

Article

Latent Classes of Proximal Traumatic Exposure Among Portuguese Police and Security Professionals: Associations with PTSD Symptoms and Psychological Distress

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Abstract

Background: Police and security professionals are routinely exposed to potentially traumatic events as part of occupational duties, placing them at increased risk for post-traumatic stress and broader psychological difficulties. This study aimed to identify latent classes of proximal traumatic exposure among Portuguese police/security professionals and examine their associations with PTSD symptoms and general psychological distress. **Methods:** A cross-sectional online survey was conducted with Portuguese police/security professionals (N = 644). Latent class analysis (LCA) was applied to 17 indicators of potentially traumatic events coded as directly experienced or witnessed, derived from the Life Events Checklist for DSM-5. PTSD symptoms were assessed using the PTSD Checklist for DSM-5, and general psychological distress was assessed using the Brief Symptom Inventory. Exploratory receiver operating characteristic (ROC) analyses examined whether counts of proximal traumatic events could approximate the LCA-derived classes. **Results:** A three-class solution was identified, comprising low proximal exposure (37.3%), moderate proximal exposure (40.7%), and high proximal/cumulative exposure (22.0%) classes. The classes reflected a graded cumulative pattern of exposure across traumatic event categories, rather than clearly distinct qualitative configurations defined by specific event types. Higher exposure classes were associated with progressively higher PTSD symptoms and psychological distress, and these associations remained significant after adjustment for sociodemographic and occupational variables. Exploratory receiver operating characteristic (ROC) analyses showed that a simple count of proximal traumatic event categories closely approximated the empirically derived class structure within the present sample. However, the resulting thresholds are sample-specific, exploratory, and should not be interpreted as validated screening cutoffs. **Conclusions:** Proximal traumatic exposure among police/security professionals appears to follow a graded cumulative structure associated with increased PTSD symptoms and psychological distress. The person-centered analysis provided an empirical test of whether exposure was organized according to qualitatively distinct event configurations or primarily along a cumulative gradient. In this sample, cumulative exposure burden emerged as the dominant organizing dimension. The count-based approximation requires external validation before any screening or decision-making application can be considered.

Keywords: police; security professionals; trauma exposure; latent class analysis; PTSD; psychological distress; LEC-5



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1. Introduction

Police and security professionals are routinely exposed to potentially traumatic events, including violence, serious injury, death, threats to life, and the aftermath of accidents or assaults. This exposure is not limited to rare major disasters; rather, it often occurs as part of routine police work and may accumulate across years of service. Accordingly, trauma exposure in policing should be understood not only as an acute event-based phenomenon, but also as a potentially cumulative occupational risk [1–3]. Consistent with this cumulative perspective, Craddock and Telesco [4] found that years of service were associated with greater cumulative traumatic exposure, whereas repeated exposure to critical incidents, rather than years of service itself, was associated with post-traumatic stress symptoms.

The mental health impact of this exposure has been increasingly documented. A systematic review focused specifically on police officers following routine work-related critical incident exposure concluded that PTSD prevalence is elevated in this occupational group and appears to be most strongly related to workplace exposure [3]. Consistent with this, a global systematic review and meta-analysis of police personnel found that police officers face an increased risk of mental health problems, underscoring the importance of examining trauma exposure as an occupational and cumulative risk factor in this population [5].

The mental health impact of traumatic exposure in police officers has been increasingly documented. Systematic reviews indicate that PTSD prevalence is elevated in police officers and appears to be particularly related to workplace exposure, although prevalence estimates vary substantially depending on measurement approach, sample characteristics, and diagnostic criteria [3]. Large-scale studies in UK police officers have also highlighted the relevance of cumulative trauma burden, showing that PTSD and complex PTSD are clinically meaningful concerns in this occupational group and that repeated exposure to traumatic incidents and traumatic visual material are associated with trauma-related psychopathology [6]. Beyond PTSD, police officers may also experience broader psychological difficulties. Systematic evidence indicates that anxiety, depression, and general psychological distress are relevant mental health outcomes in this occupational group, supporting the need to examine psychological distress alongside PTSD symptom severity [7].

A major challenge in this field is that traumatic exposure in policing is heterogeneous. Officers may be exposed to transportation accidents, physical assault, armed threat, sudden deaths, severe human suffering, sexual violence, or life-threatening injury, and these events may differ in psychological meaning and clinical impact. Studies focusing on police-specific traumatic events have shown that not all exposures are equivalent and that event characteristics, including type and recency, may matter for PTSD symptoms [8]. In police/security contexts, it may also be important to distinguish proximal exposure, events that officers directly experienced or witnessed, from more distal or occupationally mediated forms of exposure, such as learning that an event occurred or endorsing it as part of one's job. This distinction is consistent with DSM-5 Criterion A pathways, which differentiate direct exposure, witnessing an event, learning that a traumatic event occurred to someone close, and repeated or extreme occupational exposure to aversive details of traumatic events [9]. For police/security professionals, this distinction is especially relevant because exposure to potentially traumatic events or traumatic material may occur frequently as part of routine occupational duties, whereas directly experienced or witnessed events may reflect more proximal forms of traumatic exposure [1].

Therefore, treating traumatic exposure as a single undifferentiated count may obscure meaningful variation in how different types of events and forms of exposure cluster within individuals. Person-centered approaches, such as latent class analysis (LCA), are particularly useful for addressing this limitation because they identify subgroups of individuals who share similar patterns of responses across multiple categorical indicators. In trauma

research, a systematic review of person-centered studies found that traumatic events tend to cluster into identifiable exposure classes and that these classes may differ in psychiatric risk [10]. This approach is especially relevant for police/security populations, where exposure is often repeated, multifaceted, and embedded in occupational routines.

Despite the growing use of LCA in trauma research, person-centered studies in police populations remain limited and have mostly focused on symptom profiles, moral injury, or combinations of PTSD and general psychopathology rather than on latent classes of traumatic event exposure itself. For example, Mensink et al. [11] conducted an LCA of moral injury and PTSD symptom profiles in trauma-exposed, treatment-seeking police officers and military veterans, identifying classes characterized by moral injury, PTSD, both, or neither. More recently, Mooren et al. [12] used LCA to identify classes of moral injury appraisals and PTSD symptoms among trauma-exposed police officers. These studies are important, but they do not directly answer whether police/security professionals can be classified according to patterns of exposure to different potentially traumatic events. Thus, comparatively little is known about whether distinct latent classes of traumatic event exposure can be identified in police/security professionals, particularly when focusing on proximal forms of exposure.

This gap is also relevant from an applied perspective. Previous work has developed police-specific trauma exposure tools, such as the Police Traumatic Experiences Checklist, which was designed as a practical tool for self-assessment, peer support, occupational health monitoring, and improving access to care [13]. Other first-responder research has examined cumulative exposure to work-related traumatic events as a predictor of PTSD and depression, including through ROC-based evaluation of exposure indices [14]. However, this literature has generally focused on documenting, describing, or scoring exposure, or on testing exposure indices as predictors of mental health outcomes, rather than identifying latent classes of traumatic event exposure and translating those classes into practical count-based thresholds. Similarly, ROC analyses in police and first-responder research have mostly been used to evaluate symptom screening tools, such as the PCL-5, rather than to derive simple approximations of LCA-based exposure classes [15]. Therefore, an important unresolved question is whether person-centered models of proximal traumatic exposure can be made more applicable to occupational screening and monitoring by identifying preliminary count-based thresholds that approximate latent exposure classes.

Identifying proximal trauma exposure classes is clinically and theoretically important. If police/security professionals differ not only in the overall amount of trauma exposure but also in the configuration of events they have directly experienced or witnessed, then prevention, screening, and intervention strategies may need to consider these distinct exposure patterns. This rationale is supported by police-specific evidence showing that the frequency, recency, and type of traumatic events are associated with PTSD symptoms, suggesting that different exposure characteristics may carry different clinical implications [8]. Moreover, evidence from a large study of UK police officers supports a cumulative burden model of trauma-related psychopathology, indicating that repeated exposure to traumatic incidents and traumatic material is clinically relevant for PTSD and complex PTSD [6].

The present study addresses this gap by using LCA to identify latent classes of proximal traumatic exposure in a large sample of Portuguese police/security professionals. Proximal exposure was defined as potentially traumatic events that participants reported having directly experienced or witnessed. By focusing on proximal exposure, the study aimed to reduce conceptual overlap with indirect or routine occupational exposure and to examine whether distinct patterns of traumatic event exposure could be identified across 17 categories of potentially traumatic events. To our knowledge, this is one of the first studies to combine a person-centered model of proximal traumatic exposure with an ex-

ploratory count-based approximation of LCA-derived exposure classes in police/security professionals. By modeling the traumatic event categories as separate indicators, the LCA allowed us to examine empirically whether proximal exposure was organized into qualitatively distinct configurations, quantitatively graded levels of cumulative exposure, or a combination of both. The subsequent exploratory analysis examined whether a simple count of proximal traumatic event categories could approximate the class structure identified by the LCA. This count-based analysis was intended as a descriptive approximation of the latent solution and not as a validation of screening thresholds.

The aims of the present study were threefold, with one additional exploratory objective. First, we aimed to identify latent classes of proximal traumatic exposure among police/security professionals based on patterns of directly experienced or witnessed potentially traumatic events. Given prior person-centered trauma research, we expected to identify distinct exposure classes, including lower-exposure and higher cumulative exposure groups, although the exact number and composition of classes were treated as exploratory. Second, we aimed to examine whether the resulting proximal exposure classes differed in PTSD symptom severity. Based on cumulative burden models and prior evidence linking police traumatic exposure to PTSD symptoms, we hypothesized that classes characterized by higher proximal/cumulative exposure would show higher PTSD symptom severity. Third, we examined whether proximal exposure classes differed in general psychological distress. Given evidence that police officers may experience broader psychological difficulties beyond PTSD, including anxiety, depression, and general psychological distress, we hypothesized that higher proximal/cumulative exposure would also be associated with higher general psychological distress. Finally, as an exploratory supplementary objective, we examined whether the total number of proximal traumatic events could approximate the LCA-derived classes and yield preliminary count-based thresholds for distinguishing between empirically identified levels or patterns of proximal exposure burden. This analysis was intended to explore the translational potential of the LCA solution for future occupational risk stratification, rather than to establish validated screening cutoffs. Because this analysis was exploratory and dependent on the class structure identified, no formal hypothesis was specified.

2. Methods

2.1. Participants

The initial dataset included 1504 responses. Of these, 1488 participants provided informed consent. For the present study, eligible participants were required to be actively serving in police/security-related professions, namely the Guarda Nacional Republicana (GNR; National Republican Guard), Polícia de Segurança Pública (PSP; Public Security Police), or other security forces. Eligibility screening was conducted at the beginning of the survey. Participants who reported performing exclusively administrative duties were considered ineligible, and the survey was automatically terminated. Only participants meeting this criterion proceeded to the full questionnaire. A total of 828 participants completed the questionnaire, of whom 652 met the profession-specific eligibility criteria for the present study.

The final analytic sample comprised 644 participants with complete data on the 17 proximal trauma exposure indicators used in the latent class analysis. These indicators reflected potentially traumatic events that participants reported having directly experienced or witnessed. Participants were predominantly male ($n = 568$, 88.2%), with 76 participants identifying as female (11.8%). The mean age was 43.70 years ($SD = 8.60$; range = 21–69), based on 643 valid responses. Participants reported an average of 20.40 years of professional experience ($SD = 8.87$; range = 0–41).

Regarding professional affiliation, 396 participants were members of the GNR (61.5%), 214 were members of the PSP (33.2%), and 34 reported belonging to other security forces (5.3%). Implausible age values were treated as missing, and values entered as calendar years for professional experience were converted into years of service based on the year of questionnaire completion.

2.2. Instruments

Sociodemographic and professional information was collected using a questionnaire developed by the research team. The questionnaire included items on age, sex, marital status, nationality, place of residence, educational background, professional activity, years of professional experience, monthly household income, household size, number of dependents, medical conditions, and current medication use.

The Brief Symptom Inventory [16], Portuguese version [17], was used to assess general psychological distress. The BSI is a 53-item self-report measure that evaluates psychopathological symptoms across nine symptom dimensions: Somatization, Obsessive–Compulsive symptoms, Interpersonal Sensitivity, Depression, Anxiety, Hostility, Phobic Anxiety, Paranoid Ideation, and Psychoticism. The instrument also provides three global indices: the Global Severity Index (GSI), the Positive Symptom Distress Index (PSDI), and the Positive Symptom Total (PST). In the present study, the GSI was used as the main indicator of general psychological distress. Participants rated how much each symptom had distressed or bothered them during the previous week using a 5-point Likert-type scale ranging from 0 (Never) to 4 (Very often). Higher scores indicate greater psychological distress. In the present sample, the BSI total score showed excellent internal consistency (Cronbach's $\alpha = 0.977$).

The Life Events Checklist for DSM-5 (LEC-5) [18], Portuguese version [19], was used to assess exposure to potentially traumatic events. The LEC-5 includes 17 categories of potentially traumatic events, including natural disasters, fire or explosion, transportation accidents, physical assault, sexual assault, sudden violent death, and one additional item assessing other extremely stressful events. For each event, participants indicated the type of exposure experienced using the following response options: happened to me, witnessed it, learned about it, part of my job, not sure, and does not apply. For the latent class analysis, proximal traumatic exposure was defined as exposure that participants had either directly experienced or witnessed. Accordingly, each event was coded as endorsed when participants selected either happened to me or witnessed it. Indirect exposure, occupational exposure, and uncertain exposure were not included in the final LCA indicators.

The Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5) [20], Portuguese version [19], was used to assess PTSD symptom severity. The PCL-5 is a 20-item self-report measure assessing PTSD symptoms according to the DSM-5 symptom clusters: intrusion symptoms, avoidance, negative alterations in cognition and mood, and alterations in arousal and reactivity. Participants rated how much they had been bothered by each symptom during the previous month using a 5-point Likert-type scale ranging from 0 (Not at all) to 4 (Extremely). Total scores range from 0 to 80, with higher scores indicating greater PTSD symptom severity. In the present sample, the PCL-5 total score showed excellent internal consistency (Cronbach's $\alpha = 0.965$).

2.3. Procedure

This study was approved by the Ethics and Deontology Committee for Scientific Research (protocol code CEDIC-2023-06-09) on 8 March 2023. Data were collected from March to December 2023. Participants were recruited through convenience and snow-ball sampling methods. Study information and link to the questionnaire were distributed in

social media platforms (Facebook and WhatsApp), and several institutional contacts were made, where two official European Portuguese entities—Associação Sindical dos Profissionais de Polícia (ASPP [Police Union Association]) and Guarda Nacional Republicana (GNR [National Republican Guard])—agreed to disseminate the study to their employees.

Prior to participation, all respondents were required to provide informed consent electronically. Participants could only proceed to the questionnaire after actively selecting the consent checkbox. No identifying or personally sensitive information was collected. An email contact for the principal investigator was provided for participants who wished to ask questions or seek clarification about the study. Completion of the questionnaire took approximately 15 min.

2.4. Statistical Analysis

All analyses were conducted in R version 4.3.2 (R Foundation for Statistical Computing, Vienna, Austria). Data were first screened for missing values, implausible responses, and coding inconsistencies. Implausible age values were treated as missing. When years of professional experience were entered as calendar years, values were converted into years of service based on the year of questionnaire completion. Descriptive statistics were computed to characterize the sample and study variables. Continuous variables were summarized using means, standard deviations, medians, and ranges, whereas categorical variables were summarized using frequencies and percentages. Internal consistency of the PCL-5 total score and BSI total score was examined using Cronbach's alpha, calculated with the psych package (version 2.6.1).

Latent class analysis (LCA) was used to identify subgroups of participants with similar patterns of proximal traumatic exposure. LCA is a person-centered mixture modeling approach that identifies unobserved subgroups based on participants' response patterns across categorical indicators [21]. The LCA indicators were derived from the LEC-5. For each of the 17 potentially traumatic events, a binary indicator was created to reflect proximal exposure. Events were coded as endorsed when participants reported that the event had either happened to them directly or had been witnessed by them. Indirect exposure ("learned about it"), occupational exposure ("part of my job"), uncertain exposure ("not sure"), and "does not apply" responses were not included as proximal exposure indicators. This operationalization was chosen to focus the latent class model on direct or witnessed traumatic exposure and to avoid conflating proximal exposure with indirect or occupational exposure, which may be conceptually overlapping in police/security contexts.

LCA models with one to six classes were estimated using the poLCA package (version 1.6.0.1) in R, which estimates latent class models for categorical indicators using maximum likelihood procedures [22]. To reduce the risk of local maxima, each model was estimated using multiple random starts. Model selection was based on a combination of statistical fit indices, classification quality, class size, parsimony, and substantive interpretability. Specifically, models were compared using the log-likelihood, Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), sample-size adjusted BIC (SABIC), entropy, class sizes, and posterior classification probabilities.

The BIC was treated as the primary information criterion for class enumeration because simulation evidence and best-practice recommendations suggest that it is among the most reliable information criteria for identifying the number of classes in mixture models, while also rewarding parsimony and penalizing unnecessary model complexity [21,23]. Lower values of AIC, BIC, and SABIC indicate better relative fit; however, because information criteria do not always converge on the same solution, the final model was not selected on statistical indices alone. Consistent with LCA best-practice recommendations, model selection was based on the joint consideration of statistical fit, parsimony, classification

quality, class size, and substantive interpretability [24]. Entropy and average posterior probabilities were examined as indicators of classification precision, but were not used as the sole basis for determining the number of classes, in line with current recommendations [21]. The three-class solution was retained because it had the lowest BIC, adequate class sizes, acceptable classification quality, and provided the most parsimonious and substantively meaningful representation of proximal trauma exposure, distinguishing participants with low, moderate, and high proximal/cumulative exposure.

As an exploratory supplementary step, receiver operating characteristic (ROC) analyses were conducted to examine whether the total count of proximal traumatic events could approximate the LCA-derived exposure classes. ROC analysis was used because it provides an index of overall discrimination through the area under the curve (AUC) and allows the evaluation of candidate thresholds for classifying participants into binary outcome groups [25]. Analyses were conducted using the pROC package (version 1.18.5) in R, which implements ROC curve analysis, AUC estimation, confidence intervals, and threshold evaluation [26]. Two ROC contrasts were examined: first, the Low proximal exposure class versus the combined Moderate and High proximal exposure classes; second, the High proximal/cumulative exposure class versus the combined Low and Moderate proximal exposure classes. Optimal thresholds were identified using the Youden index, which maximizes the combined sensitivity and specificity of a classification rule [27]. Because traumatic exposure counts are integer values, ROC-derived thresholds were rounded upward to the next whole number to generate practical count-based cutoffs. For each contrast, AUC, 95% confidence intervals, sensitivity, specificity, accuracy, positive predictive value, and negative predictive value were reported. These analyses were intended only as an exploratory approximation of the latent classes and not as a validation of clinical screening cutoffs.

After assigning participants to their most likely latent class, class differences in PTSD symptom severity, general psychological distress, and years of professional experience were examined. PTSD symptoms were assessed using the PCL-5 total score, and general psychological distress was assessed using the BSI Global Severity Index. First, unadjusted differences across latent classes were examined using Welch's analysis of variance, conducted with the rstatix package (version 0.7.3), which is recommended as a robust alternative to the classical one-way ANOVA when the assumption of homogeneity of variances may be violated or when group sizes are unequal [28]. Games–Howell post hoc tests, also conducted with the rstatix package, were then used for pairwise comparisons because this procedure does not assume equal variances or equal sample sizes.

Second, adjusted linear regression models were estimated to examine whether differences between latent classes remained after controlling for sex, age, years of professional experience, and professional affiliation. Robust HC3 standard errors were used in the adjusted linear regression models to reduce sensitivity to heteroscedasticity and improve the reliability of statistical inference. HC3 covariance matrices were computed using the sandwich package (version 3.1-1), and robust coefficient tests were obtained using the lmttest package (version 0.9-40). HC estimators are recommended for OLS regression when the homoscedasticity assumption may be violated, with HC3 often preferred because of its improved performance in finite samples [29]. Adjusted estimated marginal means were obtained using the emmeans package (version 1.9.0), and pairwise comparisons between classes were adjusted using Tukey correction. Statistical significance was evaluated at $p < 0.05$.

3. Results

3.1. Descriptive Results

In the final analytic sample ($N = 644$), most participants reported at least one proximal traumatic exposure, defined as an event that they had directly experienced or witnessed. Overall, 566 participants (87.9%) endorsed at least one proximal traumatic event. The mean number of proximal traumatic events was 4.83 ($SD = 3.74$; median = 4; range = 0–15).

As shown in Table 1, the most frequently reported proximal traumatic events were transportation accidents ($n = 397$, 61.6%), physical assault ($n = 368$, 57.1%), and fire or explosion ($n = 318$, 49.4%). The least frequently reported events were captivity ($n = 17$, 2.6%), sexual assault ($n = 34$, 5.3%), and unwanted sexual experiences ($n = 61$, 9.5%).

Table 1. Prevalence of Proximal Traumatic Exposure Indicators in the Analytic Sample.

Proximal Traumatic Exposure Indicator	<i>n</i> Exposed	% Exposed
Transportation accident	397	61.6
Physical assault	368	57.1
Fire/explosion	318	49.4
Natural disaster	230	35.7
Life-threatening illness/injury	223	34.6
Serious accident	219	34.0
Severe human suffering	218	33.9
Assault with a weapon	202	31.4
Other stressful event	185	28.7
Sudden accidental death	184	28.6
Sudden violent death	167	25.9
Causing serious injury/death	131	20.3
Combat/war zone	88	13.7
Toxic substance exposure	66	10.2
Unwanted sexual experience	61	9.5
Sexual assault	34	5.3
Captivity	17	2.6

Note. $N = 644$. Proximal exposure indicators reflect potentially traumatic events that participants reported having directly experienced or witnessed. Percentages were calculated using the full analytic sample as the denominator.

Valid PCL-5 total scores were available for 618 participants. The mean PCL-5 total score was 15.30 ($SD = 15.10$; median = 10; range = 0–63), suggesting relatively low average PTSD symptom severity at the sample level, although with substantial variability. Using a cutoff score of 31 or higher, 104 participants (16.8%) screened positive for probable PTSD. Using the more conservative cutoff score of 33 or higher, 93 participants (15.0%) screened positive. In addition, 98 participants (15.9%) met the DSM-5 symptom cluster rule based on the PCL-5 scoring algorithm.

General psychological distress was assessed using the BSI-GSI. Valid BSI-GSI scores were available for 643 participants. The mean BSI-GSI score was 0.75 ($SD = 0.57$; median = 0.62; range = 0–3.38), suggesting low-to-moderate average levels of general psychological distress, again with considerable interindividual variability. The mean BSI Positive Symptom Distress Index was 1.39 ($SD = 0.38$; median = 1.29; range = 1.00–3.38). Based on the 1.7 cutoff for the Positive Symptom Distress Index, 113 participants (17.7%) scored above the threshold suggestive of clinically relevant psychological symptoms.

3.2. Latent Class Analysis

Latent class analysis (LCA) was conducted using 17 dichotomous indicators representing proximal traumatic exposure, defined as events that participants had either directly experienced or witnessed. Indicators based on indirect exposure (i.e., learning that the

event happened to someone else) and occupational exposure were not included in the final model. Only complete cases were retained for the LCA, resulting in an analytic sample of 644 participants.

Models specifying one to six latent classes were estimated, and fit indices for all competing solutions are presented in Table 2. Although the Akaike Information Criterion (AIC) continued to decrease as additional classes were added, the Bayesian Information Criterion (BIC) reached its lowest value for the three-class solution (AIC = 9798.92, BIC = 10,035.70, SABIC = 9867.43). This solution was therefore retained because it provided the best BIC, adequate class sizes, moderate overall class separation with satisfactory class-specific posterior probabilities, and a substantively interpretable representation of proximal traumatic exposure. Entropy for the three-class solution was 0.774. Average posterior probabilities were 0.919 for the Low proximal exposure class, 0.864 for the Moderate proximal exposure class, and 0.915 for the High proximal/cumulative exposure class. Thus, classification uncertainty was greatest for the Moderate class, consistent with its intermediate position and partial overlap with the Low and High exposure classes. Although entropy was higher for the two-class solution (0.860), its BIC was 108.87 points higher than that of the three-class solution. Because entropy reflects class separation and should not be used as the sole criterion for class enumeration, the lower entropy of the three-class model was considered alongside the information criteria, class sizes, posterior probabilities, and substantive interpretability.

Table 2. Fit Indices for Competing Latent Class Models of Proximal Traumatic Exposure.

Classes	Log-Likelihood	Parameters	AIC	BIC	SABIC	Entropy
1	−5724.16	17	11,482.32	11,558.27	11,504.30	—
2	−4959.10	35	9988.20	10,144.57	10,033.45	0.860
3	−4846.46	53	9798.92	10,035.70	9867.43	0.774
4	−4799.12	71	9740.25	10,057.45	9832.03	0.779
5	−4762.00	89	9702.01	10,099.63	9817.06	0.798
6	−4732.46	107	9678.92	10,156.96	9817.24	0.775

Note. $N = 644$. AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; SABIC = sample-size adjusted Bayesian Information Criterion. Lower AIC, BIC, and SABIC values indicate better relative fit. Entropy is not available for the one-class model.

The retained three-class solution comprised the following classes: Low proximal exposure ($n = 240$, 37.3%), Moderate proximal exposure ($n = 262$, 40.7%), and High proximal/cumulative exposure ($n = 142$, 22.0%).

To clarify how the Moderate class emerged, individual classifications from the two- and three-class solutions were compared. The two-class solution comprised a lower-exposure class ($n = 391$; $M = 2.27$ proximal event categories) and a higher-exposure class ($n = 253$; $M = 8.77$ event categories). In the three-class solution, all participants assigned to the Low class had belonged to the lower-exposure class, whereas all participants assigned to the High class had belonged to the higher-exposure class. The Moderate class included participants from both two-class groups: 151 (57.6%) had previously been assigned to the lower-exposure class and 111 (42.4%) to the higher-exposure class. Thus, the Moderate class did not result exclusively from splitting either the lower- or higher-exposure class; rather, it captured intermediate exposure patterns that the two-class solution distributed across both broader groups.

The conditional probabilities of endorsement for each proximal traumatic exposure indicator across the three latent classes are displayed in Figure 1.

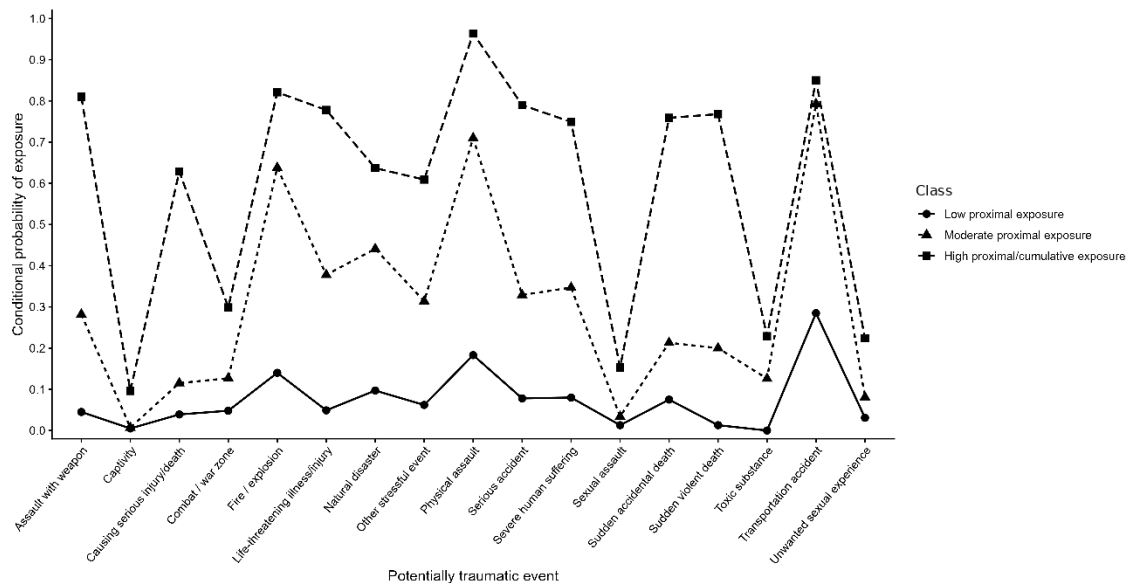


Figure 1. Conditional Probabilities of Proximal Traumatic Exposure Across the Three Latent Classes. Note. Proximal exposure indicators reflect potentially traumatic events that participants directly experienced or witnessed. Conditional probabilities represent the probability of endorsing each event within each latent class. The three-class solution included the low proximal exposure class ($n = 240$, 37.3%), the moderate proximal exposure class ($n = 262$, 40.7%), and the high proximal/cumulative exposure class ($n = 142$, 22.0%).

The Low proximal exposure class was characterized by low probabilities of endorsement across all traumatic event categories, with conditional probabilities generally below 0.10 and only modest elevations for transportation accidents (0.285) and physical assault (0.183). The Moderate proximal exposure class showed intermediate probabilities across a broad range of events, particularly transportation accidents (0.793), physical assault (0.710), fire/explosion (0.638), and natural disaster (0.441). Finally, the High proximal/cumulative exposure class was characterized by high probabilities of exposure across multiple event types, including physical assault (0.964), transportation accident (0.850), fire/explosion (0.821), assault with a weapon (0.810), serious accident (0.790), life-threatening illness/injury (0.778), sudden violent death (0.768), sudden accidental death (0.759), and severe human suffering (0.749). Although sexual assault and unwanted sexual experiences were less prevalent overall, both indicators showed their highest conditional probabilities in the high proximal/cumulative exposure class: 0.153 for sexual assault and 0.224 for unwanted sexual experiences.

Taken together, the three-class solution suggested a predominantly quantitative and graded structure of proximal trauma exposure, distinguishing participants with low, moderate, and high cumulative exposure to directly experienced or witnessed traumatic events, rather than qualitatively distinct classes defined by specific event types.

3.3. Exploratory Count-Based Approximation of Proximal Exposure Classes

As an exploratory step, we examined whether the total number of proximal traumatic events could approximate the LCA-derived classes. Receiver operating characteristic analyses showed excellent discrimination between the Low proximal exposure class and the combined Moderate/High classes, $AUC = 0.995$, 95% CI [0.992, 0.998], and between the High proximal/cumulative exposure class and the combined Low/Moderate classes, $AUC = 0.991$, 95% CI [0.986, 0.995] (Table 3). The optimal thresholds were 2.5 and 7.5 events, corresponding to practical cutoffs of ≥ 3 events for distinguishing Moderate/High exposure from Low exposure and ≥ 8 events for identifying the High proximal/cumulative

exposure class. Based on these exploratory thresholds, participants could be classified as follows: 0–2 events = Low proximal exposure, 3–7 events = Moderate proximal exposure, and ≥ 8 events = High proximal/cumulative exposure. This count-based approximation correctly classified 92.2% of participants according to their most likely LCA class, with class-specific accuracy of 91.7% for the Low class, 90.8% for the Moderate class, and 95.8% for the High proximal/cumulative exposure class. These thresholds should be interpreted as preliminary and require validation in independent samples.

Table 3. Exploratory Count-Based Approximation of LCA-Derived Proximal Exposure Classes.

Classification Target	AUC	95% CI	Threshold	Practical Cutoff	Sensitivity	Specificity	Accuracy	PPV	NPV
Low vs. Moderate/High exposure	0.995	0.992–0.998	2.5	≥ 3 events	1.000	0.917	0.969	0.953	1.000
High vs. Low/Moderate exposure	0.991	0.986–0.995	7.5	≥ 8 events	0.958	0.952	0.953	0.850	0.988

Note. AUC = area under the receiver operating characteristic curve; CI = confidence interval; PPV = positive predictive value; NPV = negative predictive value. Practical cutoffs were obtained by rounding the optimal ROC thresholds upward to the next integer. These thresholds are exploratory and require external validation before use in screening or decision-making.

3.4. Associations Between Proximal Exposure Classes, PTSD Symptoms, and Psychological Distress

Classes derived from the proximal exposure LCA were then compared on PTSD symptom severity (PCL-5 total score) and general psychological distress (BSI-GSI), and years of professional experience. Descriptive statistics and adjusted estimated marginal means for both outcomes across the three proximal exposure classes are presented in Table 4.

Table 4. PTSD symptoms and psychological distress across proximal trauma exposure classes.

Class	<i>n</i> PCL-5	PCL-5 <i>M</i> (<i>SD</i>)	Adjusted PCL-5 <i>M</i> (<i>SE</i>)	<i>n</i> BSI-GSI	BSI-GSI <i>M</i> (<i>SD</i>)	Adjusted BSI-GSI <i>M</i> (<i>SE</i>)
Low proximal exposure	227	10.40 (12.70) ^a	11.50 (1.41) ^a	240	0.58 (0.45) ^a	0.62 (0.05) ^a
Moderate proximal exposure	254	16.30 (14.20) ^b	17.50 (1.46) ^b	261	0.79 (0.56) ^b	0.83 (0.05) ^b
High proximal/cumulative exposure	137	21.60 (17.40) ^c	22.70 (1.96) ^c	142	0.98 (0.68) ^c	1.02 (0.08) ^c

Note. Different superscript letters indicate significant pairwise differences between classes, $p < 0.05$. Adjusted means were estimated from linear regression models controlling for sex, age, years in profession, and profession type, using robust standard errors. PCL-5 = PTSD Checklist for DSM-5; BSI-GSI = Brief Symptom Inventory Global Severity Index.

For PTSD symptoms, descriptive analyses showed a clear gradient across classes. Participants in the Low proximal exposure class presented the lowest mean PCL-5 score ($M = 10.40$, $SD = 12.70$), followed by those in the Moderate proximal exposure class ($M = 16.30$, $SD = 14.20$), whereas the High proximal/cumulative exposure class showed the highest PTSD symptom levels ($M = 21.60$, $SD = 17.40$). A Welch ANOVA confirmed significant differences across the three classes, Welch's $F(2, 329) = 25.20$, $p < 0.001$. Games-Howell post hoc comparisons indicated that all pairwise differences were statistically significant: the Moderate proximal exposure class scored significantly higher than the Low proximal exposure class (mean difference = 5.89, $p < 0.001$), the High proximal/cumulative exposure class scored significantly higher than the Low proximal exposure class (mean difference = 11.20, $p < 0.001$), and the High proximal/cumulative exposure class also scored significantly higher than the Moderate proximal exposure class (mean difference = 5.32, $p = 0.007$).

This pattern remained after adjusting for sex, age, years in profession, and profession type using linear regression models with robust standard errors. Relative to the Low proximal exposure class, the Moderate proximal exposure class was associated with significantly higher PCL-5 total scores, $b = 5.95$, $SE = 1.24$, $p < 0.001$, and the High proximal/cumulative

exposure class was associated with even higher PCL-5 total scores, $b = 11.16$, $SE = 1.72$, $p < 0.001$. Adjusted estimated marginal means followed the same graded pattern: Low proximal exposure ($M = 11.50$, $SE = 1.41$), Moderate proximal exposure ($M = 17.50$, $SE = 1.46$), and High proximal/cumulative exposure ($M = 22.70$, $SE = 1.96$). Tukey-adjusted pairwise comparisons confirmed that all three classes significantly differed from one another.

A similar pattern emerged for general psychological distress. The Low proximal exposure class had the lowest BSI-GSI mean ($M = 0.58$, $SD = 0.45$), followed by the Moderate proximal exposure class ($M = 0.79$, $SD = 0.56$), whereas the High proximal/cumulative exposure class showed the highest distress levels ($M = 0.98$, $SD = 0.68$). Differences across classes were significant, Welch's $F(2, 336) = 23.60$, $p < 0.001$. Games-Howell post hoc tests again showed that all pairwise comparisons were statistically significant: Moderate proximal exposure versus Low proximal exposure (mean difference = 0.21 , $p < 0.001$), High proximal/cumulative exposure versus Low proximal exposure (mean difference = 0.40 , $p < 0.001$), and High proximal/cumulative exposure versus Moderate proximal exposure (mean difference = 0.19 , $p = 0.013$).

These associations also remained significant in the adjusted regression model. Compared with the Low proximal exposure class, the Moderate proximal exposure class showed significantly higher BSI-GSI scores, $b = 0.21$, $SE = 0.05$, $p < 0.001$, and the High proximal/cumulative exposure class showed the highest scores, $b = 0.40$, $SE = 0.06$, $p < 0.001$. Adjusted estimated marginal means showed the same progression: Low proximal exposure ($M = 0.62$, $SE = 0.05$), Moderate proximal exposure ($M = 0.83$, $SE = 0.05$), and High proximal/cumulative exposure ($M = 1.02$, $SE = 0.08$). Tukey-adjusted post hoc comparisons confirmed significant differences between all three classes.

A modest overall difference in years of professional experience was observed across the three classes, Welch's $F(2, 380.90) = 3.38$, $p = 0.035$. Participants in the Low proximal exposure class reported a mean of 19.98 years of professional experience ($SD = 9.24$), compared with 19.99 years ($SD = 8.97$) in the Moderate proximal exposure class and 22.00 years ($SD = 7.85$) in the High proximal/cumulative exposure class. However, none of the Games-Howell pairwise comparisons reached statistical significance after adjustment (Low vs. Moderate, $p = 1.000$; Low vs. High, $p = 0.061$; Moderate vs. High, $p = 0.053$).

Overall, the results indicate a dose-response pattern, whereby increasing levels of proximal trauma exposure were associated with progressively higher levels of PTSD symptoms and general psychological distress.

4. Discussion

The present study used latent class analysis to identify classes of proximal traumatic exposure among Portuguese police/security professionals and examined whether these classes differed in PTSD symptom severity and general psychological distress. Four main findings emerged. First, proximal traumatic exposure was highly prevalent: 87.9% of participants reported at least one event that they had directly experienced or witnessed, and participants reported an average of nearly five proximal traumatic events. Second, the LCA supported a three-class solution reflecting a graded structure of exposure: low proximal exposure, moderate proximal exposure, and high proximal/cumulative exposure. Third, these classes differed consistently in mental health outcomes. Participants in the high proximal/cumulative exposure class showed the highest PTSD symptom severity and general psychological distress, followed by those in the moderate proximal exposure class, whereas participants in the low proximal exposure class showed the lowest symptom levels. This graded pattern remained significant after adjustment for sex, age, years in profession, and professional affiliation. Fourth, exploratory ROC analyses suggested that a simple count of proximal traumatic events could approximate the LCA-derived classes

with high accuracy, providing a preliminary basis for future work on exposure-based risk stratification in police/security settings. Taken together, these findings offer a novel contribution by linking person-centered modeling of proximal traumatic exposure with an applied, count-based approach that may be more easily translated into occupational monitoring and prevention contexts.

The high prevalence of proximal traumatic exposure observed in this sample is consistent with the occupational reality of police and security work. Police officers are repeatedly exposed to potentially traumatic events, including accidents, violence, sudden death, serious injury, and severe human suffering, often as part of routine duties rather than exceptional disasters [1,3]. In the present study, the most frequently endorsed proximal events were transportation accidents, physical assault, and fire or explosion, which aligns with previous police-specific research showing that law enforcement professionals are exposed to diverse and recurrent critical incidents [8]. Importantly, the findings reinforce the idea that trauma exposure in policing should not be treated only as a single event or “worst-event” phenomenon, but also as a cumulative occupational burden that may unfold across years of service. This interpretation is consistent with Craddock and Telesco [4], who found that years of service were associated with greater cumulative traumatic exposure, whereas repeated exposure to critical incidents, rather than years of service itself, was associated with post-traumatic stress symptoms. In the present study, years of professional experience differed modestly across the exposure classes at the omnibus level, although none of the pairwise comparisons reached statistical significance. Participants in the High proximal/cumulative exposure class had approximately two more years of professional experience, on average, than those in the Low and Moderate classes. Nevertheless, the associations between the exposure classes and both PTSD symptoms and psychological distress remained significant after adjustment for years of professional experience, indicating that these associations were not explained solely by occupational tenure. These findings should not, however, be interpreted as establishing that the number of exposures is more consequential than the type of exposure, because cumulative burden and event composition were jointly represented in the latent classes.

The three-class solution suggests that, in this sample, proximal traumatic exposure was organized primarily along a cumulative exposure gradient rather than into qualitatively distinct classes based on specific event types. The Low proximal exposure class was characterized by low probabilities across most event categories; the Moderate proximal exposure class showed intermediate probabilities across several events; and the High proximal/cumulative exposure class showed high probabilities across multiple event types, including physical assault, transportation accidents, fire/explosion, assault with a weapon, serious accidents, life-threatening illness or injury, sudden deaths, and severe human suffering. Because the 17 traumatic event categories were entered separately as indicators, the LCA allowed the class structure to be empirically derived from patterns of item endorsement rather than imposed a priori through a summed exposure score [30]. The resulting classes could differ primarily in their overall level of endorsement, in the configuration of event-specific probabilities, or in both respects [31,32]. The emergence of a predominantly graded solution therefore represents an empirical feature of the data. The Moderate class occupied an intermediate position and included participants who had been assigned to both the lower- and higher-exposure groups in the two-class solution. This partial overlap with the Low and High classes likely contributed to the lower entropy of the three-class solution. Nevertheless, the lower BIC, adequate class sizes, and satisfactory class-specific posterior probabilities supported retaining the three-class model as a more informative representation of the graded structure of exposure. Taken together, these findings indicate that the dominant organizing dimension of proximal traumatic exposure in this sample

was the extent of cumulative exposure across event categories, rather than the presence of clearly differentiated subgroups defined by specific trauma types. The added value of the LCA was therefore to identify and characterize this underlying structure empirically, while retaining information on the conditional probability of each event category within each class. The predominantly cumulative structure identified in the present study is consistent with person-centered trauma research showing that traumatic exposures may cluster into latent classes that vary in overall burden, frequency, and trauma type, with higher-burden classes generally showing greater psychiatric risk than lower-exposure classes [10]. In this sense, the present findings extend this literature to Portuguese police/security professionals by showing that patterns of directly experienced or witnessed events can be empirically organized into graded levels of proximal exposure burden.

A further methodological contribution of the study was to examine whether the empirically derived class structure could subsequently be approximated using a simple count of proximal traumatic event categories. Exploratory ROC analyses indicated that 0–2 directly experienced or witnessed events corresponded primarily to the low proximal exposure class, 3–7 events to the moderate proximal exposure class, and eight or more events to the high proximal/cumulative exposure class. This count-based approximation correctly classified 92.2% of participants according to their most likely LCA class. However, this close correspondence should be interpreted cautiously. Because the ROC analyses were conducted in the same sample and using the same event indicators from which the latent classes were derived, they assess how closely a simple count reproduces the LCA solution internally, rather than the external predictive or screening validity of the proposed thresholds. This distinction is particularly relevant because previous police and first-responder research has generally used ROC analyses either to examine whether cumulative exposure indices predict mental health outcomes or to evaluate the performance of symptom screening instruments [14,15]. In contrast, the present analyses used ROC methods to examine whether an event-count rule could descriptively approximate an empirically derived latent class structure. The findings therefore indicate that, once the LCA had identified a predominantly cumulative structure, that structure could be summarized by a simple event count in the present sample. The resulting thresholds are sample-specific exploratory approximations and should not be interpreted as validated clinical or occupational screening cutoffs. Independent replication and external validation are required before their use in individual classification, screening, referral, or occupational decision-making can be considered.

The graded increase in PTSD symptom severity across the three classes strengthens the view that trauma-related risk in police/security professionals is not adequately captured by the presence or absence of a single traumatic event. Rather, risk appears to emerge from the accumulation and configuration of multiple proximal exposures. Although the class structure was predominantly cumulative, it was not defined exclusively by overall exposure burden. In the high proximal/cumulative exposure class, events involving interpersonal violence, personal threat, and death, including physical assault, assault with a weapon, sudden violent death, and sudden accidental death, also showed particularly high conditional probabilities. This pattern suggests that both cumulative burden and the composition of traumatic exposure may be relevant to PTSD symptom severity. However, because these dimensions were jointly represented in the latent classes, the present analyses cannot disentangle their independent associations with PTSD symptoms. This interpretation is consistent with police-specific evidence showing that traumatic event frequency, recency, and type are associated with PTSD symptoms [8], and with prospective police research showing that prolonged exposure to work-related critical incidents is relevant for later PTSD symptoms and mental health outcomes [33]. Thus, the present findings

add to cumulative burden models by showing that PTSD symptom severity is not only associated with how much trauma officers report, but also with the latent patterning of directly experienced or witnessed events.

A similar graded pattern was observed for general psychological distress. Participants in the high proximal/cumulative exposure class reported the highest BSI-GSI scores, followed by those in the moderate proximal exposure class and then those in the low proximal exposure class. This is important because police trauma research has often focused primarily on PTSD, even though police officers may also experience broader psychological difficulties, including anxiety, depression, and general distress [5,7]. The present findings suggest that proximal trauma exposure classes are not only associated with trauma-specific symptoms, but also with broader psychological morbidity. This supports the inclusion of general psychological distress indicators alongside PTSD measures in occupational trauma research with police/security professionals.

The present study also contributes to the literature by focusing specifically on proximal traumatic exposure, defined as events that participants directly experienced or witnessed. This focus is important because DSM-5 Criterion A distinguishes between different pathways of trauma exposure, including direct exposure, witnessing, learning about traumatic events, and repeated or extreme occupational exposure to aversive details [9]. It is also supported by systematic evidence indicating that direct exposure, including experiencing a traumatic event firsthand or witnessing it as it occurs to others, is associated with PTSD risk, while indirect exposure may also be clinically relevant but appears to confer a lower probability of PTSD than direct exposure [34]. However, because the present study did not compare proximal, indirect, and occupational exposure modalities, the findings should not be interpreted as showing that proximal exposure is more clinically important than other forms of occupational trauma exposure. Instead, they indicate that even when focusing only on directly experienced or witnessed events, police/security professionals can be differentiated into meaningful exposure classes that are associated with PTSD symptoms and general psychological distress.

These findings have practical implications for occupational mental health screening and prevention. First, assessment protocols for police/security professionals should consider cumulative proximal exposure rather than relying exclusively on single-event screening or worst-event approaches. Because the three classes reflected a graded pattern of exposure, the findings suggest that instruments such as the LEC-5, or adapted occupational trauma exposure checklists, could potentially be used not only to document whether traumatic exposure occurred, but also to characterize cumulative proximal exposure burden. However, the event-count ranges identified in the present study—0–2, 3–7, and eight or more events—are sample-specific descriptive approximations of the latent class solution. They should not be interpreted as validated screening thresholds or used independently to classify professionals, determine referral, or guide occupational decisions. If replicated and externally validated, cumulative exposure history might eventually complement symptom assessment and clinical judgment. Because this approach is based on occupationally plausible exposure history rather than on symptom disclosure, it may offer a less stigmatizing entry point for preventive monitoring and support. This may be particularly relevant in policing contexts, where mental health help-seeking stigma has been shown to be negatively associated with help-seeking attitudes and, indirectly, with intentions to seek psychological support [35]. Accordingly, exposure burden should be interpreted as a non-diagnostic contextual indicator rather than as evidence of psychological disorder or individual impairment.

Second, the identification of a high proximal/cumulative exposure class suggests that some professionals may carry a broad burden of directly experienced or witnessed

traumatic events, placing them at increased risk for both PTSD symptoms and broader psychological distress. Importantly, the association between exposure classes and mental health outcomes remained significant after adjustment for sociodemographic and occupational variables, including years of professional experience, suggesting that the clinical relevance of these classes is not reducible simply to time in service or professional affiliation.

Third, because the moderate exposure class also showed significantly higher symptom levels than the low exposure class, preventive efforts should not focus only on the most highly exposed group. Instead, stepped approaches to monitoring, early identification, psychoeducation, peer support, and referral pathways may be useful across different levels of exposure. This reinforces the potential value of exposure-informed prevention strategies that identify professionals who may benefit from support before psychological symptoms become clinically salient or are voluntarily disclosed.

Future research should examine whether empirically derived thresholds or scoring rules can be developed from proximal exposure indicators to support practical risk stratification in occupational settings. Such cutoffs would require external validation before being used for screening or decision-making, but the present findings provide an initial empirical basis for moving toward exposure-informed risk classification. These implications are consistent with systematic evidence highlighting the need for enhanced occupational mental health strategies in police populations [3,5,36].

Several strengths should be noted. The study used a relatively large sample of police/security professionals and examined 17 categories of potentially traumatic events. By applying LCA, the study moved beyond variable-centered approaches and identified person-centered patterns of proximal exposure. The analyses also considered both PTSD symptom severity and general psychological distress, providing a broader picture of psychological functioning. Finally, associations between exposure classes and mental health outcomes remained significant after adjusting for relevant sociodemographic and occupational covariates.

The study also has limitations. First, the cross-sectional design prevents causal conclusions about whether proximal traumatic exposure classes lead to higher PTSD symptoms and psychological distress. It is also possible that current psychological symptoms influenced recall or reporting of traumatic exposure. Longitudinal studies are needed to examine how exposure classes develop over time and whether they prospectively predict PTSD and broader psychological distress. Second, all data were based on self-report measures, and PTSD was assessed through symptom severity rather than clinical diagnostic interviews. Third, the use of convenience and snowball sampling may limit generalizability, and the sample was predominantly male, reflecting the gender composition of many police/security contexts but limiting conclusions about potential gender differences. In addition, because participation was voluntary and recruitment was conducted through social media and professional organizations, no sampling frame was available and a response rate could not be calculated. Consequently, responders could not be compared with non-responders, and it was not possible to determine whether occupational trauma exposure influenced participation. Although the distribution across the exposure classes indicates that respondents represented a broad range of exposure histories, this does not exclude selection bias. Professionals with greater trauma exposure may have been more likely to participate because of the personal relevance of the topic, or less likely because of trauma-related avoidance, mental health stigma, or reluctance to revisit traumatic experiences. Professionals with lower exposure may also have been less inclined to participate if they perceived the study as less personally relevant. Therefore, the magnitude and direction of any exposure-related selection bias cannot be determined from the available data. Beyond potential differences in participation, opportunities for occupational trauma exposure may

also have varied within the eligible sample. Although professionals performing exclusively administrative duties were not eligible for the study, operational police and security work encompasses considerable variation in activities, contexts, and opportunities for traumatic exposure. Formal occupational roles or assignments may not fully capture this variation, as professionals with similar roles may nevertheless differ substantially in the incidents they encounter. Therefore, equivalent opportunities for exposure across participants cannot be assumed. Future studies could address this complexity through more detailed or prospective assessment of task-related and incident-level exposure, rather than relying exclusively on broad occupational categories. Fourth, although the decision to focus on directly experienced or witnessed events was conceptually justified, indirect and occupational exposure may also have clinical relevance in police/security professionals. Future studies should compare alternative operationalizations of exposure, including models that distinguish direct, witnessed, indirect, and occupationally mediated exposure. Fifth, although the LCA solution showed acceptable classification quality and substantive interpretability, latent classes are probabilistic and should be interpreted as empirically derived groupings rather than fixed diagnostic categories. Sixth, the exploratory count-based thresholds were derived from the same sample and the same indicators used to estimate the LCA model. Therefore, they should be interpreted only as preliminary approximations of the latent classes, not as validated screening cutoffs. Consistent with recommendations for prediction and risk stratification research, these thresholds would require external validation, calibration, and evaluation of practical utility in independent police/security samples before being implemented in occupational screening or decision-making protocols [37].

Future research should replicate these findings in independent police and security samples, including samples from different countries and occupational roles. Longitudinal studies would be particularly valuable to test whether proximal exposure classes predict later PTSD symptoms, complex PTSD symptoms, depression, anxiety, functional impairment, and help-seeking. Future studies could also examine protective factors, such as perceived social support, organizational support, coping strategies, and access to trauma-informed supervision or peer support. This would help clarify why some highly exposed professionals develop significant symptoms whereas others remain resilient.

In conclusion, this study identified three latent classes of proximal traumatic exposure among Portuguese police/security professionals: low proximal exposure, moderate proximal exposure, and high proximal/cumulative exposure. These classes primarily represented graded levels of cumulative proximal exposure rather than qualitatively distinct configurations defined by specific event types. They were associated with progressively higher levels of PTSD symptoms and general psychological distress, even after adjustment for sociodemographic and occupational covariates. Exploratory analyses further suggested that the empirically derived class structure could be closely approximated within the present sample using a simple count of proximal traumatic events. However, the resulting event-count ranges are sample-specific and should not be interpreted as validated screening thresholds. Independent external validation is required before any applied use can be considered. The findings highlight the importance of assessing cumulative proximal traumatic exposure in police/security professionals and suggest that person-centered approaches may help identify and characterize the underlying structure of exposure burden before it is simplified into a total event count. By focusing on directly experienced and witnessed events, this study contributes to a more nuanced understanding of trauma exposure in policing and may inform future research on exposure assessment, prevention, and occupational mental health.

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Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to ethical/privacy issues.

Conflicts of Interest: S.B. is president and owner of Clinique et Développement In Virtuo, a spin-off company from the Université du Québec en Outaouais that distributes virtual environments. The terms and arrangements for this spin-off have been reviewed and approved by the Université du Québec en Outaouais in accordance with its Conflict of Interest Policy. S.B. also receives honoraria from conferences, workshops, and books. The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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