

# On-Duty Nonfatal Injury that Lead to Work Absences Among Police Officers and Level of Perceived Stress

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**Objective:** We examined prevalence, frequency, duration, and recency of injury leave and the association of duty-related injury with perceived stress in U.S. police officers. **Methods:** This cross-sectional study contained 422 active duty police officers from a mid-sized urban police department. For each participating officer, work history records were used to assess on-duty injuries that lead to work absences. Linear regression analyses were used for analyses. **Results:** Most participants had experienced at least one injury (62%), and among those injured, 67% experienced more than one duty-related injury. The average number of injuries per officer was three (range 1 to 12). There was a significant linear trend in mean perceived stress across injury count even after adjusting for age, rank, and sex ( $P=0.025$ ). **Conclusion:** Findings suggest that work-related injury is common and repeated work-related injuries are psychologically distressing in U.S. police officers.

Police work involves exposure to multiple critical incident stressors including the risk of being seriously injured or killed. The most common nonfatal injuries among law enforcement officers are attributable to assaults, transportation incidents, and training incidents that result in sprains, strains, contusions, and abrasions.<sup>1–4</sup> Such incidents may occur more than once throughout an individual's work history. In 2011, as part of the Survey of Occupational Injuries and Illnesses (SOII), states reported total nonfatal injuries and illnesses for public sector employees. As reported from the SOII, police and sheriff's patrol officers had the highest percentage of injuries requiring days away from work compared with other local and state government workers.<sup>4,5</sup>

In recent years, researchers have begun to demonstrate empirically the social and economic consequences of occupational injuries. Many physical, psychological, social, and behavioral changes occur in the aftermath of a moderate to severe occupational injury. These changes can occur with repeated injuries, even if they are less severe.<sup>6</sup> An occupational injury can be thought of as a critical incident that can cause added pressure on career performance and tax an individual's emotional resources, resulting in a range of responses such as exhaustion and chronic mental health symptoms.<sup>7–9</sup> Long-term financial hardship, limited ability to perform activities of daily living, and shifts in family dynamics associated with loss of income and disability can add to the

emotional and physical burdens that accompany injuries.<sup>10–12</sup> The occurrence of occupational injury may be especially distressing for law enforcement officers given that they must rely on a high level of physical functioning to perform their jobs. In addition, although many first responders are able to obtain disability income, the absence of overtime pay due to disabling injury can place additional financial strain on a responder who regularly relies on overtime pay as part of their income.<sup>13</sup>

Stress in law enforcement has been extensively documented. Many potential sources of stress have been described, including exposure to traumatic or violent events, extended work hours, shift work, a negative public image, supervisor/coworker conflict, and equipment not working.<sup>14</sup> Racism and sexual harassment may be a source of additional stress for minority and female officers.<sup>15</sup> The accumulation of organizational, operational, and interpersonal pressures has been shown to lead to burnout, posttraumatic stress disorder, depression, anxiety, and unhealthy coping behaviors in this profession.<sup>16–19</sup> The psychosocial stress model describes how one's perceived capacity to handle situational demands can be overcome by the inability to cope with such demands.<sup>20</sup> A person may appraise the condition (ie, traumatic event) as stressful if they determine that they do not have the available resources to deal with it.

This paper focuses on injury and perceived stress for law enforcement personnel with the intent that the findings will help to improve health and safety promotion efforts in these groups. An injury in the life of a police officer is likely perceived as stressful and represents an important stress antecedent that has not been previously examined in this population. Our aim was to examine the prevalence, frequency, duration, and recency of injury leave and the association of duty-related injury and perceived stress in U.S. police officers. Identifying and defining risk factors for psychological distress resulting from traumatic and nontraumatic injury will aid in development of prevention strategies in first-responder groups.

## METHODS

For this research, we utilized data from the Buffalo Cardio-Metabolic Occupational Police Stress (BCOPS) Study, which is a cross-sectional study of active-duty police officers from the Buffalo, New York police department, a mid-sized urban department with 810 officers. The Buffalo area has a population of approximately 260,000 with a high violent crime rate as compared with other American cities. The BCOPS study aims to elucidate the effects of policing and stress on adverse metabolic and early stage (subclinical) cardiovascular outcomes with the ultimate goal of preventing these and other stress-related disorders. The study obtained physiologic and self-reported measures of stress, adverse metabolic outcomes, psychosocial outcomes, and subclinical cardiovascular outcomes. All 710 officers were invited to participate in the BCOPS study during the period of May 21, 2004, to October 2, 2009. Participants completed questionnaires and were interviewed once between 2004 and 2009, providing information on perceived stress and demographic characteristics, lifestyle behaviors, and medical history. Payroll work history data were obtained to assess

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occurrence of on-duty injury from 1994 to 2009 for each participating officer. Data collection was performed at The Center for Preventive Medicine, State University of New York at Buffalo. The BCOPS study was approved by the Internal Review Board of the State University of New York at Buffalo and the Human Subjects Review Board of the National Institute for Occupational Safety and Health. This study was approved by the Health Sciences and Behavioral Sciences Institutional Review Boards at the University of Michigan.

To be included in the BCOPS study, a participant had to be an active sworn police officer, not on long-term leave, and not pregnant. One hundred officers who were on extended leave due to illness, disability, or suspension, and two pregnant officers were excluded. An additional 110 officers did not participate due to retirement, leaving the force, or death, and 134 chose not to participate. This yielded a sample of 464 participants for the BCOPS study.<sup>21</sup> Payroll work history data were available for 430 of the 464 BCOPS study participants. For each subject, injuries from the work history data that occurred after the date of questionnaire completion in the BCOPS study were excluded. We excluded eight officers who did not respond to the perceived stress questions. This yielded a final sample size of 422 for the present study.

The payroll work history data contained a day-by-day account of activities for each officer, including shifts, activity type (regular time work, court work or overtime work), leave, sickness and injury information, and the specific hours worked. On-duty injuries were determined when the payroll record indicated an officer was on leave due to an injury sustained during working hours. The continuous leave period due to on-duty injury was defined as one injury event. From this, a binary variable was constructed for ever having been injured (yes/no). An officer was at risk for developing a new injury following a full day of regular time at work after a previous injury. Using this definition, the number of injuries for each participant was calculated (injury count) and categorized as one injury and more than one injury. The total number of days including weekends that a participant was on leave due to on-duty injury was calculated for each injury and was summed across injuries to get the total duration of injury leave for each subject. We used the injury with the longest continuous duration of days on disability leave to define duration of injury leave used in these analyses, which we categorized on the basis of set administrative cutpoints. At 30 days leave, officers typically qualify for short-term disability and at 90 days for long-term disability. We also defined a variable, recency of injury, based on the time interval from last injury to the date of questionnaire completion.

Perceived stress was assessed using the Perceived Stress Scale (PSS), a 14-item self-reported questionnaire that asks about feelings and thoughts during the past month.<sup>22</sup> Questions focus on how unpredictable, uncontrollable, and overloaded respondents perceive their lives to have been over the past month. It is considered a valid predictor of stress-induced consequences, including burnout, physical symptoms, and job dissatisfaction and has shown good internal consistency in other studies (Cronbach  $\alpha = 0.93$ ).<sup>23,24</sup> Internal consistency for the total scale reached a relatively high value of  $\alpha = 0.87$  for this study. Participants rated each item on a five-point scale based on the frequency with which a particular event was experienced: 0 (never), 1 (almost never), 2 (sometimes), 3 (fairly often), and 4 (often). The total PSS scores were obtained by reverse coding the seven positively stated items and then summing across all 14 items; the scores ranged from 0 to 56, with higher scores indicating higher stress.<sup>21</sup>

Age, sex, race/ethnicity, marital status, and work characteristics were measured through interviews and self-administered questionnaires. Work characteristics, including rank, workload (light, moderate, or heavy), and years of service, were assessed by a questionnaire. Rank was collapsed into three categories for the

current analysis: patrol police, sergeant/lieutenant, and captain/detective/executive/others.

## Statistical Analysis

We calculated prevalence, frequency, duration, and recency of injury leave. In addition, we examined distributions of variables and compared demographic and work characteristics of participants with and without injury and by mean values of perceived stress. Associations of potential confounders with injury and stress were examined. Student *t* tests, analysis of variance (ANOVA), and analysis of covariance (ANCOVA) were used to compare mean values of continuous variables by category of injury and Chi-square tests were used to examine the relationships between categorical covariates. Multiple linear regression models were constructed to examine the association of injury with perceived stress adjusted for possible confounders. Four types of injury were examined: injury status (any injury vs no injury); count of injury (0 to 8 or more); duration of injury leave (0, <30, 30 to 89,  $\geq 90$  days), and recency of injury (less than 1 year, 1 to 2 years, 2 to 3 years, 3 to 5 years, and 5 or more years). We also assessed potential interactions between the injury variables and age, sex, and rank by including interaction terms in multiple linear regression models. Inclusion of select covariates in multiple regression models was based on results of initial bivariate analyses, previously published literature, and observed appreciable change in the parameter coefficient of the main exposure as each potential confounder was introduced into the regression model. We used a sequential modeling approach where models are (1) unadjusted and (2) adjusted for age, sex, and rank. Statistical significance was assessed for all tests at the 5% level. All analyses were performed using SAS 9.3 (SAS institute, Cary, NC).

## RESULTS

Sixty-two percent of the participants had experienced an injury and of those who were injured, 67% experienced more than one duty-related injury. The average number of injuries per officer between 1994 and 2009 was three (range 1 to 12). The average number of days away from work due to a duty-related injury was 86 (range of 1 to 2250). Duration of injury leave varied, but 41% of participants who were injured had more than 90 days away from work due to duty-related injury. Of the duty-related injuries experienced by participants, 18% had the last injury 1 year prior and 72% had the last injury in the 5 years before the time of questionnaire completion. Demographic and lifestyle characteristics of study participants by injury status and mean perceived stress score are summarized in Table 1. Overall, most of the participants were male (74%) with an average age of 43 years (range 27 to 70). Those who had experienced a duty-related injury were more likely to be younger, have fewer years of service, and be a patrol officer. The average perceived stress score in this sample was 20.3 (SD = 7.8). Women had a higher mean perceived stress score ( $22.5 \pm 9.2$ ) than men ( $19.6 \pm 7.1$ ).

Table 2 presents the association between injury status and perceived stress. Although mean perceived stress score was slightly higher in those injured than not injured, the unadjusted and adjusted mean differences were not statistically significant, controlling for age, rank, and sex. There was a significant linear trend in mean perceived stress across injury count even after adjusting for age, sex, and rank ( $P = 0.025$ ) (Table 3). Perceived stress scores did not differ by duration of injury leave (Table 4). Lower stress levels were reported in participants with 500 or more days of leave ( $n = 10$ ), which could represent a special circumstance in the officer's career where the injury would not be considered as psychologically distressing (data not shown). In our analyses, we found these points exerted some leverage so we examined the association when those with 500 or more days of leave were excluded. The association approached statistical significance after controlling for age, rank,

**TABLE 1.** Associations of Demographic, Lifestyle, and Work History Characteristics of Study Participants With Injury Status and Perceived Stress

Characteristics	No Injury <i>n</i> = 161		Any Injury <i>n</i> = 261		<i>P</i> *	Perceived Stress Score <i>n</i> = 422		<i>P</i> <sup>†</sup>
	<i>n</i>	%	<i>n</i>	%		<i>n</i>	Mean ± SE	
Age								
<40 years	45	28.0	115	43.7	<0.0001	160	21.1 ± 7.9	0.2664
40–49 years	68	42.2	115	44.0		183	20.1 ± 8.1	
>50 years	48	29.8	31	11.9		79	19.4 ± 6.6	
Sex								
Women	40	24.8	68	26.1	0.7822	108	22.5 ± 9.2	0.0008
Men	121	75.2	193	74.0		314	19.6 ± 7.1	
Race								
White	128	81.5	198	76.2	0.3592	326	20.5 ± 8.0	0.3332
Black	26	16.6	58	22.3		84	19.2 ± 7.2	
Hispanic	3	1.9	4	1.5		7	21.6 ± 5.9	
Education								
≤High school/GED	19	11.9	28	11.2	0.3668	47	20.2 ± 8.2	0.8581
College <4 years	82	51.3	152	58.2		234	20.5 ± 8.0	
College ≥4 years	59	36.7	81	31.0		140	20.1 ± 7.2	
Marital status								
Single	23	14.4	28	10.5	0.1709	51	21.3 ± 8.2	0.5600
Married	121	75.6	192	73.6		313	20.1 ± 7.5	
Divorced	16	10.0	41	15.7		57	20.6 ± 8.9	
Rank								
Patrol officer	83	52.5	204	78.5	<0.0001	287	20.3 ± 7.9	0.8086
Sergeant/Lieut/Capt	33	20.9	36	13.9		69	20.9 ± 8.8	
Detective/Exec/Others	42	26.6	20	7.7		62	20.2 ± 6.3	
Workload								
Low	9	5.8	10	3.9	0.6614	19	18.9 ± 7.7	0.4379
Moderate	49	31.4	79	30.9		128	20.9 ± 7.7	
High	98	62.8	167	65.2		265	20.0 ± 7.7	
Years of service								
0–9 years	39	24.2	65	24.9	<0.0001	104	20.4 ± 7.3	0.1731
10–14 years	13	8.1	76	29.1		89	21.3 ± 8.2	
15–19 years	36	22.4	57	21.8		93	21.0 ± 8.4	
>20 years	73	45.3	63	24.1		136	19.1 ± 7.2	

Buffalo Cardio-metabolic Occupational Police Stress (BCOPS) Study, 2004–2009; Injury data from payroll records, 1994–2009; *N* = 422.\**P* value: From *t* test to compare covariates in those with and without injury.†*P* value: From ANOVA to compare mean values of perceived stress by levels of covariates.

and sex ( $P = 0.06$ ). Lastly, we compared perceived stress scores by how recent the last injury was in relation to when perceived stress was measured. Although no statistically significant linear trend was found between recency of injury and mean perceived stress scores, a statistically significantly higher mean perceived stress was found for those with injury leave within 1 to 2 years of completing the baseline questionnaire than those with no injury ( $P = 0.0468$ ) after adjustment (Table 5). No significant effect modification was observed in by age, sex, and rank (data not shown).

**TABLE 2.** Unadjusted and Adjusted Mean Perceived Stress Scores by Injury Status

Injury Status	<i>N</i>	Model 1: Unadjusted	Model 2: Adjusted for Age, Sex, and Rank
Not injured	161	19.9 ± 0.6	20.0 ± 0.6
Injured	261	20.6 ± 0.5	20.6 ± 0.5
<i>P</i> *		0.3843	0.4183

BCOPS Study, 2004–2009; Injury data from payroll records, 1994–2010; *N* = 422.\**P*: *t* test and ANCOVA.

## DISCUSSION

This study assessed whether the occurrence, frequency, duration, or recency of injury leave of duty-related injury was

**TABLE 3.** Unadjusted and Adjusted Mean Perceived Stress Scores by Count of Injuries

Count of Injuries	<i>N</i>	Model 1: Unadjusted	Model 2: Adjusted for Age, Sex, and Rank
0	161	19.9 ± 0.6	20.0 ± 0.6
1	87	19.6 ± 0.8	19.6 ± 0.8
2	61	21.5 ± 1.0	21.2 ± 1.0
3	44	21.1 ± 1.2	20.9 ± 1.2
4	25	19.7 ± 1.5	19.8 ± 1.5
5	18	17.7 ± 1.8	18.0 ± 1.8
6	8	19.5 ± 2.7	19.6 ± 2.7
7	6	22.2 ± 3.1	22.8 ± 3.1
8 or more	12	28.0 ± 2.2	28.5 ± 2.2
<i>P</i> *		0.0462	0.0254

BCOPS Study, 2004–2009; Injury data from payroll records, 1994–2009; *N* = 422.\**P*: Linear regression-trend test.

**TABLE 4.** Unadjusted and Adjusted Mean Perceived Stress Scores by Duration of Injury Leave

Duration of Injury Leave, days*	N	Model 1: Unadjusted	Model 2: Adjusted for Age, Sex, and Rank
0	161	19.9 ± 0.6	19.9 ± 0.6
1–30	84	20.5 ± 0.8	20.6 ± 0.9
30–89	71	19.8 ± 0.9	19.6 ± 0.9
≥90	106	21.2 ± 0.8	21.4 ± 0.8
P <sup>†</sup>		0.9122	0.9085

BCOPS Study, 2004–2009; Injury data from payroll records, 1994–2009; N = 422.

\*Duration of injury leave that lasted longest.

†P: Linear regression-Trend test.

associated with levels of perceived stress in U.S. police officers. Most participants had experienced more than one duty-related injury and of those who were injured, nearly half had taken extended time off of work due to the injury. The difference in mean perceived stress score in injured compared with not-injured participants was not statistically significant. However, mean perceived stress scores did increase with number of injuries. These findings have shed light on the work-related injury experience and how it can lead to stress in U.S. public safety workers. It is worth noting that most of the officers in this study had been injured, most repeatedly, and much of the resulting leave was taken on a long-term basis. The prevalence of injuries was higher than that reported in other studies of police officers and first responders.<sup>3,25</sup>

The high percentage of injury can partially be explained by the length of period it represents (15 years) and how injury was defined. The data used were from administrative data/payroll history and an injury was counted if an officer was on leave for a reported on-duty injury for any continuous length of time, and we defined a new injury of the same officer if they returned to duty the following full day of regular time at work after a previous injury. The leave taken may have been a result of the same injury (ie, the same back injury exacerbated in the line of duty resulting in officer requesting leave). We examined time intervals between successive injuries because of this concern, and we found a small percentage of the participants had short intervals of time (1 to 5 days) between successive injuries suggesting this may have been the same injury; which could have contributed to a higher percentage in comparison to other studies that used self-reported injury. In addition, the estimated prevalence of 62% is what we call “lifetime” prevalence, as it represents percentage of officers who experienced an injury (leading to work absence) during the past 15 years. This is not a true rate, as the calculation of the percentage did not involve person-time-at risk of being injured. The estimate is simply a percentage of officers who experienced at least one injury during a 15-year period, hence the high percentage.

However, this data collection method did not encompass all on-duty nonfatal injuries experienced in this department, as minor injuries may not have resulted in the officer being off duty. The policy of the department state that if an officer is not capable of “strenuous, physical activity,” then they cannot return to work after an on-duty injury. Thus, a sprained wrist of ankle can incapacitate an officer enough to keep him/her off duty. Taken together, we are reasonably assured given the evidence; this study is demonstrating a high burden of injury that is fairly severe in this population. Past research findings from this population looking at shift work and injury highlighted this high number of injury in the department, and interventions were recommended that included improved rotation and shift scheduling practices, light duty accommodation, and fatigue reduction and physical fitness interventions.<sup>26</sup>

Repeated injury was the primary injury measure that was found to be significantly associated with perceived stress after controlling for age, rank, and sex. One study examining sick or injury absence and work stress in police officers found a linear association between frequency of work-related absences and stress, but did not find an association with number of days lost.<sup>27</sup> A study of Finnish police officers examining psychological distress, using the 12-item version of the General Health Questionnaire, after experiencing a work-related injury found officers with two or more injuries had a higher risk of experiencing psychological distress symptoms than noninjured officers.<sup>25</sup> Similar findings were reported in a study comparing symptoms of psychological distress between injured and uninjured workers. The author found greater emotional instability, depressive, and anxiety symptoms in injured than uninjured workers and concluded the psychological consequences for workers who return to, or remain at, work following injury may reduce adaptation and increase vulnerability to secondary work disability.<sup>28</sup> These studies also suggest a dose-response effect of work injuries or sickness absence and level of psychological distress.

The lack of association found with duration of leave and perceived stress was surprising. Typically, injury severity is measured using the injury severity score (ISS), which is based on a summed score of the severity and self-reported location of the injury on the body,<sup>29</sup> and it has shown utility in determining extent of health care access,<sup>30</sup> but the ISS was not used for this study. The length of recovery time needed after injury has been used as a surrogate of injury severity in other studies.<sup>31</sup> However, our results suggest that duration of injury may be associated with perceived stress when very long-term leave (>500 days) was excluded in the present study.

The stress measure used in this study was one of many types of measures that could have been used. The PSS is a good instrument for measuring appraised stress; the questions are of general nature and are not specific to particular situations or populations. Stress is a complex phenomenon, influenced by a wide variety of factors, and the definition used in this study may not capture the whole picture of police officers’ stress experience, and due to its general nature, the measure may not have focused narrowly enough on aspects of stress that are salient to this population. As a group, police officers are known to be reluctant to report symptoms of stress and alternative measures deserve further study. Inclusion of additional self-reported and physiologic measures of stress may broaden our understanding of the biology of stress response syndromes and physical disability. In addition, perceived stress levels were affected by time since participant’s last injury leave. This

**TABLE 5.** Unadjusted and Adjusted Mean Perceived Stress Scores by Recency of Injury Leave

Recency of Injury Leave, years*	N	Model 1: Unadjusted	Model 2: Adjusted for Age, Sex, and Rank
No injury	161	19.9 ± 0.6	19.9 ± 0.6
<1	47	20.3 ± 1.1	20.5 ± 1.1
1–2	55	23.0 ± 1.0	22.8 ± 1.1 <sup>‡</sup>
2–3	36	19.5 ± 1.3	19.7 ± 1.3
3–5	49	19.9 ± 1.1	20.0 ± 1.1
≥5 years	74	20.0 ± 0.9	20.0 ± 0.9
P <sup>†</sup>		0.2670	0.3725

BCOPS Study, 2004–2009; Injury data from payroll records, 1994–2009; N = 422.

\*Recency of last injury to measurement of perceived stress.

†P: Linear regression-Trend test.

‡Comparison of mean perceived stress scores of those who were injured within 1–2 years compared with those with no injury (P = 0.0468).

analysis suggests that someone is likely to perceive their lives to be more stressful if the injury event occurred within 1 to 2 years. Collectively, these factors may have led to underestimated levels of perceived stress reported in this study.

Researchers have recommended that future studies examine the role of potential modifiers, such as coping, when assessing psychological morbidity after injury.<sup>30</sup> In general, police officers are thought to have a higher level of resiliency than other occupational populations because they undergo pre-employment and in some cases ongoing physical and psychological medical screening; however, whether this level of resiliency remains as a potent buffer after a traumatic injury or after repeated exposure to acute and chronic life stressors requires future research.

An important limitation of the study is the absence of type, nature, or cause of injury from the payroll work history data. Psychological distress effects likely differ with type and nature of injury. The potential for loss of those who left the force before completing the BCOPS study surveys and interviews, and exclusion of those on long-term sick leave could have resulted in selection bias. An earlier comparison of demographic characteristics between participants and nonparticipants in the BCOPS study from the work history data found similar frequency distributions for sex, age, rank, and year of hire.<sup>21</sup> The extent that these findings are generalizable to other law enforcement and first responder populations may be limited, as the study includes participants from one city police department. Additional studies in police and first responder populations in other areas of the U.S. are needed. Finally, there is some potential for reverse causation given the absence of concurrent health and injury information and the potential of stress leading to an increased risk of occupational injury.

## CONCLUSION

Findings of this study suggest that injury is common among police officers and repeated injury is associated with higher perceived stress. Findings from this research improve our understanding of the impact of injury in the line of duty for police. These findings have shed light on the work-related injury experience and how it can lead to stress in U.S. public safety workers. Results can be used to inform the future development of targeted and timely clinical and workplace interventions to prevent serious psychological symptom development and to direct limited resources for resilience training and early intervention. Further investigation is needed about the circumstances that result in severe injury and may also require change in safety culture so that management and the health community intervene early to prevent injuries, their sequelae, and subsequent injuries. In addition, future studies that examine associations of physiologic measures of stress (objective measure) in relation to injury would significantly contribute to the field.

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