

Prevalence of Potentially Morally Injurious Events in Operationally Deployed Canadian Armed Forces Members

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As moral injury is a still-emerging concept within the area of military mental health, prevalence estimates for moral injury and its precursor, potentially morally injurious events (PMIEs), remain unknown for many of the world's militaries. The present study sought to estimate the prevalence of PMIEs in the Canadian Armed Forces (CAF), using data collected from CAF personnel deployed to Afghanistan, via logistic regressions controlling for relevant sociodemographic, military, and deployment characteristics. Analyses revealed that over 65% of CAF members reported exposure to at least one event that would be considered a PMIE. The most commonly PMIEs individuals reported included seeing ill or injured women and children they were unable to help (48.4%), being unable to distinguish between combatants and noncombatants (43.6%), and finding themselves in a threatening situation where they were unable to respond due to the rules of engagement under which they were required to operate (35.4%). These findings provide support for both the presence of exposure to PMIEs in CAF members and the need for formal longitudinal data collection regarding PMIE exposure and moral injury development.

For the 50 years following the Korean War, the Canadian Armed Forces (CAF) were predominantly deployed to various areas of the globe in support of multinational peace-support operations (i.e., peacemaking, peacebuilding, peace enforcement, peacekeeping, and monitoring) and humanitarian aid missions. This focus on peace support missions changed when the CAF was deployed to Afghanistan as part of multinational combat operations to neutralize members of al Qaeda and remove the Taliban regime from political power (Public Safety Canada, 2018). The CAF would remain in the region for the next 13 years and experience a type of combat they had not encountered previously, including exposure to situations where the “morally correct” decision was either unclear or not available to

them. Researchers have postulated (Litz et al., 2009; Maguen & Litz, 2012) that these situations can cause some service members to experience psychological or religious and spiritual injuries through the transgression of their core moral beliefs—beliefs about what is right, just, and fair and about themselves, others, and the world.

These experiences are most frequently referred to as potentially morally injurious events (PMIEs; Litz et al., 2009) or as transgressive acts (Frankfurt & Frazier, 2016). In recent years, these events have been defined with varying levels of specificity (Currier, Holland, & Malott, 2015; Drescher et al., 2011; Koenig & Al-Zaben, 2020), but at their respective cores, the formulation put forth by Litz and his colleagues, defined as “perpetrating, failing to prevent, or bearing witness to acts that transgress deeply held moral beliefs and expectations” (Litz et al., 2009, p. 697), remains. These PMIEs form the precursors for what may eventually manifest in the symptoms of moral injury. These symptoms include, but are not limited to, intense feelings of shame, guilt, and hopelessness; social withdrawal; a loss of trust in one's self and others; and, occasionally, religious, spiritual, or existential conflict (Griffin et al., 2019; Houle et al., 2020). Litz et al. (2009) went on to stipulate that moral injury itself is not caused by exposure to PMIEs but rather results from an individual's reprocessing of the event, which can cause them to realize that some aspect of their moral belief system has been compromised or transgressed. This realization can lead to the creation of dissonance or inner conflict for the individual, manifesting as a moral injury; in effect, it is the reprocessing and realization of the transgression that is the cause of moral injury

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(Koenig & Al-Zaben, 2020; Richardson et al., 2020; Zalta & Held, 2020).

Predicting which individuals develop moral injury after exposure to a transgressive event is a challenging prospect, as what is and is not considered morally permissible behavior can vary across culture, time, and context. Individual differences also contribute to the complexities of defining morally permissible and impermissible behaviors in that what may violate one individual's moral code may not violate another's. These issues have, until the development of specific scales to measure moral injury, such as the Moral Injury Events Scale (MIES; Nash & Litz, 2013), Moral Injury Questionnaire–Military Version (MIQ-M; Currier, Holland, Drescher, et al., 2015), Expressions of Moral Injury Scale–Military Version (EMIS-M; Currier et al., 2018), and the Moral Injury Symptom Scale–Military Version full (MISS-M; Koenig et al., 2017) and short forms (MISS-M-SF; Koenig et al., 2018), necessitated that researchers approach the problem of moral injury by looking instead at rates of its precursor, the PMIE. Although being exposed to a PMIE does not mean the individual will develop moral injury, if an individual is morally injured, they must have previously been exposed to a PMIE.

The CAF does not currently collect information on either exposure to PMIEs or rates of moral injury itself; thus, the prevalence rates for these events are currently unknown in this population. As such, in the present study, we set out to (a) estimate the prevalence rate of certain PMIE exposures within a representative sample of CAF members who served in support of the recent mission to Afghanistan and (b) determine if there are any sociodemographic, military, or deployment characteristics that may be related to PMIE exposure.

Method

Participants and Procedure

The data for this secondary data analysis were obtained from the Canadian Forces Mental Health Survey (CFMHS), conducted by Statistics Canada between April and August 2013 (Statistics Canada, 2014b). The CFMHS was a cross-sectional survey that contained questions both directly and indirectly related to the mental health status of all full-time regular members of the CAF as well as reservists who had been deployed for any period of time in support of the mission in Afghanistan. To create a more homogenous sample, a subset of the population surveyed, specifically only regular and reserve-force CAF members who had been deployed in support of the mission in Afghanistan between 2001 and the time of survey completion ($n = 4,854$), served as the target population for the present study.

For the CFMHS, Statistics Canada utilized a stratified random sampling framework, stratified by military rank for both regular force and reservist members and by deployment status for regular force members, to ensure that the resultant sample remained representative of the whole of the CAF. Interviews

were conducted in private on-base rooms by Statistics Canada personnel using a computer-assisted personal interviewing (CAPI) system. Interviewers were neither affiliated the CAF with nor did they report back to the CAF regarding any participant responses. Using the CAPI system has advantages over traditional interviewing techniques and paper and pencil questionnaires in that these systems (a) allow questions to be automatically customized to reflect the participant's age, sex, and personal pronouns; the date of the interview; and answers to previous questions; (b) automatically skip questions that do not apply to the participant (e.g., questions about pregnancy for male participants); and (c) automatically flag inconsistent or out-of-range answers when entered and prompt the interviewer to correct or clarify the answer with the respondent (e.g., respondent says something happened during deployment 10 years ago, but they've only been in the CAF for 7 years). Additionally, conducting in-person interviews has been found to minimize the likelihood that respondents will refuse to answer questions or state that they do not know an answer, as the interviewers can gently probe the respondent to get them to commit to a better answer (M. Zamorski, personal communication, October 8, 2015), something that is not possible with a pencil and paper questionnaire.

The original data collection procedures for the survey and access to the resultant database containing the survey results were reviewed and approved by the relevant committees at Statistics Canada that serve these purposes regarding the ethical treatment of participants, following the principles detailed in the Tri-Council Policy Statement: Ethical Conduct of Research Involving Humans (TCPS-2). The Research Ethics Board of Western University provided a waiver for this study, as it constituted a secondary data analysis, which does not require an ethical review under TCPS-2.

Measures

As formal moral injury scales were not available for inclusion at the time the CFMHS was conducted, a composite measure was required to serve as a proxy to estimate PMIE exposure for the current study. Using prevailing moral injury theory and questions drawn from the psychometrically validated MIES (Nash et al., 2013) and MIQ-M (Currier, Holland, Drescher, et al., 2015) as guides, we created a composite measure using existing questions from the CFMHS that referred to PMIEs. The final measure was composed of seven dichotomously scored (“yes” or “no”) questions drawn from the Deployment Experiences (DEX) and Posttraumatic Stress (PTS) modules of the CFMHS (Statistics Canada, 2014b), with the list of selected questions (Table 2) sent to a content expert for review and verification that they met the criteria for PMIEs (B. Litz, personal communication, August 3, 2017). If respondents answered positively (i.e., “yes”) to any of the questions on the composite PMIE measure, they were considered to have been exposed to a PMIE (PMIE+), with the remainder considered to have not been exposed (PMIE-).

The CFMHS also contains information related to sociodemographic and military characteristics of the participants at the time the survey was completed. This information includes the participants' age, sex, marital status, educational attainment, rank category (i.e., Junior Noncommissioned Member [NCM]: Private to Master Corporal; Senior NCM: Sargent to Chief Warrant Officer; Officer), component (regular force, reserve force), previous exposure to mental health training, and information related to their Afghanistan deployment.

Data Analysis

Statistical analyses were conducted using SPSS (Version 23) and STATA (Version 15), with results weighted and an alpha level set to .05. We used listwise deletion to ensure all analyses were conducted on complete cases, which resulted in an estimated 1%–5% of cases being excluded depending on the variables used. Statistics Canada provided the final sample weights, adjusted for initial sampling weight, removal of outliers, and participant nonresponse, so the estimates produced from the CFMHS data were reflective of the entire CAF population at the time of survey administration ($N = 68,866$) rather than just the sample (Statistics Canada, 2014a). A bootstrapping technique using sampling weights (i.e., 500 bootstrap samples, also provided by Statistics Canada) was used to account for the complex survey design (Statistics Canada, 2014c). Per Statistics Canada requirements regarding the release of confidential data, all final cell counts were rounded to the nearest 20 to protect the identity of respondents. Descriptive statistics were calculated for each variable used in the analyses (e.g., sociodemographic, military, mental health training, and deployment-related characteristics) and used as covariates in logistic regressions conducted to explore their impact on PMIE exposure. Regarding mental health training, only the final composite item (i.e., “any mental health training in the last 5 years”) was used as a covariate in the regression analysis. Adjusted odds ratios (aOR) were calculated for the logistic regressions rather than the usual regression coefficient (i.e., beta) to ease the interpretation of results. The adjusted odds ratio was calculated to indicate the odds a given outcome would occur if an individual was exposed to a specific event or stimulus compared with the odds of the same outcome occurring without said exposure when all other sociodemographic, military, and deployment variables were kept constant.

Results

The weighted demographic, military, and deployment characteristics of survey respondents are presented in Table 1. Of the CAF members who were deployed in support of the mission to Afghanistan, 86.7% were in the Regular Forces, 48.2% had ranks of Master-Corporal or below (i.e., Junior NCM), and 51.2% had completed a postsecondary education (i.e., college or university graduate). With regard to having received some

form of mental health training in the 5 years prior to survey administration, the endorsement rates ranged from almost 14% during trades training to nearly 64% at the end of their deployment, with 83.9% indicating that they had received some mental health training during the stated period.

Almost two thirds (65.2%) of deployed personnel included in the present sample indicated that they had experienced at least one event that could be considered a PMIE. This included 48.4% reporting that they witnessed ill or injured women and children they were unable to help, 43.6% reporting they had been situations in which they could not distinguish between combatants and noncombatants, and 35.4% reporting they found finding themselves in threatening situations where they were unable to respond due to the rules of engagement (ROE) set out for the mission.

Logistic regression models for exposure to any PMIE and the component PMIE subquestions are presented in Table 3 and Supplemental Table S1, respectively. Variables found to be associated with endorsement of any PMIE exposure (i.e., endorsement of any single PMIE subquestion) included being in the youngest age group relative to the oldest group, $aOR = 2.08$, 95% CI, [1.16, 3.73]; being a member of the Reserve Forces, $aOR = 1.46$, 95% CI, [1.27, 1.68]; being in the Senior NCM rank group compared to being an officer, $aOR = 1.30$, 95% CI [1.07, 1.59]; having received any mental health training in the previous 5 years, $aOR = 1.92$, 95% CI [1.61, 2.29]; and having been deployed to Afghanistan longer than a total of 121 days, $aORs = 1.67$ – 2.56 (see Table 3 for respective confidence intervals). In comparison, being female, $aOR = 0.44$, 95% CI [0.36, 0.55], was associated with a statistically significant lower rate of PMIE endorsement in comparison to being male. This statistically significant lower rate of PMIE endorsement for female service members also emerged on all PMIE subquestions except for those related to seeing sick or injured women and children the participant was unable to help and feeling responsible for the death of Canadian or allied personnel, which, although still a lower rate than for male service members, failed to reach statistical significance, $p = .086$ and $p = .743$, respectively.

The results of logistic regression models used to determine the associations between covariates and the prediction of each of the PMIE subquestions yielded mixed results (Supplemental Table S1). Except for female sex, none of the sociodemographic, military, or deployment-related covariates showed a statistically significant association with the endorsement of the question “Have you ever done something that accidentally led to the serious injury or death of another person?” In contrast, endorsement of the question “Have you ever purposely injured, tortured, or killed another person?” was significantly associated with the following covariates: being under 45 years of age compared with being over 55 years of age, $aORs = 4.53$ – 6.40 (see Supplemental Table S1 for respective confidence intervals), and having been deployed for over 361 days, $aOR = 1.85$, 95% CI [1.25, 2.74]. Having witnessed atrocities (e.g., massacres or mass killings) was statistically associated with having graduated from a postsecondary educational institution, $aOR = 0.66$,

Table 1
Demographic, Military, and Deployment Characteristics

Characteristic	Weighted %	95% CI
Sociodemographic factors		
Sex		
Male	89.2	[88.2, 90.2]
Female	10.8	[9.8, 11.8]
Age (years)		
19–24	4.1	[3.4, 4.7]
25–34	36.6	[35.2, 37.9]
35–44	34.4	[33.1, 35.7]
45–54	23.0	[21.8, 24.2]
≥ 55	2.0	[1.7, 2.4]
Marital status		
Married or common-law	72.7	[71.4, 74.1]
Widowed, separated, or divorced	8.4	[7.5, 9.3]
Single (never married)	18.9	[17.7, 20.0]
Educational attainment		
Less than secondary school graduation	4.6	[3.9, 5.2]
Secondary school graduate	28.9	[27.50, 30.3]
Some postsecondary education	9.2	[8.3, 10.1]
Postsecondary graduation	51.2	[49.7, 52.8]
More than postsecondary graduation	6.1	[5.5, 6.7]
Military factors		
Military component		
Regular Forces	86.7	[86.6, 86.8]
Reserve Forces	13.4	[13.3, 13.5]
Rank group ^a		
Junior NCM	48.2	[47.7, 48.7]
Senior NCM	31.7	[31.4, 32.1]
Officer	20.1	[19.8, 20.3]
Mental health in the training last 5 years		
In preparation for CAF deployment	58.9	[57.5, 60.4]
At the end of CAF deployment	63.7	[62.3, 65.2]
Preparation for a higher rank	33.4	[31.9, 34.8]
During trades training	13.9	[12.8, 15.0]
By PSP personnel/health office	20.5	[19.2, 21.8]
Routine training/professional development	46.8	[45.3, 48.4]
Any mental health training in the last 5 years	83.9	[82.8, 85.0]
Total number of days deployed to Afghanistan		
< 120	13.7	[12.6, 14.7]
121–240	57.3	[55.7, 58.8]
241–360	14.2	[13.0, 15.3]
> 361 days	14.9	[13.9, 16.0]

Note. Weighted $N = 33,440$. CAF = Canadian Armed Force; NCM = noncommissioned member; PSP = Personnel Support Program.

^aJunior NCM encompasses Private to Master Corporal ranks. Senior NCM encompasses Sargent to Chief Warrant Officer ranks.

95% CI [0.46, 0.96]; having a Senior NCM rank, $aOR = 1.61$, 95% CI [1.26, 2.07]; and having been deployed to Afghanistan for more than 241 days total, $aORs = 1.40$ – 1.74 (see Supplemental Table S1 for the respective confidence intervals).

Having attained a postsecondary education was also significantly associated with being unable to respond in a threatening

situation due to ROE, $aOR = 0.62$, 95% CI [0.43, 0.88], when compared with those service members who reported less than secondary school education. Holding a rank lower than officer, $aORs = 1.60$ – 1.88 , and being deployed for 121–240 days or over 361 days, $aORs = 1.34$ – 1.53 , were both associated with a higher rate of endorsement of the question related to one's

Table 2
Prevalence of Potentially Morally Injurious Events (PMIEs) Endorsed

Characteristic	Weighted %	95% CI
Exposure to any PMIE		
Not exposed (PMIE-)	34.8	[33.4, 36.3]
Exposed (PMIE+)	65.2	[63.7, 66.7]
Specific PMIE (endorsed experience)		
Questions drawn from CFMHS PTS module "Have you ever ..."		
Accidentally caused serious injury or death of another person (PTS-25)	6.1	[5.3, 6.9]
Purposely injured, tortured, or killed another person (PTS-26)	15.9	[14.8, 17.1]
Saw atrocities or massacres (PTS-27)	29.3	[27.9, 30.8]
Questions drawn from CFMHS DEX module "During any [Canadian Armed Forces] deployment, have you ...,"		
Found self in threatening situation where you were unable to respond due to ROE (DEX-2)	35.4	[33.9, 36.9]
Seen ill or injured women or children who you were unable to help (DEX-4)	48.4	[46.7, 50.1]
Felt responsible for the death of Canadian or allied personnel (DEX-6)	8.4	[7.5, 9.4]
Had difficulty distinguishing between combatants and noncombatants (DEX-8)	43.6	[41.9, 45.2]

Note. Weighted $N = 33,440$. CFMHS = Canadian Forces Mental Health Survey; DEX = Deployment Experiences module; PSP = Personnel Support Program; PTS = Posttraumatic Stress module; ROE = rules of engagement.

inability to respond due to the ROE (see Supplemental Table S1 for respective confidence intervals). Witnessing sick or injured women or children one was unable to help was associated with being a member of the Reserves, a Senior NCM, and having been deployed a total of 121–240 days or over 361 days, $aORs = 1.18$ – 1.48 . Reporting a total deployment duration of 121–240 days or over 361 days was the only covariate that showed a statistically significant association with reporting feeling responsible for the death of Canadian or Allied personnel, $aORs = 2.13$ and 2.05 , respectively. Finally, reporting having had difficulty distinguishing between combatants and noncombatants was significantly associated with an increased likelihood of being in the Reserves, $aOR = 1.33$, 95% CI [1.15, 1.54], and having been deployed 121–240 days or over 361 days, $aORs = 1.35$ – 1.83 , whereas being in lowest rank grouping (i.e., Junior NCM) was associated with a decreased likelihood of endorsement of this item, $aOR = 0.72$, 95% CI [0.58, 0.89], when compared with being an officer.

Discussion

Using data collected as part of the CFMHS, we determined the prevalence rate of exposure to various PMIEs experienced by CAF members deployed to Afghanistan between 2001 and 2013. In addition, we established the associations between various demographic, military, and deployment-related characteristics and PMIE endorsement in this group.

Almost two thirds of the CAF members in the present sample who were deployed to Afghanistan reported having experienced at least one PMIE while deployed. Although this result is significantly higher than the results reported in other studies that have investigated the prevalence of PMIE exposure in military populations, it is in line with their respective find-

ings regarding the pervasiveness of incident exposure. In their study of 867 active duty U.S. Marines deployed to Afghanistan, Jordan et al. (2017) found that over 37% of respondents endorsed at least one question on the Moral Injury Events Scale (MIES) at the level of "slightly," "moderately," or "strongly agree." Wisco et al. (2017) also found similar results in their investigation of U.S. combat veterans who took part in the National Health and Resilience in Veterans Study in 2013, using slightly more restrictive MIES criteria. The authors reported that 42% of participants endorsed at least one question at the level of "moderately" or "strongly agree." Differences in typical deployment lengths between the Canadian and U.S. militaries make accurate comparisons between these results difficult, however, as the typical deployment duration for a CAF member is 6 months (Government of Canada, 2014), whereas deployment for a member of the U.S. Army or Marines can range from 9 to 11 months (Committee on the Assessment of the Readjustment Needs of Military Personnel, Veterans, and Their Families, & Board of the Health of Select Populations, 2013; Dreazen, 2011). The only other Canadian study that has reported rates of PMIE exposure in this population was conducted by Nazarov et al. (2018). As one of the stated goals of that study was to investigate the potential association between exposure to PMIEs and the development of posttraumatic stress disorder (PTSD), the questions used therein were more restrictive than those used in the current study. This difference in PMIE definition may have contributed to the difference in reported prevalence rates of any PMIE between their study (58%; Nazarov et al., 2018) and the current study (65.2%).

Nazarov et al. (2018) acknowledged that the deployment-related experiences they used to create their PMIE exposure variable may not have captured the range of PMIEs that a service member might encounter while deployed. Using the proposed three-factor MIES structure (Bryan et al., 2016) as a

Table 3*Logistic Regression for Prediction of Exposure to Any Potentially Morally Injurious Event (PMIE)*

Characteristic	Any PMIE	
	aOR	95% CI
Sociodemographic factors		
Sex		
Male	Reference	
Female	0.44 ^{***}	[0.36, 0.55]
Age (years)		
19–24	2.08 [*]	[1.16, 3.73]
25–34	1.39	[0.88, 2.19]
35–44	1.55	[0.99, 2.43]
45–54	1.08	[0.69, 1.69]
≥ 55	Reference	
Marital status		
Married or common-law	Reference	
Widowed, separated, or divorced	1.15	[0.87, 1.40]
Single (never married)	1.02	[0.84, 1.23]
Educational attainment		
Less than secondary school graduation	Reference	
Secondary school graduate	0.75	[0.52, 1.10]
Some postsecondary	0.90	[0.57, 1.41]
Postsecondary graduation	0.70	[0.49, 1.02]
More than postsecondary graduation	1.18	[0.73, 1.90]
Military factors		
Component		
Regular Forces	Reference	
Reserve Forces	1.46 ^{***}	[1.27, 1.68]
Rank group		
Junior NCM	0.95	[0.78, 1.17]
Senior NCM	1.30 ^{**}	[1.07, 1.59]
Officer	Reference	
MHT in last 5 years		
Any MHT	1.92 ^{***}	[1.61, 2.29]
Deployment related		
Total number of days deployed		
< 120	Reference	
121–240	1.67 ^{***}	[1.37, 2.05]
241–360	1.70 ^{***}	[1.32, 2.19]
> 361	2.56 ^{***}	[1.95, 3.35]

Note. To conform with Statistics Canada requirements relating to data reporting and confidentiality, overall model statistics cannot be reported. aOR = adjusted odds ratio; MHT = mental health training; NCM = noncommissioned member.

* $p < .05$. ** $p < .01$. *** $p < .001$.

guide (i.e., Transgression by Self, Transgression by Others, and Betrayal factors), the three questions Nazarov et al. selected could all be categorized as transgressions by self. In the current study, we attempted to capture a wider variety of PMIEs and, thereby, create a more complete picture of PMIE exposure through the inclusion of additional questions drawn from both the DEX and PTS modules of the survey. Specifically, the DEX question related to finding one's self in a threatening

situation and unable to respond due to the ROE, which was endorsed by over 35% of respondents, could be interpreted by the service member as a "betrayal," as the ROE prevented the individual from responding to a situation to which they believe they should have been allowed to respond. The United Nations peace-support and humanitarian aid operations in Somalia, the former Yugoslavia, and Rwanda, where the ROE outlined by the United Nations actively prevented soldiers from

intervening in situations that were not considered to be part of the mission's respective mandates (Dallaire, 2003; United Nations, n.d.), would also be examples of such a PMIE. Similarly, the included PTS question relating to witnessing atrocities or massacres, endorsed by over 29% of respondents in the present study, could be viewed as an example of transgression by others.

Similar to the findings reported by Nazarov et al. (2018), the two most commonly reported PMIEs by CAF members in the current study were seeing ill or injured women and children they were unable to help (48.4%) and having difficulty distinguishing between combatants and noncombatants (43.6%). These results likely arose in part from the nature of the operational deployment undertaken (i.e., counter-insurgency operations), where combat often takes place in populated areas and against combatants who blend in with the civilian population, which, in turn, increases the probability civilians will be unintentionally injured. This complex combat environment has been associated with increased incidents of multiple types of stress injuries in CAF members, including PTSD, with the highest incidence reported in service members deployed to Kandahar (17%) and Kabul (15%), the two most populated cities in Afghanistan (Boulos & Zamorski, 2011).

The likelihood of PMIE exposure was found to be associated with several sociodemographic, military, and deployment-related covariates, although the direction of the associations varied according to the question. The most consistent finding, that female service members were less likely to report PMIE exposure than their male counterparts, was found on the "any PMIE" question and across six of the seven PMIE subtypes. This sex-based difference in exposure likely results from female service members representing less than 15% of the total Canadian military, with only 2.4% and 5.6% in the Regular and Reserve Forces, respectively, serving in combat arms roles (i.e., infantry, armor, artillery, and combat engineers; Department of National Defence, 2014). The remainder of these women serve in more distal roles, such as logistic support or communications, or as medical personnel. The only other variable that was associated with a lower prevalence of PMIE endorsement was educational attainment, specifically graduating from a postsecondary institution, which only reached statistical significance with regard to two PMIEs: witnessing atrocities or massacres and the inability to respond to threatening situations because of the ROE (i.e., 34% and 38% reductions relative to not finishing secondary school, respectively). This finding, however, could be an artifact of how the education variable was defined in that it was split into five levels, ranging from less than secondary school graduation to more than postsecondary education. Previous researchers who did not split participants into as many education levels (e.g., Nazarov et al., 2018) have not found this education effect.

Individuals in the rank grouping of Senior NCM (i.e., Sergeant to Chief Warrant Officer) were found to be more likely to endorsing PMIE exposure, particularly witnessing atrocities, being unable to respond due to the ROE, and seeing injured

women or children they were unable to help. This finding may be a function of the length of time they had been in the CAF and not due to their rank per se; that is, the longer an individual is in the military, and, in turn, the more possible PMIEs they have encountered, the higher the likelihood they would have advanced in rank. Having served for a longer period also increases the odds that they would have been deployed on the aforementioned United Nations missions to areas such as Rwanda or Somalia, where they could have experienced most of the associated PMIEs. Future studies would benefit from the inclusion of variables relating to deployment history (e.g., specific deployment locations, the length of deployment to each location). This information could likely be extracted from individuals' administrative records to ensure accuracy.

The covariate that was most frequently associated with an increase in PMIE endorsement was deployment duration; however, the underlying reason for this association potentially differs. A total deployment duration between 121 to 240 days was associated with a 27%–113% increase in PMIE endorsement relative to a total deployment time of fewer than 121 days. Individuals who were deployed for 121–240 days, however, represented 57.3% of the individuals surveyed, and the result may reflect the number of individuals deployed and, therefore, able to be exposed to PMIEs, rather than deployment duration per se. In comparison, having been deployed for over 361 days was associated with a 48%–156% increase in PMIE endorsement compared with having been deployed for less than 121 days. This may be a more accurate reflection of the effect of longer deployment duration (i.e., the longer an individual is deployed, the more opportunities they have had for PMIE exposure). Future researchers interested in the influence of deployment duration on PMIE exposure might wish to create a variable that standardizes the relationship (e.g., number of PMIE exposures per days deployed).

It is important to remember that because the outcome variables of interest related to PMIE exposure rather than the development of a moral injury itself, these results are associational in nature and not causal; none of the demographic, military, or deployment characteristics will either cause or protect service members from PMIE exposure. The CFMHS did not assess combat exposure, the variable that would have a causal association with PMIE exposure and, in effect, may underly all the characteristics found to have significant associations. Not everyone who was deployed in support of the mission to Afghanistan was engaged in combat operations; thus, not everyone had the opportunity to be exposed to the types of PMIEs captured in the present study. Consequently, future researchers focused on both PMIEs and moral injury might wish to incorporate a variable or variables to assess the frequency, intensity, and/or duration of combat exposure.

There are some notable study limitations to discuss. The first stems from the necessity to use a proxy measure of PMIEs composed of questions available in the CFMHS rather than using an established and validated measure of PMIE exposure, such as the MIES (Nash et al., 2013) or the MIQ-MV (Currier,

Holland, Drescher, et al., 2015). As a result, the questions used may not reflect the complete spectrum of PMIEs a service member may encounter while deployed, and, consequently, the results may be underestimates of true exposure prevalence. A second limitation relates to the cross-sectional nature of the CFMHS. As with all studies that use this design, participant responses were captured at a single time point; thus, the results cannot be used to predict future events. As the development of moral injury is understood to be a function of an individual's re-processing of PMIE exposure (Litz et al., 2009), a longitudinal study format would have been preferable to determine precisely how exposure to PMIEs may be linked to the development of moral injury. Third, the CFMHS is a self-report questionnaire and, as such, is vulnerable to several recall biases—most importantly, social desirability bias. Although Statistics Canada took all appropriate steps to ensure both the anonymity of participants and the confidentiality of their responses, some of the questions delved into areas wherein service members may have been hesitant to respond truthfully. The questions that formed the PMIE exposure variable, in particular, were related to situations that, by definition, may have violated a service member's deeply held moral beliefs, and they may have had difficulty admitting to these perceived transgressions.

At times, the CFMHS made use of multibarreled questions (e.g., "Have you ever purposely injured, tortured, or killed another person?"), which can lead to conflicted answers, particularly when the answer options are limited to "yes" or "no." Using this question as an example, injuring, or killing other people is sometimes a necessary part of a service member's role, especially when they are deployed on a combat mission; thus, high levels of endorsement of these actions would be expected. Purposely torturing people, in contrast, is not part of their role and is expressly prohibited under international law, and, as such, low levels of endorsement would be expected for this item. Another potential limitation was the absence of a variable in the CFMHS that specified the year(s) each service member was deployed to Afghanistan, which precluded the analysis of potential cohort effects and an examination of how these related to PMIE exposure. The purpose and scope of CAF deployment to Afghanistan changed over the duration of the various operations, from combatting terrorists and insurgents at the beginning to delivering training to Afghan National Security Forces at the end. Finally, the CFMHS was only administered to currently serving members of the Canadian Armed Forces, which may have led to an incomplete picture of the prevalence of PMIE exposure in service members who were deployed to Afghanistan, as those who had been discharged from the military, including for psychological injuries, would not have been captured in the present sample. Consequently, the sample surveyed may be more representative of a "high-functioning" sample of CAF members—that is, those who were exposed to PMIEs but still able to function adequately to continue in their current roles.

Notwithstanding these limitations, we found that PMIE exposure was a common occurrence among CAF members

operationally deployed to Afghanistan between 2001 and 2013. Further research using CAF members who took part in other deployments and operations both at home and abroad is required to determine the potential rates of exposure to PMIEs as well as symptoms of moral injury to determine the prevalence of these problems in the CAF as a whole. The results of this and future studies will provide a needed foundation from which training procedures can be developed that may better prepare servicemen and servicewomen for the situations they might encounter in the ever-changing battlespace of the future.

Open Practices Statement

The study reported herein was not formally preregistered. Due to the archival nature of the data analyzed, the authors do not have direct control of either the data or materials used to generate said data; requests for access to these data should be directed to Statistics Canada.

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