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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

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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.

Keywords

law enforcement; perceived stress; cardiovascular disease; gender difference

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 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 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., 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 Met- Syn. 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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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)

Characteristic	Men (*n* = 288)		Women (*n* = 102)	
	n	Mean SD or %	*n*	Mean SD or %
< 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).

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		

Metabolic Syndrome Component	Component Cutpoint**	Prevalence						Mean (SD)*	
		Men		Women		Overall		Men (*n* = 288)	Women (*n* = 102)
		n	%	*n*	%	*n*	%		
	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).

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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).

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.