





# Associations between Trauma Exposure and Physical Conditions among Public Safety Personnel

## Associations entre l'exposition à un traumatisme et les problèmes physiques chez le personnel de la santé publique

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### Abstract

**Background:** Trauma exposure is associated with adverse health-related correlates, including physical comorbidities, and is highly prevalent among public safety personnel (PSP). The current study (1) examined the association between context of index trauma exposure (part of job vs. other) and physical conditions and (2) established the prevalence of physical conditions according to PSP category (e.g., police, paramedic) and index trauma type (e.g., serious accident, physical assault) in a large Canadian sample of PSP.

**Methods:** PSP completed an online survey between September 2016 and January 2017. Multivariable logistic regressions examined associations between context of index trauma exposure (i.e., part of job vs. other) and physical condition categories. Cross-tabulations with chi-square analyses examined whether the prevalence of physical conditions significantly differed according to PSP category and index trauma type.

**Results:** There were 5,267 PSP included in the current study. Results from the most stringent model of logistic regressions demonstrated that, compared to PSP who experienced their index trauma in any other context, PSP who experienced it as part of their job had reduced odds of "other" physical conditions (adjusted odds ratio = 0.73, 95% confidence interval, 0.57 to 0.94,  $P < 0.05$ ). Results also revealed significant differences in the prevalence of physical conditions across all PSP categories and select index trauma types.

**Conclusion:** Results highlight the relevance of trauma exposure outside of an occupational context among PSP and may have implications for the positive impact of stress inoculation and resiliency training programs for PSP.

### Abrégé

**Contexte :** L'exposition à un traumatisme est associée à des corrélats indésirables liés à la santé, notamment les comorbidités physiques, et est hautement prévalente chez le personnel de la santé publique (PSP). La présente étude: (1) a examiné l'association entre le contexte de l'exposition à un traumatisme indiciel (dans le cadre de l'emploi par rapport à un autre) et les

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problèmes physiques et (2) a établi la prévalence des problèmes physiques selon la catégorie du PSP (p. ex., police, ambulancier) et le type du traumatisme indiciel (p. ex., accident sérieux, agression physique), dans un vaste échantillon canadien de PSP.

**Méthodes :** Les membres du PSP ont répondu à un sondage en ligne entre septembre 2016 et janvier 2017. Des régressions logistiques multivariées ont examiné les associations entre le contexte de l'exposition indicielle à un traumatisme (c.-à-d., dans le cadre de l'emploi par rapport à un autre) et les catégories de problèmes physiques. Des tabulations croisées avec des analyses du chi carré ont examiné si la prévalence des problèmes physiques différait significativement selon la catégorie de PSP et le type du traumatisme indiciel.

**Résultats :** Il y avait 5 267 membres du PSP inclus dans la présente étude. Les résultats des modèles de régression logistique les plus rigoureux ont démontré que, comparativement au PSP qui avait subi leur traumatisme indiciel dans un tout autre contexte, le PSP qui l'avait subi dans le cadre de leur emploi avait réduit les probabilités « d'autres » problèmes physiques (rapport de cotes ajusté (RCA) = 0,73; intervalle de confiance (IC) à 95% [0,57 à -0,94];  $p < 0,05$ ). Les résultats ont révélé également des différences significatives dans la prévalence des problèmes physiques dans toutes les catégories de PSP et des types sélectionnés de traumatisme indiciel.

**Conclusion :** Les résultats mettent en lumière l'importance de l'exposition à un traumatisme hors d'un contexte professionnel chez le PSP et peuvent avoir des implications pour l'effet positif des programmes de formation à la résistance au stress et à la résilience pour le PSP.

### Keywords

public safety personnel, trauma exposure, physical conditions

Due to the nature of their work, public safety personnel (PSP; e.g., correctional workers, police officers, firefighters, paramedics, public safety communications officials [e.g., 911 call center operators/dispatchers]) are commonly exposed to potentially traumatic events.<sup>1-9</sup> Studies across various samples demonstrate high estimates of trauma exposure among PSP, exceeding 85%;<sup>1,3,7-9</sup> a recent study found that PSP reported exposure to 11 of the 16 types of traumatic events, on average.<sup>1</sup> Extant research has highlighted the negative health correlates associated with trauma exposure among PSP and the general population, including psychiatric illnesses<sup>1,6-7,10,11</sup> and, of particular relevance to the current study, physical conditions.<sup>12-16</sup> Researchers suggest the latter association may be explained by physiological changes associated with the body's response to traumatic stress.<sup>17</sup> Studies have shown that PSP have high rates of various physical conditions including respiratory, cardiovascular, autoimmune, gastrointestinal, chronic pain, and cancer;<sup>18-22</sup> this may be, in part, related to their elevated rates of trauma exposure; however, this has not been directly investigated.

Research among the general population has examined the relevance of trauma characteristics in the association between trauma exposure and physical conditions, including number and type of traumatic events. For example, population-based studies by our group and others have found a "dose-response" relationship between number of traumatic events and increasing odds of physical conditions.<sup>12-13,16</sup> These studies also suggest that the association between trauma exposure and physical conditions may vary according to type of traumatic event and that these associations remain significant after controlling for psychiatric conditions. In particular, researchers<sup>12-13</sup> found associations

between injurious traumas (particularly sexual assault) and witnessed traumas with a wide variety of physical conditions. However, associations between exposure to other trauma types and physical conditions, including war-related trauma, psychological trauma, and natural disasters, have been inconsistent.<sup>12-13,16</sup> The disparate results may stem from variations in covariates included within regression models across studies; nonetheless, further investigation is warranted to better understand the association between trauma characteristics and physical conditions, particularly in populations where trauma burden is high.

To our knowledge, no research to date has examined the association between trauma exposure and physical conditions among PSP despite elevated rates of both trauma exposure and physical conditions among this population. Recent research suggests that the prevalence of exposure to different types of traumatic events, cumulative number of types of traumatic events, and proportions of worst traumatic events endorsed may vary according to the type of PSP.<sup>1</sup> Accordingly, the prevalence of physical conditions may vary as a function of both type of trauma exposure experienced by PSP and type of PSP. Research that has examined either trauma exposure or physical health conditions individually among PSP has been limited to relatively homogenous samples of specific types of PSP (e.g., firefighters only). The available results limit our understanding of how differences in job requirements and work-related exposures according to PSP type may be related to trauma exposure and physical health. In addition, although studies have examined associations between trauma type and physical conditions, to our knowledge, no research to date has specifically examined the relationship between work-related traumatic events and

physical conditions. This is particularly relevant to PSP who experience high rates of traumatic exposures as part of their jobs. Understanding the relationship between work-related trauma exposure and physical health among PSP represents a valuable area of investigation with important public health implications such as informing targeted intervention or prevention initiatives. Given the existing research gaps, the current study is designed to (1) examine the association between context of index trauma exposure (i.e., part of job as PSP vs. other contexts) and physical conditions and (2) establish the prevalence of physical conditions according to PSP category and index trauma type in a large, diverse sample of Canadian PSP.

## Methods

### Data and Sample

Data were collected using an online self-report survey from September 1, 2016, to January 31, 2017. The survey was available in English or French and was conducted in accordance with web-based survey guidelines.<sup>23</sup> Email invitations were distributed to PSP from the Public Safety Steering Committee of the Canadian Institute for Public Safety Research and Treatment, advocacy organizations, and public safety organizations, and a video invitation was prepared by the Minister of Public Safety and Emergency Preparedness in order to recruit participants. Additional details regarding data collection for this study have been published elsewhere.<sup>24,25</sup> The original sample consisted of 8,520 participants; however, the sample for the current study only included 5,267 (61.8%) participants who completed the psychiatric symptom modules and items pertaining to physical conditions. Ethical approval for the study was obtained from the University of Regina Institutional Research Ethics Board (file #2016-107).

### Measures

**Physical conditions.** Following the psychiatric condition and chronic pain modules, participants were asked “Do you have any other diagnosed health conditions?” (i.e., aside from psychiatric conditions and chronic pain). If participants responded “yes,” they were asked to describe which diagnoses they had received. Responses describing physical conditions were grouped into categories based on physiological systems, clinical recommendation,<sup>26</sup> and prior research:<sup>27</sup> neurologic (e.g., migraine, concussion, epilepsy), digestive (e.g., inflammatory bowel disease, liver disease, pancreatitis), endocrine/metabolic (e.g., diabetes, high cholesterol, thyroid diseases), respiratory (e.g., asthma, bronchitis, sinusitis), cardiovascular (e.g., hypertension, cardiovascular disease, heart attack), and musculoskeletal/rheumatic (e.g., arthritis, fibromyalgia, lupus, osteoporosis). In order to obtain adequate cell sizes, we collapsed neoplastic, infectious, urogenital, hematologic, dermatologic, sensory conditions, sleep disorders, and other physical conditions into an “other” physical condition

category (see Online Appendix A for a complete list of physical conditions in each category).

**Trauma exposure.** The Life Events Checklist for *DSM-5*<sup>28</sup> assessed trauma exposure. Participants were shown a list of 17 types of traumatic events and asked whether they had ever personally experienced or witnessed each event, learned that the event happened to a close friend or family member, or were exposed to the event as part of their job as a first responder. Participants were then asked to select which of the events was the worst trauma they had ever experienced (i.e., index trauma). We categorized index traumas into seven groups (i.e., life-threatening natural disaster/explosion, serious accident, physical assault, sexual assault, life-threatening illness/injury, witnessed trauma, and other trauma) on the basis of similarity and prior research<sup>29,30</sup> (see Online Appendix B for a complete list of index trauma types in each category).

Participants were then asked “What is the most stressful way you have experienced this event?” and were provided with 5 response options: (a) It happened to me directly, (b) I witnessed it, (c) I learned about it happening to a close family member or friend, (d) I was repeatedly exposed to details about it as part of my job, and (e) other (please specify). If participants specified within the “other” category that they directly experienced the event or witnessed the event as part of their job, these responses were categorized with response option “d.” We then dichotomized response options according to whether or not the participant was exposed to the event in the most stressful way as part of his or her job as a first responder (i.e., part of my job vs. other).

**Sociodemographic and PSP characteristics.** Participants were grouped into six PSP categories based on self-report: municipal/provincial police, federal police (i.e., Royal Canadian Mounted Police [RCMP]), correctional workers, firefighters, paramedics, and public safety communications officials; municipal/provincial police and RCMP were examined separately due to differences in their work setting and context.<sup>25</sup> We examined age and years of PSP service continuously and categorized sex (male, female), marital status (married/common-law, single, separated/divorced/widowed/remarried), ethnicity (White, other), and education (high school or less, some postsecondary, university/college degree or higher) in accordance with prior research.<sup>25</sup>

**Psychiatric screens and self-reported diagnoses.** Well-validated and reliable self-report measures assessed positive screens for psychiatric conditions. The Posttraumatic Stress Disorder (PTSD) Checklist for *DSM-5* (PCL-5)<sup>31</sup> assessed past month PTSD. A positive screen for PTSD required meeting the minimum criteria for each PTSD cluster and a total PCL-5 score >32.<sup>32</sup> The Patient Health Questionnaire<sup>33,34</sup> assessed major depressive disorder (MDD) over the past 14 days with a total score >9 indicating a positive screen.<sup>35</sup> The Generalized

Anxiety Disorder (GAD) Scale (GAD-7)<sup>36,37</sup> assessed GAD over the past 14 days, wherein a total score >9 was indicative of a positive screen.<sup>38</sup> The Panic Disorder (PD) Symptoms Severity Scale–Self-Report (PDSS-SR)<sup>39</sup> assessed PD over the past 7 days. A total score >7 is suggestive of a positive screen.<sup>40</sup> The Social Interaction Phobia Scale<sup>41</sup> assessed social anxiety disorder (SAD) with a positive screen designated by a score >20.<sup>42</sup> Finally, the Alcohol Use Disorder (AUD) Identification Test<sup>43-45(AUDIT)</sup> assessed the presence of a past year AUD. A total score >15 is suggestive of a positive screen.<sup>44</sup>

Participants self-reported lifetime psychiatric conditions that were not assessed by screening measures (outlined above), including obsessive-compulsive disorder (OCD), persistent depressive disorder (PDD), bipolar I, bipolar II, and cyclothymic disorder. They were asked whether they had ever been diagnosed with a mood/anxiety disorder (separately), and if they responded “yes,” they were asked to check all responses that applied. These disorders were categorized into composite variables with the psychiatric screens due to low prevalence; categories included “any anxiety disorder” (OCD, GAD, SAD, PD) and “any mood disorder” (MDD, PDD, bipolar I, bipolar II, cyclothymic disorder). These variables were included as covariates in analyses along with positive screens for PTSD and AUD.

### Analytic Strategy

Descriptive statistics assessed sample characteristics among the total sample and among those who experienced their index trauma as part of their job as a PSP. Next, multivariable logistic regressions examined associations between context of exposure to index trauma (part of my job versus other [reference]) and physical conditions. We conducted an unadjusted model, in addition to a second model controlling for sociodemographics and PSP characteristics (i.e., age, sex, marital status, race, education, years of PSP service, PSP category) and a third model controlling for sociodemographics, PSP characteristics, and psychiatric conditions (i.e., positive screen for PTSD, any anxiety disorder, any mood disorder, AUD). Finally, although cell sizes and statistical power did not permit analyses examining the role of PSP category and index trauma type in associations between context of index trauma exposure and physical conditions, cross-tabulations with chi-square analyses assessed the prevalence of physical conditions according to PSP category and index trauma type among the entire sample. Analyses were conducted using SPSS (version 25)<sup>46</sup> and STATA (version 15)<sup>47</sup> statistical software.

## Results

### Sample Characteristics

PSP were 43.42 years old on average and primarily male (66.6%), married/common-law (75.2%), and White (90.4%) with some postsecondary education (52.5%). PSP

**Table 1.** Sample Characteristics.

	Total Sample	Experienced Worst Trauma as Part of Job
<i>n</i> (%)	5,267 (100.0)	1,649 (31.3)
Age ( <i>M</i> , <i>SD</i> )	43.42 (9.36)	42.91 (9.25)
Sex		
Male	3,510 (66.6)	1,112 (67.5)
Female	1,736 (33.0)	536 (32.5)
Marital status		
Single	532 (10.1)	151 (9.2)
Married/common-law	3,963 (75.2)	1,272 (77.5)
Separated/divorced/widowed/ remarried	727 (13.8)	219 (13.3)
Ethnicity		
White	4,763 (90.4)	1,516 (92.7)
Other	443 (8.4)	119 (7.3)
Education		
High school or less	472 (9.0)	137 (8.5)
Some postsecondary	2,767 (52.5)	901 (56.0)
College degree or higher	1,896 (36.0)	570 (35.4)
PSP category		
Municipal/provincial police	1,348 (25.6)	391 (24.4)
RCMP	1,305 (24.8)	431 (26.9)
Correctional workers	710 (13.5)	134 (8.3)
Firefighters	807 (15.3)	289 (18.0)
Paramedics	675 (12.8)	245 (15.3)
Public safety communications officials	248 (4.7)	115 (7.2)
Years of service ( <i>M</i> , <i>SD</i> )	17.68 (9.57)	17.70 (9.36)
Index trauma		
Life-threatening natural disaster/ explosion	242 (4.6)	60 (3.7)
Serious accident	762 (14.5)	295 (18.4)
Physical assault	520 (9.9)	56 (3.5)
Sexual assault	300 (5.7)	89 (5.5)
Life-threatening illness/injury	297 (5.6)	32 (2.0)
Witnessed	2,230 (42.3)	960 (59.9)
Other	700 (13.3)	112 (7.0)
Psychiatric conditions		
PTSD	1,164 (22.1)	318 (19.6)
Anxiety disorder	1,429 (27.1)	439 (29.0)
Mood disorder	1,415 (26.9)	435 (27.2)
Alcohol use disorder	299 (5.7)	79 (4.9)

Note. RCMP = Royal Canadian Mounted Police; PTSD = posttraumatic stress disorder.

served for 17.68 years on average, and the most common PSP category was municipal/provincial police (25.6%). The most frequently endorsed index trauma was witnessed trauma (42.3%), and PTSD, anxiety disorders, mood disorders, and AUDs were prevalent among 22.1%, 27.1%, 26.9%, and 5.7% of the sample, respectively. Participants who experienced their index trauma as part of their job ( $n = 1,649$ ; 31.3%) had characteristics similar to the full sample, with an elevated proportion endorsing witnessed trauma as their index trauma (59.9%; see Table 1).

**Table 2.** Associations between Context of Index Trauma Exposure and Physical Conditions.

Dependent Variables	Part of My Job	Other	Part of My Job		
	<i>n</i> (%)		OR (95% CI)	AOR1 (95% CI)	AOR2 (95% CI)
Neurologic	46 (3.0)	147 (4.6)	0.64 (0.45 to 0.89)**	0.63 (0.45 to 0.90)*	0.70 (0.48 to 1.01)
Digestive	99 (6.4)	194 (6.1)	1.06 (0.82 to 1.36)	1.06 (0.81 to 1.38)	1.00 (0.75 to 1.33)
Endocrine/metabolic	110 (7.2)	242 (7.6)	0.93 (0.74 to 1.18)	0.97 (0.76 to 1.25)	0.95 (0.73 to 1.25)
Respiratory	58 (3.8)	110 (3.5)	1.09 (0.79 to 1.51)	1.09 (0.78 to 1.54)	1.01 (0.70 to 1.46)
Cardiovascular	134 (8.7)	318 (10.0)	0.86 (0.69 to 1.06)	0.87 (0.69 to 1.10)	0.91 (0.71 to 1.17)
Musculoskeletal/rheumatic	121 (7.9)	285 (9.0)	0.87 (0.69 to 1.08)	0.88 (0.70 to 1.11)	0.85 (0.66 to 1.09)
Other	119 (7.7)	304 (9.6)	0.79 (0.64 to 0.99)*	0.79 (0.62 to 0.99)*	0.73 (0.57 to 0.94)*

Note. Reference = other context of exposure (i.e., happened to me personally, witnessed it, learned about it). *n* (%) values represent the prevalence of physical condition categories according to context of exposure; OR = unadjusted odds ratio. AOR1 = adjusted odds ratio, controlling for sociodemographics and PSP characteristics (i.e., age, sex, marital status, race, education, years of service, public safety personnel category); AOR2 = adjusted odds ratio, controlling for sociodemographics, PSP characteristics, and psychiatric conditions (i.e., positive screen for posttraumatic stress disorder, any anxiety disorder, any mood disorder, or alcohol use disorder); CI = confidence interval.

\* $P < 0.05$ .

\*\* $P < 0.01$ .

### Associations between Context of Index Trauma and Physical Conditions

The multivariable logistic regression results are shown in Table 2. Compared to experiencing an index trauma in any other context, experiencing an index trauma as part of working as a PSP was associated with reduced odds of neurologic conditions (odds ratio [OR] = 0.64, 95% CI, 0.45 to 0.89,  $P < 0.01$ ) and “other” physical conditions (OR = 0.79, 95% CI, 0.64 to 0.99,  $P < 0.05$ ). Results remained consistent after controlling for sociodemographic and PSP characteristics. After additionally adjusting for psychiatric conditions, experiencing an index trauma as part of working as a PSP was associated with reduced odds only of “other” physical conditions (adjusted OR [AOR] = 0.73, 95% CI, 0.57 to 0.94,  $P < 0.05$ ) compared to experiencing an index trauma in any other context. Post hoc analyses examined associations between context of index trauma exposure (part of working as PSP vs. other [reference]) and individual physical conditions within the “other” physical condition category. Results revealed no significant associations for any of the individual “other” physical conditions (AOR range: 0.90 to 1.01,  $P > 0.05$ ).

### Prevalence of Physical Conditions

Among the entire sample, the prevalence of each physical condition category significantly varied according to PSP category (see Table 3). Across PSP categories, paramedics had the highest prevalence of neurologic (6.1%), digestive (11.0%), endocrine/metabolic (10.5%), and respiratory conditions (7.2%); correctional workers had the highest prevalence of cardiovascular conditions (11.9%); RCMP had the highest prevalence of musculoskeletal/rheumatic conditions (12.2%); and communications officials had the highest prevalence of other physical conditions (12.9%). Firefighters

had the lowest prevalence of each physical condition with the exception of cardiovascular conditions.

The prevalence of respiratory, cardiovascular, musculoskeletal/rheumatic, and other physical conditions varied according to index trauma type among PSP (see Table 3). Cardiovascular (13.9%), musculoskeletal/rheumatic (13.6%), and other physical conditions (16.1%) were most prevalent among PSP who endorsed a life-threatening illness/injury as their index trauma. Respiratory conditions (6.3%) were most prevalent among those who endorsed sexual assault as their index trauma.

### Discussion

The current study adds to the growing body of literature on trauma exposure and health-related correlates among PSP. The novel findings from this study outline that participants who experienced their index trauma as part of working as a PSP had reduced odds of certain physical conditions. In addition, results revealed variations in the prevalence of physical conditions according to both PSP type and index trauma. The current results have important implications for trauma-related care for PSP.

Results indicate that experiencing one's worst trauma as part of working as a PSP was associated with reduced odds of neurologic and “other” physical conditions compared to experiencing the worst trauma in any other context. The lower odds remained statistically significant for “other” physical conditions after controlling for sociodemographics, years of service as a PSP, type of PSP, and psychiatric conditions. These results may suggest that PSP are able to cope with work-related trauma more effectively than trauma experienced in other contexts and subsequently are less likely to experience adverse physical health correlates related to occupational trauma. The current results may provide preliminary support for the positive impact of stress inoculation and resiliency training programs for PSP

**Table 3.** Prevalence of Physical Conditions according to Public Safety Personnel Category and Index Trauma Type.

	Municipal/ Provincial Police	RCMP	Correctional Workers	Firefighters	Paramedics	Public Safety Communications Officials	$\chi^2$	
Neurologic	50 (4.0)	48 (4.0)	33 (5.2)	16 (2.1)	39 (6.1)	11 (4.7)		16.22**
Digestive	50 (4.0)	80 (6.7)	39 (6.1)	30 (3.9)	70 (11.0)	19 (8.2)		45.43***
Endocrine/metabolic	77 (6.1)	92 (7.7)	50 (7.8)	37 (4.8)	67 (10.5)	22 (9.4)		21.33**
Respiratory	39 (3.1)	32 (2.7)	30 (4.7)	12 (1.6)	46 (7.2)	16 (6.9)		44.82***
Cardiovascular	99 (7.9)	123 (10.4)	76 (11.9)	58 (7.6)	75 (11.8)	17 (7.3)		17.51**
Musculoskeletal/rheumatic	85 (6.8)	145 (12.2)	64 (10.0)	40 (5.2)	43 (6.8)	25 (10.7)		42.02***
Other	86 (6.8)	122 (10.3)	80 (12.5)	42 (5.5)	68 (10.7)	30 (12.9)		36.69***

	Life-threatening Natural Disaster/Explosion	Serious Accident	Physical Assault	Sexual Assault	Life-threatening Illness/Injury	Witnessed	Other	$\chi^2$	
Neurologic	9 (4.0)	21 (2.9)	27 (5.6)	16 (5.9)	13 (4.8)	83 (4.0)	29 (4.6)		7.79
Digestive	16 (7.1)	41 (5.7)	22 (4.5)	25 (9.2)	15 (5.5)	126 (6.1)	46 (7.3)		8.66
Endocrine/metabolic	15 (6.7)	38 (5.3)	37 (7.6)	23 (8.5)	26 (9.5)	155 (7.4)	58 (9.2)		9.84
Respiratory	12 (5.4)	19 (2.6)	9 (1.9)	17 (6.3)	16 (5.9)	66 (3.2)	32 (5.1)		22.30**
Cardiovascular	19 (8.5)	55 (7.6)	40 (8.3)	17 (6.3)	38 (13.9)	207 (9.9)	65 (10.3)		14.57*
Musculoskeletal/rheumatic	12 (5.4)	58 (8.1)	33 (6.8)	28 (10.3)	37 (13.6)	171 (8.2)	63 (10.0)		16.64*
Other	19 (8.5)	56 (7.8)	36 (7.4)	41 (15.1)	44 (16.1)	149 (7.2)	73 (11.5)		45.86***

Note. Values represent the prevalence of physical conditions according to public safety personnel categories and index trauma types. RCMP = Royal Canadian Mounted Police.

\* $P < 0.05$ .

\*\* $P < 0.01$ .

\*\*\* $P < 0.001$ .

(e.g., mental health first aid, critical incident stress management, the Road to Mental Readiness, mindfulness-based resilience training),<sup>48-54</sup> which are designed to mitigate negative impacts of repeated work-related trauma exposure; however, additional investigation is warranted to explore this hypothesis further. Relatedly, PSP resilience toward work-related trauma may stem from reduced uncertainty promoted by job-specific training and expectations formed about deployment experiences. In contrast, nonoccupational trauma may be associated with greater uncertainty and reduced support, which may be related to increased vulnerability to trauma-related sequelae<sup>55,56</sup> including physical comorbidity. In addition, work-related trauma may be associated with fewer adverse health-related correlates in light of greater access to treatment services (e.g., through the Workplace Safety and Insurance Board) compared to non-work-related trauma.

The emergent associations may also relate to the nature of the specific types of work-related and non-work-related traumatic events. For example, it is possible that work-related traumas may more often include events such as serious accidents and life-threatening natural disasters, whereas non-work-related traumas may more often include interpersonal traumas involving victimization, such as sexual assault. Previous research has demonstrated differences in the odds of physical conditions according to the type of traumatic event; in particular, sexual assault has been associated with increased odds of several physical conditions across multiple

studies.<sup>12,13</sup> The duration of time since the index trauma, and subsequently the chronicity of traumatic stress, may also play a role in the current results. Work-related index traumas likely would have occurred within the previous two decades on average, considering PSP's average number of years of service (~18), whereas non-work-related traumas may date back to participants' childhood. The association between chronic stress and allostatic overload with maladaptive physiological changes is well-established.<sup>57</sup> This may translate to increased vulnerability to physical conditions among those who experienced earlier index traumas and thus may be implicated in the "protective" association between more recent work-related trauma and physical conditions in the current study. Of note, however, due to the cross-sectional nature of this survey, we are unable to determine the temporal and causal nature of the emergent associations. It is also possible that those with certain physical conditions are more or less likely to experience certain types of traumas. For example, an individual with functional limitations related to a chronic condition may be at increased risk of victimization; alternatively, an individual with poor physical health may have reduced risk of being exposed to work-related trauma due to multiple medical leaves. Future longitudinal research should explore this further.

Interestingly, however, post hoc analyses revealed no significant associations between context of index trauma and individual "other" physical conditions. This may suggest the

emergent result captures an association between work-related trauma and reduced odds of physical multimorbidity as opposed to individual conditions. Future research should examine this hypothesis further. Nonetheless, the current results highlight the potential importance of monitoring trauma exposure that occurs outside of an occupational context among PSP (both prior to and during employment) and the possible associated impact on mental and physical health. In addition, it may be beneficial for stress inoculation, resiliency, and other training programs for PSP to incorporate training focused on nonoccupational trauma or emphasize the generalizability of skills included to nonoccupational contexts.

To further understand factors associated with physical conditions among PSP, cross-tabulations with chi-square analyses assessed differences in the prevalence of physical conditions according to PSP category and index trauma type. Prevalence estimates for each of the seven physical condition categories varied significantly by PSP category with the lowest estimates among firefighters across nearly all physical conditions. This pattern of results is in line with the “healthy worker effect”<sup>58</sup> found among samples of firefighters,<sup>59</sup> which suggests that certain employment groups, such as firefighters, have lower mortality risk compared to the general population. Choi<sup>59</sup> outlines various possible explanations for the healthy worker effect, including beneficial health effects of a certain job (e.g., positive physical impact of high physical exertion for firefighters) or a selection bias wherein those who are physically healthier are selected for a certain job, among others. The reduced rates of physical conditions among firefighters are also consistent with recent studies that found the lowest rates of chronic pain among firefighters compared to other types of PSP.<sup>24,60</sup> Previous research has also found evidence that firefighters have the lowest estimates of any mental health condition compared to other PSP,<sup>25</sup> though some studies included the same participants as the current study. There are several possibilities for the relatively positive physical and mental health specific to firefighters when compared to other PSP; for example, there may be a variety of systemic or organizational variables that support firefighter resilience or there may be an implicit systematic selection bias in the current sample. In any case, further investigation is warranted to determine whether the pattern generalizes to other large samples that facilitate comparisons across PSP.

In contrast to firefighters, paramedics reported the highest estimates of most physical conditions including neurologic, digestive, endocrine/metabolic, and respiratory conditions. Recent research focused on paramedics found declines in participant physical health status across the duration of approximately a decade;<sup>61</sup> specifically, an increasing proportion of the participating paramedics endorsed “fair/poor” overall health (i.e., 5.5% in 1999 vs. 8.2% in 2008) and “fair/poor” physical fitness (i.e., 17.5% in 1999 vs. 23.6% in 2008). The same study also found sleep difficulties were highly prevalent (20% to 27%) among their entirely

paramedic sample.<sup>61</sup> Accordingly, the established association between sleep difficulties and poor physical health<sup>62-64</sup> may partially explain the elevated prevalence of physical conditions in the current study; however, further investigations with large samples that include diverse PSP for comparisons appear warranted to better understand any physical health disparities.

In line with previous research, the prevalence of certain physical conditions varied according to trauma type.<sup>12,13,30</sup> In particular, the prevalence of respiratory, cardiovascular, musculoskeletal/rheumatic, and “other” physical conditions varied according to trauma type. The current results suggest that across trauma types, life-threatening illness/injury is associated with the highest prevalence of cardiovascular, musculoskeletal/rheumatic, and “other” physical conditions; it is possible that in many cases, the physical condition itself may be considered the life-threatening illness/injury trauma. A growing body of research has examined illness-induced PTSD<sup>64,65</sup> including cardiac disease-induced<sup>66,67</sup> and cancer-related PTSD.<sup>68,69</sup> Evidence from the extant literature suggests that certain physical conditions may be perceived as traumatic and are capable of triggering the onset of PTSD.<sup>70</sup> Alternatively, life-threatening illnesses and injuries may be associated with greater medical comorbidity compared to other traumas, which may explain the elevated prevalence of physical conditions among individuals endorsing these index traumas. In support, prior research from our group found that among individuals with PTSD, those who endorsed a life-threatening illness as their index trauma had a higher mean number of physical conditions and a higher prevalence of both acute and chronic physical conditions compared to those endorsing any other index trauma.<sup>64</sup> The current study’s result that sexual assault was associated with the highest prevalence of respiratory conditions is consistent with previous research that has established an association between sexual assault and poor physical health including respiratory conditions.<sup>12,71,72</sup> Further investigation is warranted to understand why only certain physical conditions varied according to trauma type, or whether this trend is a consequence of limited power and small cell sizes in the current study.

The current study results benefit from using a large, diverse PSP sample; nevertheless, the study has limitations that provide important directions for future research. First, psychiatric conditions were assessed using self-report screening measures, and physical conditions were assessed using a single self-report question. These methods of assessment may be less reliable than clinician-ascertained diagnoses and may be susceptible to response biases. In addition, physical conditions were not assessed using condition-specific targeted questions; rather, participants were asked to report any other diagnosed health conditions. This method of assessment may be associated with additional recall bias. Further, although some participants reported conditions associated with chronic pain, participants responded to specific questions directly assessing

chronic pain prior to the item assessing physical conditions in the current study (i.e., “Do you have any other diagnosed health conditions?”). As such, chronic pain conditions are most likely underrepresented in the current analyses (see Carleton et al.<sup>24</sup> for additional information on chronic pain in the current sample). Second, psychiatric symptoms may have been underreported in the current study; although responses were anonymous, research suggests there are concerns with stigma related to mental health among PSP.<sup>73,74</sup> Third, the current sample was not randomly selected and may not be representative of all Canadian PSP; however, demographic proportions for sex, age, and provincial region in the overall data collection were comparable to data provided by Statistics Canada for PSP using the 2011 National Household Survey and the National Occupational Classification.<sup>75</sup> Similarly, trends in the proportions of PSP categories were also comparable to those listed in the National Occupational Classification.<sup>75</sup> Fourth, due to the cross-sectional nature of this study, temporal and causal assumptions cannot be made regarding the emergent associations; in particular, we are unable to determine whether the onset of physical conditions occurred before or after (or concurrently with) index trauma exposure. Finally, due to small cell sizes for certain physical conditions, some of the analyses may have been underpowered.

## Conclusion

Despite the limitations, the current results are a novel contribution to the literature on trauma exposure among PSP. Results highlight the importance of considering PSP trauma exposure beyond that which occurs in an occupational setting. Future research should examine the associations between occupational trauma and physical conditions longitudinally in order to understand the temporal nature of these associations. In addition, further investigation is warranted to elucidate the mechanisms driving the associations between trauma characteristics and physical conditions among PSP, for whom potentially traumatic or injurious events are part of their work.

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## Supplemental Material

The supplemental material for this article is available online.

## References

1. Carleton RN, Afifi TO, Taillieu TL, et al. Exposure to potentially traumatic events among public safety personnel in Canada. *Can J Behav Sci.* 2018. Forthcoming. doi: 10.1037/cbs0000115.
2. Chopko BA, Palmieri PA, Adams RE. Critical incident history questionnaire replication: frequency and severity of trauma exposure among officers from small and midsize police agencies. *J Trauma Stress.* 2015;28(4):157-161. doi: 10.1002/jts.21996.
3. Declercq F, Meganck R, Deheegher J, Van Hoorde H. Frequency of and subjective response to critical incidents in the prediction of PTSD in emergency personnel. *J Trauma Stress.* 2011;24(1):133-136. doi: 10.1002/jts.20609.
4. Gulen B, Serinken M, Hatipoglu C, et al. Work-related injuries sustained by emergency medical technicians and paramedics in Turkey. *Ulus Travma Acil Cerrahi Derg.* 2016;22(2):145-149. doi: 10.5505/tjtes.2015.94224.
5. Harvey SB, Milligan-Saville JS, Paterson HM, et al. The mental health of fire-fighters: an examination of the impact of repeated trauma exposure. *Aust N Z J Psychiatry.* 2016; 50(7):649-658. doi: 10.1177/0004867415615217.
6. Jones S. Describing the mental health profiles of first responders: a systematic review. *J Am Psychiatr Nurses Assoc.* 2017; 23(6):200-214. doi: 10.1177/1078390317695266.
7. Lee JH, Lee D, Kim J, Jeon K, Sim M. Duty-related trauma exposure and posttraumatic stress symptoms in professional firefighters. *J Trauma Stress.* 2017;30(2):133-141. doi: 10.1002/jts.22180.
8. MacDermid JC, Nazaris G, Rashid C, Sinden K, Carleton N, Cramm H. Two-month point prevalence of exposure to critical incidents in firefighters in a single fire service. *Work.* 2019; 62(3):477-483. doi: 10.3233/WOR-192882.
9. Weiss DS, Brunet A, Best SR, et al. Frequency and severity approaches to indexing exposure to trauma: the Critical Incident History Questionnaire for police officers. *J Trauma Stress.* 2010;23(6):734-743. doi: 10.1002/jts.20576.
10. Forman-Hoffman VL, Bose J, Batts KR, et al. Correlates of lifetime exposure to one or more potentially traumatic events and subsequent posttraumatic stress among adults in the United States: results from the mental health surveillance study, 2008-2012. Rockville (MD): CBHSQ Data Review; 2016.



11. Kim JI, Park H, Kim JH. The mediation effect of PTSD, perceived job stress and resilience on the relationship between trauma exposure and the development of depression and alcohol use problems in Korean firefighters: a cross-sectional study. *J Affect Disord.* 2018;229(1):450-455. doi: 10.1016/j.jad.2017.12.055.
12. Atwoli L, Platt JM, Basu A, Williams DR, Stein DJ, Koenen KC. Associations between lifetime potentially traumatic events and chronic physical conditions in the South African stress and health survey: a cross-sectional study. *BMC Psychiatry.* 2016; 16:214. doi: 10.1186/s12888-016-0929-z.
13. Husarewycz MN, El-Gabalawy R, Logestty S, Sareen J. The association between number and type of traumatic life experiences and physical conditions in a nationally representative sample. *Gen Hosp Psychiatry.* 2014;36(1):26-32. doi: 10.1016/j.genhosppsy.2013.06.003.
14. May-Ling JL, Loxton D, McLaughlin D. Trauma exposure and the subsequent risk of coronary heart disease among mid-aged women. *J Behav Med.* 2015;38(2):57-65. doi: 10.1007/s10865-014-9577-2.
15. Roberts AL, Malspeis S, Kubzansky LD, et al. Association of trauma and posttraumatic stress disorder with incident systemic lupus erythematosus in a longitudinal cohort of women. *Arthritis Rheumatol.* 2017;69(11):2162-2169. doi: 10.1002/art.40222.
16. Scott KM, Koenen KC, Aguilar-Gaxiola S, et al. Associations between lifetime traumatic events and subsequent chronic physical conditions: A cross-national, cross-sectional study. *PLoS One.* 2013;8(11):e80573. doi: 10.1371/journal.pone.0080573.
17. Oral R, Ramirez M, Coohy C, et al. Adverse childhood experiences and trauma informed care: the future of health care. *Pediatr Res.* 2016;79(1-2):227-233. doi: 10.1038/pr.2015.197.
18. Garbern SC, Ebbeling LG, Bartels SA. A systematic review of health outcomes among disaster and humanitarian responders. *Prehosp Disaster Med.* 2016;31(6):635-642. doi: 10.1017/S1049023X16000832.
19. Gargano LM, Mantilla K, Fairclough M, Yu S, Brackbill RM. Review of non-respiratory, non-cancer physical health conditions from exposure to the world trade centre disaster. *Int J Environ Res Public Health.* 2018;15(2):E253. doi: 10.3390/ijerph15020253.
20. Kotov R, Bromet EJ, Schechter C, et al. Posttraumatic stress disorder and the risk of respiratory problems in world trade center responders: longitudinal test of a pathway. *Psychosom Med.* 2015;77(4):438-448. doi: 10.1097/PSY.000000000000179.
21. Mindlis I, Morales-Raveendran E, Goodman E, et al. Post-traumatic stress disorder dimensions and asthma morbidity in World Trade Center rescue and recovery workers. *J Asthma.* 2017;54(7):723-731.
22. Yip J, Zeig-Owens R, Webber MP, et al. World Trade Center-related physical and mental health burden among New York City Fire Department emergency medical service workers. *Occup Environ Med.* 2016;73(1):13-20. doi: 10.1136/oemed-2014-102601
23. Ashbaugh AR, Herbert CF, Bulter LD, et al. A new frontier: trauma research on the internet. In: Brunet A, Ashbaugh AR, Herbert CF, editors. *Internet use in the aftermath of trauma.* Amsterdam, the Netherlands: IOS Press BV; 2010. 99-120.
24. Carleton RN, Affi TO, Turner S, et al. Chronic pain among public safety personnel in Canada. *Can J Pain.* 2018;1(3): 237-246. doi: 10.1080/24740527.2017.1410431.
25. Carleton RN, Affi TO, Turner S, et al. Mental disorder symptoms among public safety personnel in Canada. *Can J Psychiatry.* 2018;63(1):54-65. doi: 10.1177/0706743717723825.
26. World Health Organization. *International Statistical Classification of Diseases and related Health Problems, 10th Revision (ICD-10).* Geneva, Switzerland: WHO; 1992.
27. Sommer JL, Mota N, El-Gabalawy R. Maladaptive eating in posttraumatic stress disorder: a population-based examination of typologies and medical condition correlates. *J Trauma Stress.* 2018;31(2):708-718. doi: 10.1002/jts.22323
28. Weathers FW, Blake DD, Schnurr PP, et al. *The Life Events Checklist for DSM-5 (LEC-5).* Instrument available from the National Center for PTSD at [www.ptsd.va.gov](http://www.ptsd.va.gov); 2013.
29. Kaster TS, Sommer JL, Mota N, Sareen J, El-Gabalawy R. Post-traumatic stress and cancer: findings from a cross-sectional nationally representative sample. *J Anxiety Disord.* 2019;65:11-18. doi: 10.1016/j.janxdis.2019.04.004.
30. Sommer JL, Mota N, El-Gabalawy R. Understanding the association between posttraumatic stress disorder and physical health conditions: a population-based study. *J Psychosom Res.* 2019;126. Forthcoming. doi: 10.1016/j.jpsychores.2019.109776.
31. Blevins CA, Weathers FW, Davis MT, Witte TK, Domino JL. The posttraumatic stress disorder checklist for DSM-5 (PCL-5): development and initial psychometric evaluation. *J Trauma Stress.* 2015;28(6):489-498. doi: 10.1002/jts.22059.
32. Weathers FW, Litz BT, Keane TM, et al. *The PTSD Checklist for DSM-5 (PCL-5).* Boston (MA): National Center for PTSD; 2013.
33. Kroenke K, Spitzer RL, Williams JB, Löwe B. The Patient Health Questionnaire somatic anxiety, and depressive symptom scales: a systematic review. *Gen Hosp Psychiatry.* 2010; 32:345-359. doi: 10.1016/j.genhosppsy.2010.03.006.
34. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med.* 2001; 16(9):606-613.
35. Manea L, Gilbody S, McMillan D. A diagnostic meta-analysis of the Patient Health Questionnaire-9 (PHQ-9) algorithm scoring method as a screen for depression. *Gen Hosp Psychiatry.* 2015;37(3):67-75. doi: 10.1016/j.genhosppsy.2014.09.009.
36. Beard C, Bjorgvinsson T. Beyond generalized anxiety disorder: psychometric properties of the GAD-7 in a heterogeneous psychiatric sample. *J Anxiety Disord.* 2014;28(1):547-552. doi: 10.1016/j.janxdis.2014.06.002.
37. Spitzer RL, Kroenke K, Williams JB, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med.* 2006;166(10):1092-1097.

38. Swinson RP. The GAD-7 scale was accurate for diagnosing generalised anxiety disorder. *Evid Based Med.* 2006;11(2):184.
39. Shear MK, Rucci P, Williams J, et al. Reliability and validity of the panic disorder severity scale: replication and extension. *J Psychiatr Res.* 2001;35(2):293-296.
40. Shear MK, Brown TA, Barlow DH, et al. Multicenter collaborative panic disorder severity scale. *Am J Psychiatry.* 1997;154(11):1571-1575.
41. Menatti AR, Weeks JW, Carleton RN, et al. The Social Interaction Phobia Scale: continued support for the psychometric validity of the SIPS using clinical and non-clinical samples. *J Anxiety Disord.* 2015;32:46-55. doi: 10.1016/j.janxdis.2015.03.003.
42. Carleton RN, Collimore KC, Asmundson GJG, McCabe RE, Rowa K, Antony MM. Refining and validating the Social Interaction Anxiety Scale and the Social Phobia Scale. *Depress Anxiety.* 2009;26(2):E71-E81. doi: 10.1002/da.20480.
43. Allen JP, Litten RZ, Fertig JB, Babor T. A review of research on the Alcohol Use Disorders Identification Test (AUDIT). *Alcohol Clin Exp Res.* 1997;21(4):613-619.
44. Gache P, Michaud P, Landry U, et al. The Alcohol Use Disorders Identification Test (AUDIT) as a screening tool for excessive drinking in primary care: reliability and validity of a French version. *Alcohol Clin Exp Res.* 2005;29(11):2001-2007. doi: 10.1097/01.alc.0000187034.58955.64.
45. Saunders JB, Aasland OG, Babor TF, De la Fuente JR, Grant M. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption—II. *Addiction.* 1993;88(2):791-804. doi: 10.1111/J.1360-0443.1993.Tb02093.X.
46. IBM Corp. IBM SPSS Statistics for Windows. Version 25.0. Armonk (NY): IBM Corp; 2017.
47. StataCorp. Stata Statistical Software. Release 15. College Station (TX): StataCorp; 2017.
48. Arnetz BB, Nevedal DC, Lumley MA, Backman L, Lublin A. Trauma resilience training for police: psychophysiological and performance effects. *J Police Crim Psychol.* 2009;24(2):1-9. doi: 10.1007/s11896-008-9030-y.
49. Carleton RN, Afifi TO, Turner S, et al. Mental health training, attitudes toward support, and screening positive for mental disorders. *Cogn Behav Ther.* 2020;22(2):1-19. doi: 10.1080/16506073.2019.1575900.
50. Christopher MS, Goerling RJ, Rogers BS, et al. A pilot study evaluating the effectiveness of a mindfulness-based intervention on cortisol awakening response and health outcomes among law enforcement officers. *J Police Crim Psychol.* 2016;31(3):15-28.
51. Joyce S, Shand F, Lal TJ, et al. Resilience@Work mindfulness program: results from a cluster randomized controlled trial with first responders. *J Med Internet Res.* 2019;21:e12894. doi: 10.2196/12894.
52. Marks MR, Bowers C, DePesa NS, Trachik B, Deavers FE, James NT. REACT: a paraprofessional training program for first responders: a pilot study. *Bull Menninger Clin.* 2017;81:150-166. doi: 10.1521/bumc.2017.81.2.150.
53. Wild J, El-Salahi S, Tyson G, et al. Preventing PTSD, depression and associated health problems in student paramedics: protocol for PREVENT-PTSD, a randomised controlled trial of supported online cognitive training for resilience versus alternative online training and standard practice. *BMJ Open.* 2018;8(12):e022292. doi: 10.1136/bmjopen-2018-022292.
54. Szeto A, Dobson KS, Knaak S. The road to mental readiness for first responders: a meta-analysis of program outcomes. *Can J Psychiatry.* 2019;64(2):18S-29S. doi: 10.1177/0706743719842562.
55. Carleton RN. Fear of the unknown: one fear to rule them all? *J Anxiety Disord.* 2016;41(4):5-21. doi: 10.1016/j.janxdis.2016.03.011.
56. Carleton RN. Into the unknown: a review and synthesis of contemporary models involving uncertainty. *J Anxiety Disord.* 2016;39(3):30-43. doi: 10.1016/j.janxdis.2016.02.007.
57. McEwen BS. Central effects of stress hormones in health and disease: understanding the protective and damaging effects of stress and stress mediators. *Eur J Pharmacol.* 2008;583(1):174-185. doi: 10.1016/j.ejphar.2007.11.071.
58. Choi BC. Definition, sources, magnitude, effect modifiers, and strategies of reduction of the healthy worker effect. *J Occup Med.* 1992;34(3):979-988.
59. Choi BC. A technique to re-assess epidemiologic evidence in light of the healthy worker effect: the case of firefighting and heart disease. *J Occup Environ Med.* 2000;42(10):1021-1034.
60. Carleton RN, Afifi TO, Taillieu T, et al. Anxiety-related psychopathology and chronic pain comorbidity among public safety personnel. *J Anxiety Disord.* 2018;55(4):48-55. doi: 10.1016/j.janxdis.2018.03.006.
61. Bentley MA, Levine R. A national assessment of the health and safety of emergency medical services professionals. *Prehosp Disaster Med.* 2016;31:S96-S104. doi: 10.1017/S1049023X16001102.
62. Leng Y, Wainwright NW, Cappuccio FP, et al. Daytime napping and increased risk of incident respiratory diseases: symptom, marker, or risk factor? *Sleep Med.* 2016;23(1):12-15. doi: 10.1016/j.sleep.2016.06.012.
63. Yen CM, Kuo CL, Lin MC, et al. Sleep disorders increase the risk of osteoporosis: a nationwide population-based cohort study. *Sleep Med.* 2014;15(1):1339-1344. doi: 10.1016/j.sleep.2014.07.005.
64. El-Gabalawy R, Mota N, Sommer JL, Edmondson D. Prevalence of illness-induced posttraumatic stress disorder in the United States. *Psychosom Med.* 2018;80:783-785. doi: 10.1097/PSY.0000000000000635
65. Sommer JL, Mota N, Edmondson D, El-Gabalawy R. Comorbidity in illness-induced posttraumatic stress disorder versus posttraumatic stress disorder due to external events in a nationally representative study. *Gen Hosp Psychiatry.* 2018;53:88-94. doi: 10.1016/j.genhosppsy.2018.02.004
66. Fait K, Vilchinsky N, Dekel R, Levi N, Hod H, Matetzky S. Cardiac-disease-induced PTSD and fear of illness progression: capturing the unique nature of disease-related PTSD. *Gen Hosp Psychiatry.* 2018;53(3):131-138. doi: 10.1016/j.genhosppsy.2018.02.011.

67. Vilchinsky N, Ginzburg K, Fait K, Foa EB. Cardiac-disease-induced PTSD (CDI-PTSD): a systematic review. *Clin Psychol Rev.* 2017;55(2):92-106. doi: 10.1016/j.cpr.2017.04.009.
68. Cordova MJ, Riba MB, Spiegel D. Post-traumatic stress disorder and cancer. *Lancet Psychiatry.* 2017;4(2):330-338. doi: 10.1016/S2215-0366(17)30014-7.
69. Kangas M, Henry JL, Bryant RA. Posttraumatic stress disorder following cancer: a conceptual empirical review. *Clin Psychol Rev.* 2002;22(3):499-524.
70. Edmondson D. An enduring somatic threat model of posttraumatic stress disorder due to acute life-threatening medical events. *Soc Personal Psychol Compass.* 2014;8:118-134. doi: 10.1111/spc.12089.
71. Larsen ML, Hilden M, Skovlund CW, Lidegaard Ø. Somatic health of 2500 women examined at a sexual assault center over 10 years. *Acta Obstet Gynecol Scand.* 2016;95(2):872-878. doi: 10.1111/aogs.12903.
72. Lechner ME, Vogel ME, Garcia-Shelton LM, Leichter JL, Steibel KR. Self-reported medical problems of adult female survivors of childhood sexual abuse. *J Fam Pract.* 1993; 36(4):633-638.
73. Halpern J, Gurevich M, Schwartz B, Brazeau P. What makes an incident critical for ambulance workers? emotional outcomes and implications for intervention. *Work Stress.* 2009; 23(1):173-189.
74. Karaffa KM, Koch JM. Stigma, pluralistic ignorance, and attitudes toward seeking mental health services among police officers. *Crim Justice Behav.* 2016;43(2):759-777.
75. Statistics Canada. National Household Survey. Ottawa, Ontario: Statistics Canada; 2011.