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Adiposity in Policing: Mental Health Consequences

John M Violanti
Department of Social and Preventive Medicine
School of Public Health and Health Professions
State University of New York at Buffalo

Desta Fekedulegn
Biostatistics and Epidemiology Branch
Health Effects Laboratory Division
National Institute for Occupational Safety and Health

Michael E. Andrew
Biostatistics and Epidemiology Branch
Health Effects Laboratory Division
National Institute for Occupational Safety and Health

Luenda E. Charles
Biostatistics and Epidemiology Branch
Health Effects Laboratory Division
National Institute for Occupational Safety and Health

Tara A. Hartley
Biostatistics and Epidemiology Branch
Health Effects Laboratory Division
National Institute for Occupational Safety and Health

Cecil M. Burchfiel
Biostatistics and Epidemiology Branch
Health Effects Laboratory Division
National Institute for Occupational Safety and Health

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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