Stress, Trauma, and Wellbeing in the Legal System

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CHAPTER

8 Stress and Cardiovascular Disease in Law Enforcement

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Abstract

Police officers have higher rates of cardiovascular disease (CVD) than the general population. While officers have an increased prevalence of some conventional CVD risk factors, the increased CVD is not solely explained by these risk factors. Thus, characteristics of the profession likely contribute to CVD. Job-related stress is frequently suggested as an underlying factor. In this chapter, the evidence for and against stress contributing to CVD risk in law enforcement officers is discussed. While the majority of officers are not markedly stressed, stressed officers do have a higher risk for developing CVD. In general, organizational stress appears more burdensome than operational stress for officers, although the nature and severity of stressors varies by law enforcement department. Mechanisms underlying the stress-CVD relationship remain uncertain, indicating a need for more research to identify these mechanisms. Finally, the chapter concludes with suggestions for improving officer health.

Keywords: stress, trauma, wellbeing, courts, legal system, police officers, law enforcement, innovations

Subject: Criminal and Forensic Psychology, Clinical Forensic and Law Psychology

Introduction

It is almost axiomatic within the law enforcement profession that police work and cardiovascular disease (CVD) go hand in hand. Indeed, many states codify this relationship with a heart-lung presumption, which provides disability retirement benefits for officers stricken with CVD. Even at the federal level, laws presume that police and their families need to be protected from the pervasive threat of CVD; the U.S. Department of Justice's Hometown Heroes Survivors Benefits Act (2003) provides "a statutory presumption that public safety officers who die from a heart attack or stroke following a non-routine stressful or strenuous physical public safety activity or training, died in the line of duty for benefit purposes." These facts beg the question: Is this very expensive presumption well founded, or is it based on anecdotal evidence? This chapter reviews the research assessing the association between CVD and the law enforcement profession and examines factors that might contribute to this association. The primary focus here will be stress, because a widespread assumption is that the stress of police work is a major contributor to CVD.

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The Prevalence of Cardiovascular Disease in Law Enforcement

The most common way to evaluate the relationship between law enforcement and CVD has been to
p. 178 determine if officers have higher CVD mortality than ↳ a control population. Six of 10 published studies (shown in Table 8.1) found that a law enforcement cohort suffered a statistically significant increase in mortality. Given that three studies did not find a significant difference and one found police officers to have reduced mortality, the evidence from these studies was not clear-cut. However, overall, the data suggest that law enforcement officers experience a higher CVD mortality rate.

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Table 8.1. Cardiovascular Disease Mortality in U.S. Law Enforcement Cohorts

Locale	Odds Ratio	95% CI	How Compared	Outcome	Ref
Nationally					
50 states	1.58	$p < 0.05$	Standardized mortality ratio (SMR)	↑ mortality	Guralnick, 1962
27 states			Proportionate mortality rate (PMR)	↑ mortality	Calvert, Merling, & Burnett, 1999
Sheriffs, bailiffs, etc.	1.26	1.11–1.43			
Correctional officers	1.21	1.07–1.36			
Police and detectives	1.14	1.06–1.21			
States					
Connecticut	1.32	1.16–1.48	SMR	↑ mortality	Sardinas, Miller, & Hansen, 1986
Rhode Island	1.7	1.2–2.5	Summary odds ratio (SOR)	↑ mortality	Dubrow, Burnett, Gute, & Brockert, 1988
Utah	1.6	1.1–2.4	SOR	↑ mortality	Dubrow et al., 1988
Washington	1.15	$p < 0.05$	PMR	↑ mortality	Milham, 1983
New Jersey	1.07	$p > 0.05$	PMR	= mortality	Feuer & Rosenman, 1986
Municipalities					
Buffalo	1.05	0.93–1.19	SMR	= mortality	Vena, Violanti, Marshall, & Fiedler, 1986
Buffalo	1/06	0.96–1.18	SMR	= mortality	Violanti, Vena, & Petralia, 1998

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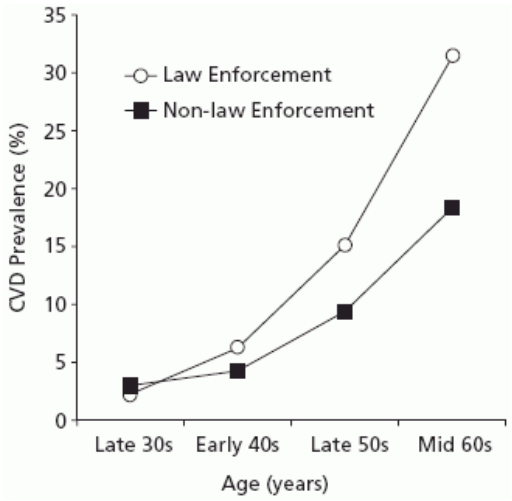
Seattle, Tacoma, and Portland	0.86	0.75–0.98	SMR	↓ mortality	Demers, Heyer, & Rosenstock, 1992

p. 179 Nevertheless, these studies suffer an inherent weakness: In solely assessing CVD *mortality*, by definition they ignore CVD *morbidity*. During the past 30 years, CVD mortality has declined while morbidity has increased (Roger et al., 2011). Thus, assessing solely mortality may skew interpretation of the relationship between CVD and the law enforcement profession.

A handful of studies assessed CVD morbidity in police in reference to a nonpolice cohort (Franke, Collins, & Hinz, 1998; Franke, Ramey, & Shelley, 2002; Ramey, Downing, & Franke, 2009; Sparrow, Thomas, & Weiss, 1983). These studies examined police in a range of ages—from officers at midcareer to those well into their retirement. Cardiovascular disease typically takes considerable time to become clinically overt, and the effects of risk factors on CVD progression may go unnoticed until after years of exposure. Thus, exploring the CVD–law enforcement relationship over a wide range of ages may provide insight that cannot be gleaned otherwise.

Figure 8.1 reveals a trend showing that, compared to civilian peers, young officers do not have an increased prevalence of CVD but that, as officers age, their rates of CVD become as much as 70% higher. Although several conventional CVD risk factors contributed to this increase, it is noteworthy that in studies of older officers (Franke et al., 1998; Ramey et al., 2009), the law enforcement profession remained a "risk factor" even after statistically controlling for age. The odds ratio was 1.70 (95% confidence interval [CI] = 1.03–2.79) for retired officers who were, generally, in their 50s (Ramey et al., 2009) and 2.34 (95% CI = 1.5–3.6) for retired officers in their 60s and older (Franke et al., 1998). On the other hand, studies assessing younger,
p. 180 active-duty officers may underreport ↳ group differences. The aforementioned favorable disability retirement policies probably induce younger officers with clinically significant CVD to leave the department. This may have excluded them from the studied cohorts. Such is a valid shortcoming in the cross-sectional study by Franke et al. (2002), but not for Sparrow et al. (1983), who employed a longitudinal design.

Figure 8.1



Differences in prevalence of cardiovascular disease (CVD) in cohorts of law enforcement officers and nonofficers.

These complicating factors prompted studies that used an alternative approach: testing whether law enforcement officers have an increased prevalence of *subclinical* CVD. To that end, Joseph and colleagues compared active-duty police officers to a civilian control group on several relevant measures: brachial

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artery flow–mediated dilation (Joseph et al., 2010), common carotid intima–media thickness, and mean maximum carotid intima–media thickness (Joseph et al., 2009). Brachial artery flow–mediated dilation assesses endothelial function via determining how greatly this peripheral artery dilates in response to the accumulation of local metabolites. A reduction in this dilatory response is suggestive of endothelial dysfunction due to atherosclerosis. Rather than reflecting functional changes, alterations in carotid intima–media thickness reflect structural changes in the peripheral vasculature ascribable to atherosclerosis. The results showed that, although both the control and police officer groups were free of clinically overt CVD, the officers had reduced endothelial function and increased structural changes (i.e., increased intima–media thickness) in their peripheral vasculature. Joseph and colleagues (2009, 2010) controlled for group differences in age, gender, depression, and conventional CVD risk factors. Thus, these differences suggest that officers have an earlier presence of atherosclerosis, estimated to be the equivalent of 3 to 4 years of plaque progression (Joseph et al., 2010). This study, however, did not attempt to measure the mechanisms underlying this subclinical CVD.

To date, the literature strongly suggests that law enforcement officers are at an increased risk of developing CVD and, as will be described further in the next section, this risk remains after controlling for conventional CVD risk factors. Thus, the analogy of the law enforcement profession as a "risk factor" is valid.

Conventional Cardiovascular Disease Risk Factors in Law Enforcement

The published literature is replete with studies suggesting police work is linked to well-known CVD risk factors: physical inactivity, hypercholesterolemia, hypertension, tobacco use, obesity, and hyperinsulinemia (Kales, Tsismenakis, Zhang, & Soteriades, 2009; Peter & Siegrist, 1983; Pollock, Gettman, & Meyer, 1978; Thomas, Cady, O'Connell, Bischoff, & Kershnar, 1979; Williams et al., 1987). Studies comparing officers and nonofficers have consistently found several CVD risk factors to be more prevalent in officers, thereby putting them at an increased risk for CVD (Franke et al., 1998; Franke et al., 2002; Joseph et al., 2009; Pyörälä, Miettinen, Halonen, Laakso, & Pyörälä, 2000; Ramey, 2003; Ramey et al., 2009).
p. 181 Nevertheless, simply comparing the prevalence ↳ of individual risk factors across populations does not describe the relative influence of these risk factors. For example, how can one determine the net effect on CVD risk if officers are at higher risk than controls in one factor but at lower risk in another?

Identifying the combined and interactive influence of a set of risk factors better assesses the "gestalt" of these risk factors. Accordingly, prediction equations, developed through the ongoing Framingham study, can estimate the probability of developing CVD (Wilson et al., 1998; current algorithms are available at http://www.framinghamheartstudy.org/risk/index.html). Indeed, in the United States, the Framingham algorithm offers the best model (Eichler, Puhan, Steurer, & Bachmann, 2007). As such, we used a Framingham algorithm to compare the 10-year risk of developing clinically significant CVD, comparing law enforcement officers and a reference population. No difference was found using either cross-sectional (Franke, Cox, Schultz, & Anderson, 1997; Franke et al., 2010) or longitudinal comparisons (Franke et al., 1997). To the best of our knowledge, no one else has made a similar comparison. Thus, our study suggests the CVD–law enforcement relationship is complex because police officers' increased CVD risk arises from something other than conventional CVD risk factors. Of course, individual officers may have an increased risk for CVD due to conventional risk factors, but this is true for anyone regardless of occupation.

These prediction models are limited, however, because they only considered a subset of known risk factors: age, gender, total cholesterol, high-density lipoprotein, systolic blood pressure, tobacco use, diabetes status, and presence of left ventricular hypertrophy. The studies did not include obesity or physical inactivity, which are CVD risk factors that can be particularly problematic for police. For example, while not universally seen (e.g., Joseph et al., 2009), most evidence suggests officers tend to be more overweight than the general population (Franke et al., 2002; Ramey et al., 2009; Ramey, 2003; Ramey, Downing, Franke,

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Perkhounkova, & Alasagheirin, 2011; Ramey, Perkhounkova, Downing, & Culp, 2011). Over time, officers also appear to gain fat faster than the general population (Franke & Anderson, 1994). The mechanisms underlying this difference have not been definitively identified. Officers' eating habits, especially while on duty, may contribute to this weight gain. For example, some departments require officers to eat in public places, such as restaurants, rather than in their official vehicle. Moreover, in some communities, fast food establishments have a booth reserved for officers to encourage them to eat there. Law enforcement is also a relatively sedentary occupation (data unpublished). However, excessive body fat is ultimately the result of a caloric imbalance and obesity is an epidemic in the U.S. population. Thus, while considerable anecdotal evidence exists, to the best of our knowledge, the extent to which these habits differ from other occupational groups has not been extensively assessed in law enforcement.

Recall that a number of studies that found an increased CVD prevalence in officers did so after statistically
p. 182 controlling for the presence of conventional ↳ risk factors (Franke et al., 1998; Franke et al., 2002; Ramey et al., 2009; Joseph et al., 2009, 2010). Thus, while conventional risk factors likely contribute to CVD, for police officers, they do not fully explain the increased prevalence. The increased risk must be caused by other occupationally relevant factors.

Stress as a Cardiovascular Disease Risk Factor in Law Enforcement

Despite the concerted effort of many researchers, the mechanism(s) linking police work to CVD remain unidentified. The most commonly hypothesized contributor is job stress. Most recent reviews agree that psychosocial stress and CVD are related (Hemingway & Marmot, 1999; Krantz & McCeney, 2002; Rozanski, Blumenthal, & Kaplan, 1999), yet these reviews offer no consensus on which psychosocial variables reliably increase the risk of CVD or, of those that do, which are most important. Some evidence supports the idea that stress indirectly affects CVD risk by increasing the prevalence of conventional risk factors (Franke et al., 2002; Violanti et al., 2006), presumably because stress alters an individual's lifestyle. It is noteworthy that, for officers, high levels of physical activity do not appear to buffer the effects of stress on either CVD risk (Yoo, Eisenmann, & Franke, 2009) or perceived health (Gerber, Kellmann, Hartmann, & Pühse, 2010). Limited evidence also suggests that, for officers, neither chronic stress (Franke et al., 2010) nor posttraumatic stress disorder (McCanlies et al., 2011) is associated with a proatherogenic inflammatory vascular environment. Thus, the mechanisms by which stress exerts its deleterious effects—either in general or in law enforcement, in particular—remain uncertain.

Although the unique and pronounced effects of stress in policing are well recognized (Finn & Tomz, 1996; Havassey, 1994; Violanti, 1992), the sources of this stress can be difficult to categorize but are certainly multifactorial (Abdollahi, 2002). The unique stress of police work can be characterized by its duration (e.g., acute vs. chronic) and whether the source of stress is external, operational, or organizational. For police, *external stress* includes issues such as public criticism of police and conflicts between the demands of professional commitments and family (Garcia, Nesbary, & Gu, 2004). *Operational stress* refers to the stress associated with the actual duties of law enforcement (e.g., making on-the-spot decisions, apprehending potentially dangerous suspects, or critical incidents such as officers being assaulted). *Organizational stress* refers to issues such as dealing with the criminal justice system or the bureaucracy of a police department. The governance structure in many police agencies likely contributes to organizational stress, because it is frequently hierarchical, paramilitaristic, and often with a top-down style of management.

When large samples of police officers are assessed, studies consistently conclude that operational stressors are the most intense (Berg, Hem, Lau, Haseth, & Ekeberg, 2005; Garcia et al., 2004). For example, interviews
p. 183 with officers in the Milwaukee Police Department suggest that traffic control is a ↳ very stressful activity (Ramey, unpublished observations). Critical incidents are perhaps the most severe operational stressor and can markedly affect perceived work stress (Gershon, Lin, & Li, 2002; Violanti & Aron, 1994). However,

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critical incidents are typically acute, short term, and, in many police departments, relatively infrequent. For example, in a survey of 2,800 Norwegian police officers, work injuries (e.g., officer hurt in the line of duty) were rated the most severe stressor but also the least frequent (Berg et al., 2005). In contrast, job pressure was the least severe stressor but the most frequent. Job pressure is typical of an organizational stressor—less injurious in the short term but more chronic in the long term.

Evaluating operational stress as a contributor to CVD risk might be done best by assessing officers with posttraumatic stress disorder (PTSD), because the nature of police work puts officers at an increased risk for developing PTSD. (PTSD results from a traumatic event that involved the threat of injury or death; it may occur shortly after the event or months afterward.) To assess psychological symptoms of PTSD, Violanti and colleagues used the Impact of Event Scale (Horowitz, Wilner, & Alvarez, 1979) in 115 police officers and explored whether PTSD was linked to conventional CVD risk factors (Violanti et al., 2006), inflammatory markers (McCanlies et al., 2011), and subclinical CVD (Violanti et al., 2006). These studies found that officers with low versus high PTSD symptomatology did not differ statistically in these measures, suggesting that the operational stress of police work contributes little to their increased risk of CVD.

In contrast, officer health appears to be greatly affected by organizational stress. Interestingly, organizational stress appears to be more deleterious not because it is extreme, but because it is chronic. Indeed, of all types of stressors, organizational stress is generally considered to be the most hazardous (Brown & Campbell, 1990; Crank, Regoli, Hewitt, & Culbertson, 1995; Grier, 1982; Kirkcaldy, Cooper, & Ruffalo, 1995; Kroes, Margolis, & Hurrell, 1974; Storch & Panzarella, 1996; Violanti, 1981). Among police, chronic organizational stressors predict psychological distress, including PTSD, more strongly than cumulative exposure to critical incidents (Liberman et al., 2002). Moreover, officers who view organizational stress as being more stressful than operational stress are at higher risk for impaired mental health (Collins & Gibbs, 2003). Organizational stress can contribute to vital exhaustion, an outcome of occupational stress that has been previously associated with CVD (Appels, 1997; Appels & Mulder, 1989; Cole, Kawachi, Sesso, Paffenbarger, & Lee, 1999; Kopp, Falger, Appels, & Szedmak 1998; Prescott et al., 2003). Vital exhaustion is characterized by feelings of excessive fatigue and a lack of energy, increasing irritability, and feelings of demoralization (Appels, 1997).

Organizational stressors can take many forms (Ayres & Flanagan, 1992; Biggam, Power, MacDonald, Carcary, & Moodie, 1997; Collins & Gibbs, 2003; Hartsough, 1991; Malone, Denny, Dalton, & Addley, 1997; Miller & Monge, 1986, 1987; Storch & Panzarella, 1996; Violanti & Aron, 1994), but no clear consensus exists
p. 184 on which organizational stressors are most detrimental ↳ (Liberman et al., 2002). Many notable organizational stressors, however, center on time constraints, as well as poor communication between officers and their superiors. For example, in a survey of over 850 officers (Collins & Gibbs, 2003), nine organizational stressors were indicated as being the most severe:

1. Work demands impinging on home life
2. Lack of consultation/communication
3. Not enough support from senior officers
4. Pressure to get results
5. Urgent requests preventing completion of planned work
6. Deadlines or time pressures
7. Too much work
8. Paperwork

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9. Working in shifts

Likewise, in another review of the literature, Stinchcomb (2004) summarized organizational stressors into four categories:

1. Lack of consultation and communication
2. Not enough guidance or support from administrators
3. Inadequate feedback
4. Inadequate input into department policies, especially felt as an imbalance between too many responsibilities and too little authority, and felt particularly by senior officers, meaning those with more work experience

These studies were largely survey-based, quantitative assessments. To "flesh out" such findings, individual interviews and focus groups can provide informative qualitative assessments. To that end, sworn officers of the Milwaukee Police Department were asked to describe workforce supports and barriers to optimal health (Ramey et al., 2009). (In terms of sworn officers, the Milwaukee Police Department is one of the 20 largest departments in the United States; Reaves, 2010.) Approximately 30% of the officers voiced lack of control over their job as a problem, and more than half cited the example of not being able to use their judgment in responding to "call-backs" to public inquires because, in this department, the decision when to respond is made by the dispatcher rather than the officers. Moreover, officers reported experiencing a heavy workload, fatigue, lack of a routine, irregular hours, excessive overtime, and working different shifts in 1 week. They frequently expected to work shifts longer than 8 hours because of unpredictable events. In addition, the officers said that it was not uncommon, after working a night shift, to be required to return midmorning for a court appearance after sleeping only a few hours. All mentioned that shift work contributed to their fatigue and exhaustion. Officers also attributed fatigue, in part, to what they referred to as "hypervigilance," meaning they are constantly on the lookout for something out of the ordinary, even during off hours. Thus,
p. 185 they have difficulty "letting down" or relaxing, even when they are off duty. Fifty-four percent of ↳ interviewees mentioned negative health consequences, which they attributed to exhaustion, job demands, and lack of time. Specifically, they felt that irregular hours, lack of routine, and fatigue made it difficult to get enough sleep and establish healthy eating patterns, and left little time for physical activity; 42% of interviewees mentioned weight gain as an issue related to their job. Officers linked job constraints to frequent family conflicts and strained relationships with partners. Although some of these stressors are operational in nature, clearly most are organizationally mediated.

Such evidence, considered as a whole, suggests that the most significant contributors to officers' risk for CVD are organizational stressors. Indeed, organizational factors are four (Brown & Campbell, 1990) to six times (Vena, Violanti, Marshall, & Fiedler, 1986) more stressful than nonorganizational factors. Organizational stressors are also likely context dependent; the frequency, duration, and intensity of these stressors will differ depending on the organizational practices of each different department. Thus, the negative health effects on employees likely will also differ. Nevertheless, based on the extant research, it appears that much of the organizational stress in policing could be attenuated with careful attention to the work structure and climate of police departments. While much easier said than done, a close appraisal of organizational structure might lead to a sustained, robust attenuation of a considerable proportion of police officer stress.

An often overlooked aspect of the stress–law enforcement relationship is that most officers are *not* markedly stressed. This has been seen in several studies of police officers from quite disparate police departments. In studies of over 2,800 officers spanning nine different state-level police agencies (Franke et al., 2002), over 670 officers from one of the 20 largest municipal police departments in the United States

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(Ramey, Downing, & Knoblauch, 2008), and 336 officers (Ramey, Perkhounkova, et al., 2011) from one of the 200 largest departments (Reaves, 2010), the mean stress levels were not appreciably different from other large samples of nonofficers (Cohen & Williamson, 1988) and were similar to college-age cohorts (Cohen, Kamarck, & Mermelstein, 1983). So, although police work can certainly be stressful, for most officers on most days, it is not. A caveat to this is that the most distressing part of the job according to officers (Ramey et al., 2008) can be the chronic, albeit modest, exposure to organizational stress within the job. Furthermore, an issue that has yet to be considered fully in the literature is the extent to which the health effects of officer stress are due to the job per se, such that all officers are at an increased risk, or due to the officer's response to the stress, meaning only susceptible officers will be affected. For example, Collins and Gibbs (2003) found organizational stressors to be a significant health issue in a large police department. However, they also noted that affected officers tended to differ in several personality traits and coping behaviors from officers who were not appreciably affected.

Nevertheless, for officers who do view their job as stressful, the effects can be deleterious. In the aforementioned sample of 2,800+ active-duty officers (Franke et al., 2002), regardless of their age, CVD was
p. 186 directly associated ↳ with both perceived stress and duration of employment. Most striking was the comparison between the officers in the lowest and highest quintile of stress scores. The most stressed officers had a markedly higher prevalence of CVD, compared to the least stressed officers (odds ratio [OR] = 2.54; 95% CI = 1.07–6.01; unpublished data on file with author). Moreover, a recent study of active-duty male officers found the link between CVD, stress, and vital exhaustion to be statistically significant (Ramey, Perkhounkova, et al., 2011). A unit change in either perceived stress or vital exhaustion increased the odds of CVD by 20% or 31%, respectively (Ramey, Downing, et al., 2011). As seen with Franke and colleagues' study of active-duty officers (2002), the overall prevalence of CVD was lower than expected for these police officers. Again, however, for these two studies, heart-lung presumption laws likely caused the rate of CVD to be underestimated, because officers with diagnosed CVD may have self-selected out of the sample via disability retirement.

Despite considerable evidence linking CVD and the law enforcement profession (especially law enforcement–related stress), the biological mechanisms underlying this association are unknown. In a study published in 2010, we assessed the association between job-related stress, conventional CVD risk factors, and inflammatory mediators in law enforcement (Franke et al., 2010); the latter are increasingly being implicated in atherogenesis. As a group, the officers in this study displayed a relatively proatherogenic inflammatory profile that could not be attributed to differences in conventional CVD risk factors or to differences in stress. In fact, the affected officers were not greatly stressed and had chronic stress levels (including vital exhaustion) below that of the control cohort. On the other hand, we recently performed similar assessments in officers working in a large metropolitan police department and found statistically significant, albeit modest, associations between inflammatory mediators and both traumatic stress and work stress (Ramey, Downing, et al., 2011). This study was performed in a small group of officers (n = 71), making generalizability somewhat limited. Thus, although these studies do not define the job-related factors contributing to CVD in law enforcement officers, they do provide clues about the underlying biological mechanism.

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Suggestions for Reducing Chronic Disease in Law Enforcement

The increased risk for CVD experienced by law enforcement officers can be attributed to forces that are both intrinsic and extrinsic to the profession itself. As with the U.S. population as a whole, some of this CVD risk is attributable to conventional CVD risk factors. In this context, the processes of risk factor reduction are the same for both law enforcement and civilians and usually entail promoting lifestyle changes such as increases in physical activity and healthier eating habits. For example, a recent published review assessed worksite-based health/lifestyle programs promoting the common, modifiable risk factors of tobacco use,
p. 187 sedentary lifestyle/inactivity, alcohol ↳ use, and poor dietary patterns associated with overweight and obesity (Soler et al., 2010). Combining health risk appraisal with health education reduced the prevalence of risk factors and improved outcomes. Programs were most effective when they were offered for at least an hour and repeated several times over the course of a year. Additionally, the best programs were accompanied by a variety of health promotion activities, including health education and awareness. This methodology could be readily employed in law enforcement, because most departments have mandatory, annual, in-service training sessions. During such mandatory sessions, officers could be informed of their health risks and receive evidence-based health education on risk and disease morbidity awareness. This type of training has the potential to reach the personnel employed by the almost 18,000 law enforcement agencies functioning in the United States.

Unfortunately, promoting physical activity in law enforcement agencies can be challenging. While fitness standards are common for new hires in most law enforcement agencies, many departments do not have ongoing fitness requirements or required annual medical examinations. In departments that are unionized, the decision to embrace a fitness standard often involves extensive negotiation among union and department leadership. If fitness standards are considered, common issues are whether (1) these standards are either job specific (i.e., all officers must meet the same standard) or if age- and gender-specific standards are used; (2), depending on how this issue is resolved, whether senior, or veteran, officers will be "grandfathered" in; (3) whether officers can exercise while on duty; and (4) what incentives will be used to encourage the adoption of physical activity.

Part of the CVD risk associated with law enforcement is uniquely due to the occupation. Because some of the stressors involved in police work are unique to that profession (e.g., operational stressors), some risk reduction techniques must also be tailored to the environment in which police officers work. For example, while lifestyle choices affect CVD risk in all individuals, the effects of job stress may be manifested in unhealthy lifestyle choices that susceptible officers make. For example, the number of officers who commit suicide is three times more than the number who die in the line of duty (Miller, 2005; Violanti & Aron, 1995). For most officers, the psychological, emotional, physical, social, and spiritual stressors of their daily work environment may contribute to unhealthy lifestyles and poor living habits (Tanigoshi, Kontos, & Remley, 2008). These habits likely underlie the increased prevalence of conventional CVD risk factors often found in officers. Clearly, programs are needed to maintain wellbeing among police.

One such program offered a psychological intervention termed the "Badge of Life" (Levenson, O'Hara, & Clark, 2010). Initiated in 2008, the Badge of Life aimed to reduce the number of police officer suicides via the Emotional Self-Care Program, which emphasizes that voluntary, confidential, annual mental health checks promote officers' emotional wellbeing. The program employs teaching and mentoring of younger officers
p. 188 by older ones. The program focuses ↳ on each officer's ability and responsibility to care for his or her own emotional wellbeing—an idea based on the premise that credible officers (from all levels) can "set an example" and encourage fellow officers to get involved in their own annual in-service training. The program is founded on the principles of peer support in policing, research on suicide prevention, and the work of Jeffery T. Mitchell's critical incident stress management (CISM; see also chapter 11, this volume, for use of CISM in juror innovations). According to Levenson et al. (2010), departments that embrace CISM have less absenteeism, greater cohesiveness among officers, greater job satisfaction, and more acceptance of

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mental health personnel in general (R. Levenson, personal communication, June 1, 2011). Assessing program efficacy is complicated by the observation that, in many police agencies, the measurement of outcomes does not usually involve the scholarly methods researchers would identify. Rather, the goal and primary interest of programs like the Badge of Life are to educate and promote positive mental health approaches within law enforcement and to be a resource for officers, police administrators, researchers, and planners (R. Levenson, personal communication, June 1, 2011). This program is currently in use and available within the United States and Canada.

In the past, the efficacy of health promotion interventions for police officers has been assessed only infrequently; those that were developed and tested employed small sample sizes and usually only collected outcome data at one time point. Most types of interventions either were based on exercise or used psychological approaches such as social skills training and befriending. In these studies, physical activity, including cardiovascular exercise and strength training, was effective for reducing the rate of clinical depression (Penalba, McGuire, & Leite, 2008); even in older officers, exercise appeared to enhance mood and improve cognitive function (Penalba et al., 2008). Cognitive behavioral therapies and similar approaches aim to help officers deal with anxiety and stress disorders by focusing on how to recognize distorted thoughts and replace them with realistic ideas (Penalba et al., 2008).

Consistently, authors have identified the police department *environment* as "stressful" and further suggest that daily encounters may contribute to a sense of negative affect, which has consequences on general health. To that end, programs have been designed to address the stress and bereavement associated with deaths that occur in the line of duty (Miller, 2007). For example, to foster "mental toughness and resilience" and to facilitate recovery from critical incidents, programs have applied methods used in sports psychology (Miller, 2008) that conceptually apply to police and can be carried over to law enforcement. Because organizational stress appears to be pervasive in most law enforcement agencies and detrimental to officer health, efforts to reduce these stressors should be made. These changes could range from the modest (e.g., adjusting work scheduling procedures) to the dramatic (e.g., changing leadership style and governance structures), depending on the nature of the stressor. Poor communication practices and top-down
p. 189 administrative styles are recurring stressors identified in the relevant literature. To the extent it is ↳ practical, participatory management practices would likely improve job satisfaction (Wycoff & Skogan, 1994) and, in our opinion, reduce CVD risk in many officers by reducing officer stress. Examples of such principles within existing management models include transformational leadership and giving voice to officers regarding agency improvements like upgrading computer software used by the membership. There are also opportunities to give more autonomy to officers regarding decision making. In interviews with the authors, officers in a large metropolitan police department noted that the dispatcher sends all calls to the officers and agency policy is that all calls require immediate response regardless of the nature of the call. Allowing officers to triage calls is a simple method of increasing autonomy. In addition, in this department, it is not uncommon for officers who have worked the night shift to be required to be in court early in the morning. Working with the local judicial system and judges would make it possible to consider the officer's work schedule when assigning court appearance times. These changes in administrative style would entail short-term expenses but, if they became permanent, would likely also yield long-term benefits without any ongoing expense. Given the fiscal constraints imposed upon most law enforcement agencies, the latter is a potent argument for making these changes.

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Gaps in Our Knowledge and Needed Research

Concerted effort by the research community has expanded our understanding of the relationship between CVD, stress, and the law enforcement profession. Nevertheless, the largest gap in our understanding of this relationship remains our ignorance of the underlying mechanisms. The causal mechanisms are almost certainly multifactorial and likely include lifestyle activities as well as job-specific activities. Our best guess is that organizational stress is a primary component of the job-specific activities.

One difficulty in identifying the job-specific stressors is that much of the existing research is somewhat piecemeal. Comprehensively assessing the sources of stress in a law enforcement agency could be a mammoth undertaking. These stressors are complex and likely interact; they can include organizational sources, operational stress, and external stressors such as job–family conflicts. Moreover, the relative influences and the interactive effects of these different stressors likely vary across law enforcement agencies; officers within a well-managed police department may be less stressed than their peers in a poorly run department, despite similar levels of crime in their municipalities. Thus, even if one were able to quantify all the stressors in a police department, one would need to be cautious in generalizing the findings from one police department to the broader law enforcement community. Consequently, while distinguishing the different sources and types of stress is critical for developing effective targeted interventions, these sources and types likely vary across police departments. Thus, a "one size fits all" approach to reducing police stress will likely not be very successful.

p. 190 As alluded to previously, a second gap in understanding the CVD–stress–law enforcement relationship is a determination of the extent to which this relationship is intrinsic to the occupation or intrinsic to the individual officer. Many researchers have made the tacit assumption that police stress uniquely affects officer health. While some of these stressors are unique to the occupation, many occupations are equally stressful; a common shortcoming of the literature is that many studies assessing police officer health have not used a meaningful control group. For example, we are unaware of any studies comparing the effects of job stress on health among police officers and similarly stressful occupations. In other words, it is unclear if the police occupation is different from other stressful occupations in its effects on officers.

While police work can certainly be stressful enough to affect officer health, it is important to recognize that most officers are either not severely stressed or do not suffer adverse health consequences from the job-specific stressors. This suggests that, to a certain extent, most officers either are not susceptible to the ill effects of this stress or have appropriate coping mechanisms in place. Thus, more research is needed to tease out whether police stress should be viewed as a universal issue that affects all officers (and is uniquely different from the effects of job stress in nonofficers) or whether police stress only affects officers susceptible to the effects of stress. If the latter, then knowledge of the attributes that increase susceptibility can be used when screening applicants for employment as police officers. Unfortunately, concerted efforts to identify these attributes in police officers have not been performed.

Finally, the biological mechanisms underlying the association between CVD and law enforcement remain unclear. In studies controlling for conventional CVD risk factors, limited evidence suggests officers are more prone to a proinflammatory vascular environment than nonofficer peers. While these studies did not identify the aspects of the law enforcement profession that trigger increased CVD risk, job-related stress does not appear to be a strong candidate. Thus, considerable work remains to be completed before we fully understand how the law enforcement occupation contributes to the development of CVD.

In order to close these gaps, an ideal research study would be a large, multisite, prospective, observational study. This study would include an array of police departments, varying in the number of officers, the population served, and the geographic locale. Current officers and incoming officers would be assessed on their current CVD risk factors, novel CVD risk markers (e.g., flow-mediated dilation, inflammatory

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mediators), lifestyle habits related to these factors, their current and past stress levels, and their responses to various forms of stress. In addition, a careful assessment of the organizational and administrative practices of each police department would be performed. Parallel assessments in other "peer" occupations would be performed. These data would be collected serially and long enough for CVD to become clinically significant, perhaps over 20 or 30 years. Thereafter, the data would be analyzed to determine the extent to
p. 191 which CVD prevalence differed among ↳ the different occupations, the factors that explained any differences in CVD, and whether these factors differed among the occupations, as well as among the different police departments. Such a study would be prohibitively expensive and logistically challenging; however, it is the type of research needed to gain a firm understanding of the CVD–stress–law enforcement relationship.

Conclusion

Based on the extant literature, it appears that law enforcement officers have an increased risk for CVD. Some of this risk is due to an excess of conventional CVD risk factors, such as a tendency to become relatively more overweight than nonpolice officers, while some is not, such as an increased proinflammatory vascular environment. The mechanisms underlying this increased risk remain elusive. While stress may play a role in the development of CVD in susceptible officers, it is an overstatement to suggest that police stress per se is causally or universally associated with the occupational risk for CVD. More research is needed to fully understand these relationships.

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