 4) study participants were employed. Percentage of women and mean age (actual or calculated from weighted averages) were reported and, where appropriate, were considered as a potential explanation for differences between the two groups. Third, CVD risk factors may differ by demographic characteristics. For example, in our previous findings, male police officers were found to have a higher prevalence of MetSyn than female police officers (Hartley et al., 2011). Yet, in the current study we were not able to stratify the analyses by key demographic characteristics, such as sex and age. Finally, several of the variables used in the comparison were derived from different measures. For example, the prevalence of depression is based on the Center for Epidemiologic Studies – Depression Scale (CES-D) for the BCOPS Study participants and from the Patient Health Questionnaire-9 (PHQ-9) for the comparison group, which

may represent one potential explanation for the difference found between the two groups, although the level of agreement between the two measures has been addressed by others (Dbouk, Arguedas, & Sheikh, 2008; Milette, Hudon, Baron, Thombs & Canadian Scleroderma Research Group, 2010).

Strengths of this study include the use of clinical measurements versus self-report. Previous studies comparing police officers with the general population have relied upon self-report measures of hypertension, hypercholesterolemia and diabetes (Ramey, Downing & Knoblauch, 2008). In the current study, all six of the cardio-metabolic risk factors were obtained via standardized anthropometric and clinical protocols for both the BCOPS Study participants and the respective comparison groups, thus eliminating concerns about reporting bias.

In the current study we found that police officers have higher levels of traditional and non-traditional CVD risk factors than other employed adults. To our knowledge this is the first comparison of key CVD risk factors between a sample of police officers and the general U.S. employed population. Our findings highlight the need for expanding the scope of demographic characteristics that define a health disparity to include occupation, as this factor can contribute significantly to an individual's overall health and well-being. Future studies should reexamine this comparison with additional traditional and non-traditional CVD risk factors and should be expanded to other occupational groups.

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Is Suicide Higher Among Separated/Retired Police Officers? An Epidemiological Investigation

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Abstract: It is often assumed that separated or retired officers are at increased risk for suicide. The goal of this study was to compare police suicide rates between currently working and separated/retired officers. A 55-year retrospective mortality police cohort was utilized consisting of 3,228 officers who worked between January 1, 1950 and December 31, 2005. Poisson regression and survival analysis were used for comparisons. Adjusted for age and years of service, suicide rates were 8.4 (95% CI = 3.8-18.7) times higher in working officers vs. separated/retired officers (110.5 vs. 13.1 per 100,000 person-years respectively). Survival time to suicide was significantly lower ($p<0.0001$) for current working officers, suggesting suicide in a significantly shorter time span. Previous research indicates that the majority of suicides in working officers occur in the five years just prior to retirement eligibility, suggesting a period of decision anxiety. Results suggest a higher risk of suicide among working compared to separated/retired officers. However, the need for suicide prevention efforts remains important among both active and retired police officers. [International Journal of Emergency Mental Health, 2011, 13(4), p. 221-228].

Key words: *police, suicide, retirees, suicide rates, survival time*

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Epidemiological evidence suggests an elevated rate of suicide within law enforcement (Violanti, Vena & Petralia, 1998; Forastiere, Perucci, Dipietro, Miclei, Rapiti, Bargagli, et al, 1994; Gershon, Lin & Li, 2002; Cantor, Tyman & Slater, 1999; Charbonneau, 2000; Hartwig & Violanti, 1999; Violanti, Fekedulegn, Charles, Andrew, Hartley, Manatsakanova & Burchfiel, 2008; O'Hara & Violanti, 2009). Although rarely

considered in these studies, it is often assumed that retired or separated officers are more likely than current working officers to commit suicide. This assumption is based on proposed separation anxiety factors which may lead officers to a state of isolation, depression, and potential suicide (Fonda, Wallace & Herzog, 2001). Lindy, Grace, and Green (1981) described this as the membrane effect, where a network of trusted, close persons served to protect persons from distress. Forcese and Cooper (1985) found associations between the police career and post-separation inactivity, bitterness, and disappointment. Goldfarb (1994) found that 12% of officers who left police work were dissatisfied with separation, and 40.63% noted that they missed being a police officer. A study of 1,334 retired male Scottish police officers (34 – 94 years old) found that officers were increasingly susceptible to depression (Touhy, Knussen & Wrennel, 2005).

Contradictory research suggests that separated or retired police officers do not experience the harmful vestiges of stress. Gaska (1980) conducted a suicide study on retired Detroit police officers over a period of 35 years. Broken down on a per-year basis, the crude suicide rate was actually lower among Detroit police retirees than the white male general population at the time of the study (9.8/100,000 vs. 31.5/100,000 respectively). Pole and colleagues (2006) suggested that integrating stress associated with police work into officers' daily social lives prepared them for a resilient separation free from the residuals of posttraumatic stress and depression. In a related study, Pole (2008) found that cumulative duty-related trauma exposure poorly predicted PTSD symptoms in separated police officers. Ozee (2001) found that there were generally no differences in the quality of life in retired Illinois State Police officers, regardless of the retirement option chosen. Harris (1998) concluded that former officers were generally more satisfied with their jobs than current officers, a conclusion contrary to previous studies and conventional wisdom.

In sum, these studies suggest either the presence or absence of precipitants associated with suicide among separated officers but do not establish any actual difference in suicide rates within the occupation of policing. The goal of this study was to empirically examine police suicide rates among currently working and separated/retired officers, utilizing a retrospective police mortality cohort spanning 55 years (1950-2005). In this study, we used the term separated officers which included those who left police employment for any reason, e.g., retirement, resignation, or unknown. Retired officers are those who officially retired from police work after completing the required number of years prescribed by their departments. Our reasoning is based on the proposition that police work is a cohesive occupation and officers develop a strong bond with coworkers and with the status of the job itself (Violanti, 1992). Separating from police work, even prior to an official retirement, may have an impact on psychological well-being (Violanti, 1992; Pole, Kulkami, Bernstein, & Kaufmann, 2006). However, it is likely that the majority of separated officers in this study were officially retired, given their mean age of 55.3 years. Current workers were defined as actively employed or died while working.

METHOD

The mortality cohort consisted of officers (n = 3,228) who worked a minimum of five years for the Buffalo Police Department, New York, between January 1, 1950 and December 31, 2005. A portion of this cohort was involved in a comprehensive study on police stress and health (Violanti, Vena, Burchfiel, Sharp, Miller, Andrew, Dorn, et al, 2006). Officers who did not have birth data, hire date, or date of termination (n = 142), and officers who worked less than 5 years (n = 54) were excluded from the original data set (N = 3,424). Sources of follow-up included the benefit and pension programs of the city of Buffalo, the New York State Retirement System, New York State Vital Statistics Division, Buffalo Police employment records, Buffalo Police Association publications, obituaries, and the National Death Index. Death certificates were coded by state nosologists according to the International Classification of Diseases (ICD) revision for suicide in effect at the time of death (ICD codes E950-E959; suicide and self inflicted injury). Codes were subsequently converted for analysis to the 8th ICD Revision.

Statistical Analysis

Employment status was defined as *current or separated* from police service. An officer was defined as *separated* if he was terminated from payroll because of resignation (involuntary or voluntary), retirement, death, or any other reason. An officer was defined as *current* if he was actively employed as of 12/31/2005 or died while still employed in the service. The person-years at risk of dying by suicide were calculated for each officer. Among the separated group, the period starting from the date of first employment or 01/01/1950 (for those hired prior to 1950) as a police officer

to 12/31/2005 or the date of suicide after leaving the police service was considered to be the years at risk of dying by suicide. For example, officer A was first employed in 1928 and committed suicide in 1968 after having retired in 1962, therefore he contributed 18 person-years at risk (1950 – 1968 = 18). Among the *current* group, the period starting from the date of first employment or 01/01/1950 as a police officer to 12/31/2005 (if no suicide committed) or the date of suicide while still a police officer was considered to be the years at risk of dying by suicide. For example, officer B started employment in 1951 and committed suicide in 1958. He therefore contributed 7 person-years at risk. Within each group, the individual years at risk were summed across all officers in that group to provide the total years at risk. Demographic characteristics were compared across employment status (separated vs. current officers) using *t*-tests for differences in means of continuous variables and Chi-square tests of independence for categorical variables. Poisson regression was used to estimate the unadjusted, age-adjusted, and years of service-adjusted suicide mortality rates by employment status and were expressed per 100,000 person-years. Rate-ratios were calculated as the suicide mortality rate among currently employed officers divided by the corresponding rate among separated officers. Survival analysis was used to compare survival time by employment status. All calculations were performed with Statistical Analysis Systems version 9.2 (SAS Institute, Inc., 2008).

RESULTS

Table one provides demographic characteristics of the entire police cohort (n = 3,228). The cohort was mostly male (92.9%) and white (89.9%), with 37.3% having over thirty years of service. There was a significant difference in mean years of police service between separated and current officers (28.4 vs. 20.6 years respectively; p <0.001).

Table two provides suicide mortality rates by demographic characteristics. There were a total of 30 police suicide cases during this time period. Results suggest that the suicide rate generally decreased as years of service increased (linear trend p <0.001) and as years of separation from police work became more recent (linear trend p <0.001). For the years of police service category, the highest suicide rate was among officers with 19 years of service or less (52.4/100,000; 95% CI = 27.3-100.8).

Table three compares the suicide rate and rate ratios between currently working and separated officers. The adjusted rates were 13.1 vs. 110.5/100,000 person-years for separated and working officers respectively. If person-years at risk were not taken into account, the crude suicide rates would be 8.76/100,000 and 31.5/100,000 per year for separated and working officers respectively. Adjusted for age and years of service, current working officers were 8.4 times (95% CI = 3.8-18.7) more likely to commit suicide than separated officers..

The survival curves shown in Figure 1 compare the probability of surviving past a specific time without committing suicide by employment status. This survival estimate is much lower for currently working officers than for separated officers (log-rank test for homogenity of the survival curves, p-value <0.0001), a result consistent with the findings from the Poisson regression model.

DISCUSSION

Contrary to literature, which portrays separated or retired police officers as susceptible to suicide, the present study suggests that police officers who did commit suicide did so at a higher rate while working and in a significantly shorter time frame than separated officers.

Adjusted for age and years of service, current working officers were 8.4 times (95% CI = 3.8-18.7) more likely to commit suicide than separated officers. Adjusted rates over the 55 year mortality cohort period were 13.1 vs. 110.5/100,000 person-years for separated and working officers respectively; annual crude suicide rates, without taking into account person-years at risk, were 8.76/100,000 and 31.5/100,000 respectively. Although not directly comparable, the yearly crude rate for separated officers was lower than that of the U.S. general population (8.76/100,000 vs. 11/100,000 respectively). Additionally, it was lower than white males over the age of 65 years (8.76/100,000 vs. 14.3/100,000 respectively; Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, 2009).

The survival curve was useful in terms of comparing the two groups rather than making specific estimates for each group separately. The likelihood of not committing suicide for at least a specific number of years was significantly smaller for current officers compared to retired officers (Log-rank test p<0.0001). The curve also suggested that current officers are at higher risk of suicide compared to separated officers because their likelihood of surviving (not committing suicide) is much smaller at every time point on the curve.

Table 1.
Demographic characteristics of police officers by employment status.

	Total (N=3,228)		Separated (N=2,075)		Current (N=1,153)		P-value§
	N	%	N	%	N	%	
Gender							<0.001
Male	3000	92.9	2025	97.6	975	84.6	
Female	228	7.1	50	2.4	178	15.4	
Race/Ethnicity							<0.001
White	2892	89.9	2001	96.7	891	77.6	
Black	248	7.7	55	2.7	193	16.8	
Hispanic	78	2.4	13	0.6	65	5.6	
Age first employed							0.451
≤ 24 years	1134	35.1	745	39.5	385	33.7	
25-29 years	1463	45.3	933	45.0	530	46.0	
≥ 30 years	631	19.6	397	19.1	234	20.3	
Years of Service							<0.001
≤ 19	904	28.0	293	14.1	611	53.0	
20-29	1121	34.7	810	39.0	311	27.0	
≥ 30	1203	37.3	972	46.9	231	20.0	
Decade Officer Worked							<0.001
1950s	389	12.1	259	12.5	130	11.3	
1960s	447	13.9	325	15.7	122	10.6	
1970s	515	16.0	457	22.0	58	5.0	
1980s	522	16.2	463	22.3	59	5.1	
1990s	396	12.3	372	17.9	24	2.1	
2000-2005	959	29.7	199	9.6	760	65.9	
	Mean	SD	Mean	SD	Mean	SD	P-value‡
Age first employed	26.9	4.5	26.8	4.6	27.1	4.4	0.063
Years of service	25.7	9.8	28.4	8.8	20.6	9.5	<0.001
Age officer separated	52.6	10.1	55.3	9.5	na	na	
Age at end of risk‡‡	61.4	14.9	68.9	11.8	47.9	9.4	<0.001

'Separated' means termination of payroll for retirement, resignation, any death except suicide, or unknown reason.

'Current' means actively employed as of 12/31/2005 or was still in service when died from any cause including suicide.

§ P-values are from Chi-square tests of independence comparing separated vs. current officers.

‡ P-values are from t-tests for differences in mean values comparing separated vs. current officers.

‡‡ End of risk means date separated from police service or, if 'current', date of death or 12/31/2005.

There are some limitations to the present study. Since the data is retrospective and cross sectional, results provided statistical but not necessarily causal associations between police work and suicide. As with most retrospective mortality based designs, we had limited data on confounding factors related to lifestyle, ethnicity, alcohol use, social class, and work conditions. Our study did allow for length of police service, year of initial employment, and age at start of employment. We did not have access to information which provided the circumstances of separation. However, given the mean age (55.3 years) of the separated officers, it is likely that a majority were officially retired from police work. Additionally, we did not have information on whether or not the separation was voluntary, involuntary, or due to work related disability.

Table 2.
Suicide mortality rate of police officers by demographic characteristics.

Characteristics	No. at risk	No. of suicides	Person-years	Rate* (95% CI)	*P*-value
Gender					0.097
Male	3000	30	87,673	34.2 (23.9, 48.9)	
Female	228	0	4,114	0	
Race/Ethnicity					0.186
White	2892	29	85,719	33.8 (23.5, 48.7)	
Black	248	0	4,427	0	
Hispanic	78	1	1,460	68.5 (9.6, 486.2)	
Age first employed					<0.001
≤ 24 years	1134	8	33,977	23.5 (11.8, 47.1)	
25-29 years	1463	16	41,678	38.4 (23.5, 62.7)	
≥ 30 years	631	6	16,133	37.2 (16.7, 82.8)	
Years of Service					<0.001
≤ 19	904	9	17,167	52.4 (27.3, 100.8)	
20-29	1121	10	35,211	28.4 (15.3, 52.8)	
≥ 30	1203	11	39,409	27.9 (15.5, 50.4)	
Decade Officer Worked					0.001
1950s	389	6	6,239	96.2 (43.2, 214.1)	
1960s	447	9	11,531	78.1 (40.6, 150.0)	
1970s	515	5	19,219	26.0 (10.8, 62.5)	
1980s	522	6	21,621	27.8 (12.5, 61.8)	
1990s	396	1	14,408	6.9 (1.0, 49.3)	
2000-2005	959	3	18,770	16.0 (5.2, 49.6)	

**The suicide mortality rate is expressed per 100,000 person-years. The 95% CI was computed using the Poisson regression model.*

P-*values for gender and race are for any difference.* P-*values for age at employment, years of service, and year of separation are for tests for trend from Poisson regression model.*

Potocnik, Todera, and Peiro (2010) found that levels of depression were higher in involuntary compared to voluntary retirees. Wallman and colleagues (2006) found that subjects with a disability pension had increased mortality rates as compared with non-retired subjects. Gaska (1980) found the suicide rates to be higher among disabled vs. non-disabled officer retirees.

Although the present findings suggest that current working police officers had significantly higher rates for suicide than separated officers and suicide occurred in a shorter time span, little is known about police occupational factors which contribute to suicide. Future studies of police suicide risk should include identification of potential confounders which may help to identify possible causal relationships between suicide and occupation. A number of medical, psychological, and social influences appear to be associated with police suicide; knowledge of these influences is necessary in order to facilitate prevention efforts. The rate of suicide found among both current working and separated police officers in this study indicates a need for suicide awareness education and increased psychological services. Counseling programs should be initiated to help officers in the critical middle years of their police career. Mid-career and pre-retirement crises can be averted if departments have enough insight to intervene at times of discontent (Violanti, 1992, Darnely, 1975; Dross, 1965; Fretz, Kluge, Ossna & Jones, 1989; Mattila, Joukamaa, & Salokangas, 1988).

The police organization can also benefit separated/retired officers by helping with the transition process to civilian life. Unfortunately, not many police departments offer retirement

Table 3. Suicide mortality rate by work status

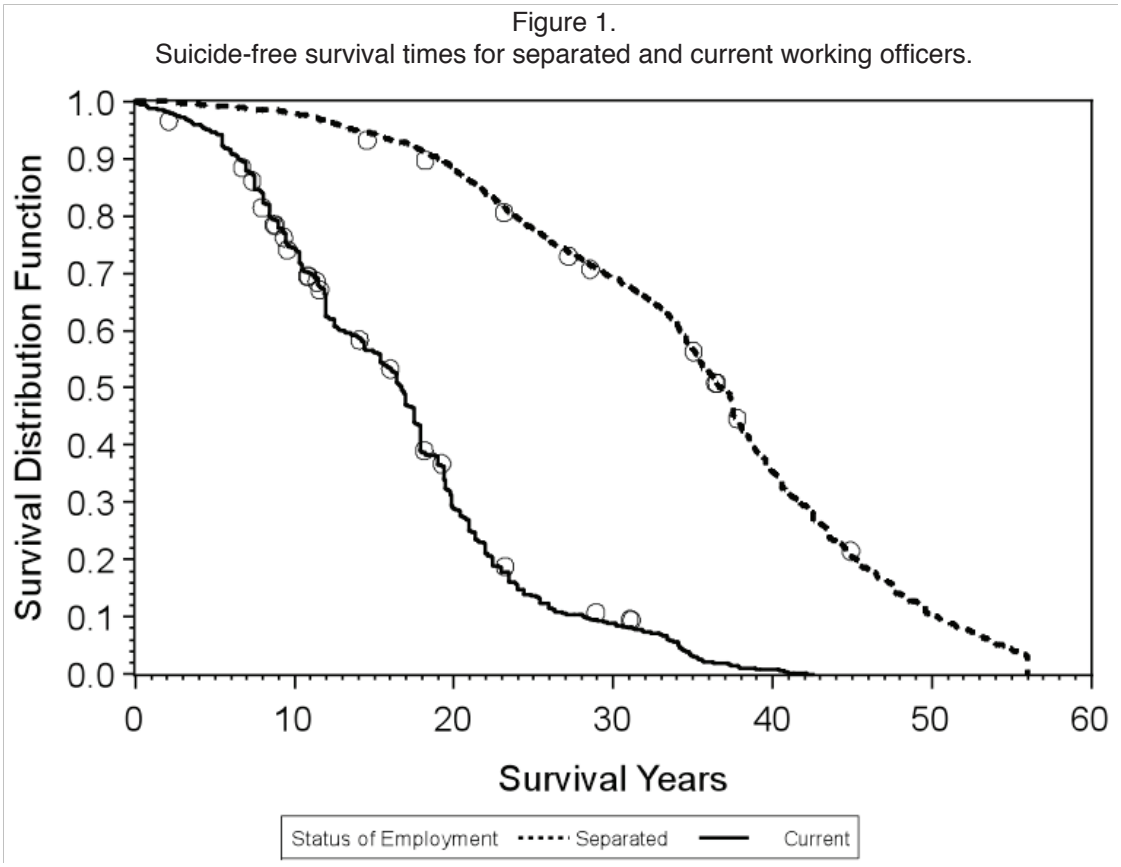
Status	No. at risk	No. of suicides	Person-years	Unadjusted rate (95% CI)	Age-adjusted rate (95% CI)	Multivariate-adjusted rate (95% CI)
Separated	2,075	10	72,945	13.7 (7.4, 25.5)	13.6 (7.3, 25.4)	13.1 (6.9, 24.8)
Current	1,153	20	18,841	106.1 (68.5, 164.5)	107.2 (69.2, 166.2)	110.5 (70.8, 172.4)
Rate-ratio*				7.7 (3.6, 16.5)	7.9 (3.7, 16.8)	8.4 (3.8, 18.7)

The suicide mortality rate is expressed per 100,000 person-years. The 95% CI was computed using the Poisson regression model.

**The rate-ratio is calculated as the mortality rate among currently employed officers divided by the mortality rate among separated officers.*

*** Rate is adjusted for age and years of service.*

Figure 1.
Suicide-free survival times for separated and current working officers.



Median survival time for separated officers is 36.8 years.

Median survival time for current officers is 16.7 years.

Since the p-valus for the Log-rank test is <0.0001, the survival curve between separated and current officers is significantly different.

or separation planning. Doucet (1975) surveyed thirty-two major city police departments in the United States with regards to retirement programs or counseling and found that most departments did not offer any official program. Other options might include utilizing retired officers as a resource for police departments such as a voluntary auxiliary police force or consultants.

Suicide is a clear indication of the intolerable strain placed on the police officer's life both during and after the work experience. All too often the dangers of police work are emphasized, leading to neglect of the hidden psychological danger of this profession. It is timely to address this "other side" of police work with educational and prevention efforts.

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Association of Perceived Stress with Sleep Duration and Sleep Quality in Police Officers

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Abstract: The objective was to investigate associations of perceived stress with sleep duration and quality among 430 police officers. Perceived stress was assessed using the Perceived Stress Scale. Sleep duration and quality were assessed using the Pittsburg Sleep Quality Index questionnaire. Mean hours of sleep were determined across quartiles of perceived stress using ANOVA/ANCOVA. Logistic regression was used to obtain odds ratios and 95% confidence intervals for poor sleep quality across perceived stress quartiles. Mean age was 42.1 years. Perceived stress was inversely associated with sleep duration among certain groups: men ($p = 0.004$), higher-ranked officers ($p = 0.002$), those with higher depressive symptoms ($p = 0.097$), no military experience ($p = 0.006$), and higher workload ($p = 0.003$). Gender, police rank, depressive symptoms, and workload each significantly modified the association between stress and sleep duration. Prevalence of poor sleep quality increased with higher levels of perceived stress; the trend was significant among men only ($p <0.0001$), and gender significantly modified this association (interaction $p = 0.015$). Compared to those in the first quartile of perceived stress, women in the fourth quartile were almost four times and men almost six times more likely to have poor sleep quality. Perceived stress was inversely associated with sleep duration and positively associated with poor sleep quality. [International Journal of Emergency Mental Health, 2011, 13(4), pp.229-242]

Key words: *Perceived stress, sleep quality, sleep duration, police*

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Good sleep quality and adequate sleep duration (i.e., 7 to 8 hours in a 24-hour period) are necessary for good health. According to the National Sleep Foundation, few Americans get high quality sleep or at least seven hours of sleep on a regular basis (2009 Sleep in America Poll). Short sleep duration has been shown to be associated with impaired immune and metabolic function, obesity, cardiovascular disease (CVD) and other chronic diseases (Charles et al., 2011; Van Cauter, Spiegel, Tasali, & Leproult, 2008; Sabanayagam & Shankar, 2010; AlDabal & BaHammam, 2011), and increased mortality (Nielsen, Kristensen, Schnohr, & Gronbaek, 2008). Sleep restriction and deprivation are also associated with impairment of short-term memory, concentration, and higher-order cerebral processes such as decision making (McCoy & Strecker, 2011; Durmer & Dinges, 2005; Drake et al., 2001), factors which are critical in the law enforcement profession. Risk factors for sleep deprivation and poor sleep quality include personal and work-related stress.

Psychosocial stress is an unavoidable part of human life. Perceived work stress has been defined as the degree to which workers "feel strain" associated with their jobs (Karasek & Theorell, 1990). Psychosocial stress and fatigue are two factors that are inherent in police work. Police officers often experience extended work schedules, shift work, traumatic events, and job dissatisfaction due to negative interpersonal interactions with supervisors and/or coworkers and perceived organizational unfairness (Violanti & Gehrke, 2004; Barger, Lockley, Rajaratnam, & Landrigan, 2009; Gershon, Barocas, Canton, Li, & Vlahov, 2009). In addition, minority and female officers may experience additional stressors such as racism and sexual harassment (Gershon et al., 2009). Police officers are often fatigued because several of the above mentioned occupational exposures negatively affect their sleep quantity and quality (Neylan et al., 2002; Vila, 2006; Kalimo, Tenkanen, Harma, & Poppius, 2000). Higher perceived stress has been shown to be associated with a reduction in sleep duration (Heslop, Smith, Metcalfe, Macleod, & Hart, 2002) and with poor sleep quality (Tworoger, Davis, Vitiello, Lentz, & McTiernan, 2005; Burgard & Ailshire, 2009).

To our knowledge, no published studies have investigated the association between perceived stress and sleep duration or sleep quality among members of the law enforcement profession. Therefore, the objectives of our study are a) to investigate the cross-sectional associations of perceived stress with sleep duration and quality among police officers and b) to determine if any of these associations are modified by gender, police rank, depressive symptoms (Center for Epidemiologic Studies Depression [CES-D] scale score), shift work status, physical activity, social support, previous military experience, or workload. We hypothesized that higher perceived stress would be associated with shorter sleep duration and poorer sleep quality in all officers.

METHODS

Study Design and Participants

During 2004-2009, all police officers employed at the Buffalo, New York Police Department (estimated to be approximately 710 in 2004) were invited to participate in the Buffalo Cardio-metabolic Occupational Police Stress (BCOPS) study, a comprehensive examination of the health consequences of stress in law enforcement officers. Some of them had previously participated in the 1999-2000 (n = 115) and 2001-2003 (n = 100) examinations. Data were collected at The Center for Health Research, School of Public Health and Health Professions, University at Buffalo, State University of New York (Violanti et al., 2006). The State University of New York at Buffalo Internal Review Board approved the study and informed consent was obtained from all participants. The original sample size was 464. Officers who did not have complete information on perceived stress (n = 20), sleep duration (n = 24), or sleep quality (n = 36) were excluded from these analyses. The final sample size for the analyses on perceived stress and sleep duration was 430 officers (111 women and 319 men) and for perceived stress and sleep quality, 418 officers.

Study Measures

Perceived stress was assessed using the Perceived Stress Scale (PSS), an original 14-item self-reported questionnaire that asks about feelings and thoughts during the past month (Cohen & Willamson, 1988). The questionnaire was originally designed for use in community samples with at least a junior high school education. The questions are general in nature, do not contain content specific to any subpopulation group, and are sensitive to the nonoccurrence of events as

well as to ongoing life circumstances. Participants rated each item on a five-point scale based on the frequency with which a particular event was experienced: 0 (never), 1 (almost never), 2 (sometimes), 3 (fairly often), and 4 (often). Seven of the 14 items were designed to identify positive events and hence were reversed-coded (items 4, 5, 6, 7, 9, 10, and 13). The total PSS scores were obtained by summing across all 14 items; the scores ranged from 0 to 56, with higher scores indicating higher stress (Cohen & Willamson, 1988).

Sleep Duration and Sleep Quality

Sleep duration and quality were assessed using the Pittsburg Sleep Quality Index (PSQI) questionnaire (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). Sleep duration was obtained from officers responding to the question "How many hours of sleep did you get at night (during the past month)?" Sleep quality was obtained from 19 self-rated individual questions that assessed various sleep quality related factors over the previous one-month period. These 19 items were grouped into seven components that include subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications, and daytime dysfunction. Each component was scored by summing the scores of each item. Each item was weighted equally on a 0 – 3 scale. A global PSQI score was derived by summing up the seven component scores with a possible range of 0 – 21; a global score of > 5 defined poor sleep quality (Buysse et al., 1989). The PSQI global score provides a single overall assessment of sleep quality, allows direct comparisons among groups, and identifies groups that differ in the quality of sleep. Studies have shown that the PSQI has high internal homogeneity, reliability, and validity (Buysse et al., 1989; Knutson, Rathouz, Yan, Liu, & Lauderdale, 2006).

Covariates

Officers were given self-and interviewer-administered questionnaires to provide information on demographic characteristics, lifestyle behaviors, and medical history. For educational status, they checked one of eight choices from *less than 12 years of school to graduate degree.* These categories were collapsed into three levels to allow adequate numbers in each category. Rank, race/ethnicity, years of service, and marital status were self-reported. Rank was collapsed into two or three categories for the current analysis: a) patrol officer vs. all other officers and b) patrol police, sergeant/lieutenant/captain, and detective/executive/others. Officers were asked how often they consumed alcoholic beverages with one drink defined as a 12-oz. can or bottle of beer, one medium glass of wine, or one shot of liquor. The total number of drinks consumed per week was used. Officers reported their smoking status as current, former, or never.

Body mass index (BMI) was calculated as weight (in kilograms) divided by height (in meters) squared. Abdominal height was measured with the participant in a supine position. The participant was asked to gently inhale, exhale, and then relax at rest. A caliper was used to measure the mid-section, one inch above the iliac crests. The caliper slightly touched, but did not compress the abdomen. Three measurements of abdominal height (to the nearest 0.1 cm) were taken and the average value was used as the participant's abdominal height.

Physical activity during the previous seven days was obtained with the Seven-Day Physical Activity Recall questionnaire used in the Stanford Five-City Project (Sallis, Haskell, Fortmann, Wood, & Vranizan, 1986). Participants reported the duration (hours per weekday, hours per weekend) and intensity (moderate, hard, very hard) of three types of physical activity (occupational, household, sports). A total physical activity score was then computed by summing the intensities of the three types of physical activity performed during the weekday and weekend, and multiplying that number by the reported duration.

The Center for Epidemiologic Studies Depression scale (CES-D) was used to measure depression in the participants (Radloff, 1977). The CES-D is a 20-item test which has good reliability for measuring symptoms of depression and stress (Radloff, 1977). Respondents rated items on a 4-point scale based on the frequency of symptom occurrence in the previous seven days: 0 (rarely or none of the time, less than 1 day), 1 (some or little of the time, 1-2 days), 2 (occasionally or a moderate amount of time, 3-4 days), and 3 (most of the time, 5-7 days). Four of the 20 items were designed to identify positive symptoms (# 4, 'I felt that I was just as good as other people'; #8, 'I felt hopeful about the future'; #12, 'I was happy'; #16, 'I enjoyed life') and hence were reverse-coded. The CES-D score is the sum of the scores from these 20 items and ranges from 0 to 60. Respondents with scores of 6-15 are unlikely to be clinically depressed, scores of 16-21 indicate mild to moderate depression, and scores of 22 or greater are associated with major depression (Radloff, 1977).

The Social Provisions Scale was developed to assess the six provisions of social relationships which were described by Weiss (1974) and Cutrona (1986). Each provision is assessed by four items; the presence and absence of the provision are each described by two items. Twenty-four questions were answered at four levels: strongly disagree (1), disagree (2), agree (3), and strongly agree (4). For scoring purposes, the negative items were reverse coded and summed together with

the positive items to form a score for each social provision. A total global social support score was derived by summing the scores of these six provisions, with a higher score indicating higher social support. Internal consistency for the total score is relatively high, ranging from 0.85 to 0.92 across a variety of populations (Cutrona, 1986).

Electronic work history data, from 1994 to 2009, were available on a daily basis for 428 participants. The time participants started their shift was used to classify each record into one of the following three shifts: day shift, if the start time of the record is between 4 am and 11:59 am; afternoon shift, if the start time is between 12 noon and 7:59 pm; or midnight shift, if the start time is between 8 pm and 3:59 am. Total hours worked as well as hours worked at the day, afternoon, and midnight shift were computed for each participant by summing all records. Taking into account the length of time a participant was working (from first date of work history to date of current exam), the computed hours were standardized to a weekly basis (hours worked per week) and percent of total hours worked on each shift was calculated. A variable that indicates the dominant shift worked was created by assigning the participant to the shift with the highest percentage of hours worked.

Military experience was assessed by asking the question "Were you ever in the military?" For workload level in their districts, officers were asked to check one of the following: high workload (very busy, complaints, high crime area), moderate workload (moderate complaint rate, average crime), and low workload (precinct not busy, low crime area). The final workload variable was dichotomized into low and moderate/high workload to accommodate smaller sample sizes in the higher groups.

Statistical Methods

Univariate analysis was used to describe characteristics of the study participants. Variables were chosen as potential confounders and included in the multivariate models if they were significantly associated with both the independent and dependent variables. Gender, police rank (patrol officer vs. all other ranks), CES-D score (<10 vs. ≥10), physical activity, shift work status, social support (below vs. above median), previous military experience (yes vs. no), and workload (low vs. moderate/high) were assessed for effect modification in the associations of perceived stress with sleep duration and quality. CES-D score was stratified at 10 instead of at 16, the cut-point for clinical depression, to allow for ample sample sizes in both groups. The cut-point for statistical significance of the interaction terms was set at 0.20. Mean values of sleep duration were obtained across quartiles of PSS using analysis of variance and covariance (ANOVA and ANCOVA). The prevalence of sleep quality was compared across quartiles of perceived stress using the chi-square test. Logistic regression was used to obtain the odds ratios (ORs) and 95% confidence intervals (CIs) for poor quality sleep across levels of perceived stress, with the first quartile serving as the referent group. SAS version 9.2 was used to analyze these data (SAS Institute, Cary, NC).

RESULTS

The mean age of all officers in this study was 42.1 years (SD = 8.4; Table 1). Mean hours of sleep per 24-hour period was similar for women and men (6.1 hours), but the mean level of perceived stress was significantly higher in women than in men (22.2 vs. 19.3; $p = 0.003$). The prevalence of poor sleep quality was not statistically different between women and men.

Sleep duration was negatively correlated with physical activity (-0.1126; $p = 0.021$), perceived stress (-0.1517; $p = 0.002$) and depressive symptoms [i.e., CES-D score; (-0.1695; $p < 0.001$)] (Table 2). Compared to officers who were categorized as having poor sleep quality, officers with good sleep quality had significantly more hours of sleep (6.8 vs. 5.5; $p < 0.001$) and higher mean social support (84.5 vs. 82.0; $p = 0.004$). Officers with poor sleep quality had a mean CES-D score that was approximately twice that of those who had good sleep quality (10.1 vs. 5.2; $p < 0.001$). Perceived stress was positively correlated with depressive symptoms ($r = 0.6341$, $p < 0.001$) and negatively correlated with social support ($r = -0.3545$, $p < 0.001$), but was not significantly associated with any other covariate (data not shown).

Table 3 shows mean hours of subjective sleep (PSQI) by quartiles of perceived stress for all officers and also stratified by gender, police rank, CES-D score, military experience, and workload. Among all officers, mean hours of sleep significantly decreased as perceived stress increased. Assessment for effect modification showed that social support, physical activity, shift work status, and previous military experience did not significantly modify the association between perceived stress and sleep duration. However, gender, police rank, CES-D score, and workload significantly modified the association between perceived stress and sleep duration (interaction $p = 0.145$, 0.084, 0.172, and 0.037 respectively). Among men, mean hours of sleep significantly decreased as perceived stress increased before (< 0.001) and after ($p = 0.004$) adjustment for shift work status. This association among women was not statistically significant. Among officers who were at the rank of sergeant or above, mean hours of sleep significantly decreased with increasing quartiles

Table 1.
Characteristics of study participants by gender.

	All officers (n = 430)	Women (n = 111)	Men (n = 319)	
	Mean ± SD	Mean ± SD	Mean ± SD	p-value
Age (years)	42.1 ± 8.4	41.2 ± 6.4	42.5 ± 8.9	0.104
Sleep duration (hours)	6.1 ± 1.2	6.1 ± 1.1	6.1 ± 1.2	0.744
Physical Activity score	21.3 ± 18.1	21.4 ± 17.3	21.3 ± 18.5	0.928
Alcohol intake (drinks/wk)	5.6 ± 9.5	3.8 ± 6.1	6.2 ± 10.4	0.005
Perceived stress (PSS-14)	20.0 ± 7.9	22.2 ± 9.2	19.3 ± 7.2	0.003
CES-D score	7.7 ± 7.0	8.7 ± 8.1	7.4 ± 6.5	0.108
BMI (kg/m²)	29.2 ± 4.8	26.1 ± 4.7	30.3 ± 4.2	<0.0001
Social support	83.2 ± 8.9	83.8 ± 8.7	83.0 ± 9.0	0.418
Race/ethnicity	N (%)	N (%)	N (%)	
Caucasian	332 (78.3)	79 (71.2)	253 (80.8)	0.010
African American	84 (20.1)	32 (28.8)	53 (16.9)	
Hispanic	7 (1.7)	0 (0)	7 (2.2)	
Education				
High school/GED	47 (11.0)	5 (4.5)	42 (13.2)	0.039
College < 4 years	237 (55.2)	67 (60.4)	170 (53.5)	
College ≥ 4 years	145 (33.8)	39 (35.1)	106 (33.3)	
Rank				
Patrol police	298 (70.0)	86 (77.5)	212 (67.3)	0.132
Sergeant/Lieut/Captain	67 (15.7)	13 (11.7)	54 (17.1)	
Det/Executive/Other	61 (14.3)	12 (10.8)	49 (15.6)	
Shift Work				
Day	174 (42.4)	75 (70.1)	99 (32.7)	<0.001
Afternoon	139 (33.9)	18 (16.8)	121 (39.9)	
Night	97 (23.7)	14 (13.1)	83 (27.4)	
Smoking Status				
Current	70 (16.4)	28 (25.9)	42 (13.2)	0.001
Former	107 (25.1)	32 (29.6)	75 (23.5)	
Never	250 (58.6)	48 (44.4)	202 (63.3)	
Perceived stress				
1-14	101 (23.5)	25 (22.5)	76 (23.8)	<0.001
15-19	120 (27.9)	23 (20.7)	97 (30.4)	
20-24	106 (24.7)	21 (18.9)	85 (26.7)	
25-46	103 (24.0)	42 (37.8)	61 (19.1)	
Sleep quality				
Good	201 (48.1)	50 (45.9)	151 (48.9)	0.590
Poor	217 (51.9)	59 (54.1)	158 (51.1)	
Sleep (hours per 24-hr)				
0-5.9	135 (31.4)	38 (34.2)	97 (30.4)	0.269
6.0-6.9)	139 (32.3)	29 (26.1)	110 (34.5)	
≥ 7.0	156 (36.3)	44 (39.6)	112 (35.1)	
CES-D score				
< 10	308 (71.6)	77 (69.4)	231 (72.4)	0.540
≥ 10	122 (28.4)	34 (30.6)	88 (27.6)	
Social support				
Low (< mediam)	231 (53.7)	55 (49.6)	176 (55.2)	0.306
High (≥ median)	199 (46.3)	56 (50.5)	143 (44.8)	

Table 1 (cont.): Characteristics of study participants by gender				
	All officers (n = 430)	Women (n = 111)	Men (n = 319)	
	Mean ± SD	Mean ± SD	Mean ± SD	p-value
Military Experience				
Yes	109 (25.4)	14 (12.6)	95 (29.8)	<0.001
No	321 (74.7)	97 (87.4)	224 (70.2)	
Workload				
Low	263 (64.0)	57 (53.8)	206 (67.5)	0.011
Medium/High	148 (36.0)	49 (46.2)	99 (32.5)	

P-values for continuous variables comparing women and men are from Student's t-tests.
P-values for categorical variables comparing women and men are from chi-square or Fisher's exact tests.

of perceived stress before (< 0.001) and after (p = 0.002) adjustment for shift work status. In contrast, the association between sleep duration and perceived stress among patrol police officers was not significant. Sleep duration was inversely associated with perceived stress among officers with higher depressive symptoms (CES-D score ≥ 10) but this association did not reach statistical significance. No association was evident among officers with a CES-D score of less than10. Perceived stress was not associated with sleep duration among officers with previous military experience (p = 0.534), but was inversely associated with sleep duration among those without such experience (p = 0.006). Mean hours of sleep decreased with increasing quartiles of perceived stress among officers with moderate or high workload (p = 0.003), with the mean values showing a relatively steep decline across perceived stress. In an alternative analytical procedure, senior officers in the fourth quartile of perceived stress were almost four times more likely (OR = 3.68; 95% CI = 1.12-12.12) to have short sleep duration (≤ 5 hours) compared to those senior officers in the first quartile of perceived stress after adjustment for shift work. Also, among officers who reported experiencing moderate and high workloads, those in the highest quartile were three times as likely to have short sleep duration compared to those in the first quartile (OR = 3.01; 95% CI = 1.03-8.87).

The prevalence of poor sleep quality is shown across quartiles of perceived stress in Table 4. The results are stratified by selected variables. The prevalence of poor sleep quality significantly increased across each quartile of perceived stress among men: 1st quartile = 32.4%; 2nd quartile = 41.5%; 3rd quartile = 58.5%; and 4th quartile = 80.0% (p < 0.001). Among women, there was some evidence of a positive association of poor sleep quality with perceived stress but the results were not statistically significant (p = 0.128). Gender significantly modified the association between perceived stress and sleep quality (interaction p = 0.015). No other variable was found to significantly modify the association between perceived stress and sleep quality. The prevalence of poor sleep quality increased significantly with higher perceived stress among officers with higher depressive symptoms (i.e., CES-D ≥10) but not among those with lower depressive symptoms.

In Table 5, the ORs and 95% CIs are shown for poor sleep quality with increasingly higher levels of perceived stress. In the fourth quartile of perceived stress, women were almost four times more likely (OR = 3.72; 95% CI = 1.14-12.13) and men were almost six times more likely (OR = 5.94; 95% CI = 2.50-14.13) to have poor sleep quality compared to those officers in the first quartile of perceived stress, after adjustment for social support, physical activity, and shift work status. In addition, the ORs for poor sleep quality showed a statistically significant linear trend across increasing quartiles of perceived stress.

DISCUSSION

Perceived stress and sleep duration

In this cohort of law enforcement workers, we investigated the association of perceived stress with sleep quantity and quality. We found that mean hours of sleep significantly decreased as perceived stress increased. Our overall finding of an inverse association is consistent with previous studies. Authors of a recent cross-sectional study reported that participants in the high-stress group (defined as PSS ≥ 23) had significantly shorter sleep duration than did the low-stress group (Kashani, Eliasson, & Vernalis, 2011).

Table 2.
Association of covariates with sleep duration and sleep quality.

		Sleep quality		
	Sleep Duration	Good (n = 201)	Poor (n = 217)	p-value
Age (years)	-0.0156, 0.747	42.1 ± 9.1	42.0 ± 7.8	0.849
Sleep duration (hours)	na	6.8 ± 1.0	5.5 ± 1.0	<0.0001
Physical Activity score	-0.1126, 0.021	19.2 ± 15.7	22.8 ± 19.8	0.043
Alcohol intake (drinks/w)	-0.0073, 0.881	4.8 ± 8.6	6.5 ± 10.4	0.067
Perceived stress (PSS-14)	-0.1517, 0.002	17.7 ± 7.1	22.3 ± 8.0	<0.0001
CES-D score	-0.1695,<0.001	5.2 ± 4.7	10.1 ± 7.9	<0.0001
BMI (kg/m²)	-0.0387, 0.426	29.0 ± 4.2	29.2 ± 5.1	0.593
Abdominal Height (cm)	-0.0320, 0.511	20.7 ± 3.2	20.8 ± 3.7	0.731
Waist Circumference (cm)	0.0008, 0.986	94.0 ± 13.5	94.7 ± 15.0	0.625
Social Support	0.0579, 0.241	84.5 ± 8.7	82.0 ± 9.0	0.004
Race/ethnicity				
Caucasian	6.2 ± 1.2	155 (77.9)	169 (79.3)	0.866
African American	5.9 ± 1.1	40 (20.1)	41 (19.3)	
Hispanic	6.1 ± 0.6	4 (2.0)	3 (1.4)	
p-value†	0.065			
Education				
High school/GED	6.4 ± 1.3	24 (11.9)	21 (9.7)	0.705
College < 4 years	6.1 ± 1.1	108 (53.7)	123 (56.9)	
College ≥ 4 years	6.1 ± 1.1	69 (34.3)	72 (33.3)	
p-value*	0.139			
Rank				
Patrol police	6.2 ± 1.2	140 (70.7)	150 (69.4)	0.364
Sergeant/Lieut/Captain	5.9 ± 1.0	27 (13.6)	39 (18.1)	
Det/Executive/Other	6.3 ± 1.1	31 (15.7)	27 (12.5)	
p-value†	0.234			
Shift Work				
Day	6.2 ± 1.1	92 (49.7)	75 (35.2)	0.007
Afternoon	6.1 ± 1.3	59 (31.9)	77 (36.2)	
Night	5.9 ± 1.1	34 (18.4)	61 (28.6)	
p-value†	0.096			
Smoking Status				
Current	6.1 ± 1.1	32 (16.1)	37 (17.1)	0.965
Former	6.2 ± 1.1	50 (25.1)	54 (24.9)	
Never	6.1 ± 1.2	117 (58.8)	126 (58.1)	
p-value†	0.931			
Sleep quality				
Good	6.8 ± 1.0	na	na	na
Poor	5.5 ± 1.0			
p-value†	<0.0001			
Social support				
Low	6.1 ± 1.2	96 (47.8)	128 (59.0)	0.022
High	6.2 ± 1.1	105 (52.2)	89 (41.0)	
p-value†	0.676			

Table 2 (cont.): Association of covariates with sleep duration and sleep quality.				
		Sleep quality		*p*-value
	Sleep duration	Good (*n* = 201)	Poor (*n* = 217)	
Military experience				
Yes	6.2 ± 1.2	51 (25.4)	53 (24.4)	0.823
No	6.1 ± 1.1	150 (74.6)	164 (75.6)	
p-value†	0.676			
Workload				
Low	6.1 ± 1.1	120 (64.2)	138 (64.2)	0.998
Medium/High	6.1 ± 1.2	67 (35.8)	77 (35.8)	
p-value†	0.744			

Values between continuous variables and sleep duration are Pearson's correlation coefficients and associated p-values.

P-*values between continuous variables and sleep quality are from t tests.*

P-*values between categorical variables and sleep quality are from the chi-square tests.*

†P-values are for any differences between the groups.

**P-values are from linear contrasts.*

However, this association was only significant among men, among officers of higher rank (i.e., sergeant and above), among officers with no previous military experience, and those reporting moderate or high workload. We had expected to see similar inverse associations between perceived stress and sleep duration among both men and women. In fact, we had expected to find strong inverse associations among women. Police work has been shown to be more stressful to women because they are sometimes exposed to additional stressors to which men are not usually exposed. A study on workplace stress conducted among a diverse group of police officers from the Milwaukee Police Department found that female officers (White, Latina, and African American) were exposed to more sexually offensive behaviors and that African American females experienced more ridicule than white male officers (Hassell & Brandl, 2009). Female officers in our study had a higher mean perceived stress score compared to male officers which was consistent with findings from other studies (Cohen & Willamson, 1988; Yoo & Franke, 2011; Kashani et al., 2011). In a previous study conducted on a smaller sample of Buffalo police officers, Andrew and colleagues (2008) reported higher levels of hardiness commitment and hardiness control among men compared to women, even though they also found that mean psychological distress was higher for women than for men. Individuals with higher levels of hardiness are thought to be more resilient to stressors.

Similarly, it was somewhat unexpected to find that higher perceived stress was associated with fewer hours of sleep among the more experienced officers who we surmised would be less affected because of their additional years of experience in dealing with stressful situations. Patrol officers are directly exposed to more traumatic events on a regular basis and that, plus their relative inexperience, could have increased their stress levels with more negative consequences to their sleep. In contrast, it was understandable to find that higher levels of perceived stress were associated with shorter sleep duration among persons with no prior military experience and with higher workload. This association was particularly strong among officers with higher workload.

Sleep duration was inversely associated with perceived stress among officers with higher depressive symptoms (CES-D score ≥ 10) although the association was not statistically significant. The lack of a significant association may be partly due to the selection of the cut-point. The ideal cut-point would be 16, since persons with a CES-D score greater than16 have been shown to have clinical depression. Due to the small sample size for officers with CES-D above 16, we chose to dichotomize at the lower cut-point of 10. Thus the group above 10 may have included some non-depressed with depressed officers, thus potentially diluting the association. Gender, police rank, CES-D score, and workload significantly modified the associations between perceived stress and sleep duration.

Perceived stress and sleep quality

Our study showed that the prevalence of poor sleep quality significantly increased across higher quartiles of perceived stress among all officers but the association was significant

Table 3.
Mean hours of sleep by quartiles of perceived stress
for all officers, stratified by selected variables.

		Quartiles of perceived stress					
		1st quartile	2nd quartile	3rd quartile	4th quartile		
Stratification		1.0-14.0	15.0-19.0	20.0-24.0	25.0-46.0	*p*-value†	*p*-value*
All officers		*n = 101*	*n = 120*	*n = 106*	*n = 103*		
	Model 1	6.3 ± 1.2	6.2 ± 1.1	6.2 ± 1.2	5.8 ± 1.2	0.002	
	Model 2	6.3 ± 0.1	6.2 ± 0.1	6.2 ± 0.1	5.8 ± 0.1	0.002	
	Model 3	6.2 ± 0.1	6.2 ± 0.1	6.1 ± 0.1	5.8 ± 0.1	0.007	
Gender	*Women*	*n = 25*	*n = 23*	*n = 21*	*n = 42*		0.145
	Model 1	6.2 ± 1.1	6.0 ± 1.4	6.0 ± 1.0	6.1 ± 1.1	0.639	
	Model 3	6.2 ± 0.3	6.0 ± 0.3	6.0 ± 0.3	6.1 ± 0.2	0.657	
	Men	*n = 76*	*n = 97*	*n = 85*	*n = 61*		
	Model 1	6.4 ± 1.2	6.2 ± 1.1	6.2 ± 1.2	5.7 ± 1.2	<0.001	
	Model 3	6.2 ± 0.1	6.2 ± 0.1	6.2 ± 0.1	5.7 ± 0.1	0.004	
Police Rank	*Patrol officer*	*n = 70*	*n = 85*	*n = 72*	*n = 71*		0.084
	Model 1	6.3 ± 1.2	6.1 ± 1.2	6.3 ± 1.2	5.9 ± 1.1	0.090	
	Model 3	6.2 ± 0.2	6.2 ± 0.1	6.3 ± 0.1	5.9 ± 0.1	0.204	
	Sergeant & above	*n = 31*	*n = 35*	*n = 34*	*n = 32*		
	Model 1	6.5 ± 1.0	6.3 ± 1.0	5.9 ± 1.0	5.7 ± 1.2	<0.001	
	Model 3	6.3 ± 0.2	6.3 ± 0.2	5.8 ± 0.2	5.7 ± 0.2	0.002	
CES-D score	*Low CES-D (<10)*	*n = 93*	*n = 109*	*n = 76*	*n = 30*		0.172
	Model 1	6.3 ± 1.2	6.2 ± 1.1	6.3 ± 1.1	6.3 ± 1.2	0.772	
	Model 3	6.2 ± 0.1	6.2 ± 0.1	6.3 ± 0.1	6.2 ± 0.2	0.869	
	High CES-D (≥10)	*n = 8*	*n = 11*	*n = 30*	*n = 73*		
	Model 1	6.1 ± 0.8	6.4 ± 1.0	5.7 ± 1.2	5.7 ± 1.1	0.102	
	Model 3	6.1 ± 0.4	6.4 ± 0.3	5.7 ± 0.2	5.7 ± 0.1	0.097	
Military	*Yes*	*n = 25*	*n = 31*	*n = 32*	*n = 21*		0.510
	Model 1	6.6 ± 1.4	6.0 ± 1.1	6.2 ± 1.2	6.1 ± 1.2	0.317	
	Model 3	6.4 ± 0.3	6.0 ± 0.2	6.1 ± 0.2	6.0 ± 0.3	0.534	
	No	*n = 76*	*n = 89*	*n = 74*	*n = 82*		
	Model 1	6.2 ± 1.1	6.3 ± 1.1	6.2 ± 1.2	5.8 ± 1.1	0.002	
	Model 3	6.2 ± 0.1	6.3 ± 0.1	6.2 ± 0.1	5.8 ± 0.1	0.006	
Work Load	*Low*	*n = 61*	*n = 78*	*n = 64*	*n = 60*		0.037
	Model 1	6.1 ± 1.0	6.2 ± 1.1	6.1 ± 1.1	6.0 ± 1.2	0.422	
	Model 3	6.0 ± 0.1	6.2 ± 0.1	6.2 ± 0.1	6.0 ± 0.1	0.540	
	Moderate/High	*n = 31*	*n = 38*	*n = 40*	*n = 39*		
	Model 1	6.6 ± 1.4	6.2 ± 1.2	62 ± 1.3	5.7 ± 1.1	0.004	
	Model 3	6.5 ± 0.2	6.1 ± 0.2	6.0 ± 0.2	5.6 ± 0.2	0.003	

Results are mean ± SD for unadjusted models and mean ± SE for adjusted models.

†P-values are for trends from linear regression models (perceived stress used as a continuous variable).

**P-values are for interaction by the stratified variables in the association between perceived stress and sleep duration.*

Model 1: Unadjusted.
Model 2: Adjusted for gender.
Model 3: Adjusted for shift work status.

Table 4.
Prevalence of poor sleep quality by quartiles of perceived stress, stratified by gender, social support, CES-D score, and shift work status.

		Quartiles of perceived stress					
		1st quartile	2nd quartile	3rd quartile	4th quartile		
Satisfaction		1.0-14.0	15.0-19.0	20.0-24.0	25.0-46.0	*p*-value*	*p*-value†
Gender	Women	9 (37.5)	12 (54.5)	10 (47.6)	28 (66.7)	0.128	0.020
	Men	24 (32.4)	39 (41.5)	48 (58.5)	47 (80.0)	<0.001	
Social Support	Low social support	(34.2)	26 (54.2)	31 (50.0)	58 (76.3)	<0.001	0.809
	High social support	20 (33.3)	25 (36.8)	27 (65.9)	17 (68.0)	<0.001	
CES-D score	Low CES-D (<10)	29 (23.8)	44 (36.1)	33 (27.1)	16 (13.1)	0.161	0.814
	High CES-D (≥10)	4 (4.2)	7 (7.4)	25 (26.3)	59 (62.1)	0.096	
Shift Work Status	Day	10 (13.3)	17 (22.7)	20 (26.7)	28 (37.3)	0.004	0.927
	Afternoon	9 (11.7)	18 (23.4)	23 (29.9)	27 (35.1)	0.007	
	Night	14 (23.0)	15 (24.6)	12 (19.7)	20 (32.8)	0.016	
Military	Yes	7 (13.2)	13 (24.5)	19 (35.9)	14 (26.4)	0.017	0.678
	No	26 (15.9)	38 (23.2)	39 (23.8)	61 (37.2)	<0.0001	
Workload	Low	23 (16.7)	38 (27.5)	33 (23.9)	44 (31.9)	0.001	0.524
	Medium/High	10 (13.0)	13 (16.9)	25 (32.5)	29 (37.7)	<0.001	

Results are n (%).

**P-values are for the differences between the stratified groups (from chi-square tests).*

†P-values are for tests for interaction by the stratified variables in the association between perceived stress and sleep quality.

Table 5.
ORs (95% CI) for poor sleep quality across quartiles of perceived stress, stratified by gender.

	Quartiles of perceived stress				
	1st quartile	2nd quartile	3rd quartile	4th quartile	
	1.0-14.0	15.0-19.0	20.0-24.0	25.0-46.0	P-value
Women	*n = 24*	*n = 22*	*n = 21*	*n = 42*	
Model 1	1.00	2.00 (0.62-6.49)	1.52 (0.46-4.98)	3.33 (1.17-9.49)	0.054
Model 2	1.00	1.70 (0.45-6.49)	1.28 (0.35-4.62)	3.72 (1.14-12.13)	0.023
Men	*n = 74*	*n = 94*	*n = 82*	*n = 59*	
Model 1	1.00	1.48 (0.78-2.79)	2.94 (1.53-5.67)	8.16 (3.67-18.15)	<0.0001
Model 2	1.00	1.34 (0.67-2.68)	2.29 (1.10-4.76)	5.94 (2.50-14.13)	<0.0001

Model 1: Unadjusted.

Model 2: Adjusted for social support, physical activity, and shift work status.

P-values are for trends of ORs across quartiles.

only among men. In addition, female and male officers in the fourth quartile of perceived stress were almost four and six times, respectively, more likely than those in the first quartile to report poor sleep quality after risk factor adjustment. Gender significantly modified the association between perceived stress and sleep quality. Our results are consistent with those of other studies. A cross-sectional study conducted among women reported positive associations between the perceived stress score and poor sleep quality (Tworoger et al., 2005). Kashani and colleagues (2011) reported that highly stressed (PSS $\geq$ 23) persons experienced poorer sleep quality, greater daytime sleepiness, and greater fatigue. Organizational job stressors have been shown to be positively associated with poor sleep quality (Kalimo et al., 2000; De Lange et al., 2009; Knudsen, Ducharme, & Roman, 2007). Using data collected via telephone interviews from a nationally representative random sample of American full-time employees, Knudsen and colleagues (2007) found that work overload was positively associated with the frequency of poor sleep quality, role conflict was positively associated with difficulty falling asleep and sleep that was not refreshing, and repetitive tasks were associated with more days of insomnia.

There is evidence to suggest that perceived stress may be associated with shorter sleep duration and poorer sleep quality through cardiac autonomic changes. Studies have shown that stress is associated with increased heart rate reactivity, increased systolic blood pressure, and reduced 24-hour vagal tone (Vrijkotte, van Doormen, & de Geus et al., 2000; Sloan et al., 1994). Reduced vagal tone has been shown to be associated with increased sleep disruptions and poor sleep quality (El-Sheikh, Erath, & Keller, 2007; Irwin, Valladares, Motivala, Thayer, & Ehlers, 2006).

Limitations and Strengths

Due to the cross-sectional study design, we are not able to determine the temporal sequence of exposure to perceived stress and sleep duration or sleep quality. Another limitation is that our assessment of sleep duration and quality were from self-reported data and may have resulted in some bias. However, any bias would be expected to be non-differential and dilute any associations seen. Polysomnography is considered the gold standard but this was not available. In addition, the relatively small sample size of women prevents stratified analyses within gender. However, there are several strengths to this study. To the best of our knowledge, no other studies have been published on the association between perceived stress and sleep problems in police officers or first responders. The use of the PSS has several advantages (Cohen, Kamarck, & Mermelstein, 1983). This questionnaire was designed for use in community samples with at least a junior high school education, and so the questions and the response alternatives are easy to understand. The PSS questions are of a general nature, are not specific to particular situations or populations, and are sensitive to the nonoccurrence of events as well as to ongoing life circumstances. Most importantly, the PSS was found to be a good instrument for measuring appraised stress (Cohen et al., 1983). There are also advantages to using the PSQI. Components of the PSQI were chosen from clinical information including physicians' experience with sleep disorder patients, therefore findings from this study may also be applicable to clinical practice. In addition, the PSQI has been used in a wide variety of studies involving occupational stress (Neylan et al., 2002). The results of this study may be generalizable to law enforcement officers employed in departments having similar characteristics (size, workload, etc.).

Conclusions

In summary, our results showed that higher levels of perceived stress were significantly associated with shorter sleep duration among men, officers of higher rank, those with higher depressive symptoms, no previous military experience, and higher workload. Significant positive associations were observed between perceived stress and poor sleep quality among men only. Since sleep problems are associated with cardiovascular disease, other chronic diseases, and increased mortality, police management should consider implementing tested interventions to reduce the levels of stressors that can be changed, thereby mitigating the long-term health effects associated with sleep problems in these workers. They also should establish policies and training programs that minimize sleep loss and disruption (Vila & Samuels, 2011). Future research should implement longitudinal studies and larger sample sizes of female and minority officers.

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Associations between Police Officer Stress and the Metabolic Syndrome

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Abstract: The purpose of this study was to examine the association of police officer stress with metabolic syndrome (MetSyn) and its individual components. Participants included 288 men and 102 women from the Buffalo Cardio-Metabolic Occupational Police Stress (BCOPS) Study. Police stress was measured using the Spielberger Police Stress Survey. MetSyn was defined using 2005 guidelines. Results were stratified by gender. ANCOVA was used to describe differences in number of MetSyn components across police stress categories after adjusting for age and smoking status. Logistic regression was used to calculate odds ratios for having each MetSyn component by increased police stress levels. The multivariate-adjusted number of MetSyn components increased significantly in women across tertiles of the three perceived stress subscales, and administrative and organizational pressure and lack of support indices for the previous month. No association was found among male officers. Abdominal obesity and reduced high density lipoprotein cholesterol (HDL-C) were consistently associated with police stress in women. Police stress, particularly organizational pressure and lack of support, was associated with MetSyn among female but not male police officers. Given the stress of policing and the adverse cardiovascular disease (CVD) risk factors prevalent among police officers, exploring the association between specific types of police stress and subclinical CVD is important. [International Journal of Emergency Mental Health, 2011, 13(4), pp. 243-256]

Key words: *law enforcement, perceived stress, cardiovascular disease, gender difference.*

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Policing has long been considered one of the most stressful occupations (Gershon, Lin & Li, 2002; Marmar et al., 2006). Previous studies have found that levels of high stress range from 33% to 46% among police officers and the proportion of officers with measurable mental illness has doubled over the past ten years (Deschamps, Paganon-

Badinier, Marchand & Merle, 2003; Carvalho, Del Bel Cury & Garcia, 2008; Collins & Gibbs, 2003). Police officers are exposed to numerous and varying types of stressors including inherent stressors, such as traumatic events and threats of danger, organizational and administrative pressures and demands, shift work and high work load (Taylor & Bennel, 2006; Violanti & Aron, 1993). Violanti and Aron (1994) found that events where an officer is physically threatened, such as killing someone while on duty or being physically attacked, and those which are psychologically challenging, seeing abused children or a fellow officer being killed while on duty, were perceived to be the most stressful. Yet, Taylor and Bennel (2006) found that organizational stressors ranked significantly higher and have been associated with greater psychological distress compared with operational or inherent police stressors.

There is a strong body of research which suggests that exposure to both chronic stress and work stress are associated with higher prevalence of cardiovascular disease (CVD) morbidity and mortality, including the metabolic syndrome (MetSyn; Belkic et al., 2000; Brunner, Chandola & Marmot, 2007; Chandola, Brunner & Marmot, 2006; Everson-Rose & Lewis, 2005). The MetSyn is a clustering of metabolic abnormalities significantly associated with increased risk for CVD morbidity and mortality and type II diabetes mellitus (National Cholesterol Education Program, 2002). The components of MetSyn include abdominal obesity, hypertriglyceridemia, reduced high density lipoprotein cholesterol (HDL-C), glucose intolerance and hypertension (Grundy et al., 2005). The age-adjusted prevalence of MetSyn is estimated at 20.6% for U.S. workers overall and 26.1% for protective service workers, including police officers (Davila et al., 2010).

A few studies have examined the association between stress and CVD in police officers. Greater perceived stress has been associated with increased prevalence of CVD and its risk factors (Franke, Ramey & Shelley, 2002; Yoo & Franke, 2011). It is estimated that 25-30% of police officers have a stress-related physical health problem, such as hypertension or coronary heart disease (Van Hasselt et al., 2008). Police officers have a more adverse CVD risk factor profile and higher CVD mortality rates compared to other occupations and the general population (Franke et al., 2002; Vena, Violanti, Marshall & Fiedler, 1986).

Potential biological mechanisms for this association have been posited. Belkic and colleagues (2000) suggested that work stress increases blood pressure, glucose levels, and triglyceride levels, catecholamine levels remain elevated, which leads to overactivity of the sympathetic nervous system. Rosmond and Bjorntorp (2000) hypothesized that chronic stress leads to hyperactivity of the hypothalamic pituitary adrenal (HPA) axis, thereby elevating cortisol levels and leading to the development of visceral adiposity, hypertension, and dyslipidemia, components of the MetSyn (Everson-Rose & Lewis, 2005). Others have suggested that work stress leads to deleterious health behaviors, including cigarette smoking, physical inactivity, and poor diet, which increase abdominal obesity and insulin resistance (Everson-Rose & Lewis, 2005).

Prior research on work stress or chronic stress among women, particularly police women, is limited (Puustinen, Koponen, Kautiainen, Mantyselka & Vanhala, 2010). Female officers may experience higher levels of stress due to the challenges of working in a male dominated occupation (Yoo & Franke, 2011; Rozanski, Blumenthal & Kaplan, 1999; Tennant, 2000; Rosvall et al., 2002). A few previous studies have found that female officers experience higher levels of work-related stress, while others have reported no differences between male and female officers (Taylor & Bennel, 2006; Yoo & Franke, 2011; Martin, Marchand & Boyer, 2009). Studies of CVD morbidity and mortality have focused mostly on male officers or included mixed populations, yet CVD risk differs by gender. The current study will contribute to this body of literature by examining the association between police stressors and MetSyn separately for male and female officers. Additionally, the use of a police-specific questionnaire will provide the opportunity to investigate whether specific types of stressors, specifically organizational and administrative pressures, threats of physical and psychological danger, and lack of support, are associated with the clustering of CVD risk factors referred to as MetSyn.

The purpose of the current study is to examine the association of police stress with the MetSyn and its individual components. No previous studies were identified which have examined this. The specific hypotheses are: 1) higher levels of police stress will be associated with a greater number of MetSyn components, 2) the association with the number of MetSyn components will be highest for the organizational and administrative pressures subscale compared to the physical and psychological threats or lack of support subscales, and 3) the association between police stress and MetSyn will differ between male and female police officers.

MATERIALS AND METHODS

Study Design and Population

The Buffalo Cardio-Metabolic Occupational Police Stress (BCOPS) Study was conducted between 2004 and 2009 to assess whether workplace stress is associated with adverse subclinical metabolic and CVD outcomes. The Center for Health Research, School of Public Health and Health Professions, State University of New York at Buffalo in Buffalo, NY served as the data collection site. All 710 active duty police officers from the Buffalo, NY Police Department were invited to participate in the study. Recruitment was conducted by open enrollment during the study period. Between 2004 and 2007, the number of active duty officers decreased to approximately 600 due to retirements and officers leaving the force with no new hiring until January 2008 when 80 recruits were added. No specific inclusion criteria were used for the study, other than the participant would be a sworn police officer and willing to participate in the study. Women officers pregnant at the time of examination were excluded ($n = 2$). Of the 464 officers examined, 74 were removed from analyses (33 retired, 2 missing demographic information, 16 recruits with less than one year of experience, 11 missing Spielberger Police Stress Survey, 12 missing MetSyn) leaving a final sample of 390 officers (288 men, 102 women). All participants provided informed consent and all phases, testing, and reports of the study were approved by the State University of New York at Buffalo Internal Review Board and the National Institute for Occupational Safety and Health Human Subjects Review Board.

Procedures and Measures

Questionnaires were administered to collect demographic information on age, gender, education, rank, marital status, psychosocial factors (including stress and support), and health behaviors (e.g., physical activity, smoking, and alcohol use). Participants provided a medical history (including history of cardiovascular disease) and a 12-hour fasting blood sample was collected by a certified phlebotomist. Medication use was ascertained through self-report and by inventory of current medications brought to the clinic. Blood parameters for the MetSyn were measured by standard laboratory techniques on the Beckman Coulter LX20 clinical chemistry analyzer and included a blood lipid panel for HDL-C and triglycerides, and chemistry panels for glucose (Mikolaenko et al., 2000). Anthropometric measures were conducted by trained clinic personnel. Waist circumference was measured as abdominal girth at the highest point of the iliac crest and the lowest point of the costal margin in the mid-axillary line. Blood pressure was determined using the average of the second and third of three separate measurements of resting systolic and diastolic blood pressure obtained with a standard sphygmomanometer.

Spielberger Police Stress Survey

The Spielberger Police Stress Survey is a 60-item measure for assessing specific sources of stress in police work (Spielberger, Westberry, Grier & Greenfield, 1981). For each item, the officer rates the stressfulness of experiencing the event from 0 – 100 (0 = no stress, 100 = maximum stress), total rating. The officer also provides the frequency of occurrence of each event over the past month (total frequency in past month) and past year (total frequency in past year). The mean rating and frequencies were calculated for each officer and reported as the total rating, total frequency in past month, and total frequency in past year. Three subscales were also calculated: administrative and organizational pressure (23 items) which includes satisfaction with departmental policies and procedures, fairness of rewards, performance, and the judicial system; physical and psychological threat (24 items) which includes dangerous situations and experiences; and lack of support (13 items) which includes political pressures and relationships with supervisor and coworkers. The subscales have acceptable internal consistency scores (Cronbach's alpha > 0.90). For each subscale, the mean rating (administrative and organizational pressures rating, physical and psychological threat rating, lack of support rating) and the frequencies (administrative and organizational pressures frequency in past month, physical and psychological threat frequency in past month, lack of support frequency in past month, administrative and organizational pressures frequency in past year, physical and psychological threat frequency in past year, lack of support frequency in past year) were calculated. Indices, the exposure weighted by the rating, were calculated to measure event impact: index for past month (rating x frequency in past month), and index for past year (rating x frequency in past year). These indices were calculated for the total (total index for past month, total index for past year) and the three subscales (administrative and organizational pressures index for past month, physical and psychological threat index for past month, lack of support index for past month, administrative and organizational pressures index for past year, physical and psychological threat index for past year, lack of support index for past year).

Metabolic Syndrome (MetSyn)

The MetSyn criteria were based on the National Cholesterol Education Program Adult Treatment Panel III guidelines with recent modifications from the American Heart Association and the National Heart, Lung, and Blood Institute (Grundy et al., 2005). The individual MetSyn components included: 1) abdominal obesity (gender-specific waist circumference ≥ 102 cm in males, ≥ 88 cm in females); 2) hypertension (systolic blood pressure ≥ 130 mmHg, diastolic blood pressure ≥ 85 mmHg, or reported physician-diagnosed hypertension and antihypertensive treatment); 3) reduced HDL-C (gender-specific fasting HDL-C < 40 mg/dL in men, < 50 mg/dL in women, or reported treatment with nicotinic acid or fibrates); 4) elevated triglycerides (fasting triglycerides ≥ 150 mg/dL, or reported treatment with nicotinic acid or fibrates); and 5) glucose intolerance (fasting serum glucose ≥ 100 mg/dL, or reported treatment for diabetes). Participants were categorized according to the number of MetSyn components (0-5). MetSyn was considered present in individuals with three or more components.

Statistical Methods

Descriptive statistics were used to characterize the study population. Gender-specific tertiles were created for each police stress variable. Means (standard deviations, SD) and prevalence estimates were calculated for each MetSyn component and the overall prevalence was determined for the MetSyn. Analysis of variance and covariance were used to estimate the unadjusted and multivariate adjusted mean count of MetSyn components across police stress tertiles (ratings, frequencies, indices). Tests for trend were obtained from linear regression analyses with the 20 continuous police stress variables as the independent variables and count of MetSyn components as the dependent variable. The multivariate models were adjusted for age and smoking. The covariates to adjust for were chosen based on their association with police stress and MetSyn and evidence in the literature. Logistic regression was used to calculate odds ratios for having each of the MetSyn components by levels of police stress. Odds ratios were calculated for a 10-unit increase in the ratings, and due to the large range of values for the indices, the odds ratios are based on a 1-SD increase in the index. The tests for interaction of gender with the ratings were significant ($p < 0.05$). The results are stratified by gender in order to compare associations between male and female officers. All analyses were conducted using the SAS software, Version 9.1 (SAS Institute, Inc., 2008).

RESULTS

Demographic characteristics of the study population are shown in Table 1. Male and female officers were generally similar in age, ethnicity, and educational levels. More male officers were married than female officers (78.8% vs. 59.8%). Male officers had more years of police service (mean 15.4 vs. 13.8 years) and held higher police rank than female officers (32.7% vs. 20.6% at the level of Sergeant or higher). Male officers consumed approximately six alcoholic drinks per week compared to 3.3 for female officers. The prevalence of current smoking was 13.2% in male officers and 27.3% in female officers.

The scores for the Spielberger Police Stress Survey are shown in Table 2. In general, physical and psychologically threatening events were perceived to be the most stressful (42.9 out of 100 in men, 47.9 out of 100 in women). For example, among men exposure to dead or battered children (mean = 65.4) and killing someone in the line of duty (mean = 63.2) were reported to be the most stressful events, while women report killing someone in the line of duty (mean = 70.1) and a fellow officer being killed in the line of duty (mean = 69.9) as the most stressful (data not shown). Officers reported experiencing approximately three or more events per day in the past month (95.9 events for men, 89.8 events for women) with events involving organizational and administrative pressure occurring more often than other events. Officers reported experiencing about one event per day in the past year (380.5 events for men, 358.0 events for women).

In terms of gender, female officers reported slightly higher mean stress ratings than male officers, with lack of support being significantly higher for women than men (p-value = 0.04). Male officers reported experiencing slightly more events than female officers. The indices (the product of the rating and frequency) also varied by gender. Although not statistically significant, male officers tended to have a higher index for organizational and administrative pressures in the past month and past year; women officers had a higher index score for physical and psychological threats and lack of support in the past month and past year.

The overall prevalence of MetSyn was 26.7% (Table 3). The prevalence for each of the five MetSyn components ranged from 23.6% for glucose intolerance to 42.6% for reduced HDL-C. The prevalence for each component was greater, most often two-fold higher, for male compared to female officers and, correspondingly, the prevalence of MetSyn (≥ 3 components) was 33.0% for males and 8.8% for females. Nearly half of the female officers had zero MetSyn

Table 1.
Demographic and lifestyle characteristics by gender. The Buffalo Cardio-Metabolic Occupational Police Stress (BCOPS) Study, 2004 – 2009.

Characteristic	Men (*n* = 288)		Women (*n* = 102)	
	n	Mean SD or %	*n*	Mean SD or %
Age Group				
Mean Age	288	41.7 (7.0)	102	41.0 (5.7)
< 40 years	117	40.6	41	40.2
40-49 years	126	43.8	52	51.0
50+ years	45	15.6	9	8.8
Ethnicity				
White	226	79.9	73	71.6
African American	50	17.7	29	28.4
Hispanic	7	2.5	0	0.0
Education				
≤High school/GED	38	13.2	4	3.9
College <4 yrs	151	52.6	63	61.8
College 4+ yrs	98	34.2	35	34.3
Marital status				
Single	25	8.7	22	21.6
Married	226	78.8	61	59.8
Divorced	36	12.5	19	18.6
Years of Police service				
Mean	288	15.4 (7.4)	102	13.8 (6.4)
1-5	21	7.3	7	6.9
6-10	69	24.0	35	34.3
11-15	54	18.8	14	13.7
16-20	71	24.7	29	28.4
20+ years	73	25.4	17	16.7
Rank				
Police officer	194	67.4	81	79.4
Sergent/Lieutenant	44	15.3	11	10.8
Captain/Detective/Chief/Commissioner	50	17.4	10	9.8
Alcohol intake (drinks/week)	285	5.8 (9.2)	101	3.3 (4.7)
Smoking Status				
Current	38	13.2	27	27.3
Former	58	20.1	30	30.3
Never	192	66.7	42	42.4
Physical activity (METS/week)	286	283.2 (44.4)	102	285.9 (43.9)
Body Mass Index (kg/m^2				
Mean	288	30.5 (4.2)	102	26.1 (4.7)
< 25	20	6.9	50	49.0
25-30	127	44.1	35	34.3
> 30	141	49.0	17	16.7

Table 2.
Mean values of the Spielberger Police Stress Survey for the total and subscale scores by gender.
The BCOPS Study, 2004 – 2009.

Characteristic	Men (*n* = 288)		Women (*n* = 102)	
	Mean	SD	Mean	SD
Stress Rating				
Total (60 items)	37.9	20.8	41.8	22.0
Organizational/Administrative Pressure (23 items)	33.7	19.8	35.6	20.2
Physical/Psychological Threat (24 items)	42.9	23.6	47.9	25.1
Lack of Support (13 items)*	36.0	22.8	41.6	24.0
Frequency during past month				
Total	95.9	61.2	89.8	61.5
Organizational/Administrative Pressure	42.2	30.8	37.7	29.0
Physical/Psychological Threat	36.8	24.8	34.9	25.4
Lack of Support	17.2	14.4	17.1	14.0
Frequency during past year				
Total	380.5	214.9	358.0	213.3
Organizational/Administrative Pressure	165.7	101.9	154.6	98.1
Physical/Psychological Threat	149.2	88.6	141.2	87.8
Lack of Support	66.7	49.5	62.2	44.1
Stress Indices, past month**				
Total	77.8	68.8	81.6	73.8
Organizational/Administrative Pressure	87.5	83.8	84.2	86.4
Physical/Psychological Threat	70.3	66.6	77.9	71.9
Lack of Support	75.1	86.2	83.1	92.3
Stress Indices, past year**				
Total	308.3	245.7	319.8	257.3
Organizational/Administrative Pressure	343.2	293.4	337.2	296.2
Physical/Psychological Threat	288.6	238.8	317.7	252.8
Lack of Support	283.3	284.7	290.9	282.7

**Scores for the lack of support stress rating were significantly different between male and female officers, p-value = 0.04.*

***Stress indices are the product of the stress rating and the frequency in the past month (Stress Indices, past month) and past year (Stress Indices, past year).*

components compared to 16.3% of male officers. Nearly all officers with a particular component met the criteria for that component via the measurement level compared to the self-report medication criteria.

The unadjusted and multivariate adjusted number of MetSyn components by tertiles of police stress are shown in Table 4a for men and Table 4b for women. Among men, there was no association between the number of MetSyn components and the total or subscale ratings or the total or subscale indices. In women, the number of MetSyn components significantly increased across increasing tertiles of the total rating (multivariate adjusted p-trend = 0.004), and the ratings for administrative and organizational pressure (multivariate adjusted p-trend = 0.003), physical and psychological threat (multivariate adjusted p-trend = 0.007), and lack of support (multivariate adjusted p-trend = 0.006). Similar associations were found between the index for the past month and the number of MetSyn components, with the exception of the physical and psychological threat subscale. No association was found with the index for the past year. No association was found between the number of MetSyn components and the frequency in the past month or past year for men or women (data not shown). The association between number of MetSyn components and police stress was also stratified

Table 3.
Mean levels of prevalence of metabolic syndrome by gender.
The BCOPS Study, 2004-2009.

Metabolic Syndrome Component	Component Cutpoint**	Prevalence						Mean (SD)*	
		Men		Women		Overall		Men (n = 288)	Women (n = 102)
		n	%	n	%	n	%		
Abominal Obesity		112	38.9	18	17.7	130	33.3		
Waist Circumfrence, cm	≥102 Men, ≥88 Women							99.8 (11.3)	80.2 (11.6)
Elevated triglycerides		114	39.6	9	8.8	123	31.5		
Triglycerides, mg/dL	≥150	110	38.2	9	8.8			156.1 (127.4)	90.0 (132.3)
Self-reported fibrates or nicotinic acid medication, %	Yes	6	2.1	1	1.0	7	1.8		
Reduced HDL cholesterol		139	48.3	27	26.5	166	42.6		
HDL cholesterol, mg/dL	<40 Men, <50 Women	138	47.9	27	26.5			41.9 (12.0)	58.4 (15.9)
Self-reported fibrates or nicotinic acid medication, %	Yes	6	2.1	1	1.0	7	1.8		
Glucose intolerance		80	27.8	12	11.8	92	23.6		
Fasting glucose, mg/dL	≥100	78	27.1	11	10.8			94.8 (14.2)	86.4 (8.5)
Self-reported diabetes medication, %	Yes	7	2.4	1	1.0	8	2.1		
Hypertension		127	44.1	27	26.5	154	39.5		
Systolic blood pressure, mmHg	≥130	68	23.6	18	17.7			122.6 (11.3)	116.9 (13.5)
Diastolic blood pressure, mmHg	≥85	78	27.1	17	16.7			79.0 (10.1)	74.8 (9.6)
Self-reported hypertension w/ antihypertensive medication, %	Yes	45	15.6	7	6.9	52	13.3		
Number of components								2.0 (1.4)	0.9 (1.1)
	0	47	16.3	50	49.0	97	24.9		
	1	68	23.6	24	23.5	92	23.6		
	2	78	27.1	19	18.6	97	24.9		
	3	48	16.7	6	5.9	54	13.9		
	4	31	10.8	2	2.0	33	8.5		
	5	16	5.6	1	1.0	17	4.4		
	Prevalence (≥3)	95	33.0	9	8.8	104	26.7		

**Mean levels of the continuous variables were significantly different between men and women, p-value < 0.0001.*

***Component Cutpoint (Must meet ≥1 of the cutpoints per component).*

Table 4a.
Unadjusted and adjusted number of metabolic syndrome components by tertiles of Spielberger Police Stress Scores for men.

Spielberger Police Stress Survey	Total Score			Administrative/Organizational Pressure Score			Physical/Psychological Threat Score			Lack of Support Score		
	Range	Unadjusted	Age and smoking adjusted	Range	Unadjusted	Age and smoking adjusted	Range	Unadjusted	Age and smoking adjusted	Range	Unadjusted	Age and smoking adjusted
Stress Rating												
Low	0-26.5	2.03 (1.42)	2.10 (0.15)	0-23.7	2.03 (1.40)	2.13 (0.15)	0-31.9	2.13 (1.40)	2.19 (0.16)	0-21.2	1.99 (1.35)	2.10 (0.15)
Middle	26.5-47.7	2.00 (1.43)	2.15 (0.16)	23.9-43.5	2.01 (1.38)	2.13 (0.15)	32.7-57.9	1.91 (1.41)	2.03 (0.17)	21.5-48.1	2.02 (1.49)	2.15 (0.15)
High	47.8-83.0	1.93 (1.39)	2.04 (0.15)	43.7-84.6	1.91 (1.46)	2.03 (0.15)	58.3-86.5	1.93 (1.42)	2.01 (0.16)	48.5-90.4	1.95 (1.40)	2.04 (0.16)
*p-value**		0.420	0.539		0.657	0.767		0.231	0.322		0.667	0.659
*Stress Index for Past Month***												
Low	0-40.2	2.06 (1.27)	2.12 (0.16)	0-35.4	2.12 (1.31)	2.20 (0.16)	0-32.1	2.01 (1.33)	2.07 (0.17)	0-24.6	1.95 (1.27)	2.07 (0.16)
Middle	40.5-89.6	1.91 (1.44)	2.05 (0.16)	35.9-101.5	1.91 (1.42)	2.02 (0.16)	32.3-74.4	2.17 (1.48)	2.27 (0.17)	25.4-82.3	2.03 (1.44)	2.17 (0.15)
High	90.4-406.0	1.99 (1.52)	2.11 (0.15)	102.4-427.4	1.95 (1.50)	2.08 (0.15)	74.8-375.9	1.77 (1.40)	1.91 (0.16)	83.1-509.8	1.98 (1.53)	2.04 (0.16)
*p-value**		0.992	0.882		0.883	0.760		0.287	0.447		0.223	0.427
*Stress Index for Past Year***												
Low	0-160.2	2.03 (1.29)	2.11 (0.16)	0-156.9	2.12 (1.34)	2.21 (0.16)	0-144.1	2.02 (1.36)	2.10 (0.17)	0-106.3	1.99 (1.31)	2.09 (0.16)
Middle	161.1-352.5	1.96 (1.46)	2.06 (0.15)	157.1-393.2	2.00 (1.43)	2.08 (0.15)	144.1-341.1	2.21 (1.45)	2.28 (0.16)	108.5-295.6	2.16 (1.50)	2.29 (0.15)
High	353.1-1435	1.97 (1.48)	2.12 (0.15)	405.4-1619	1.85 (1.47)	2.02 (0.15)	342.5-1198	1.72 (1.40)	1.88 (0.16)	296.2-1548	1.81 (1.42)	1.88 (0.15)
*p-value**		0.503	0.653		0.453	0.625		0.152	0.260		0.418	0.654

Unadjusted values are the mean (standard deviation). Adjusted values are the mean (standard error).

**p-values are for the linear trend.*

***Stress indices are the product of the stress rating and the frequency in the past month (Stress Index for Past Month) and past year (Stress Index for Past Year).*

Table 4b.
Unadjusted and adjusted number of metabolic syndrome components by tertiles of Spielberger Police Stress Scores for women.

Spielberger Police Stress Survey	Total Score			Administrative/Organizational Pressure Score			Physical/Psychological Threat Score			Lack of Support Score		
	Range	Unadjusted	Age and smoking adjusted	Range	Unadjusted	Age and smoking adjusted	Range	Unadjusted	Age and smoking adjusted	Range	Unadjusted	Age and smoking adjusted
Stress Rating												
Low	0.4-29.1	0.53 (0.83)	0.45 (0.20)	0-23.5	0.62 (0.85)	0.59 (0.20)	0-37.9	0.50 (0.83)	0.45 (0.20)	0-25.0	0.62 (0.92)	0.57 (0.20)
Middle	29.8-55.1	0.82 (1.00)	0.90 (0.19)	23.9-45.7	0.88 (1.09)	0.92 (0.20)	38.2-62.7	0.88 (1.01)	0.93 (0.19)	26.2-57.7	0.76 (0.96)	0.82 (0.19)
High	55.8-86.8	1.38 (1.33)	1.32 (0.19)	46.1-84.1	1.24 (1.30)	1.19 (0.19)	63.5-89.8	1.35 (1.32)	1.31 (0.19)	58.5-85.8	1.35 (1.32)	1.30 (0.19)
*p-value**		0.002	0.004		0.002	0.003		0.007	0.007		0.004	0.006
*Stress Index for Past Month***												
Low	0-29.4	0.71 (0.84)	0.70 (0.20)	0-23.9	0.65 (0.81)	0.65 (0.21)	0-30.6	0.79 (0.84)	0.77 (0.21)	0-30.0	0.68 (0.91)	0.70 (0.20)
Middle	29.4-94.5	0.79 (1.20)	0.78 (0.19)	25.7-99.1	0.97 (1.24)	0.96 (0.20)	33.9-88.8	0.88 (1.23)	0.88 (0.20)	30.8-83.5	0.76 (0.96)	0.74 (0.19)
High	95.3-359.0	1.24 (1.23)	1.22 (0.19)	101.5-365.4	1.12 (1.23)	1.10 (0.19)	94.6-372.1	1.06 (1.25)	1.07 (0.19)	85.6-483.3	1.29 (1.36)	1.27 (0.19)
*p-value**		0.041	0.040		0.021	0.023		0.239	0.229		0.042	0.043
*Stress Index for Past Year***												
Low	0-145.8	0.76 (0.85)	0.72 (0.21)	0-141.2	0.74 (0.86)	0.72 (0.21)	0-146.9	0.91 (1.11)	0.87 (0.21)	0-121.0	0.74 (0.93)	0.72 (0.21)
Middle	150.4-385.2	0.82 (1.19)	0.86 (0.20)	144.4-378.5	0.88 (1.20)	0.86 (0.20)	158.3-412.7	0.71 (1.09)	0.76 (0.20)	128.5-293.7	0.85 (1.18)	0.83 (0.20)
High	391.0-1195	1.15 (1.26)	1.12 (0.20)	389.5-1143	1.12 (1.25)	1.12 (0.20)	415.6-1210	1.12 (1.15)	1.09 (0.20)	296.3-1371	1.15 (1.21)	1.16 (0.19)
*p-value**		0.166	0.175		0.110	0.118		0.403	0.435		0.143	0.144

Unadjusted values are the mean (standard deviation). Adjusted values are the mean (standard error).

**p-values are for the linear trend.*

***Stress indices are the product of the stress rating and the frequency in the past month (Stress Index for Past Month) and past year (Stress Index for Past Year).*

by police variables: years of police service (1-15 years vs. >15 years) and police rank (police officer vs. all higher ranks; data not shown). No evidence of effect modification by years of service and police rank was found, indicating associations did not differ significantly across years of service (1-15 and >15) and rank (police officer vs. all higher ranks).

Odds ratios were calculated for having each individual MetSyn component with the rating and the index for the past month for women (Table 5). The odds ratios for the multivariate models were similar to the unadjusted and age-adjusted models. The odds of having abdominal obesity increased 37% for each 10-unit increase in the total rating (OR = 1.37, 95% CI = 1.04-1.81). Similar increases were found for the administrative and organizational pressures (OR = 1.38, 95% CI = 1.04-1.84), physical and psychological threats (OR = 1.29, 95% CI = 1.01-1.64), and lack of support (OR = 1.34, 95% CI = 1.04-1.72) ratings. The odds of having elevated triglycerides increased 57% for each 10-unit increase in the total rating (OR = 1.57, 95% CI = 1.02-2.43), and 66% for each 10-unit increase in the physical and psychological threat rating (OR = 1.66, 95% CI = 1.05-2.62). The odds of having reduced HDL-C were significantly higher for each 10-unit increase in the ratings (range 23% to 41%). For each 10-unit increase in the lack of support rating, the odds of having glucose intolerance increased 37% (OR = 1.37, 95% CI = 1.01-1.84). The odds of having abdominal obesity and reduced HDL-C were significantly higher for each standard deviation increase in the total, administrative and organizational pressures, and lack of support indices for the past month.

DISCUSSION

Few studies have examined the relationship between stressors and the physical health of police officers (Deschamps et al., 2003). Yet, the broader scientific literature has reported associations of work stress and chronic stress with MetSyn and other CVD risk factors (Branth et al.,

Table 5.
Multivariate adjusted* odds ratios for MetSyn components by Spielberger Police Stress score for women.

	Abdominal Obesity		Elevated Triglycerides		Reduced HDL-C		Glucose Intolerance		Hypertension	
Spielberger Police Stress Survey	Odds Ratio**	95% CI	Odds Ratio**	95% CI	Odds Ratio**	95% CI	Odds Ratio**	95% CI	Odds Ratio**	95% CI
Stress Rating										
Total	1.37	1.04-1.81	1.57	1.02-2.43	1.33	1.06-1.69	1.28	0.93-1.76	1.02	0.83-1.26
Administrative/ Organizational	1.38	1.04-1.84	1.41	0.96-2.08	1.41	1.11-1.83	1.29	0.94-1.79	1.02	0.81-1.28
Physical/ Psychological Threat	1.29	1.01-1.64	1.66	1.05-2.62	1.27	1.03-1.55	1.16	0.90-1.52	1.02	0.84-1.23
Lack of Support	1.34	1.04-1.72	1.40	0.98-1.97	1.23	1.00-1.50	1.37	1.01-1.84	1.01	0.83-1.22
Stress Index for Past Month* **										
Total	1.80	1.08-3.00	1.56	0.80-3.00	1.67	1.00-2.59	1.34	0.74-2.41	0.93	0.55-1.45
Administrative/ Organizational	1.68	1.00-2.80	1.68	0.92-3.05	1.54	1.00-2.57	1.19	0.65-1.99	1.09	0.65-1.68
Physical/ Psychological Threat	1.43	0.87-2.36	1.24	0.65-2.36	1.33	0.87-2.05	1.24	0.75-2.20	0.93	0.56-1.43
Lack of Support	1.90	1.10-3.29	1.32	0.69-2.29	1.74	1.10-2.75	1.59	0.91-2.75	0.69	0.40-1.20

**Multivariate model adjusted for age and smoking status.*

***Odds ratios for the stress ratings are for a 10-unit increase. Odds ratios for the stress index in the past month are for a 1-SD increase.*

****Stress Index for Past Month is the product of the stress rating and the frequency in the past month.*

2007; Chandola et al., 2008; Pyykkonen et al., 2010). Given the higher rates of CVD mortality among police officers, understanding how policing contributes to CVD outcomes is important. The current study addressed this gap by exploring the association between specific types of perceived and experienced police stress and subclinical CVD.

As hypothesized, police stress was positively associated with the number of MetSyn components. However, this association was found only in female officers. Specifically, perceived stress and the index for the past month, a product of the event rating and frequency, were positively, significantly, and independently associated with the number of MetSyn components in women but not in men. No association was found between MetSyn components and the index for the past year or the frequency of events. The index may present a better picture of the stress experience since this measure incorporates both the event frequency and the perceived stressfulness of that event. Also, the association was found for the index for the past month, which may represent a more acute stress reaction than the past year.

As suggested by Spielberger and colleagues (1981), the 60-item Police Stress Survey was divided into three subscales representing broad categories of police-specific stressors supported by the literature: organizational and administrative pressures, physical and psychological threats, and lack of support. As would be expected, physically and psychologically threatening events, such as killing someone in the line of duty or participating in a high speed chase, were perceived as the most stressful by officers compared to other events. However, the organizational and the lack of support indices were higher for officers than the threatening events. This finding reinforces the fact that repeated exposure to the "smaller" scale events, such as insufficient manpower and feeling that one's coworkers are not doing their job, are also stressful to officers (Van Hasselt et al., 2008).

It is interesting that the significant associations were in female officers only. Previous studies report inconsistencies in the association of work stress and chronic stress with the MetSyn or CVD among women while the association among men is more consistent (Everson-Rose & Lewis, 2005; Puustinen et al., 2010). Gender-specific differences in the association between police stress and MetSyn have not been previously explored, although Collins and Gibbs (2003) note the weakness of previous studies in addressing gender patterns due to predominantly male study populations.

Policing is a male-dominated occupation with women accounting for only 11.2% of all sworn law enforcement personnel in the United States and typically holding lower ranking positions than their male counterparts (National Center for Women and Policing, 2002). As a result, female officers may be exposed to discrimination and lack of acceptance within the organization and by their male colleagues (Yoo & Franke, 2011; Morash & Haarr, 1995; Rabe-Hemp, 2008). In the current study, the level of perceived stress associated with administrative and organizational pressures, physical and psychological threats, and total events were slightly higher for female officers than their male counterparts and significantly higher for lack of support. This finding is in agreement with Berg and colleagues (2005) who found that female Norwegian police officers perceived events as more severe than their male officers, while Yoo and Franke (2011) found that female officers had significantly higher levels of perceived stress but similar levels of social support than male officers. Regarding our study hypotheses, each subscale and the total perceived ratings were significantly associated with the number of MetSyn components among women. However, only the organizational and lack of support indices for the previous month were associated with the number of MetSyn components. Although no significant gender differences were found for the acute index, it appears that these types of police stress are negatively impacting the health of the female officers.

Of the five MetSyn components, abdominal obesity and reduced HDL-C were consistently associated with police stress in women. For each 10-unit increase in the total rating, the odds of having abdominal obesity increased 37% and reduced HDL-C increased 33%. The odds of having these components were also significantly elevated for each of the subscales. A similar association was found between the index for the past month and the abdominal obesity and reduced HDL-C components.

Prior studies have found chronic work stress to be predictive of obesity in the 19-year Whitehall II Study, and low job control and low decision latitude have been associated with lower levels of HDL-C in middle-aged and perimenopausal women (Brunner et al., 2007; Evolahti, Hultcrantz & Collins, 2009; Wamala, Wolk, Schrnvk-Gustafsson & Orth-Gomer, 1997). Others have suggested that lipid levels are more affected by perceived versus experienced stress (McCann, Warnick & Knopp, 1990). One potential mechanism for this association is hyperactivation of the hypothalamic-pituitary adrenal (HPA) axis. Rosmond and Bjorntorp (2000) have suggested that HPA axis overactivity leads to increased cortisol secretion. Increased cortisol output is associated with MetSyn and has been linked specifically with low HDL-C concentrations and central adiposity (Anagnostis, Athyros, Tziomalos, Karagiannis & Mikhailidis, 2009).

Reactions to police stress may have led to unfavorable changes in the health behaviors of female officers. In fact, Chandola and colleagues (2006) found that 16% of the association between work stress and coronary heart disease could be accounted for by health behaviors. This can be only partially true for the current study. Female officers in the current study reported low levels of alcohol intake, three drinks per week, had similar levels of physical activity as male officers, and had a mean body mass index (BMI) of 26, just over the threshold for being overweight. However, twice as many female officers were current smokers compared to male officers (27% vs. 13%), although adjustment for smoking status affected the association between police stress and MetSyn only minimally for both genders. Other health behaviors such as sleep duration and dietary patterns were not included in the current study, and therefore, the extent to which these factors may have influenced the association between police stress and MetSyn could not be determined.

Limitations of this study include the cross-sectional study design, which precludes causal inferences and the potential concern for generalizability of the findings to other police officers and emergency responders. Additionally, the Spielberger Police Stress Survey is a self-report measure of police stress and subject to recall bias and socially desirable responding, although it has been frequently used by others to describe sources of police stress (Violanti & Aron, 1993; Violanti & Aron, 1994; Berg et al., 2005; Aaron, 2000; Martelli, Waters & Marelli, 1989; Patterson, 1992).

Several summary measures of police stress, including the perceived rating and the frequencies of the event in the past month and past year, were included in the current study. Previous studies have used only one of these measures while citing the potential limitations of the other. For example, the perceived rating is a subjective measure of how stressful an event would be. It does not provide information on the number of times the officer has experienced the event and may be subject to biases, including socially desirable responses or conformity with police culture (Taylor & Bennel, 2006; Berg et al., 2005). Conversely, the frequency of the event is subject to recall bias and provides no information on the intensity of the event. In addition to these two measures, we calculated the index, the product of the rating and frequency. This measure provides an impact score with a higher score indicative of both experience and perception (Aaron, 2000). We were also able to look at two periods of occurrence, the past month and the past year, which could serve as proxy measures of acute and chronic stress, respectively.

In the current study, MetSyn was defined as the count of the number of components for each individual, instead of limiting the assessment to the presence or absence of MetSyn. This was particularly important for the current study, since the prevalence of MetSyn was low for female officers (8.8%) compared to male officers (33.0%) and other studies of police officers (Davila et al., 2010). Nearly half of the female officers had zero MetSyn components. Using the count of components provides an interpretable measure of association and is more sensitive in the detection of associations (Fekedulegn et al., 2010).

In summary, the perceived rating and index for the past month were positively associated with the number of MetSyn components among female but not male police officers. This association was strongest for organizational and administrative pressures and lack of support. Of the five MetSyn components, police stress was associated with having abdominal obesity and reduced HDL-C. This study contributes to the growing number of studies which have found associations between work stress and MetSyn. However, it may be the first study to distinguish sources of police stress in relation to subclinical CVD and to examine this relationship among female police officers. Future studies with more female officers are desirable given the low prevalence of MetSyn among the women in this study. Longitudinal studies would be beneficial in determining the specific pathways and mechanisms involved. Given the stress of policing and the adverse CVD risk factors prevalent among police officers, exploring this association between sources of police stress and MetSyn is important.

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Adiposity in Policing: Mental Health Consequences

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Abstract: Previous research suggests that adiposity is a health problem among police officers. Stress is also a concern in police work and can lead to depression. Although previous studies have demonstrated an association between obesity and depression, this has not been adequately addressed in the police population. Measures of adiposity (Body Mass Index [BMI], abdominal height, waist circumference) and depressive symptoms (Center for Epidemiologic Studies Depression [CES-D] scale) were obtained from a random sample of 115 officers in an urban police department. Ninety nine officers (61 men and 38 women) who had complete data and were not on anti-depressive medication were used. Linear regression analysis was conducted separately for men and women. Covariate adjustments were made for age, alcohol use, smoking, pack-years of smoking, marital status, and physical activity. Statistically significant positive trends were observed in multivariate adjusted mean (± SE) depression symptom scores across increasing tertiles of BMI (7.0 ± 1.3, 5.1 ± 1.2, 8.8 ± 1.3, p *= 0.012) and abdominal height (6.0 ± 1.4, 5.5 ± 1.3, 9.2 ± 1.4,* p *= 0.048) for men officers. No significant associations were found between CES-D score and adiposity in women officers (*p *= 0.075 for BMI,* p *= 0.317 for abdominal height,* p *= 0.114 for waist circumference). Additional factors that might influence this association should be examined prospectively in future work to help clarify causal direction. [International Journal of Emergency Mental Health, 2011, 13(4), pp. 257-266].*

Key words*: police, adiposity, obesity, depression, gender differences.*

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Excess adiposity (being overweight or obese) raises concern because of implications for the increased risk of disease. The 2003-2004 National Health and Nutrition Examination Survey (NHANES) estimated that 66% of U.S. adults are either overweight or obese (Ogden et al., 2006). During this same period of time, depression also appears to be increasing in the general population from the estimated 10% obtained from the first National Comorbidity Survey (Kessler, 1994) to approximately 16.9% in the latest study (Kessler et al., 2004; Kessler, Bergland, Demler, Jin, & Walters, 2005; Kessler & Merikangas, 2004). NHANES III data suggested that the association between obesity and depression may be strongest among the most obese persons (Simon et al., 2006). The association between obesity and depression appears to differ for men and women. Obesity in women was associated with a 36% increase in depression while among men obesity was associated with 37% decrease in depression (Carpenter, Hasin, Allison, & Faith, 2000). It was suggested that the positive association among women may relate to the stigma of obesity for women in Western culture, the greater tendency of obese women to eat in response to negative emotions, or both while the opposite association among men could be partially explained by the psychosocial consequences of being under weight among men.

Police work is a critical first responder occupation where physical fitness and mental well-being are essential for proper performance of duties. Previous research suggests that police officers exhibit both levels of excess adiposity and depression (Franke, Cox, Schultz, & Anderson, 1997; Franke, Ramey, & Shelley, 2002; Pyorala, Miettinen, Laasko, & Pyorala, 2000; Violanti, Vena & Petralia, 1998). Ramey (2003), in a nine state study of police officer health, found a greater prevalence of BMI over 25 kg/m² (overweight level) among officers (82.6%) than among the general population (74.7%).

The relationship between obesity and mental health problems is not well documented among police officers. Thus, the purpose of this cross-sectional study is to examine associations between adiposity and depression among officers. We examined associations between levels of adiposity based on three anthropometric measures (BMI, abdominal height, and waist circumference) and depressive symptoms among police officers. Covariates that may influence this association were also examined and included in covariate adjusted models (age, alcohol consumption, smoking, marital status, and physical activity).

METHODS

Sample

This study involved 115 (45 women and 70 men) randomly selected police officers from a mid-sized urban police department of 934 officers (185 women and 749 men). The random sample, stratified by gender, was developed from all officers in the department using a computer-generated random number table. Women officers were over-sampled to help ensure adequate representation. One hundred percent of the random sample voluntarily agreed to participate in the study. The Center for Preventive Medicine in the School of Public Health and Health Professions, State University of New York at Buffalo, NY, served as the site for data collection. The clinic has an established protocol for medical testing and has been in operation for twenty years. The study was approved by The State University of New York at Buffalo IRB. All participants were asked to read and sign informed consent forms prior to participation.

A comprehensive set of questionnaires (self- and interviewer-administered) and a variety of physical measures were included in an examination. Of the 115 officers, 103 (61 men and 42 women) had complete information available on adiposity and depression. Four female officers were taking anti-depressive medication and hence were excluded, resulting in 99 officers (61 men and 38 women) for statistical analyses. Officers with complete data were similar to the 12 officers who had incomplete data with respect to age, gender, education, marital status, police rank, smoking status and alcohol intake, but not with respect to years of police service. Officers with complete data had greater service duration. No specific inclusion criteria were used for the study, other than the participant was a sworn police officer.

Measures

Adiposity

This study employed three measures of adiposity: BMI, abdominal height, and waist circumference. Clinic staff mem-

bers specifically trained and certified for this study performed the anthropometric measures. Height was measured with shoes removed, the participant being asked to stand erect with his/her back to the vertically-mounted ruler, with his/her weight distributed evenly across both feet, and looking straight ahead. Height was recorded to the nearest half of a centimeter. Weight was measured with shoes removed rounding up to the nearest quarter of a pound. Adiposity measures were considered indicators of either obesity or being overweight. Body mass index (BMI), was expressed as weight/height2 (BMI; kg/m²), and is commonly used to classify overweight (BMI = 25-30) and obesity (BMI ≥ 30.0) among adults age 20 years and over (National Institutes of Health, 1998). For the abdominal height measure, the participant was asked to lie supine on the table and to adjust clothing so that the top of both hips and the midsection is exposed. The technician palpated the right and left iliac crest, marking each area, and used a Holtein-Kahn abdominal caliper to measure the mid-section, just touching but not compressing the abdomen. Three measurements were taken to the nearest 0.1 cm. All three readings were required to be within 0.5 cm of each other otherwise they were repeated. The average of the three measurements was used for analyses. For waist circumference, a cloth tape was used to measure around the abdomen horizontally at the midpoint between the highest point of the iliac crest and lowest part of the costal margin in the mid-axillary line. Two measurements were recorded to the nearest 0.5 cm. If the second waist measurement differed by more than 0.5 cm, a third reading was performed. Average of the three measurements was used.

Depressive symptoms

Depressive symptoms were measured utilizing the Center for Epidemiologic Studies Depression (CES-D) scale. The CES-D was administered at the same time as anthropometric measures were obtained. The CES-D is a short scale designed to measure symptoms of depression in the general population (Radloff, 1977). The CES-D measures symptoms of depression (e.g., poor appetite, restless sleep, sadness) using 20 items on a 4-point scale. The 4-point scale represents how frequently each symptom occurred during the past 7 days as follows: 0 (rarely or none of the time, less than 1 day); 1 (some or little of the time, 1-2 days); 2 (occasionally or a moderate amount of time, 3-4 days); and 3 (most or all of the time, 5-7 days). The CES-D is scored by reverse coding the appropriate items and summing the scores to obtain an overall score. A score of ≥ 16 has been reported as an indicator of clinical depression and has been used as a reliable measure for stress. The CES-D has been shown to have stable psychometric properties across age, demographic groups, and differing cultures; and has been widely used to measure depressive symptoms in the general population (Mcdowell & Newell, 1996).

Demographic and Lifestyle Characteristics

Questionnaires were used to ascertain demographic characteristics including years of education, physical activity, marital status, years of police service, and police rank. Given small numbers in some categories of police rank, sergeants and lieutenants, and captains and detectives were grouped together respectively. Officers were categorized as current, former, and never smokers. Pack-years of smoking were calculated by multiplying the number of packs of cigarettes smoked per day by the number of years the person smoked. An alcohol intake was based on the number of drinks reported per week using categories of 0, < 1, 1-6, and > 6 drinks per week. A cumulative intensity score for physical activity was calculated by multiplying the level of intensity of activity (Moderate = 1, Hard = 2, and Very hard = 3) and the number of hours spent doing an activity at work, household, and sports. Examples include house painting, raking the lawn, sweeping, volleyball and golf for moderate intensity, heavy carpentry, construction work, scrubbing, and tennis for hard intensity, and digging with heavy tools, carrying heavy loads, jogging, and soccer for very hard activity.

Analysis

Only officers with complete data on adiposity measures and CES-D scores (n = 99) were used for analyses. Initially analysis of variance (ANOVA) was used to describe mean CES-D scores across demographic and lifestyle characteristics. When assumptions of ANOVA were not met (non-normality, unequal variances, small sample size) transformation of CES-D score or a nonparametric approach (Kruskal-Wallis test) was used. The relation between adiposity and CES-D score was examined separately for women and men. A simple linear regression analysis was used to examine the unadjusted relation between measures of obesity and CES-D score. Multiple linear regression analyses and analyses of covariance (ANCOVA) were then used to examine the independent relation between each measure of adiposity and CES-D score controlling for a number of confounding covariates (age, alcohol consumption, smoking, marital status and physical activity). In all cases, the residuals from the fitted regression models were examined for normality, independence, and homogeneity of variance. Categorical covariates (smoking and mital status) were dummy coded, while

age, alcohol consumption (number of drinks per week) and physical activity score were entered in the regression model in continuous form. For presentation purposes, results of the statistical analyses are summarized by presenting unadjusted mean CES-D scores (± *SD*) and multi-factor adjusted mean CES-D score (± *SE*) across evenly distributed gender-specific tertiles of each adiposity measure. All statistical analyses were performed using the SAS/STAT software, version 9.2 for Windows and interpretations of results were presented using the standard significance level of 0.05.

RESULTS

The participants consisted of 38 women and 61 men. The mean CES-D score for women (7.4 ± 6.6) and men (6.9 ± 5.7) did not differ significantly ($t = 0.34$, $df = 97$, $p = 0.731$). The prevalence of depression (CES-D score ≥ 16) was 7.9% and 6.6% for women and men respectively ($x^2 = 0.064$, N=99, df=1, $p = 0.801$). Measures of adiposity were significantly smaller for women compared to men (BMI: 26.2 ± 4.5 for women, 29.0 ± 3.8 for men, $t = -3.3$, $df = 97$, $p = 0.001$; abdominal height: 18.9 ± 2.8 for women, 21.8 ± 2.4 for men, $t = -5.3$, $df = 97$, $p < 0.0001$; waist circumference: 80.3 ± 10.0 for women, 96.8 ± 10.0 for men, $t = -8.0$, $df = 97$, $p < 0.0001$).

Table 1 presents the demographic and lifestyle characteristics of the participants. The majority of the sample (71.7%) was Caucasian and male (61.6%). The majority of participants were in younger age categories (age < 35= 28.3%; age 35-44=45.5%), married (62.6%) and had the lower rank of police officer (65.6%).

Table 2 presents mean depression symptom scores (CES-D) across demographic and lifestyle characteristics. The mean depression scores for white and black women officers were 7.9 ± 7.3 and 5.8 ± 4.0 respectively. The corresponding estimates in men officers were 6.3 ± 4.5 and 8.25 ± 8.0. A non-significant but suggestive linear trend (*Contrast SS* = 105, $df = 1$, $F = 3.3$, $p < 0.075$) was observed for education among male officers, depression scores decreasing as education increased. A significant difference ($F = 5.1$, $df = 2$, $p < 0.009$) in mean depression scores was noted among male officers who were single (3.45) and those who were divorced (12.60).

Table 3 presents results from regression analyses and ANCOVA relating CES-D scores to each measure of adiposity: BMI, abdominal height, and waist circumference. The results indicate a positive linear trend between CES-D score and BMI for men ($t = 3.0$, $df = 59$, $p = 0.004$) and women ($t = 2.3$, $df = 36$, $p = 0.030$) officers, indicating that officers with a higher BMI tended to have a higher mean CES-D score. Multiple linear regression analyses relating CES-D score to BMI and other covariates also showed a significant positive trend after adjusting for age in both men ($t = 2.9$, $df = 58$, $p = 0.005$) and women ($t = 2.2$, $df = 36$, $p = 0.034$). However, adjustment for a combination of factors including age, alcohol consumption, smoking, pack-years of smoking, marital status and physical activity attenuated the association in women ($t = 1.9$, $df = 28$, $p = 0.075$) but less so in men ($t = 2.6$, $df = 51$, $p = 0.012$). Also seen in Table 3 is a significant positive trend between CES-D score and abdominal height in men ($t = 2.9$, $df = 59$, $p = 0.006$). Men with larger abdominal height tended to have a higher mean CES-D score. Adjustment for age ($t = 2.8$, $df = 58$, $p = 0.008$) and age, alcohol consumption, smoking, pack-years of smoking, marital status and physical activity ($t = 2.0$, $df = 51$, $p = 0.048$) did not alter the association appreciably. Relationships were similar for waist circumference and CES-D score, although associations were not statistically significant for men ($p = 0.137$) or women ($p = 0.055$).

DISCUSSION

A number of explanations for a relation between obesity and mental health, particularly depression, have been offered, including the possible role of psychological, sociological, and biological factors (Markowitz, Friedman, & Arent, 2008; Ross, 1994; Palinkas, 1996; Freidman & Brownell, 1995). Our results show a significant positive trend between levels of adiposity and depression among men but not women officers, suggesting that the association between obesity and depression may be moderated by gender in police work. Similar associations have been found in other studies among women but not men (Markowitz et al., 2008; Roberts, Deleger, Strawbridge & Kaplan, 2003; Musante, Costanzo, & Friedman, 1997; van der Merwe, 2007; Atlantis & Baker, 2008; Piccinelli & Wilkinson, 2000) .

Although women officers in the present study did not demonstrate significant increasing depressive symptoms across increasing tertiles of adiposity, their overall level of depressive symptoms were somewhat higher than men officers. The mean CES-D score for women was 7.4 ± 6.6 and 6.9 ± 5.7 for men. The prevalence of depression (CES-D score ≥ 16) was 7.9% and 6.6% for women and men respectively. These findings are consistent with several other investigations (Weissman, Bland, Canino & Faravelli, 1996; Wulsin et al., 2005). Data from the National Institute of Mental Health

Table 1.
Demographic and life style characteristics by gender.

	Women		Men		Total		
Characteristics	*N*	%	*N*	%	*N*	%	*P**
Race							
White	28	73.7	43	70.5	71	71.7	0.128
Black	10	26.3	12	19.7	22	22.2	
Hispanic	0	0.0	6	9.8	6	6.1	
Age group (years)							
26 -34	12	31.6	16	26.2	28	28.3	0.062
35-44	21	55.3	24	39.3	45	45.5	
≥ 45	5	13.2	21	34.4	26	26.3	
Education							
≤ High School/GED	4	10.5	13	21.3	17	17.2	0.362
College <4 yrs	14	36.8	18	29.5	32	32.3	
College 4+ yrs	20	52.6	30	49.2	50	50.5	
Marital status							
Single	13	34.2	11	18.0	24	24.2	0.013
Married	17	44.7	45	73.8	62	62.6	
Divorced	8	21.1	5	8.2	13	13.1	
Years of service							
1-5	13	34.2	10	16.4	23	23.2	0.027
6-10	8	21.1	7	11.5	15	15.2	
11-15	10	26.3	17	27.9	27	27.3	
> 15	7	18.4	27	44.3	34	34.3	
Smoking status							
Current	8	21.1	8	13.3	16	16.3	0.100
Former	15	39.5	15	25.0	30	30.6	
Never	15	39.5	37	61.7	52	53.1	
Rank							
Police Officer	28	77.8	35	58.3	63	65.6	0.025
Sergeant/Lieutenant	6	16.7	8	13.3	14	14.6	
Captain/Detective	2	5.6	17	28.3	19	19.8	
Alcohol drinks/week							
0	13	34.2	13	21.3	26	26.3	0.057
< 1	12	31.6	10	16.4	22	22.2	
1- 6	10	26.3	30	49.2	40	40.4	
≥ 6	3	7.9	8	13.1	11	11.1	
Physical activity score ± SD	38	12.3±14.0	61	11.9±19.0	99	12.0±17.2	0.911

**p-value from a chi-square test for the null hypothesis that there is no association between each characteristic and gender.*

+

Table 2.
Mean CES-D score by levels of demographic and lifestyle characteristics.

	Women			Men			All		
	N	Mean	SD	*N*	Mean	SD	*N*	Mean	SD
Race									
White	28	7.93	7.33	43	6.33	4.48	71	6.96	5.78
Black	10	5.8	3.99	12	8.25	7.98	22	7.14	6.46
Hispanic	0	**	**	6	8.67	8.62	6	8.66	8.61
p-value*+		0.391			0.442			0.806	
Age group (years)									
26-34	12	6.83	4.99	16	6.06	4.81	28	6.39	4.81
35-44	21	6.05	4.64	24	7.38	7.01	45	6.76	5.99
≥45	5	14.02	12.74	21	7.10	4.88	26	8.46	7.29
p-value***		0.337**			0.594			0.214	
Education									
≤High school/GED	4	4.50	3.00	13	9.31	6.85	17	8.18	6.42
College <4 yrs	14	8.21	7.90	18	6.94	6.37	32	7.50	6.98
College 4+ yrs	20	7.35	6.27	30	5.90	4.60	50	6.48	5.32
p-value***		0.444			0.075			0.323	
Marital status									
Single	13	7.62	4.81	11	3.45	4.08	24	5.71	4.88
Married	17	7.29	7.38	45	7.16	5.51	62	7.91	6.02
Divorced	8	7.13	8.25	5	12.60	6.54	13	9.23	7.85
p-value*		0.986			0.009			0.238	
Years of service									
1-5	13	6.77	4.27	10	5.30	4.99	23	6.13	4.55
6-10	8	7.13	4.97	7	7.29	4.07	15	7.20	4.41
11-15	10	8.60	7.54	17	7.18	6.89	27	7.70	7.03
>15	7	7.00	10.82	27	7.29	5.73	34	7.24	6.87
p-value***		0.833			0.403			0.477	
Smoking status									
Current	8	8.38	5.10	8	6.25	4.30	16	7.31	4.68
Former	15	5.13	4.10	15	8.73	5.96	30	6.93	4.35
Never	15	9.07	8.80	37	6.41	5.96	52	7.17	6.91
p-value*		0.243			0.398			0.977	
Rank									
Police officer	28	6.46	4.53	35	6.43	6.23	63	6.44	5.49
Sergent/Lieutenant	6	12.67	12.33	8	5.88	5.14	14	8.79	9.23
Captain/Detective	2	3.00	4.24	17	8.29	5.04	19	7.74	5.14
p-value*		0.357			0.484			0.372	
Alcohol drinks/week									
0	13	8.23	4.71	13	8.77	7.42	26	8.50	6.09
< 1	12	9.67	9.80	10	5.20	4.34	22	7.64	7.97
1-6	10	4.40	3.03	30	6.30	5.66	40	5.83	5.16
≥ 6	3	4.33	4.04	8	8.50	3.89	11	7.36	4.20
p-value***		0.194**			0.971			0.439	
Physical activity score ¥									
Low	12	8.08	7.83	19	7.84	4.95	34	7.59	5.96
Medium	13	8.00	7.81	22	6.73	5.78	33	7.70	6.65
High	13	6.08	3.95	20	6.30	6.51	32	5.97	5.54
p-value***		0.463			0.409			0.282	

ANOVA (test of differences in means); * Test for trend*

*** Due to unequal variances p-values are based on log-transformed CES-D score.*

¥ Physical activity score classified as low, medium and high using gender-specific tertiles as cut points

Table 3.
Unadjusted, age– and multifactor-adjusted mean CES-D scores
by gender-specific tertiles of adiposity measures.

Tertile **	Unadjusted				Age-adjusted		Multi-factor Adjusted*	
	n	Women Mean±SD	*n*	Men Mean±SD	Women Mean±SE	Men Mean±SE	Women Mean±SE	Men Mean±SE
BMI								
Low	12	4.8±4.0	20	6.3±4.2	4.9±2.0	6.3±1.3	5.0±2.1	7.0±1.3
Medium	13	8.6±8.0	21	5.8±4.8	8.5±1.9	5.7±1.2	8.8±2.2	5.1±1.2
High	13	8.5±6.9	20	8.9±7.5	8.5±1.8	8.9±1.3	8.1±2.2	8.8±1.3
p-value***		0.030		0.004	0.034	0.005	0.075	0.012
		(0.542)		(0.544)	(0.516)	(0.542)	(0.514)	(0.504)
Waist circumference								
Low	12	6.0±5.0	20	5.8±4.6	5.9±1.9	5.8±1.3	5.9±2.1	6.9±1.4
Medium	13	5.5±4.2	20	6.7±4.9	5.6±1.8	6.7±1.3	5.5±2.2	6.4±1.3
High	13	10.5±8.9	21	8.3±7.2	10.5±1.8	8.3±1.3	10.6±2.1	7.5±1.3
p-value***		0.055		0.137	0.058	0.163	0.114	0.650
		(0.208)		(0.111)	(0.207)	(0.106)	(0.200)	(0.038)
Abdominal height								
Low	12	6.8±5.1	20	5.4±3.7	6.9±1.9	5.4±1.2	6.8±2.2	6.0±1.4
Medium	13	6.0±7.8	20	5.9±4.9	5.9±1.9	5.9±1.3	6.6±2.1	5.5±1.3
High	13	9.2±6.7	21	9.4±7.3	9.2±1.9	9.4±1.2	8.7±2.1	9.2±1.4
p-value***		0.196		0.006	0.211	0.008	0.317	0.048

**Adjusted for age, alcohol intake, smoking status, pack-years of smoking, marital status and physical activity.*

***BMI tertiles (kg/m2): Low=19.5-22.9, Medium=23.0-27.6, High=27.7-37.1 for women;*
Low=21.7-26.5, Medium=26.6-30.6, High=30.7-39.8 for men;

Waist tertiles (cm) Low= 64.5-74.0, Medium=74.1-84.5, High=84.6-110.1 for women;
Low=78.2-90.2, Medium=90.3-102.0, High=102.1-126.0 for men;

Abdominal height tertiles (cm) Low=14.3-17.2, Medium=17.3-19.8, High=19.9-26.4 for women;
Low=16.9-20.8, Medium=20.9-22.8, High=22.9-27.5 for men

****P-value from simple and multiple linear regression analyses relating CES-D score to the continuous measures of adiposity.*

**Values in brackets are regression coefficients for each measure of adiposity and represent the unadjusted and covariate adjusted change in CES-D score for a unit change in each measure of adiposity.*

(NIMH) indicated a 5.2% lifetime prevalence for depression (Weissman, et al, 1996), and differences in depression by gender where women are 2.6 times more likely to experience the symptom. Results from the Framingham Heart Study (Wulsin et al., 2005) showed that prevalence of depression was 10% for men and 17% for women. A future prospective analysis is necessary to determine whether depression leads to obesity or vice-versa in both women and men officers; or if this relationship is bidirectional.

Given legally prescribed standards, the exposure of female officers should not vary substantially from that of male officers in the day to day performance of police work. Thus, there are likely factors other than adiposity associated with police work which increase the risk of depression among women officers. Social isolation, conflict with colleagues, and negative group climate are relatively strong predictors of depression in policewomen (Dormann & Zapf, 2002). Such stressors may be problematic for women, given that support is perceived as important by women in achieving job satisfaction. The emergence of interpersonal stress as a distinct factor in job related stress for women officers, is consistent with the increasing emphasis on interpersonal conflicts as stressors in models of job stress. The increased stress associated with managing multiple roles could leave female officers

more susceptible to depression (Harris, Moritzen, Robitshek, Imhoff, & Lynch, 2001). In this study, 87% of female police officers were under the age of 44 and, therefore, some are likely to have children in the home. More female officers reported being single (34.2%) or divorced (21.1%) than male officers (18.0% and 8.2%, respectively). It is possible that some female officers are heads of single-parent households and therefore have sole responsibility for raising children.

Our results indicating a direct relation between depression and adiposity in male officers, as evidenced by increasing levels of depression with increasing adiposity levels was somewhat unexpected. Recent epidemiological meta-analytic studies generally support the association between obesity and depression in women but not in men (Atlantis & Baker, 2008; Heo, Pietrobelli, Fontaine, Sirey, & Faith, 2006). Specifically why this occurs in police work is an interesting question. According to Stunkard (2003), susceptibility to both depression and obesity may be related to sociocultural influences. For male officers, the association between adiposity and depression may be mediated by the degree to which they perceive themselves incapable of effective police action (Musante et al., 1997). This negative self and public image may increase the risk of depression (Ross, 1994). Ross terms this "reflected self-appraisal," suggesting that the stigma toward and devaluation of overweight or obese persons may cause them to suffer lowered self-esteem, negative self-images, and higher levels of depression.

Shift work could also account for the association between adiposity and depression for both genders in police work. In our study, the majority of officers who worked midnight shifts were male. Dysregulation of eating habits, excessive consumption of "junk" foods, and increased depression have been found in officers who work midnight shifts (Czeisler, 1988; Burke & Mikkelson, 2006; Vila, 2006; Violanti et al., in press). Circadian disruption, lack of facilities to purchase nutritious meals, and less opportunity to exercise are other problems for officers who work midnight shifts (Vila, 2006). Palinkas and colleagues (1996) noted that obesity might also be associated with depression through differential consumption of nutrients affecting depression, in particular, carbohydrates. Consumption of carbohydrates appears to affect the vegetative symptoms of depression via central serotonergic activity while also affecting weight (Wurtmann, & Wurtmann, 1989). Obese people also are less likely to exercise, and physical activity reduces the risk of depression by increasing the levels of endorphins, improved regulation of norepinephrine, improved fitness, and enhanced self-esteem (Ross & Hayes, 1988). Depression can lead to a dysregulation of the hypothalamic-pituitary-adrenal axis (HPA axis), leading to higher levels of cortisol secretion. Circadian disruption and poor sleep coupled with depression can exacerbate dysregulated cortisol even more, leading to increased levels of abdominal body fat (Bjorntorp, 2001, Violanti, et al, 2008).

The present study is cross-sectional and limited in sample size, thus results should be interpreted with caution. The sequence of physiological and psychological factors that influence associations between adiposity and depression should be examined prospectively in future research. Additional moderating and mediating factors that contribute to obesity and depression should be considered (Stunkard et al. , 2003). We did not have information on exposure to specific, actual stress experiences at work or mediating factors such as social support, cognitive perceptions, or physiological data.

Although our study is specific to police officers, excess adiposity and depression are prevalent in other populations. Information gained in the present study may be generalizable to other high stress responder occupations such as firefighters, emergency medical technicians, nurses, physicians, air traffic controllers, and the military. The strengths of this study include the availability of precise clinically measured anthropometric and depression measures, the use of a standardized protocol, and high response rates. We have carefully obtained three different measures of adiposity instead of one single measure. Participation of 100% of the randomly selected officers suggests that the sample is highly representative. Our results concerning women may be helpful in providing baseline assessment data for future work in this area. Very little is presently known about the mental and physical health of women officers.

Associations between adiposity and mental well-being are complex. It is important in prevention interventions to understand the directional pathways between adiposity and depression. The present study has identified associations in one gender, but temporal study designs are needed to substantiate and extend the cross-sectional findings presented here. To help clarify this association, our future work will include a longitudinal analysis of adiposity and depression. This is not only important for research purposes, but also for clinical applications. Prevention strategies in police work may need to be gender-specific, with emphasis on male officers who appear to have a significant increase in depressive symptoms as adiposity levels increase. The critical occupation of policing requires that officers be both physically and mentally fit to perform their duties. To be otherwise is a disservice to the officer as well as the public. Police agencies should therefore take the initiative and responsibility to assist officers in prevention efforts for weight control and mental health.

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Association of Sleep Quality with Depression in Police Officers

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Abstract: Poor sleep quality has been shown to adversely affect neurobehavior, including an increase in depression symptoms. Police officers are at increased risk of poor sleep quality due to occupational factors. This study analyzed self-reported sleep and depression data from police officers; 391 police officers from Buffalo, New York reported on sleep and depression by completing the Pittsburgh Sleep Quality Index (PSQI) and the Center for Epidemiological Studies Depression (CES-D) questionnaires. Mean CES-D scores were assessed across quintiles of PSQI. As PSQI scores increased, reflecting poorer sleep quality, CES-D scores also increased significantly, indicating an increase in depression symptoms as sleep quality worsens. This trend held for both male and female officers. Mean CES-D scores across quintiles ranged from 4.72 to 12.65 in men and from 5.53 to 12.63 in women. Multivariate adjustment only very slightly attenuated the association in female officers. After adjustment, five of the seven PSQI components showed statistically significant associations with CES-D scores in male officers and two in female officers. Sleep quality was significantly and independently associated with depressive symptoms as evidenced by a trend of increasing depressive symptom scores with decreasing sleep quality in both male and female officers. [International Journal of Emergency Mental Health, 2011, 13(4), pp. 267-277].

Key words*: law enforcement, cardiovascular disease, risk factors, health disparity, epidemiology*

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Studies have shown that poor sleep and depression are positively associated to a high degree. Sleep disturbances in older individuals and in women have strongly correlated with depression (Leineweber, Kecklund, Janszky, Akerstedt, & Orth-Gomer, 2003; Rodin, McAvay, & Timko, 1988). Other studies have shown similar results, indicating that the best predictor of future depression in the elderly was current sleep disturbance, with females having a higher incidence rate than males (Livingston, Blizard, & Mann, 1993; Roberts, Shema, Kaphan, & Strawbridge, 2000; Rodin et al., 1988; Sukegawa et al., 2003). Studies with younger populations have also found a higher risk of depression in young men who reported difficulty sleeping (Chang, Ford, Mead, Copper-Patrick, & Klag, 1997).

Sleep disorders are common in the general population, affecting up to one-third of adults in the United States (Seidel et al., 2009), while more than a one-quarter of US adults have reported not getting enough sleep (Ram, Seirawan, Kumar, & Clark, 2009). Those who have reported extraordinary stress commonly report sleep problems (Rosen, Reynolds, Yeager, Houck, & Hurwitz, 1991). Considering the high prevalence of sleep disturbances and the close relation between sleep and depression, sleep quality can be an important indicator of quality of life (Seidel et al., 2009).

Chronic sleep deprivation may lead to alterations in daily circadian rhythms (Bollinger, Bollinger, Oster, & Solbach, 2010; Maurovich-Horvat, Pollmacher, & Sonka, 2008). Sleep disorders have been found to be associated with a decrease in performance of routine daily activities, such as concentration and recall (Alapin et al., 2000; Ram et al., 2009).

While there has been evidence of a bi-directional association between poor sleep and depression (Tractenberg, Singer, & Kaye, 2005), longitudinal studies have shown that poor sleep can lead to depression. A study of twins found longitudinal associations between sleep problems and depressive symptoms among children aged eight to ten (Gregory, Rijsdijk, Lau, Dahl, & Eley, 2009). Another prospective study demonstrated that sleep disturbance was an independent risk factor for depression recurrence in community-dwelling older adults (Cho et al., 2008). Persons with insomnia symptoms have been shown to have an increased risk for developing depression (Chang et al., 1997; Szklo-Coxe, Young, Peppard, Finn, & Benca, 2010). Another study has shown that those with sleep related breathing disorders had higher odds of developing depression (Peppard, Szklo-Coxe, Hla, & Young, 2006).

Investigators from multiple disciplines, including molecular biology, neurology, and pathophysiology, have examined potential mechanisms that might link poor sleep and mental disorders (Meerlo, Mistlberger, Jacobs, Heller, & McGinty, 2009). A recent review concluded that altered sleep rhythm may interrupt melatonin secretion (Srinivasan et al., 2009), which itself may be a cause of depression, such as that caused by seasonal affective disorder (Kellner et al., 1997; Sack et al., 1990).

There is also evidence that full-time workers are more likely to experience shorter sleep duration (< 6 hours; Knutson, Van Cauter, Rathouz, DeLeire, & Lauderdale, 2010). Police officers may even be at a higher risk for sleep disturbances and shorter sleep duration than other occupational groups, due to their irregular shifts, overtime, required court attendance, and training (Vila & Kenney, 2002). Protective service occupations, of which police officers are a part, have over a 38% prevalence of short sleep duration (≤ 6 hours/night), and a higher prevalence ratio of short sleep when compared to the retail sales industry (PR = 1.16; 95% CI = [1.03, 1.31]; Luckhaupt, Tak, & Clavert, 2010). This short sleep duration, and perhaps associated poor sleep quality, may in turn lead to a greater likelihood of suffering from symptoms of depression. Not only could depression lead to a lower quality of life (Baldwin et al., 2001; Brummett et al., 2006; Carter, 2002), but it also could have a negative influence on work-life, by lowering performance (Dawson & Reid, 1997; Vila & Kenney, 2002).

This study investigates the cross-sectional association between sleep quality and depressive symptoms among police.

METHOD

A study involving health outcomes associated with stress among police officers includes analysis of the research question under study: is sleep quality associated with depression? Three hundred ninety-one officers from the Buffalo, New York Police Department reported on sleep and depression

by completing the Pittsburgh Sleep Quality Index (PSQI) and the Center for Epidemiological Studies Depression (CES-D) questionnaires (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989; Radloff, 1977). Data were collected from 2004 through 2009. Informed consent was obtained from all participants in the study. This study was approved by the State University of New York at Buffalo's Internal Review Board. The population size of the Buffalo Police Department was non-stationary throughout the data collection period, but was 710 at the beginning of the study in 2004. A total of 464 officers were examined during this period. Among the 464 officers, 41 were missing either PSQI or CES-D data and were excluded from analysis. Another 32 officers were retired when the data were collected and were also excluded from analysis, resulting in a final sample size of 391.

Assessment of Sleep Quality

Sleep quality was assessed using the PSQI, an instrument that has been shown to have high internal consistency, reliability, and validity (Beck, Schwartz, Towsley, Dudley, & Barsevick, 2004; Knutson, Rathouz, Yan, Liu, & Lauderdale, 2006; Smyth, 2003). Participants completed the questionnaire based on their sleep behaviors in the past month. The questionnaire uses a series of nine questions, some of which have multiple parts. Five of these questions use a Likert scale ranging from 0 to 3, indicating the frequency of the sleep problem (0 = not during the past month; 1 = less than once a week; 2 = once or twice a week; 3 = three or more times a week). The answers to the nine questions are used to determine the scores of seven components that make up the PSQI: subjective sleep quality (a self rating of overall sleep quality); sleep latency (how long it takes to fall asleep after going to bed); sleep duration (how many hours of actual sleep per night); habitual sleep efficiency (number of hours of sleep divided by the number of hours of being in bed); sleep disturbances (waking up too early, bathroom use, cannot breathe comfortably, cough or snore loudly, feeling too hot or cold, having bad dreams, or having pain); use of sleep medication (frequency of sleep medication use, either prescribed or over-the-counter, within the past month); and daytime dysfunction (trouble staying awake or having the enthusiasm to get things done).

These seven components also incorporate Likert scores that range from 0 to 3. These component scores are then summed to give an overall global PSQI score, ranging from 0 to 21. This score can be used as a continuous variable, but also is used to differentiate between poor quality sleep (a score of five or higher) and good quality (a score of four or lower) sleep.

Assessment of Depressive Symptoms

Depressive symptoms were assessed using the CES-D, a self-report instrument commonly used to measure a participant's level of depressive symptoms in the past week. It consists of twenty questions, each of which uses a Likert scale ranging from 0 to 3, with higher scores indicating an increased frequency of the depressive symptom over the past week (0 = less than once a day; 1 = one to two days out of the week; 2 = three to four days out of the week; 3 = five to seven days out of the week). The sum of the scores for the twenty questions gives an overall CES-D score ranging from 0 to 60. This score can be used as a continuous number, but also is used to identify possible depression in participants, when the score is 16 or higher.

Assessment of Covariates

Officers were given self- and interviewer-administered questionnaires to provide information on demographic characteristics, lifestyle behaviors, and medical history. The following variables were selected as covariates based on the literature, biological plausibility, or statistical significance. For smoking status, participants were categorized as *never smokers, current smokers,* or *former smokers*. Marital status included six categories which were collapsed into three groups (single, divorced, and married). Educational status was categorized as *<12 years of school to graduate degree.* These categories were collapsed into three levels (high school or less, less than four years of college, and four or more years of college). Waist circumference, measured as distance around the waist in centimeters, and number of alcohol drinks per week (one drink being defined as a 12 ounce bottle of beer, one medium sized glass of wine, or one shot of liquor) were also categorized by ordered tertiles. Medication use was determined from actual medications that particpants reported taking in the previous two weeks. Sleep medication was defined as prescription medications specifically used for sleep.

Statistical Analysis

Statistical methods included univariate analyses, Pearson and Spearman correlations, analyses of variance (ANOVAs), and analyses of covariance (ANCOVAs). The variable of

interest was the mean CES-D score, as it associated with the PSQI scores. Global PSQI and the seven components were analyzed both as continuous variables and by ordination. PSQI global scores were categorized into quintiles, for descriptive clarity. The lowest quintile was composed of global scores 0-4, reflecting the "good sleep quality" group. The other four quintiles were established to have approximately equal sample sizes (PSQI score ranges 5-6, 7-8, 9-11, and 12+, respectively). Components of the PSQI were categorized by the participant's component score, resulting in values of 0, 1, 2, and 3, reflecting increasing frequency or intensity of the sleep condition.

Bivariate associations between PSQI scores or CES-D scores and selected covariates were assessed using Pearson's and Spearman's correlation and ANOVAs. Means, standard deviations, and p-values obtained from ANOVA/ANCOVA models were used to assess associations between PSQI and CES-D scores. The *p*-values for linear trend in mean CES-D values across PSQI scores were based on linear regression. For PSQI components yielding ordered categories linear contrasts were used.

Effect modification for categorical covariates, including gender, were assessed, setting statistical significance at an alpha level of 0.20 for interaction, to account for the decreased statistical power when assessing interaction terms. All data were analyzed using SAS version 9.1 (SAS Institute, Inc., 2008).

RESULTS

The study sample included 107 policewomen and 284 policemen with a mean age of 40.7 years (Table 1). The majority of participants were white (78.2%) and had received some college education (90.0%). 17.2% of participants reported that they were current smokers; 16.8% of female participants and 10.2% of male participants had a CES-D score of sixteen or greater, indicating possible depression; 71.0% of female and 64.4% of male participants had a PSQI score of five or greater, indicating poor sleep quality.

Analyses of variance showed that several specific components (habitual sleep efficiency and daytime dysfunction, as well as sleep disturbances being borderline non-significant) were significantly higher for women than men (Table 1). There were no statistically significant differences between men and women for the components subjective sleep quality, sleep latency, sleep duration, or use of medication, as well as global PSQI score.

Associations between covariates and CES-D scores are shown in Table 2. Few of the covariates were significantly associated with CES-D scores, although alcohol intake was for both male officers ($p = 0.020$) and female officers ($p = 0.031$). Antidepressant use was also significantly associated with CES-D scores for both men ($p = 0.005$) and women ($p = 0.002$).

There were strong correlations between CES-D scores and the PSQI global score and the seven PSQI components (data not shown, *p*-values < 0.001). All tests for interaction, with the above listed covariates, were not statistically significant *(p*-interaction > 0.20). Although the test for interaction between gender and sleep was not significant ($p = 0.781$), the results are presented separately for men and women to provide results for both genders, given the limited availability of findings for female officers.

Among male officers, mean CES-D values increased significantly across increasing quintiles of PSQI score (4.72, 5.60, 7.88, 12.67, and 12.65 respectively; p for trend < 0.001; Table 3). The results were similar for female officers, with mean CES-D values increasing significantly across increasing quintiles of PSQI score (5.53, 6.21, 13.08, 10.88, 12.63, respectively; *p* for trend = 0.001).

Results were similar for male officers when looking at mean CES-D scores across PSQI component levels, with significant results for the following components: subjective sleep quality (*p*-trend < 0.001), sleep latency (*p*-trend < 0.001), sleep duration (*p*-trend <0.001), sleep disturbances (*p*-trend < 0.001), use of sleep medication (*p*-trend < 0.001), and daytime dysfunction (*p*-trend < 0.001; Table 4).

These results were only slightly attenuated for men, although they still remained statistically significant, even after multivariate adjustment for possible confounders (age, sex, smoking status, number of alcohol drinks per week, marital status, and waist circumference), which were chosen a priori.

Female officers also had significantly increasing CES-D values across component scores, for the following components: subjective sleep quality (*p*-trend < 0.001), sleep latency (*p*-trend = 0.029 and daytime dysfunction (*p*-trend = 0.019), with sleep disturbances being borderline non-significant (*p*-trend = 0.052; Table 5).

The results for female officers were attenuated for the component sleep latency after multivariate adjustment. The results for the quintiles of the global score and other sig-

Table 1.
Demographic and lifestyle variables by gender, 2004-2009.

Values are means (standard deviations) for continuous variables and number (percent) for categorical variables.

Characteristc	All	Men	Women	*p*-value*
	N = 391	*n* = 284	*n* = 107	
Age (years)	40.70 (7.14)	40.72 (7.52)	40.64 (6.04)	0.924
Waist Circumference (cm)	93.81 (14.16)	99.03 (11.24)	80.11 (11.67)	<0.001
Alcohol Intake (drinks/week)	5.43 (9.20)	6.00 (10.07)	3.91 (6.11)	0.014
Race (%)				
Caucasian	301 (78)	222 (80)	79 (74)	0.053
African American	77 (20)	49 (18)	28 (27)	
Hispanic American	7 (2)	7 (2)	0 (0)	
Smoking Status (%)				
Current	67 (17)	39 (14)	28 (27)	<0.001
Former	89 (23)	59 (21)	30 (28)	
Never	233 (60)	186 (65)	47 (45)	
Education (%)				
High School or less	39 (10)	35 (12)	4 (4)	0.039
< 4 years of college	218 (56)	153 (54)	65 (61)	
≥ 4 years of college	133 (34)	95 (34)	38 (35)	
Marital Status (%)				
Single	52 (13)	27 (10)	25 (23)	<0.001
Married	284 (73)	222 (78)	62 (58)	
Divorced	55 (14)	35 (12)	20 (19)	
Antidepressant Use (%)	29 (7)	17 (6)	12 (11)	0.079
Sleep Medication (%)	7 (2)	4 (1)	3 (3)	0.513
CES-D Score	7.79 (7.08)	7.40 (6.58)	8.81 (8.21)	0.354
PSQI Global Score	6.46 (3.36)	6.27 (3.18)	6.94 (3.76)	0.102
PSQI Components				
Subjective Sleep Quality	1.36 (0.75)	1.35 (0.70)	1.36 (0.88)	0.897
Sleep Latency	1.13 (1.02)	1.12 (0.98)	1.16 (1.10)	0.734
Sleep Duration	1.05 (0.96)	1.05 (0.95)	1.05 (1.00)	0.956
Habitual Sleep Efficiency	0.45 (0.84)	0.39 (0.79)	0.60 (0.93)	0.039
Sleep Disturbances	1.28 (0.59)	1.25 (0.59)	1.37 (0.59)	0.058
Use of Medication	0.34 (0.82)	0.32 (0.84)	0.37 (0.80)	0.595
Daytime Dysfunction	0.85 (0.77)	0.79 (0.76)	1.03 (0.79)	0.006

**Based on difference between genders using t-tests (for continuous variables) and chi-square and Fisher's exact tests (for categorical variables).*

nificant components were slightly attenuated, but remained statistically significant.

Analyses were also performed after excluding all officers who were taking medications for depression and/or to aid sleep to determine whether results were similar after exclusion. Twenty-nine officers were taking medication for depression and seven officers were taking medication for sleep, with four of the officers taking medication for both. The trend and statistical significance for the association between CES-D and PSQI quintiles did not change for the remaining 359 officers.

Shift work was also analyzed, as it can have an impact on sleep quality. Shift work did not have an influence, as either a confounding variable or effect modifier, and was thus left out of the models (data not shown).

Table 2.
Associations of selected covariates with CES-D.

Covariate	Males*	*p*-value	Females*	*p*-value*
Age (years)	-0.002	0.976	-0.0002	0.999
Waist Circumference (cm)	0.023	0.709	0.105	0.286
Alcohol Intake (drinks/week)	0.140	0.020	0.211	0.031
Antidepressant Use				
Yes	11.76 (9.56)	0.065	15.61 (12.38)	0.002
No	7.12 (6.27)		7.95 (7.17)	
Sleep Medication Use				
Yes	13.25 (8.18)	0.073	14.67 (4.93)	0.212
No	7.32 (6.53)		8.64 (8.23)	
Race				
Caucasian	7.62 (6.93)	0.207	9.05 (7.75)	0.619
African American	5.81 (4.30)		8.14 (9.51)	
Hispanic American	7.89 (4.31)		n/a	
Smoking Status				
Current	9.15 (7.51)	0.200	8.94 (7.07)	0.999
Former	7.03 (6.59)		8.83 (8.58)	
Never	7.15 (6.34)		8.90 (8.86)	
Education				
High School or less	6.71 (5.63)	0.808	8.25 (9.98)	0.894
< 4 years of college	7.38 (6.87)		8.55 (6.83)	
≥ 4 years of college	7.56 (6.38)		9.32 (10.19)	
Marital Status				
Single	7.91 (7.50)	0.622	7.66 (5.23)	0.646
Married	7.20 (6.31)		8.91 (8.34)	
Divorced	8.26 (7.59)		9.95 (10.72)	

*Associations are Pearson correlation coefficients for continuous variables or mean (standard deviation) values for categorical variables.

‡Indicates a significant association at the 0.05 level, using correlation analyses for continuous variables and ANOVAs for categorical variables.

DISCUSSION

The results of this study show that in both male and female officers sleep quality is strongly associated with depression, with depressive symptom scores increasing as sleep quality worsens. These associations remained significant after adjustment for several covariates: age, smoking status, number of drinks per week, marital status, and waist circumference. These results are consistent with previous studies, including those that specifically use the PSQI and CES-D questionnaires, where: for patient caregivers, depressive symptoms are higher when sleep quality is worse, and that this association may be stronger in females (Carter, 2002); there was a statistically significant increase in PSQI-J (Pittsburgh Sleep Quality Index – Japanese version) scores in older adults who had depression symptoms, based on the Geriatric Depression Scale, versus those who were in the control (non-depressive) group (Sukegawa et al., 2003); a study looking at subjective sleep quality in suicidal and non-suicidal patients reported a significantly higher PSQI score for suicidal depressive patients over those who were non-suicidal, as well as increased scores in several of the PSQI's components (Agargun, Kara, & Solmaz, 1997); a study looking at sleep quality during pregnancy found that sleep problems, as measured by the PSQI, may be prospective risk factors for increases in depressive symptoms, as measured by the Beck Depression Inventory (Skouteris, Wertheim, Germano, Paxton, & Milgrom, 2009); Kuwaiti college students showed

Table 3.
Mean CES-D score by quintiles of PSQI score and gender.

Gender	PSQI Score	*n*	Unadjusted Mean (SD)	Age adjusted Mean (SE)	Multivariable Adjusted* Mean (SE)
Male	Glocal Score				
	0-4	101	4.72 (4.71)	4.72 (0.58)	4.89 (0.60)
	5-6	67	5.60 (4.41)	5.61 (0.71)	5.63 (0.74)
	7-8	46	7.88 (6.63)	7.87 (0.86)	7.76 (0.87)
	9-11	53	12.67 (7.78)	12.67 (0.80)	12.64 (0.81)
	12+	17	12.65 (6.77)	12.66 (1.41)	12.43 (1.56)
	p-trend‡		<0.001	<0.001	<0.001
Female	Global Score				
	0-4	31	5.53 (3.72)	5.53 (1.39)	5.34 (1.55)
	5-6	24	6.21 (7.28)	6.08 (1.60)	6.29 (1.69)
	7-8	13	13.08 (8.77)	12.95 (2.16)	12.73 (2.26)
	9-11	23	10.88 (9.72)	10.85 (1.62)	11.06 (1.72)
	12+	16	12.63 (9.79)	12.97 (2.02)	11.75 (2.30)
	p-trend		0.001	0.001	0.008

*Adjusted for age, smoking status, alcohol intake (drinks per week), marital status, and waist circumference.

‡*p*-trend obtained from linear regression.

significant correlations between insomnia and depression, as measured by the CES-D (El-Anzi, 2006).

This study also showed statistically significant associations for some of the PSQI's seven components. In men, a worsening of depressive symptoms tended to occur with higher component scores (lower sleep quality) of subjective sleep quality, sleep latency, sleep duration, sleep disturbances, use of medication, and daytime dysfunction. In women, it occurred with higher component scores of subjective sleep quality and daytime dysfunction.

Although mean values of CES-D did increase with increasing values of PSQI, most scores were still below the threshold for being at-risk for depression (CES-D $\geq$ 16).

One limitation of this study is that the design is cross-sectional. While our hypothesis follows biological theory that poor sleep could lead to depression, our study cannot make causal inferences.

This study has several strengths. The participation rate was relatively high, with nearly two-thirds of Buffalo police officers participating. Both the PSQI and the CES-D are validated instruments for measuring sleep quality and depression. Many possible confounding variables were available for adjustment, to ensure the validity of the reported association between PSQI and CES-D scores.

Another strength is that this study presents information on police officers, a population that is at high risk for poor sleep from work-related stress and shift work. The potential depressive symptoms that may result can have a negative impact on home and work life. This study also provides new information regarding women police officers, a population that has a scarcity of studies in the literature.

In summary, the results of this study show that as sleep quality gets worse, depressive symptoms do as well. In a profession that requires high levels of alertness, as well as sometimes requiring instantaneous decisions, it would be optimal if police officers were well rested, and thus have fewer depressive symptoms and correspondingly higher cognitive skills. For future investigations, the use of a prospective study design would enhance the inferences that could be drawn from these findings.

Table 4.
Mean CES-D score by PSQI component score for Male Officers.

PSQI	*n*	Unadjusted Mean (SD)	Age adjusted Mean (SE)	Multivariable Adjusted Mean (SE)
Subjective Sleep Quality				
0 (very good)	21	3.44 (2.78)	3.44 (1.35)	3.60 (1.43)
1 (fairly good)	158	5.99 (6.00)	5.98 (0.49)	6.04 (0.51)
2 (failry bad)	89	9.98 (6.83)	9.98 (0.65)	10.10 (0.67)
3 (very bad)	16	12.20 (6.99)	12.24 (1.55)	11.21 (1.65)
p-trend‡		<0.001	<0.001	<0.001
Sleep Latency				
0 (15 min)	87	5.92 (5.34)	5.92 (0.69)	6.17 (0.70)
1 (16-30 min)	111	6.59 (6.11)	6.59 (0.61)	6.53 (0.64)
2 (31-60 min)	51	10.17 (8.15)	10.17 (0.90)	10.18 (0.90)
3 (> 60 min)	35	9.63 (6.71)	9.63 (1.08)	9.47 (1.12)
p-trend		<0.001	<0.001	0.001
Sleep Duration				
0 (> 7 hours)	98	6.62 (6.66)	6.63 (0.66)	6.74 (0.69)
1 (6-7 hours)	95	6.92 (5.98)	6.92 (0.67)	7.06 (0.68)
2 (5-6 hours)	69	7.75 (6.24)	7.75 (0.78)	7.83 (0.80)
3 (< 5 hours)	22	11.85 (8.21)	11.86 (1.38	11.17 (1.44)
p-trend		0.208	0.211	0.429
Habitual Sleep Efficiency				
0 (< 85%)	216	6.58 (6.03)	6.58 (0.44)	6.63 (0.45)
1 (75-84%)	39	10.49 (8.48)	10.49 (1.03)	10.71 (1.05)
2 (65-74%)	16	9.88 (6.14)	9.88 (1.62)	9.20 (1.68)
3 (3+/week)	13	8.74 (6.45)	8.74 (1.80)	8.85 (1.81)
p-trend		0.315	0.317	0.388
Sleep Disturbances				
0 (0 times)	18	3.06 (3.15)	2.98 (1.48)	3.20 (1.55)
1 (<1/week)	183	6.42 (5.91)	6.42 (0.46)	6.49 (0.47)
2 (1-2/week)	78	10.34 (7.43)	10.36 (0.71)	10.50 (0.74)
3 (3+/week)	5	13.00 (5.39)	13.01 (2.79)	11.70 (3.16)
p-trend		<0.001	<0.001	<0.001
Use of Medication				
0 (0 times)	240	6.84 (6.15)	6.84 (0.42)	6.85 (0.42)
1 (<1/week)	16	7.75 (7.01)	7.75 (1.61)	8.10 (1.61)
2 (1-2/week)	8	11.63 (6.97)	11.64 (2.28)	11.75 (2.28)
3 (3+/week)	20	12.15 (8.78)	12.15 (1.44)	12.83 (1.51)
p-trend		<0.001	<0.001	<0.001
Daytime Dysfunction				
0 (0 times)	108	4.12 (4.05)	4.11 (0.56)	4.03 (0.59)
1 (<1/week)	137	8.19 (6.46)	8.19 (0.50)	8.27 (0.50)
2 (1-2/week)	30	13.57 (7.25)	13.66 (1.07)	14.11 (1.11)
3 (3+/week)	9	14.11 (7.85)	14.05 (1.94)	13.69 (2.08)
p-trend		<0.001	<0.001	<0.001

**Adjusted for age, smoking status, alcohol intake (drinks/week), marital status, and waist circumference.*
‡*p*-trend obtained from linear contrast for all PSQI components except for sleep duration, where linear regression was used.

Table 5.
Mean CES-D score by PSQI component score for Female Officers.

PSQI	*n*	Unadjusted Mean (SD)	Age adjusted Mean (SE)	Multivariable Adjusted Mean (SE)
Subjective Sleep Quality				
0 (very good)	19	5.00 (2.87)	5.00 (1.73)	5.43 (1.92)
1 (fairly good)	40	6.31 (6.01)	6.31 (1.19)	6.02 (1.26)
2 (failry bad)	38	11.35 (8.90)	11.35 (1.22)	10.78 (1.30)
3 (very bad)	10	16.40 (12.04)	16.41 (2.38)	17.11 (2.47)
p-trend‡		<0.001	<0.001	<0.001
Sleep Latency				
0 (15 min)	39	6.50 (5.29)	6.48 (1.28)	6.55 (1.38)
1 (16-30 min)	30	8.10 (7.86)	8.11 (1.46)	8.06 (1.54)
2 (31-60 min)	20	13.25 (10.57)	13.24 (1.78)	13.59 (1.90)
3 (> 60 min)	18	10.07 (9.44)	10.11 (1.90)	9.08 (2.09)
p-trend		0.017	0.030	0.107
Sleep Duration				
0 (> 7 hours)	42	8.41 (6.70)	8.39 (1.29)	8.28 (1.43)
1 (6-7 hours)	27	8.37 (8.36)	8.34 (1.61)	8.55 (1.67)
2 (5-6 hours)	29	9.08 (8.94)	9.11 (1.55)	9.00 (1.65)
3 (< 5 hours)	9	11.11 (12.15)	11.20 (2.81)	10.36 (2.99)
p-trend		0.352	0.343	0.521
Habitual Sleep Efficiency				
0 (< 85%)	69	7.53 (7.15)	7.43 (0.98)	7.59 (1.05)
1 (75-84%)	19	13.70 (12.02)	13.85 (1.85)	13.94 (2.08)
2 (65-74%)	12	7.50 (4.85)	7.78 (2.36)	7.05 (2.57)
3 (3+/week)	7	10.43 (5.71)	8.74 (1.80)	9.14 (3.42)
p-trend		0.802	0.756	0.842
Sleep Disturbances				
0 (0 times)	5	5.40 (2.41)	5.33 (3.33)	6.09 (3.59)
1 (<1/week)	58	5.78 (5.27)	5.75 (0.98)	5.86 (1.06)
2 (1-2/week)	43	13.06 (9.84)	13.11 (1.14)	12.82 (1.23)
3 (3+/week)	1	13.00 (5.39)	18.73 (7.47)	n/a
p-trend		0.052	0.055	0.083
Use of Medication				
0 (0 times)	84	8.88 (8.47)	8.87 (0.90)	9.09 (0.95)
1 (<1/week)	10	5.40 (5.38)	5.35 (2.62)	4.71 (2.71)
2 (1-2/week)	9	11.22 (8.51)	11.36 (2.81)	9.80 (3.12)
3 (3+/week)	4	10.50 (7.33)	10.46 (4.13)	9.75 (4.51)
p-trend		0.419	0.417	0.622
Daytime Dysfunction				
0 (0 times)	28	6.40 (7.56)	6.40 (1.51)	6.10 (1.64)
1 (<1/week)	52	8.09 (7.70)	8.09 (1.11)	8.00 (1.14)
2 (1-2/week)	23	12.26 (8.76)	12.26 (1.67)	11.92 (1.76)
3 (3+/week)	4	15.25 (9.18)	15.25 (3.99)	17.10 (4.28)
p-trend		0.019	0.020	0.009

**Adjusted for age, smoking status, alcohol intake (drinks/week), marital status, and waist circumference.*
‡*p*-trend obtained from linear contrast for all PSQI components except for sleep duration, where linear regression was used.

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Cancer Incidence Among Police Officers in a U.S. Northeast Region: 1976-2006

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Abstract: Police officers are exposed to occupational hazards which may put them at increased risk of cancer. We examined the incidence of cancer in a cohort of 2,234 white-male police officers in Buffalo, New York. The study population was followed for 31 years (1976-2006). The incidence of cancer, ascertained using a population-based tumor registry, was compared with 9 US regions using the Surveillance Epidemiology and End Results (SEER) program data. Four hundred and six officers (18.2%) developed cancer between 1976 and 2006. The risk of overall cancer among police officers was found to be similar to the general white-male population (Standardized Incidence Ratio [SIR] = 0.94, 95%, Confidence Interval [CI] = 0.85-1.03). An elevated risk of Hodgkin's lymphoma was observed relative to the general population (SIR = 3.34, 95%, CI = 1.22-7.26). The risk of brain cancer, although only slightly elevated relative to the general population (SIR = 1.61, 95%, CI = 0.73-3.05), was significantly increased with 30 years or more of service (SIR = 2.92, 95%, CI = 1.07-6.36). Incidence ratios were significantly lower than expected for skin and bladder cancer. Police officers were at increased risk of Hodgkin's lymphoma overall and of brain cancer after 30 years of service. [International Journal of Emergency Mental Health, 2011, 13(4), pp. 279-289]

Key words: *Incidence; cancer; law enforcement officers; epidemiology; employment; occupational health.*

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Research studies have demonstrated an increased risk of mortality for several cancers among police. Excess mortality has been found for cancers of the colon, bladder, kidney, trachea, lung, digestive organs, and for melanoma and non-Hodgkin's lymphoma (Forastiere et al., 1994; Violanti, Vena, & Petralia, 1998; Rosenstock, Demers, Heyer, & Barnhart,

1990). This increased risk of cancer mortality may be due to their occupational exposures. Police officers are routinely exposed to radiation from radar guns (Lotz, Rinsky, & Edwards, 1995; Breckenkamp, Berg, & Blettner, 2003; Finkelstein, 1998; Davis & Mostofi, 1993; Cherry, 2001; Van Netten, Brands, Hoption Cann, Spinelli, & Sheps, 2003), air pollution (Burgaz, Demircigil, Karahalil, & Karakaya, 2002; Carere, Andreoli, & Galati, 2002; Lepardi et al., 2003), ultraviolent-radiation (Ramirez, Federman, & Kirsner, 2005), and are sometimes exposed to chemical hazards (Thrasher, Von Derau, & Burgess, 2009; Pilidis, Karakitsios, Kassomenos, Kazos, & Stalikas, 2009). Other occupational exposures which may increase officers' risk for cancer include psychological stress (Andrew et al., 2008) and shift work (Gordon, Cleary, Parker, & Czeisler, 1986). The International Agency for Research on Cancer (IARC) has concluded that shift work is a carcinogen (IARC, 2010). Lifestyle factors which may increase the risk for cancer include obesity (Ramey, Downing, & Franke, 2009), decreased physical activity (Richmond, Wodak, Kehoe, & Heather, 1998), sleep deprivation and poor sleep quality (Stevens et al., 2011; Burch et al., 2007), smoking (Sasco, Secretan, & Straif, 2004), and consumption of alcohol (Boffetta & Hashibe, 2006).

The majority of studies of police officers and cancer have been based on mortality. To our knowledge, only a few studies have been published on cancer incidence in police officers. An excess risk of prostate cancer was observed among fire fighters and police officers in Washington State during 1944-1979 (Demers et al., 1992). Another study conducted in Washington State reported increased incidence of testicular cancer (Davis and Mostofi, 1993). Two Canadians studies reported an increased incidence of testicular, skin, and other cancers among police officers (Finkelstein, 1998; Van Netten et al., 2003). Lope and colleagues (2005) reported increased risk for thyroid cancer among Swedish police officers, and a case-cohort study conducted in the Netherlands reported a substantial (67%) increase in prostate cancer risk for each decade of police work (Zeegers, Friesema, Goldbohm, & Van den Brandt, 2004). Therefore, the goal of this paper is to examine the incidence of cancer for police officers in a US northeast metropolitan city and compare this with the U.S. population, using Surveillance Epidemiology and End Results (SEER) data obtained from the National Cancer Institute.

MATERIALS AND METHODS

Study Population

A list of Buffalo police officers (N = 3,391) who worked at least 5 years as officers in the city of Buffalo between 1950 and 2005 was sent to the New York State Cancer Registry (NYSCR) where it was linked with NYSCR data. The period of investigation for cancer incidence was from January 1, 1976 to December 31, 2006. NYSCR provided cancer case, date of diagnosis, site, tumor's histology, and a recode value that converts site and histology to specific types of cancer. The target population included all white male officers who worked at least 5 years as a city employee of Buffalo between 1950 and 2005. Exclusions included female officers (n = 298) and non-white officers (n = 205) because of relatively small numbers of individuals, officers who died before January 1, 1976 (n = 610) when the follow-up for the cancer incidence analysis started, and those who did not have birth date and hire date information (n = 44), leaving a total of 2,234 officers in the study population.

Person-Years at Risk

The cumulated person-years for each officer began the first day of the study (January 1, 1976) or the date when 5 years of employment was achieved, and ended on the date of cancer diagnosis, date of death, date of loss to follow-up, or the end of the study period (December 31, 2006), whichever occurred first. The person-years at cancer risk contributed by each officer were classified into 14 age groups (22-24, 25-29, 30-34, 35-39, … …, 80-84, 85+) and 7 calendar year groups (1976-79, 1980-84, 1985-89, 1990-94, 1995-99, 2000-04, 2005-06).

Age-and calendar year-specific cancer incidence rates for US population

SEER 9 registries from the National Cancer Institute is a surveillance data set available since 1973 and is provided by the National Cancer Institute (2009). One of the main goals of SEER was to collect complete and accurate data on all cancers diagnosed among residents of the geographic area covered by SEER cancer registries. The data set includes information on demographics and cancer diagnosis from nine US regions: Atlanta, Connecticut, Detroit, Hawaii, Iowa, New Mexico, San Francisco-Oakland, Seattle-Puget Sound, and Utah. SEER 9 registries cover 9.2% of the US population based on the year 2000.

Statistical Analysis

Expected numbers of cancer cases were calculated based on 5-year age- and calendar year- specific incidence rates multiplied by the cohort's person-years in each specific stratum. The Standardized Incident Rate (SIR) for a specific type of cancer was obtained by dividing the total number of observed cases by the corresponding total expected number. The statistical significance of the difference between observed and expected numbers was determined by the Mantel-Haenszel chi-square test with 1 degree of freedom, and the 95% confidence intervals (CIs) were calculated for the SIR point estimates (Rothman & Boice, 1979).

RESULTS

A total of 2,234 white male officers were enrolled in this study; 1,214 (54.3%) were still alive at the end of follow-up, December 31, 2006 (Table 1). Table 1 shows the distribution of several characteristics such as vital status and occupational factors. Four hundred and six officers (18.2%) developed cancer between 1976 and 2006. Eighty-two percent of officers had been hired before the age of 30, and 76% were in service for 20 or more years. Approximately 66% of those first diagnosed with cancer were diagnosed between the ages of 55 and 74 years, and the mean age of diagnosis was 65.7 years. Multiple malignancies were observed in 46 officers during the period. Our analyses were based on the first occurrence.

The age- and calendar year- adjusted SIRs and 95% CIs for officers are presented in Table 2. The overall number of observed cancer incident cases for white male officers was similar to the number expected (SIR = 0.94, 95% CI = 0.85-1.03) based on the US white male population. Of the 18 lymphomas observed, a third (n = 6) were Hodgkin's lymphomas; the other two thirds (n = 12) were non-Hodgkin's lymphomas. The incidence of Hodgkin's lymphoma was significantly greater than that which would be expected for the white male population (SIR = 3.34, 95% CI = 1.22-7.26). Slightly increased incidence ratios were observed for kidney (SIR = 1.56, 95% CI = 0.94-2.43), brain (SIR = 1.61, 95% CI = 0.73-3.05), and thyroid cancer (SIR = 1.99, 95% CI =0.64-4.64), although none of the excesses were statistically significant. In contrast, incidence ratios were significantly decreased for skin (SIR = 0.54, 95% CI = 0.26-0.98) and bladder cancer (SIR = 0.64, 95% CI = 0.39-0.99). No excess risk was found for cancer of the digestive system (SIR = 1.01, 95% CI = 0.81-1.24) and respiratory system (SIR = 0.97, 95% CI = 0.77-1.20). Among digestive system cancers, esophagus (SIR = 1.39, 95% CI = 0.60-2.73), stomach (SIR = 1.28, 95% CI = 0.66-2.24), and rectal cancer (SIR = 1.22, 95% CI = 0.67-2.05) were slightly elevated yet not statistically significant, while colon (SIR = 0.80, 95% CI =0.53-1.14), liver (SIR = 0.82, 95% CI = 0.16-2.39), and pancreatic cancer (SIR = 0.87, 95% CI = 0.40-1.66) were slightly decreased.

Table 3 displays all cancer incidence ratios by characteristics related to employment as a police officer. The younger age groups had slightly higher cancer rates (SIR = 1.15 for ages 22-54, SIR = 1.16 for ages 55-64) than the older age groups (SIR = 0.91 for ages 65-74, SIR = 0.67 for ages 75+). Cancer incidence decreased significantly with increasing age at diagnosis ($P < 0.001$). The cancer incidence ratio was higher in years 2000-06 than in the previous years.

Cancer incidence by years of police service is presented in Table 4. There were no statistically significant elevated risks for site-specific cancer, except for brain cancer among officers with 30 years or more of service (SIR = 2.92, 95% CI = 1.07-6.36). The risk of Hodgkin's lymphoma (SIR = 5.23, 95% CI = 1.68-12.19) was increased among officers with less than 30 years of latency (data not shown).

DISCUSSION

This study examined overall and site-specific cancer incidence among a cohort of white male police officers in Buffalo, New York. Overall, police officers had slightly lower cancer rates than the general population. Finkelstein (1998) stated in his research of Ontario police officers that the lower rate may be reflective of the "healthy worker effect" and may also be partly attributable to failure to ascertain diagnoses among officers who emigrated from the study.

This study revealed elevated risks in some analyses for brain cancer and Hodgkin's lymphoma, but not for skin and prostate cancer. Brain cancer was significantly elevated among those with 30 years or more of service. In a study of Ontario police officers, the incidence of melanoma was increased, while the incidence of brain cancer and Hodgkin's disease were not elevated (Finkelstein, 1998). Violanti and colleagues (1998), in the 1950-1990 Buffalo police cohort mortality study, reported excess mortality for Hodgkin's disease and slight but not significant elevations in brain cancer and leukemia. Vena and colleagues (2011) extended that study for the Buffalo police cohort through 2005, and found that mortality from brain cancer, Hodgkin's lymphoma, and leukemia were significantly higher than expected.

Table 1.
Characteristics of Buffalo police officers by cancer status

	Cancer (N=406)		No Cancer (N=1,828)		All (N=2,234)	
Characteristic	N	(%)	N	(%)	N	(%)
Vital status						
Alive	140	(43.5)	1,074	(58.8)	1,214	(54.3)
Deceased	266	(65.5)	644	(35.2)	910	(40.7)
Loss to follow-up	0	(0.0)	110	(6.0)	110	(4.9)
Age hired as police officer						
<=24	131	(32.3)	706	(38.6)	837	(37.5)
25-29	189	(46.6)	815	(44.6)	1,004	(44.9)
30-34	75	(18.5)	243	(13.3)	318	(14.2)
35+	11	(2.7)	64	(3.5)	75	(3.4)
Calendar year of hire						
<1950	145	(35.7)	463	(25.3)	608	(27.2)
1950-1959	136	(33.5)	322	(17.6)	458	(20.5)
1960-1969	98	(24.1)	427	(23.4)	525	(23.5)
1970-1979	18	(4.4)	163	(8.9)	181	(8.1)
1980-1989	8	(2.0)	266	(14.6)	274	(12.3)
1990-1999	1	(0.3)	169	(9.3)	170	(7.6)
2000-2005	0	(0.0)	18	(1.0)	18	(0.8)
Length of police service						
5-9	12	(3.0)	152	(8.3)	164	(7.3)
10-19	48	(11.8)	328	(17.9)	376	(16.8)
20-29	155	(38.2)	708	(38.7)	863	(38.6)
30-39	174	(42.9)	569	(31.1)	743	(33.3)
40+	17	(4.2)	71	(3.9)	88	(3.9)
Person-years by age group						
25-34	11	(0.2)	104	(0.3)	115	(0.3)
35-44	135	(2.0)	2,248	(6.3)	2,248	(5.6)
45-54	502	(7.5)	5,600	(15.7)	6,101	(14.4)
55-64	2,027	(30.3)	9,330	(26.1)	11,164	(26.8)
65-74	2,391	(35.7)	8,773	(24.6)	10,792	(26.3)
75-84	1,344	(20.1)	6,898	(19.3)	8,243	(19.4)
85+	289	(4.3)	2,746	(7.7)	3,035	(7.2)
Total	6,698	(100.0)	35,699	(100.0)	42,398	(100.0)
Age at cancer diagnosis						
<=54	60	(14.8)				
55-74	269	(66.2)				
75+	77	(19.0)				
	Mean	(SD)	Mean	(SD)	Mean	(SD)
Years of Police Service	28.1	(8.1)	25.2	(9.4)	25.7	(9.2)
Age at cancer diagnosis	65.7	(10.8)		N/A		N/A

Table 2.
Cancer incidence in Buffalo police officers, 1976-2006.

Cancer Sites (ICD-O-3[1])	Observed	Expected	SIR	95% CI
All Cancers	406	432.52	0.94	0.85-1.03
Buccal cavity and pharynx (C000-C148)	10	15.23	0.66	0.31-1.21
Digestive system (C150-C269, C480-C488)	89	88.14	1.01	0.81-1.24
Esophagus (C150-C159)	8	5.77	1.39	0.60-2.73
Stomach (C160-C169)	12	9.35	1.28	0.66-2.24
Colon (C180-C189)	29	36.47	0.80	0.53-1.14
Rectum (C209)	14	11.44	1.22	0.67-2.05
Liver (C220)	3	3.66	0.82	0.16-2.39
Pancreas (C250-C259)	9	10.32	0.87	0.40-1.66
Respiratory system (C320-C399)	83	85.81	0.97	0.77-1.20
Lung and Bronchus (C340-C349)	69	76.03	0.91	0.71-1.15
Skin (C440-C449)	10	18.68	0.54	0.26-0.98*
Prostate (C619)	104	118.13	0.88	0.72-1.07
Urinary System (C649-C689)	40	44.65	0.90	0.64-1.22
Bladder (C670-C679)	20	31.22	0.64	0.39-0.99*
Kidney (C649, C659)	19	12.19	1.56	0.94-2.43
Brain (C710-C719)	9	5.61	1.61	0.73-3.05
Thyroid (C739)	5	2.52	1.99	0.64-4.64
Lymphoma[2]	18	18.01	1.00	0.59-1.58
Hodgkin's lymphoma[2]	6	1.80	3.34	1.22-7.26*
Non-Hodgkin's lymphoma[2]	12	16.21	0.74	0.38-1.29
Leukemia[2]	15	12.35	1.21	0.68-2.00

[1]International Classification of Disease for Oncology, 3rd Edition, 2000. Classified using site code.

[2]Classified using ICD-O-3 Histology. ** Statistical significance*

Most police officers, except executives and detectives, engage in the widespread use of radio transmissions and radar during the work hours, and could be exposed for long periods of time. Police speed enforcement radar devices generate a continuous wave reference frequency in X-band (10.50 - 10.55 Ghz), K-band (24.05 - 24.250 Ghz), or Ka-band (33.4 - 36.0 Ghz) (US. Department of Transportation, 2007) and transmit nonionizing electromagnetic frequency. There is some evidence that emissions from radar may increase testicular cancer (van Netten et al., 2003; Davis & Mostofi, 1993; Lotz et al., 1995), melanoma (Findelstein et al., 1998; Lotz et al., 1995; van Netten et al., 2003), brain cancer (Cherry, 2001; Lotz et al., 1995), lymphatic & hematopoietic system cancer (Szmigielski, 1996), and leukemia (Van Netten et al., 2003; Groves et al., 2002).

Police officers are also likely to be exposed to several kinds of chemicals through cleaning firearms, using fingerprint powder in forensic work, and being exposed to toxic chemicals such as carbon monoxide, lead, benzene, sulfur dioxide, particulate matter, and nitrogen dioxide in highway and street duties, which may lead to an increased risk of these diseases (Violanti et al., 1998; Burgaz et al., 2002; Proietti et al., 2005; Vimercati et al. 2006). Cherry (2001) also evaluated those who were exposed for a long period of time to microwaves from police radar and found a significantly increased risk of astrocytoma. Breckenkamp and colleagues (2003) found excess risk of brain tumors and leukemia in police. It is possible that some of the police officers in our study had served in the Vietnam and Korean wars and may have been exposed to Agent Orange. Agent

Table 3.
Cancer incidence by selected characteristics, 1976-2006.

Characteristic	Observed	Expected	SIR	95% CI
Age at Employment				
<=24	131	124.05	1.06	0.88-1.25
25-29	189	212.10	0.89	0.77-1.03
30+	86	96.37	0.89	0.71-1.10
P-value for trend			0.312	
Employment				
0-19	60	56.33	1.07	0.81-1.37
20-29	155	273.90	0.89	0.76-1.04
30+	191	202.29	0.94	0.82-1.09
P-value for trend			0.372	
Age at Cancer Diagnosis				
22-54	60	52.00	1.15	0.88-1.49
55-64	127	109.16	1.16	0.97-1.38
65-74	142	156.39	0.91	0.76-1.07
75+	77	114.97	0.67	0.53-0.84*
P-value for trend			<0.001	
Calendar Year				
1976-1979	39	43.33	0.90	0.64-1.23
1980-1984	56	61.83	0.91	0.68-1.18
1985-1989	65	71.95	0.90	0.70-1.15
1990-1994	69	81.31	0.85	0.66-1.07
1995-1999	69	75.27	0.92	0.71-1.16
2000-2004	75	72.56	1.03	0.81-1.30
2005-2006	33	26.28	1.26	0.86-1.76
P-value for trend			0.194	
Latency †				
0-29	69	72.81	0.95	0.74-1.20
30-39	146	142.99	1.02	0.86-1.20
40+	191	226.72	0.88	0.76-1.02
P-value for trend			0.965	

** Statistical significance* † *Latency: years from onset of work to cancer diagnosis*

Orange was contaminated with a toxic dioxin compound, 2,3,7,8-tetrachlorodibenzodioxin (TCDD), and was used as a herbicide and defoliant during the Vietnam war (1961-1971) and in the Korean Demilitarized Zone (DMZ) in the late 1960s and early 1970s (United States, Department of Veterans Affair [US DOVA], 2011a; Kang et al., 1991). Veterans who were exposed to Agent Orange had higher rates of leukemia, Hodgkin's lymphoma and non-Hodgkin's lymphoma, and cancers of the brain, lung, throat, and liver (Breslin, Kang, Lee, Burt, & Shepard, 1988; Thomas & Kang, 1990; US DOVA, 2011b).

Police officers may frequently come in contact with persons who might be infected with a virus. Epstein-Barr virus is a common contagious virus and in some cases could result in the development of Hodgkin's lymphoma, Burkitt's lymphoma, and nasopharyngeal cancer (CDC, 2006; Schottenfeld & Fraumeni, 2006; Pattle & Farrell, 2006; Veltri, Shah, McClung, Klingberg, & Sprinkle, 1983).

A slightly elevated risk of kidney cancer was found in our study, but it was not statistically significant. Forastiere et al. (1994) and Violanti et al. (1998) also reported some

Table 4.
Site-specific cancer standardized incidence ratios by years of police service.

Cancer Sites	Years of Service								
	0-19			20-29			30+		
	Obs	Exp	SIR (95%CI)	Obs	Exp	SIR (95%CI)	Obs	Exp	SIR (95%CI)
All Cancers	60	56.33	1.07 (0.81- 1.37)	155	173.90	0.89 (0.76- 1.04)	191	202.29	0.94 (0.82- 1.09)
Buccal cavity and pharynx	2	2.38	0.85 (0.09- 3.03)	4	6.60	0.61 (0.16- 1.55)	4	6.24	0.64 (0.17- 1.64)
Digestive system	12	10.61	1.14 (0.58- 1.98)	31	34.69	0.89 (0.61- 1.27)	46	42.84	1.07 (0.79- 1.43)
Esophagus	1	0.69	1.46 (0.02- 8.07)	2	2.44	0.82 (0.09- 2.96)	5	2.64	1.90 (0.61- 4.42)
Stomach	1	1.17	0.86 (0.01- 4.77)	5	3.63	1.38 (0.44- 3.21)	6	4.56	1.32 (0.48- 2.87)
Colon	4	4.20	0.96 (0.26- 2.44)	7	13.86	0.51 (0.20- 1.04)	18	18.41	0.98 (0.58- 1.55)
Rectum	4	1.44	2.79 (0.75- 7.11)	5	4.63	1.08 (0.35- 2.52)	5	5.37	0.93 (0.30- 2.17)
Liver	0	0.45	-	1	1.55	0.64 (0.01- 3.58)	2	1.65	1.21 (0.14- 4.37)
Pancreas	2	1.23	1.64 (0.18- 5.88)	3	4.13	0.73 (0.15- 2.12)	4	4.96	0.81 (0.22- 2.06)
Respiratory system	9	10.46	0.86 (0.39- 1.63)	31	34.87	0.89 (0.60- 1.26)	43	40.49	1.06 (0.77- 1.43)
Lung and Bronchus	7	9.11	0.77 (0.31- 1.58)	27	30.73	0.88 (0.58- 1.28)	35	36.20	0.97 (0.67- 1.34)
Skin	1	4.47	0.23 (0.00- 1.24)	3	7.95	0.38 (0.08- 1.10)	6	6.25	0.96 (0.35- 2.09)
Prostate	13	11.27	1.15 (0.61- 1.97)	49	47.17	1.04 (0.77- 1.37)	42	59.68	0.70 (0.51- 0.95)
Urinary System	7	5.52	1.28 (0.51- 2.61)	13	17.98	0.72 (0.38- 1.24)	20	21.15	0.95 (0.58- 1.46)
Bladder	2	3.63	0.55 (0.06- 1.99)	6	12.23	0.49 (0.18- 1.07)	12	15.36	0.78 (0.40- 1.37)
Kidney	5	1.75	2.85 (0.92- 6.66)	7	5.29	1.32 (0.53- 2.73)	7	5.15	1.36 (0.54- 2.80)
Brain	2	1.20	1.67 (0.19- 6.03)	1	2.36	0.42 (0.01- 2.36)	6	2.05	2.92 (1.07- 6.36)*
Thyroid	3	0.72	4.16 (0.84-12.17)	0	1.08	-	2	0.72	2.77 (0.31-10.02)
Lymphoma	4	3.48	1.15 (0.31- 2.94)	8	7.41	1.08 (0.46- 2.13)	6	7.11	0.84 (0.31- 1.84)
Hodgkin's lymphoma	2	0.67	2.99 (0.34-10.78)	3	0.66	4.57 (0.92-13.36)	1	0.47	2.12 (0.03-11.79)
Non-Hodgkin's lymphoma	2	2.81	0.71 (0.08- 2.57)	5	6.76	0.74 (0.24- 1.73)	5	6.64	0.75 (0.24- 1.76)
Leukemia	2	1.75	1.14 (0.13- 4.13)	7	4.84	1.45 (0.58- 2.98)	6	5.75	1.04 (0.38- 2.27)

** Statistical significance*

elevation in kidney cancer mortality (SMR = 1.39, 95% CI = 0.56-2.8; SMR = 2.08, 95% CI = 1.00-2.88 respectively) in police officers. The American Cancer Society (2010) includes the following as risk factors for kidney cancer: smoking, obesity, and the chemical exposures (asbestos, cadmium, benzene, solvents, and trichloroethylene) on the job. Police work includes high stress, longer hours of work, and irregular meals due to shift work. Lifestyle factors such as smoking and obesity may be elevated, and the long time spent in traffic may expose them to chemical agents. Some of these exposures may be associated with kidney disease in police.

The present study did not find excess risks for the incidence of colon cancer in white male officers, while excess mortality from colon cancer had been reported in a previous Buffalo Police mortality study 1950-1990 by Violanti and colleagues (1998). Our findings showed that the risk for esophageal cancer was slightly elevated yet not statistically significant. Violanti et al. (1988) and Vena et al. (2011) found that mortality for cancer of the esophagus was significantly elevated among Buffalo police officers. These differences between incidence and mortality may reflect insufficient follow-up for cancer incidence involving cancers with long latency periods.

Our findings for respiratory system cancers and lung cancer were similar to earlier studies that found the risks of these cancers were equal to or less than for the general population (Demers et al. 1992, Finkelstein 1998; Forastiere et al. 1994). Patrol officers are highly exposed to traffic pollution; thus carbon monoxide, benzene, and lead exposure could be relatively frequent (Tomao, Baccolo, Sacchi, De Sio, & Tomei, 2002; Tomei et al., 2001). The chemicals and particles present in vehicle emission may impair pulmonary function (Pal, Robert, Dutta, & Pal, 2010; Proietti et al., 2005) and cause allergic sensitization (Vimercati et al. 2006). In addition, Vineis and Husgafvel-Pursiainen (2005) and Castano-Vinyals and colleagues (2004) reported an association between air pollution and biomarkers of lung carcinogenesis.

In recent years, shiftwork has been shown to be a potential cause of breast cancer (Schernhammer, Kroenke, Laden, & Hankinson, 2006; Davis, Mirick, & Stevens, 2001), colorectal cancer (Schernhammer et al., 2003) and endometrial cancer (Viswanathan, Hankinson, & Schernhammer, 2007) for women, and prostate cancer (Kubo et al., 2006) for men, since it disrupts the circadian rhythm, the body's biological clock. Most police officers are in rotating shift work. Our findings for male officers do not show excess risk of prostate, colon, and rectal cancer.

Strengths and Limitations

This study is one of the few to investigate cancer risk in police officers. Additionally, it is the first study to compare cancer risk using data from the SEER program of the National Cancer Institute. Since the United States does not have a pool of cancer registries that covers the entire nation, our standard population used to generate expected incidence is only based on 9.2% of US total population.

Additionally, as the number of female officers in traditionally male-dominated occupations increases, future research is needed on cancer risk in females as well as in minority officers such as African-Americans, and Hispanic Americans. This study excluded females and minority groups since the number of cancers occurring in these groups was too small. Thus, generalizability of results may be limited to white male police officers in a mid-sized urban setting.

This study has a retrospective cohort design. Potential confounding factors were limited to the demographic variables available. Other factors which may confound the associations, such as smoking habits, alcohol intake, second jobs, military experience, and environmental exposure, were not available.

CONCLUSION

Compared with the previous mortality studies for Buffalo police by Violanti and colleagues (1998) and Vena and colleagues (2011), the present study found that overall police cancer incidence was not elevated compared with a standard reference population. However, a significantly increased incidence of Hodgkin's lymphoma was observed among Buffalo police officers. This study also found an excess risk of brain cancer after 30 or more years of police service. A long period of exposure to radar emissions could be one possible explanation for this excess. Future research in police officers could investigate associations of radar exposure and other risk factors with cancer perhaps using a case-control design.

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Selected Annotated Journal Resources

Colleen Jones, M.S., and Michelle A. Siegel, M.S.

Prati, G., Pietrantoni, L., & Cicognani, E. (2011). Coping strategies and collective efficacy as mediators between stress appraisal and quality of life among rescue workers. I*nternational Journal of Stress Management, 18,* 181-195. doi: 10.1037/a0021298.

TYPE OF ARTICLE

- Correlational Study.

OBJECTIVE/PURPOSE OF THE ARTICLE

- To examine if coping strategies and collective efficacy mediate the relation between stress appraisal and quality of life.

METHODS

Participants

- Examiners recruited participants via a webpage for a Crisis Psychology Group, developed by the psychology faculty at the University of Bologna.
- The sample included 68.9% male and 31.1% female participants.
- In total, 463 emergency workers participated, including firefighters, civil protection volunteers, and emergency health care professionals.

Materials

- Demographic information was gathered regarding gender, age, and length of service.
- Stress appraisal was assess with one item prompting participants to rate the degree of stress experienced following a most difficult incident on a five-point scale.
- Collective efficacy was assessed with the Perceived Collective Efficacy scale for members of volunteer associations.
- Coping strategies were examined utilizing the Brief COPE Inventory.
- Quality of life was assessed by the Professional Quality of Life Scale, Revision IV (ProQOL R-IV).

Procedure

- An online questionnaire was posted to the webpage of a Crisis Psychology Group, which included a general introduction to the purpose of the study and a consent form.

RESULTS

- Results demonstrated a significant total indirect effect of the relation between stress appraisal and compassion fatigue, above and beyond the effect of mediators.
- The indirect effects of collective efficacy, problem-focused coping, cognitive restructuring, religion coping, and denial were not significant.
- Emotion and support coping, self-distraction, and self-blame mediated the relation between stress appraisal and compassion fatigue.
- Results demonstrated a significant total indirect effect of the relation between stress appraisal and burnout, above and beyond the effect of mediators.
- The indirect effects of emotion and support coping, problem-focused coping, cognitive restructuring, self-distraction, and denial were not significant.
- Collective efficacy, religion coping, and self-blame mediated the relation between stress appraisal and burnout.
- The total indirect effect of the relation between stress appraisal and compassion satisfaction was not significant.

- The indirect effects of emotion and support coping, cognitive restructuring, religion coping, self-distraction, and denial were not significant.
- Results showed a significant indirect effect for collective efficacy, problem-focused coping, and self-blame.

CONCLUSIONS/SUMMARY

- Results demonstrated that collective efficacy mediated the relation between stress appraisal and both burnout and compassion satisfaction.
- Results demonstrated no mediation effect for compassion fatigue.
- Results offer support for empirically derived categories of coping including the following four factors: problem-focused coping, avoidance, meaning-focused coping, and social support coping.

CONTRIBUTIONS/IMPLICATIONS

- Avoidance coping strategies may be considered as maladaptive.
- Traumatic stressors may negatively impact collective efficacy of rescue teams, leading to poor professional quality of life.
- Interventions aimed at monitoring avoidance coping strategies and collective efficacy following traumatic stressors may be beneficial.

Pietrzak, R. H., Schechter C. B., Bromet, E. J., Katz, C. L., Reissman, D. B., Ozbay, F., Sharma, V., Crane, M., Harrison, D., Herbert, R., Levin, S. M., Luft, B. J.;Moline, J. M., Stellman, J. M. ,Udasin, I. G., Landrigan, P. J., & Southwick, S.M. (2012). The Burden of Full and Subsyndromal Posttraumatic Stress Disorder Among Police Involved in the World Trade Center Rescue and Recovery Effort. *Journal of Psychiatric Research*. doi.org/10.1016/j.jpsychires.2012.03.011

TYPE OF ARTICLE

- Original empirical investigation.

OBJECTIVE/PURPOSE OF THE ARTICLE

- To examine the prevalence, correlates and the perceived mental health needs associated with subsyndromal Posttraumatic Stress Disorder (PTSD), defined as symptoms below the threshold for a diagnosis of PTSD, in police officers involved in the World Trade Center (WTC) rescue and recovery operations.

METHODS

Participants

- Participants included 8466 police who were part of the World Trade Center Medical Monitoring and Treatment program (WTC-MMTP).
- Sample included predominantly (>85%). New York City police officers and also included Port Authority police, police from New York City and non-New York City police departments.
- WTC police responders who had worked or volunteered as part of rescue, recovery, restoration, or cleanup in Manhattan south of Canal Street, barge-loading piers in Manhattan or the Staten Island landfill for at least four hours during September 11th—14th 2011, for twenty four hours during September 11th—30th 2001, or for greater than eighty hours between September 11, 2001—December 31, 2001 were eligible to participate.

Materials

- Clinician administered interviews were used to assess WTC exposures associated with PTSD. These exposures included early arrival (beginning work between 9/11/01—9/13/01), being caught in the dust cloud, working adjacent to the collapsed site, working greater than the median number of hours on the WTC site, exposure to human remains, involvement in the search and rescue effort, traumatic death of a colleague, family member or friend on 9/11 and knowing someone who suffered an injury on 9/11.
- The Disaster Supplement of the Diagnostic Interview Schedule was used to assess stressful life events that occurred in the year before 9/11.
- The Posttraumatic Stress Disorder Checklist—Specific Version was used to assess WTC related PTSD symptoms.
- The Patient Health Questionnaire was used to assess for major depressive disorder and panic disorder.
- The CAGE Questionnaire was used to assess extent of alcohol use.
- The Sheehan Disability Scale was used to assess the extent in which emotional problems caused functional

impairment in three domains including; work/school, social, and family life/home responsibilities.

- The somatic subscale of the General Health Questionnaire was used to assess somatic symptoms.
- Participants were asked to indicate important sources of support while working at the WTC, including spouse/ partner, children and parent(s).
- Participants were also asked to endorse which services (e.g.,one –to-one mental health counseling, alcohol counseling or treatment, medication for emotional problems, marriage counseling, religious counseling, stress management, peer support groups, and family counseling) they thought they might need within the next year.

Procedure

- Participants completed the surveys as part of the WTC-MMTP, between July 16, 2002 and September 11, 2008, with an average of 3.9 (SD=1.8) years after September 11, 2001.

RESULTS

- A total of 455 (5.4%) police met criteria for full PTSD and 1300 (15.4%) met criteria for subsyndromal PTSD. Rates of PTSD for male officers were 5.3% and rates of subsyndromal PTSD for male officers were 15.3%. Rates of PTSD for female officers were 6.0% and rates of subsyndromal PTSD were 15.7%. The remaining 6711 (79.2%) of respondents were trauma controls who were involved in the WTC rescue and recovery, but did not met criteria for full or subsyndromal PTSD.
- Loss of someone or knowing someone injured on September 11, 2001, pre 9/11 stressors, lack of family support and non-union membership were associated with both full and subsyndromal PTSD.
- Exposure to the dust cloud, performing search and rescue operations, having low amounts of work support were also associated with subsyndromal PTSD.
- Rates of comorbid depression, panic disorder, alcohol use problems, and somatic problems were highest among police with full PTSD.
- Police with full and subsyndromal PTSD were significantly more likely than those officers who did not have full or subsyndromal PTSD to report needing services including, one-to-one counseling, stress management, psychotropic medication, marriage/family counseling and alcohol counseling/ treatment.

CONCLUSIONS/SUMMARY

- Subsyndromal PTSD is not a diagnostic classification and therefore may not be identified by routine screening tools for PTSD for disaster response personnel. As a result, clinicians may underestimate the prevalence of PTSD in this population.
- Subsyndromal PTSD is associated with several comorbid psychiatric conditions, functional difficulties, and somatic symptoms. Therefore, clinicians, disaster response organizations and public health officials, who are caring for this population should make sure treatment is not solely targeted at PTSD, but also encompasses other comorbid conditions that affect mental health and wellbeing.
- Given that police with full and subsyndromal PTSD both reported significant needs for mental health care, it appears that this population may require mental health resources in the aftermath of a mass disaster.
- Pre-9/11 stressors were associated with risk of full and subsyndromal PTSD. This suggests that confidential and routine mental health screenings may be useful in monitoring the health and wellbeing of police officers.

CONTRIBUTIONS/IMPLICATIONS

- Current screenings for disaster-related PTSD might not identify many of the police officers with significant mental health symptoms and may be in need of services after responding to a mass disaster.
- It is important to screen, monitor and treat mass disaster responders with subsyndromal PTSD.

Kleim, B., Ehring, T., & Ehlers, A. (2012). Perceptual processing advantages for trauma related visual cues in Posttraumatic Stress Disorder. *Psychological Medicine. 42*, 173-181.

TYPE OF ARTICLE

- Original empirical investigation

OBJECTIVE/PURPOSE OF THE ARTICLE

- Intrusive re-experiencing is one of the key features of Posttraumatic Stress Disorder (PTSD). The purpose of this study is to investigate how the intrusions are triggered. There are two studies reported in this manuscript testing the hypothesis that after an individual experi-

ences a trauma, that trauma related perceptual stimuli contributes to re-experiencing symptoms.

METHODS

Participants

- Participants were trauma survivors who had been treated for their injuries in an Emergency Department in South London, UK following a motor vehicle accident or an assault.
- The participants of study 1 consisted of 99 motor vehicle accident survivors who were assessed between 3 and 12 months after their accidents. Of these participants, 22% met the criteria for PTSD.
- The participants for study 2 consisted of assault survivors two weeks (n=221) and six months (n=202) after the trauma. At two weeks 16.7% of the participants met the criteria for acute stress disorder (ASD) and at six months 22.7% met the criteria for PTSD.

Measures

- The study included administration of 30 9 cm x 12 cm blurred pictures consisting of 10 trauma related pictures (accident related for study 1 and assault related for study 2), 10 general threat pictures (e.g., pictures of a cemetery, an aggressive dog, and skulls), and 10 neutral pictures (e.g., pictures of cups, door handles, dustbins, and chairs).
- The Structured Clinical Interview for DSM-IV (SCID) was used for study 1 to assess for PTSD.
- The Acute Stress Disorder Scale was used for study 2, to assess for ASD.
- The Posttraumatic Stress Diagnostic Scale (PDS) was used to assess for symptom severity.
- The Intrusion Interview was used to assess the frequency, modality and distress of intrusive trauma memories.
- The State Dissociation Scale (SDQ) was used to assess ongoing dissociation.
- The Peritraumatic Fear Scale was used to assess the degree of fear during the trauma (used in study 2).

Procedure

- Participants received an information sheet regarding the study in the mail. They subsequently received a telephone call inviting them to participate.
- At the beginning of each research session the experimenter gave them a complete description of the study and answered all questions. Written informed consent was then obtained from each of the participants.
- Participants were presented with the blurred trauma-related, general threat and neutral pictures on a computer screen and asked to name the main object.
- A clinical interview was also administered to each of the participants in order to establish a diagnosis of PTSD. They also had a semi-structured interview to assess for intrusive trauma memories. Participants also filled out several self-report measures assessing symptom severity, dissociation and the degree of fear experienced during the trauma (for participants in study 2).

RESULTS

- Participants with ASD or PTSD identified trauma related pictures, but not general threat pictures, better than neutral pictures.
- Trauma survivors without PTSD or ASD identified trauma-related and neutral pictures equally well.
- Trauma survivors with posttraumatic disorders preferentially processed stimuli that were reminiscent of perceptual impressions during the trauma, compared with neutral stimuli.
- The findings were specific to trauma related pictures, because there was no difference in the processing of the general threat pictures in either group. Both groups did not identify the general threat pictures better than the neutral pictures.
- The processing advantage for trauma related cues (PAT) was related to re-experiencing symptoms, dissociation and predicted PTSD at follow-up.

CONCLUSIONS/SUMMARY

- PAT associated with a traumatic event contributes to PTSD.
- PAT is also likely to facilitate the detection of triggers in the trauma survivor's everyday environment, which may then trigger re-experiencing symptoms.
- The emotionally arousing association of fear enhances the encoding of memories, which may lead to better recognition of emotionally arousing stimuli compared with neutral stimuli.

CONTRIBUTIONS/IMPLICATIONS

- Trauma survivors with PTSD or ASD show a relative processing advantage for trauma related stimuli. This is linked to their re-experiencing symptoms.
- Further research should be done to determine whether this is due to an attentional bias or a priming effect and whether it interacts with other memory processes.
- Further research should also be conducted to determine whether changes in PAT accompany a reduction in experiencing symptoms.

The Resilient Warrior: Before, During, and After War

By Glenn R. Schiraldi, Ph.D., Lt .Colonel, USAR (Retired)
Resilience Training International, 2011, 73 pages, Softcover, $18.00

The Resilient Warrior is a booklet for warriors and their families, written by a warrior. LTC Schiraldi (Retired) uses his training, background, and experience to offer simple yet effective recommendations for building resilience across eight topic areas. His plans are designed to assist those warriors preparing to deploy to, serving in, or returning from the battlefield.

The booklet begins by describing combat stress and PTSD, including a modified military version of the PTSD Checklist, then briefly describes the resilient brain and offers recommendations for optimizing brain health and function.

Chapter Three focuses on calming skills, and includes a variety of skills such as tactical breathing, progressive muscle relaxation, and heart coherence (described as "synchronizing the heart with the brain and the gut"). The author also describes cognitive distortions, such as overgeneralizing and mind reading, and offers positive replacement thoughts. For example, replacing "I never succeed" with "Sometimes I don't succeed," and "I lost three men in battle" with "I didn't lose them. They were killed by the enemy." These calming skills flow smoothly into the next chapter on managing distressing emotions.

Chapter Five, "Especially for warriors," aids military personnel in emotionally preparing for battle and its aftermath. The author begins by examining the realities of killing, then stresses the importance of war zone integrity and honor. This chapter may be especially helpful to military personnel struggling with PTSD and/or the moral wounds of combat.

The author asserts in the next chapter that warriors need two sets of skills, war zone skills and home life skills. He includes a useful table showing a column of skill areas, followed by columns of war zone skills, how this might translate to home, and goals for homecoming. For example, the skill area of response tactics in the war zone means acting first-thinking later, and responding automatically and forcefully. In the home environment, this may translate to anger, intolerance, and seeming to be unfriendly or intimidating. His suggestions for homecoming are to think first-act later, which avoids impulsive behaviors, and may help loved ones feel more secure.

In the next chapter, the author depicts happiness and positive thinking as important survival skills, and central to good health and performance. He stresses the importance of self-esteem, realistic optimism, balance, and fun. Throughout, he offers practical suggestions for developing these skill areas.

The author closes with a chapter on meditation, including several specific exercises illustrating both mindfulness meditation and internal yoga meditation. Five pages of resource material conclude the workbook.

I recommend this book to military members and their families, plus mental health professionals, chaplains, and health care providers who work with the military. This is an excellent resource, filled with practical and efficient recommendations.

The author, Glenn R. Schiraldi, Ph.D., has served on the stress management faculties at the Pentagon, The International Critical Incident Stress Foundation, and the University of Maryland. He is the author of various articles and books on human mental and physical health. Glenn's writing has been recognized by various scholarly and popular sources, including the Washington Post, American Journal of Health Promotion, the Mind/Body Health Review, and the International Stress and Tension Control Society Newsletter. He is a graduate of the U.S. Military Academy, West Point, and a Vietnam-era veteran. His research interests center on personality and stress, including resilience, post-traumatic stress, self-esteem, depression, anger/hostility, and anxiety.

Helping Parents Grieve: Finding new life after the death of a child

Available from Paraclete Video Productions, www.paracletepress.com
60 minute DVD, 2011, $59.99

This DVD is for any parent who has lost a child, or someone assisting a grieving parent. Two moderators, Khris Ford and Paula D'Arcy, guide the viewer through a series of interviews with grieving parents and family members. The DVD includes a short group discussion guide noting major details of the presentation.

Helping Parents Grieve contains five major sections, beginning with "Knowing you are not alone." The narrators assert that the parent-child bond is unique, regardless of their ages, and that this special connection results in an extended grief process. Parents frequently express guilt, questioning if they did the right thing or if they could have done anything differently. The narrators assure the viewer that, although life will be different without their child, they can have a life after their child's death.

Section Two, "Dealing with the loss of your hopes and dreams," addresses the paradigm shift of children dying before their parents. Parents and family members grieve the loss of what could have been: graduations, weddings, grandchildren, etc. Further, this grieving process may begin even before the actual death if the child is ill. Parents also question if they even remain parents after their child dies.

Section Three, "Grieving the death of a baby," focuses specifically on the earliest losses, and includes miscarriages, stillbirths, and neonatal death. When the infant is ill, the family may experience multiple traumas due to multiple interventions, treatments, and surgeries. Parents may experience fear during subsequent pregnancies as they worry about another potential loss.

"The family's journey through grief," section four, explores the impact of the death on the family and on the parental relationship. The narrators make the critical observation that parents often grieve differently from each other, which is important information for parents to understand. For all family members, but especially single parents, they recommend connecting with trusted others outside the family for additional support when the family support is not enough. Grief/support groups may be very helpful for the family.

The DVD closes with "Honoring and remembering your child." This section stresses the importance of honoring the memories of the child through speaking their name, telling stories about them, and noting the milestones in life they will not experience, such as birthdays and graduations.

This is a professional, informative video certain to be very useful to parents and family members grieving the death of a child. Mental health professionals, Chaplains (and students of both professions), support group leaders, and peer supporters will also benefit from this information.

Khris Ford is the Founder/Executive Director of My Healing Place in Austin, Texas. Khris has spent twenty years working with children and adults who have experienced a significant or traumatic loss. She holds a Master's degree in Counselor Education, is a Certified Grief and Trauma Specialist and School Consultant, and a trained spiritual director.

Paula D'Arcy is a psychotherapist and founder of the Red Bird Foundation. Paula survived a drunk driving accident in 1975, which took the lives of her husband and daughter. Today, her work includes leading workshops and writing books, including When People Grieve: The Power of Love in the Midst of Pain.

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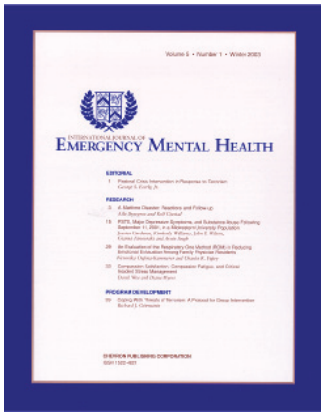

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