



Post-traumatic Embitterment Disorder in UK Authorised Firearms Officers Following Post-incident Procedures: A Cross-Sectional Web Survey

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Abstract

In the United Kingdom, authorised firearms officers (AFOs) respond to the most serious threats, and in situations where a weapon is discharged may be subject to a post-incident investigation. The investigation may feel unjust and lead to post-traumatic embitterment disorder (PTED), however, there is a lack of research on PTED in this group. The current study estimated the prevalence, predictors, and outcomes of PTED in 40 UK AFOs with experience of a post-incident procedure following a firearms-related incident. An online cross-sectional survey was hosted on Qualtrics, and participants were recruited via a gatekeeper at one UK police force. PTED was assessed using the PTED self-rating scale. Potential predictors and outcomes were measured using surveys of personal and general belief in a just world (BJW), including belief in distributive justice (i.e., fair outcomes) and procedural justice (i.e., fair processes), anger, and social desirability. Participants reported whether they had post-traumatic stress disorder (PTSD) or depression, and whether they experienced the post incident investigation as more problematic than the firearms incident. Results showed 15% of participants displayed clinically relevant levels of PTED. Having a possible post-traumatic stress disorder and/or depression diagnosis, feeling as though the post-incident procedure and subsequent treatment were more problematic than the incident itself, and a lack of belief in personal distributive justice, increased the risk of experiencing PTED and PTED predicted increased feelings of anger. Measures are needed to ensure the post-incident procedure delivers fair outcomes and that AFOs are given the right targeted support throughout the process.

Keywords Post-traumatic embitterment disorder · Post-incident procedure · Armed policing · United Kingdom · Anger · Belief in a just world

Introduction

Policing in England and Wales remains a largely unarmed service, and only a proportion of police officers volunteer and are trained as authorised firearms officers (AFOs). In the year ending March 2021, there were only 6,543 operationally deployable armed officers out of 135,301 police officers in the United Kingdom (UK), which represents 4.83% of the total number of police officers (Home Office 2021). The nature of UK armed policing means that AFOs are often only deployed as a last resort, and only to incidents which pose a serious threat (College of Policing 2013).

Most incidents involving armed officers are resolved peacefully. Of 18,262 police firearms operations in the year ending March 2021, only 4 incidents resulted in police firearms being discharged at someone, which represents 0.02% of total operations (Home Office 2021). Despite the extremely small numbers of police shootings, concerns exist around armed policing, particularly following inappropriate decisions to shoot such as the cases of Jean Charles de Menezes in 2005 and Harry Stanley in 1999 (Crown Prosecution Service 2006; Independent Police Complaints Commission 2006). On 22 September 1999, Harry Stanley was shot and killed by Metropolitan Police Service (MPS) officers, after an individual reported an Irish male with a gun wrapped in a bag to the police. Two officers shot and killed Stanley, a Scottish man carrying a table leg wrapped in a plastic bag. In 2005, Jean Charles de Menezes was shot and killed by MPS officers, after he was wrongly suspected to be linked to the failed 21st of July 2005 London bombings. De Menezes,

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a Brazilian national, was mistakenly identified as a suspected suicide bomber, and shot at Stockwell Tube station (Crown Prosecution Service 2006; Independent Police Complaints Commission 2006). AFOs must make rapid decisions, where failure to shoot a suspect may endanger themselves and the public, yet an incorrect decision to shoot will likely result in widespread media attention, a full inquiry, and possibly a court case.

In situations where a weapon (including a conventional firearm, less lethal weapon, or specialist munition) is discharged by the police and results in a death or serious injury (DSI), command failure, or danger to officers or the public, a post-incident investigation into police action is conducted. Post-incident procedures are conducted by internal Professional Standards Departments (PSDs) or depending on the nature and severity of the incident, by the external Independent Office for Police Conduct (IOPC; College of Policing 2013). The College of Policing (2013) states that the post-incident investigation must determine whether the force used was or was not justified, and identify and punish those responsible, where appropriate. Though no research exists on police perceptions of post-incident procedures, recent interviews with police officers subjected to misconduct investigations revealed that police officers felt the process was 'evil', 'horrific' and a 'witch hunt' (McDaniel et al. 2020). The study also identified symptoms of anxiety, stress, post-traumatic stress disorder (PTSD), and embitterment in police officers. A recent meta-analysis found that the prevalence of mental health problems in police officers is twice as high as in the general population, with elevated global estimates of depression (14.6%), PTSD (14.2%), generalised anxiety disorder (9.6%), suicidal ideation (8.5%), alcohol dependence (5%) and hazardous drinking (25.7%; Syed et al. 2020). In this context, AFOs that have experienced a post-incident investigation may be at an even greater risk of mental distress.

A particularly pressing but under-researched mental health-related concern is the way in which AFOs feel they have been treated throughout the post-incident procedure and the associated psychological impact. AFOs risk their lives by responding to serious incidents, and so subsequent investigations into their professional conduct may lead to feelings of injustice, placing them at an increased risk of experiencing post-traumatic embitterment disorder (PTED). PTED has not yet been validated as a discrete diagnosis or included in diagnostic manuals (see Sensky 2010 for an overview), but has recently been mentioned in the *International Classification of Diseases 11th Revision* (ICD-11; World Health Organization 2019) for the first time under adjustment disorders. Despite this, PTED is often described as a disorder with diagnostic criteria (i.e., Linden 2003; Linden and Arnold 2021).

Core to the diagnostic criteria of PTED is a critical life event, that is normal but exceptional, and is perceived to be an injustice, humiliation, or breach of trust. The critical event is not necessarily life-threatening and instead is perceived to be a violation of basic beliefs and values (Linden et al. 2007). When the individual is reminded of the event or has intrusions they react with distinct emotional arousal. Intrusive thoughts can be simultaneously painful and rewarding which may be because patients feel they should not forget the cause and need to convince others of its importance. There is a wide range of additional symptoms, such as dysphoric-aggressive-depressive mood, somatic symptoms such as changes in appetite, fatigue and tension, reduced drive, avoidance of people or places related to the event, and self-blame at having allowed the event to happen. The patient may have suicidal ideation and engage in revenge or aggressive fantasies, and these thoughts of revenge can even allow the patient to smile and show normal affect (Linden 2003; Linden and Arnold 2021). Typically, PTED is chronic, and a study with potential PTED patients as diagnosed by the PTED diagnostic interview, found on average, a duration of 32 months with a range of 6 to 144 months (Linden et al. 2007).

Reactive embitterment often occurs at work (Linden et al. 2007), and findings from our recent meta-analysis show that the overall prevalence of occupational PTED is 26% (Brennan et al. 2023). No data exists on the prevalence of PTED in AFOs, though findings suggest that PTED does occur in members of the police (Carter 2021) and the armed forces (Sabic et al. 2018). Since the nature of occupational stressors can differ between the general population, armed police, and military personnel, it is possible that rates of PTED will differ. For instance, recent research has shown whilst rates of PTSD are largely similar between military personnel and police employees, harmful alcohol use and binge drinking is three times greater in the military (Irizar et al. 2021). Interestingly, rates of probable PTSD were lower in both groups in comparison to the general population (McManus et al. 2016), which may reflect greater resilience in the police and military because they are trained to operate in traumatic situations, and experience trauma collectively rather than individually.

Furthermore, not all AFOs will develop PTED because of their experiences during a post-incident investigation and research suggests that individual-level characteristics such as belief in a just world (BJW) protect against the development of PTED (Brennan et al. 2022, 2023). BJW is the belief that everyone gets what they deserve and deserves what they get and individuals with this belief tend to find it easier to accept whatever happens in the world, whether good or bad (Lucas et al. 2011). This suggests that individuals with high BJW may find it easier to accept post-incident procedures

following firearms-related incidents and so experience less embitterment. There are two broad types of BJW. General BJW is the belief that the world is just for others, and personal BJW is the belief that the world is just for oneself, and research suggests that personal rather than general BJW is key in protecting against PTED following injustice (Dalbert 2011; Shin and You 2022). Furthermore, BJW can be further divided into two types; distributive justice which refers to fair outcomes, and procedural justice which refers to fair processes and procedures (Lucas et al. 2011). Research suggests procedural justice (Michailidis and Cropley 2017) and distributive justice (Michailidis and Cropley 2018) protect against chronic embitterment, however, these studies measured belief in organisational justice rather than belief in overall justice as a trait.

The current study reports on findings from a cross-sectional study of UK AFOs who had been subjected to a post-incident investigation following a firearms-related incident. This is the first study measuring embitterment in UK AFOs. The study aims to establish the prevalence of PTED and investigate the relationship between PTED and possible antecedents (i.e., BJW) and outcomes (i.e., feelings of anger). It was hypothesised that having a possible PTSD or depression diagnosis, and reporting that the post-incident procedure and treatment after the firearms-related incident caused more problems than the incident itself would predict higher levels of PTED. Based on previous research, it was also hypothesised that personal, but not general BJW would protect against PTED, and that personal belief in both procedural and distributive justice would protect against PTED. It was also hypothesised that PTED would predict feelings of anger.

Method

Design

This is a cross-sectional analysis. Ethical approval was granted by the Ethics Committee at the University of Liverpool.

Participants and Procedure

Participants were 40 AFOs that have experienced a post-incident procedure following a firearms-related incident. AFOs from one UK police force were recruited via a gatekeeper as part of a wider project funded by Police Care UK to improve the health and wellbeing of AFOs. The police force has a wellbeing initiative because psychological disorders are among the main reasons for long term sickness in this group. Participants that volunteered were directed to an online survey hosted on Qualtrics where they provided

informed consent, responded to psychological measures in a randomised order, and were debriefed. The survey took approximately 15 min to complete. A power calculation conducted in G*Power found that 43 participants were required to find a moderate effect size of $f^2 = 0.15$ with a power of 0.80 and $\alpha = 0.05$ in multiple linear regression. Prior to study completion, 26 out of 67 participants did not complete the questionnaire in full and so were removed from the dataset, which is a response rate of 61.19%. Of the 41 responses recorded, 1 participant reported no experience of a post-incident procedure and so was removed.

Materials

Overall, 60 survey items were distributed across 6 pages, and items per page ranged from 1 to 19.

To assess mental health, participants indicated whether they had a PTSD and/or depression diagnosis as either 'Yes' (1) or 'No' (2). After reading NHS descriptions of both diagnoses, participants indicated whether they believed they suffered from PTSD and/or depression as either 'Yes' (1) 'No' (2) or 'Other' (3). For analyses, participants that answered 'Other' were recoded to 'Yes'.

PTED was assessed using the PTED Self-Rating Scale (Linden et al. 2009, $\alpha = 0.93$) which is a 19-item scale assessing embitterment following negative life events. Participants were asked to respond regarding their involvement in a firearms-related event and subsequent post-incident procedure in their career on a 5-point scale ranging from 0 (*not true at all*) to 4 (*extremely true*). The mean score across the 19 items was used in analyses relating to PTED. In line with recommendations (Linden et al. 2009) a mean total score of ≥ 2 was indicative of clinically relevant signs of PTED.

Participants indicated whether the post-incident procedure and how they were treated after the firearms-related incident caused more problems than the incident itself as either 'Yes' (1) or 'No' (2). This question was developed because a post-incident procedure aims to ensure the law is followed and that there is accountability through disciplinary and/or criminal proceedings when it is not (College of Policing 2013). Officers may perceive this procedure as unjust, a humiliation or breach of trust which are the core characteristics of PTED (Linden et al. 2009).

The Belief in a Just World Scale (Lucas et al. 2011) contained eight items measuring perceptions of fairness towards oneself (personal BJW) and eight items measuring perceptions of fairness towards others (general BJW). Four items measured distributive justice towards oneself (distributive justice-self, $\alpha = 0.88$), and four items measured procedural justice towards oneself (procedural justice-self, $\alpha = 0.94$). Four items measured distributive justice towards others (distributive justice-others, $\alpha = 0.85$), and four items measured procedural justice towards others (procedural justice-others,

$\alpha = 0.91$). All sixteen items were rated on a 7-point Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*).

The DAR-5 (Forbes et al. 2014, $\alpha = 0.90$) included five items describing feelings of anger over the previous four weeks including the frequency, intensity, duration, level of aggression and impact on functioning. Responses were given on a 5-point Likert ranging from 1 (*none or almost none of the time*) to 5 (*all or almost all of the time*). In line with recommendations (Forbes et al. 2014), a mean total score of > 12 was indicative of problematic levels of anger.

Social desirability was measured using the 13-item Marlowe-Crowne (1960) Social Desirability Scale ($\alpha = 0.76$). Participants indicated either 'True' (0) or 'False' (1) and five items were reverse coded so higher scores reflected more socially desirable responses. Social desirability was controlled for in hierarchical regression analyses, so no participants were excluded based on high scores.

Data Analysis

PTED prevalence was calculated, followed by Spearman's Rho correlations to assess the relationship between PTED, anger, BJW, and social desirability. Shapiro–Wilk tests of normality showed that all variables were skewed except for distributive justice-other. Two Mann–Whitney U tests examined the impact of mental health (i.e., diagnoses or suspected diagnoses) and of perceived treatment during the post-incident procedure on PTED scores. Two hierarchical multiple regressions were then conducted to assess the effect of BJW on PTED after controlling for social desirability (regression one) and the effect of PTED on feelings of anger after controlling for social desirability (regression two). BJW was included in the regression analyses as four sub-scales because this was deemed the most valid model in the literature (Lucas et al. 2011). Inclusion of highly correlated sub-scales as independent variables in a regression can introduce multi-collinearity and thus imprecise coefficients and p values. Therefore, variance inflation factor (VIF) and tolerance values were checked. VIF scores above 10, and tolerance scores below 0.1 indicate problems with multi-collinearity (Vittinghoff et al. 2005), and values in both regressions were within an acceptable range. Bias-corrected and accelerated (BCa) bootstrapping methods were applied to all analyses to deal with violations of normality, outliers and homoscedasticity of variance, and all other assumptions were met. For all analyses $p < 0.05$ was deemed significant and we used Ferguson's (2016) recommendations for minimum practically meaningful effect size (RPME; $d \geq 0.41$, $r \geq 0.20$, $\omega^2 \geq 0.04$), medium ($d \geq 1.15$, $r \geq 0.50$, $\omega^2 \geq 0.25$), and large effect sizes ($d \geq 2.70$, $r \geq 0.80$, $\omega^2 \geq 0.64$). Cohen's (1988) f^2 was used to interpret the effect size of overall regressions, where $f^2 \geq 0.02$, $f^2 \geq 0.15$, and

$f^2 \geq 0.35$ represented small, medium, and large effect sizes. Analyses were carried out using IBM SPSS v26.

Results

PTED Prevalence

Using the clinical cut-off score of ≥ 2 on the PTED scale (Linden et al. 2009), 15% 95% CI [6.5%, 28.3%] of this sample were embittered (see Table 1). For item-level prevalence estimates see Supplementary Table 1. Using a cut-off score of ≥ 12 on the DAR scale (Forbes et al. 2014), 20% of the sample displayed problematic levels of anger.

Univariate Analyses

Anger and Just World Beliefs

PTED was significantly positively associated with anger ($p = 0.001$) and negatively associated with distributive justice-self ($p = 0.003$) and procedural justice-self ($p = 0.025$). These relationships were moderate or approaching moderate in size (see Table 2).

Mental Health

In this sample, 10% self-reported having a PTSD and/or depression diagnosis and 32% self-reported believing that they may suffer from PTSD and/or depression. Participants that indicated that they either have a PTSD and/or depression diagnosis or may suffer from PTSD and/or depression had significantly higher PTED scores than those that did not report this belief, $U = 60.50$, $z = -3.326$, $p < 0.001$, $r = 0.53$. This difference was moderate in size.

Post-incident Procedure Treatment In this sample, 42.5% reported that the post-incident procedure and how they were treated after the firearms-related incident caused more problems than the incident itself. Participants reporting that the post-incident procedure was more problematic than the

Table 1 PTED prevalence in UK AFOs that have experienced a post-incident procedure

Cut off score	Raw frequency (N)	% [95% CI]
1.6	8	20% [9.9, 34.2%]
2	6	15% [6.5, 28.3%]
2.5	2	5% [1.1, 15.1%]

Prevalence was calculated by percentage scoring above a mean total score of 1.6, 2, and 2.5

PTED post-traumatic embitterment disorder

Table 2 Descriptive statistics, internal consistency estimates and Spearman’s Rho correlations between study variables in the AFO sample

	1	2	3	4	5	6	7
Social desirability	-						
PTED	-0.24	-					
Anger	-0.36*	0.53**	-				
Distributive justice-other	-0.05	-0.25	-0.21	-			
Procedural justice-other	0.08	-0.16	-0.20	0.62**	-		
Distributive justice-self	-0.05	-0.54**	-0.34*	0.52**	0.33*	-	
Procedural justice-self	0.03	-0.36*	-0.29	0.40*	0.55**	0.81**	-
Median (Range)	10 (12)	0.39 (3.53)	7.50 (13)	15.95 (5.72)	16 (20)	20 (22)	20 (19)
Cronbach’s <i>a</i>	0.71	0.96	0.87	0.93	0.85	0.89	0.90

The values for distributive justice-other are mean and standard deviation (\pm SD). All other values are median and range

PTED post-traumatic embitterment disorder

* $p < 0.05$; ** $p < 0.01$

firearms incident had higher PTED scores than those that reported that the post-incident procedure was not more problematic, $U = 97$, $z = -2.699$, $p = 0.007$, $r = 0.43$. This difference approached a moderate effect size.

Multivariate Analyses

PTED

The full model including social desirability and BJW significantly explained 28% of the variance in PTED scores

($p = 0.040$), which represents a large effect size ($f^2 = 0.39$). Belief in personal distributive justice was the only significant protective factor for PTED ($p = 0.032$), and this was a strong effect ($\beta = -0.78$; see Table 3). No other variables were statistically significant predictors of PTED.

Anger

The full model including social desirability and PTED significantly explained 32% of the variance in anger scores ($p < 0.001$), which represents a large effect size ($f^2 = 0.47$).

Table 3 Hierarchical multiple regression analyses predicting PTED and anger with 95% bias-corrected and accelerated CIs (2000 samples)

PTED				
Predictors	β	95% CI	<i>p</i>	R ² / Δ R
Step one				0.03
Social desirability	-0.18	[-0.18, 0.02]	0.194	
Step two				0.28/0.25*
Social desirability	-0.21	[-0.18, 0.02]	0.160	
Distributive justice-other	-0.01	[-0.08, 0.08]	0.956	
Procedural justice-other	-0.13	[-0.09, 0.06]	0.553	
Distributive justice-self	-0.78	[-0.28, -0.04]	0.032	
Procedural justice-self	0.43	[-0.02, 0.21]	0.164	
Anger				
Predictors	β	95% CI	<i>p</i>	R ² / Δ R
Step one				0.12*
Social desirability	-0.34	[-1.00, -0.11]	0.041	
Step two				0.32/0.20**
Social desirability	-0.26	[-0.83, 0.02]	0.106	
PTED	0.45	[1.00, 3.07]	<0.001	

PTED post-traumatic embitterment disorder

* $p < 0.05$; ** $p < 0.001$

PTED was a significant risk factor for experiencing anger in the previous four weeks ($p < 0.001$), and this approached a moderate effect ($\beta = 0.45$; see Table 3).

Discussion

This is the first study to show that PTED was prevalent in UK AFOs that have been through a post-incident procedure. Univariate tests showed that PTED scores were higher for AFOs who self-reported either having or believing that they may suffer from PTSD and/or depression, and for those that found the post-incident procedure and how they were treated as more problematic than the firearms incident itself. Anger and personal BJW were significantly associated with PTED in correlations supporting the hypothesis that personal, but not general BJW would be associated with PTED. Correlations were significant for personal distributive justice which refers to the belief that one experiences fair outcomes and personal procedural justice which refers to the belief that one experiences fair processes. However, in hierarchical regressions, only belief in personal distributive justice remained a significant predictor of PTED, which provides partial support for the hypothesis that belief in personal procedural and distributive justice would predict PTED. PTED remained a significant predictor of anger in hierarchical regressions supporting the hypothesis.

Our study has several strengths and limitations. The study is novel, providing the first evidence that PTED is being experienced as a direct result of post-incident procedures in AFOs. Since AFOs play a vital role in protecting Britain, advancing our understanding in this area is important. The most notable limitation is the small sample size of 40 participants which is not large enough to detect small effects. However, AFOs that have experienced a post-incident procedure are a niche sample, as highlighted by Government statistics showing that only four incidents resulted in firearms being discharged at someone in the year ending March 2021 (Home Office 2021). Other limitations included the cross-sectional data with no pre post-incident investigation comparison data meaning that cause and effect cannot be established; no comparisons with a control group of armed police officers that have not been through a post-incident procedure, and despite controlling for social desirability, surveys suffer from bias. Furthermore, no demographic information or information regarding when the investigation occurred, the number of investigations the officer had been exposed to, or the outcome of the investigation was collected due to the sensitivity of the research, and the ethical risk posed by collecting this information. Therefore, it was not possible to evaluate the generalisability of the sample. Despite this, AFOs that have experienced a post-incident procedure are

niche, as highlighted by Government statistics showing that only four incidents resulted in firearms being discharged at someone in the year ending March 2021 (Home Office 2021). Thus, the sample captured a large proportion of these individuals, and these individuals are also likely to be more homogenous than other samples such as the general population.

Despite these limitations, our study expands the current literature on PTED in high-risk occupations. The prevalence in this sample is slightly lower than UK healthcare staff during the pandemic (Brennan et al. 2022, 2023) and is lower than the findings from our recent meta-analysis which shows that the overall prevalence of PTED across occupations is 26% (Brennan et al. 2023). However, this is six times higher than a general population sample pre-pandemic (Linden et al. 2009). This indicates that AFOs that have been through a post-incident procedure are experiencing elevated levels of embitterment in comparison to the general population but may be at a decreased risk of responding to negative life events with embitterment in comparison to other occupational groups. This might be explained by findings which show that professions that do not have special training to deal with traumatic events have a higher risk of developing work-related PTSD (Skogstad et al. 2013). It is possible that AFOs expect to be exposed to moral traumas and are less likely to respond with embitterment as a result. Importantly, the study also identified key risk and resiliency factors that either increased or decreased the risk of developing PTED. Notably, just under half of the sample reported that the post-incident procedure and their treatment were more problematic than the firearms incident itself, and these individuals were at a greater risk of PTED. This corroborates findings that police officers in the UK perceived misconduct investigations to be like a 'witch hunt' (McDaniel et al. 2020). Despite UK police forces highlighting that post-incident procedures are 'not a criminal investigation and staff should not be considered suspects' (Merseyside Police 2020), our data indicates that this may contradict their lived experiences.

Further risk and resiliency factors were identified. Participants with possible PTSD and/or depression were at an increased risk of PTED. This is perhaps unsurprising since 45% of patients with clinical embitterment were found to have an existing mental health diagnosis in a study by Linden and Rotter (2018). However, the PTED diagnostic criteria state that there should be no mental health disorder in the year before the critical life event (Linden 2003; Linden and Arnold 2021), which raises conceptual issues because AFOs may not meet the criteria despite displaying high levels of clinical embitterment. This suggests that armed officers may have complex needs following post-incident investigations.

Furthermore, personal, but not general BJW was significantly associated with PTED in correlations, supporting findings by Shin and You (2022) and Dalbert (2011)

who argue personal BJW is the core mechanism underlying embitterment. This suggests individuals may have a self-serving bias, and that believing the world is fair for themselves is a more important predictor of well-being. Furthermore, greater personal BJW both distributively (i.e., fair outcomes) and procedurally (i.e., fair processes) was associated with lower levels of PTED in correlations, however only greater personal belief in distributive justice remained a significant predictor of PTED in regressions. Previous research on belief in justice and embitterment has mixed findings, with one study showing procedural but not distributive justice protected against chronic embitterment (Michailidis and Cropley 2017) and a second study showing the opposite pattern (Michailidis and Cropley 2018). Perhaps, both beliefs are important depending on the context, and our results indicate that for AFOs, the belief in fair outcomes is more important. The importance of a post-incident procedure outcome, which should reveal whether appropriate force was used, and identify and punish those responsible where appropriate (College of Policing 2013) might explain why belief in distributive justice is so relevant.

BJW is primarily seen as a disposition that varies across individuals and protects against injustices. However, recent research has shown that negative life events can reduce BJW, leading to PTED (You and Ju 2020; Shin and You 2022). It is possible that for some, the post-incident outcome felt too unjust, weakening their belief in distributive justice, and triggering embitterment. Longitudinal research is necessary to investigate this. Finally, PTED predicted increased anger, and one-fifth of the sample had problematic levels of anger. Armed officers with elevated levels of embitterment are likely to exhibit anger, and this may have an impact on their ability to police with empathy, which is also known as compassion fatigue (Papazoglou et al. 2019).

These findings allow for several recommendations. First, police forces should be aware that their armed police officers may have clinically-relevant signs and symptoms of PTED in relation to their experiences during a post-incident procedure. To prevent embitterment, employers should prioritise mutual respect and fairness during these procedures and provide appropriate support during and after the investigation. Occupational health services should be aware of potential embitterment, anger and complex mental health needs in police officers related to post-incident investigations. Second, internal and external investigatory bodies, such as PSDs and the IOPC, need to balance police accountability with police welfare. Given that officers rank killing someone as the most stressful organisational experience (i.e., Violanti and Aron 1995), and killing or severely injuring a perpetrator predicts PTSD (Komarovskaya et al. 2011), it is concerning that nearly half of this sample felt as though the post-incident procedure and their treatment were more problematic than the firearms incident itself.

Future studies are needed to provide prevalence estimates of AFOs that have not experienced post-incident procedures, and the police force more widely so that comparisons to other groups within policing are possible. This can help to identify where targeted support to the most appropriate groups within policing is needed. This study has shown that delivering fair outcomes is key to reducing embitterment. However, future studies should identify how. In-depth interviews could provide possible solutions to improve the post-incident process for staff.

In conclusion, we are the first to provide prevalence estimates of PTED in UK AFOs that have been through a post-incident procedure. We provide evidence that those with possible PTSD and/or depression, that found the post-incident procedure and their treatment as more problematic, and that lacked the belief that they experienced fair outcomes are amongst the most at risk. In addition, individuals with PTED are likely to exhibit anger. These findings indicate that measures should be taken to ensure post-incident procedures use fair processes, deliver fair outcomes and that AFOs are given the right targeted support throughout the process.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s11896-023-09635-w>.

Author Contribution CB designed the project and data collection tools, collected the data, cleaned, analysed and interpreted the data and drafted and revised the paper. She is guarantor. JC designed the project and data collection tools, interpreted the data, and revised the paper. All authors gave final approval for the publication of this manuscript. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

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Data Availability Data are available upon reasonable request. Data from this study will be made available upon reasonable request by contacting the corresponding author at cbrennan@liverpool.ac.uk. Data will be made available for 10 years in line with ethical considerations.

Declarations

Ethics Approval This study involves human participants and was approved by Ethics Committee at The University of Liverpool (6250). Participants gave informed consent to participate in the study before taking part. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Conflicts of Interest Author 1 declares that she has no conflict of interest. Author 2 declares that he has no conflict of interest.

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