The Field's mall shooting: Post-traumatic stress reactions among survivors – does diagnostic manual make a difference?

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Abstract

Background: Recently in addition to the increasing number of terrorist attacks and school shootings, mass shootings in public places by psychiatric patients have become more common.

Objective: To investigate the psychological sequelae after a mall shooting at Field's in Copenhagen according to two diagnostic manuals.

Method: A sample of 85 adults who were present during the shooting were assessed half a year later for posttraumatic stress disorder (PTSD) with two questionnaires based on DSM-IV and ICD-11, respectively, together with measures of comorbid disorders, psychological factors and social support. Hierarchical multiple regression analyses were performed to study the effects of demographics, trauma exposure, and psychological factors on PTSD.

Results: The number of participants who met the ICD-11 criteria for PTSD (20.2.1%) was higher than the ones who met the similar criteria according to DSM-IV (20.0%). The final regression model included gender, injury, sick leave, self-efficacy, and dissociation. It explained 68.1% of the variation of PTSD based on ICD-11 and 72.8% of the variation based on DSM-IV.

Conclusion: The present study expands disaster research by finding close similarities of two diagnostic systems and aligns disaster research on findings of the role of gender, injury, and psychological factors. The results also point to the need for a proactive approach to intervention.

Introduction

Mass shootings are rare but devastating events that challenge both individuals and communities affected by them. While research on school shootings in the US has yielded important data on how young people are affected, few studies have examined the psychological effects on the general population exposed to mass shootings. Understanding these effects is crucial for designing effective interventions, which is essential due to the rising prevalence of mass public shootings in both the US and other countries[1,2].

No consensus definition of mass shootings exists. Some definitions argue for strict protocols, such as a fatality count – usually of three or four victims[3]. This study defines mass shooting as *intentional, planned shooting involving firearms to kill or injure multiple not pre-identified targets in a public venue by a shooter with no affiliation to an armed group*[4]. Much of the research in this field uses varying definitions, and therefore studies applying different criteria for mass shootings are referenced in this study, albeit studies focusing on school shootings have been excluded.

Mental health effects

Research on mass shootings consistently demonstrates severe and lasting psychological consequences for individuals exposed, with PTSD being the most frequently examined outcome. Elevated rates of PTSD have been observed not only among directly exposed survivors but also within communities affected by mass shootings[5].

Across studies, PTSD prevalence varies widely depending on the nature of the shooting, level of exposure, and time since the event[6]. Following a mass shooting in a Texas restaurant, 28.6% of survivors met criteria for PTSD one to two months post-incident[7]. Follow-up assessments reported PTSD prevalence rates of 17.7% after one year[8] and 18% after three years[9], suggesting that PTSD symptoms among survivors may persist over time. Other studies have reported rates as low as 5%

six to eight weeks after a 1992 courthouse shooting[10] and as high as 63.3% four years after the 2017 Las Vegas shooting[11].

In addition to PTSD, depressive symptoms are also common among survivors. Studies excluding school shootings and terrorism-related mass shootings report prevalence rates of major depression ranging from 4% following the courthouse shooting to 49.2% after the Las Vegas shooting[10-11]. For comprehensive summaries of PTSD and depression prevalence across mass shooting studies – including, but not limited to, school shootings – see[4,6,12].

Longitudinal studies have shown that a notable proportion of survivors who initially exhibited subclinical PTSD symptoms later met full diagnostic criteria, highlighting the importance of identifying and monitoring subthreshold cases in the aftermath of mass shootings[9-10]. It is important to note that many early studies, such as those by North et al.[7-9], were conducted using the more conservative DSM-III-R criteria. Consequently, some cases classified as subthreshold at the time might have met full diagnostic criteria under later, more liberal frameworks such as DSM-IV, or ICD-11[13].

Risk and protective factors

Individual responses to mass shootings vary, and research has identified a range of demographic, situational, and psychological factors that influence vulnerability and resilience. Females are generally more vulnerable to PTSD and depression following a mass shooting [4,9,14], although this association has not been observed consistently across the field (eg, [10,15]). Level of exposure to the mass shooting and sustaining a physical injury, have been consistently associated with more severe mental health symptoms[6,16]. For instance, one study found that four years after the 2017 Las Vegas shooting, individuals who had been injured, had a 36% higher risk of experiencing a major depressive episode and a 32% higher risk of PTSD within the past year[11].

Psychological mechanisms have been shown to exacerbate symptom severity. Peritraumatic dissociation has been found to be a strong predictor of subsequent PTSD[17], and dissociation has also been found to be one of the strongest predictors of PTSD 7 to 10 months after a mass shooting[15], although research in this area is limited. In contrast, social support serves as a protective role. Survivors reporting higher perceived social support and amount of social contact has been found to have less severe mental health effects following mass shootings[6,11,14]. Finally, low self-efficacy has been associated with higher post-event symptoms following school shootings[18].

Aim of the study

Research on psychological sequalae following a mass shooting is still a relatively narrow field, with few studies examining both prevalence as well as risk and protective factors among survivors. The aim of this study is to examine prevalence of PTSD and depression seven months after a mass shooting, and to investigate factors that may influence risk and resilience. Specifically, the study will explore associations between symptoms and demographic characteristics, injury during the traumatic event, sick leave, psychological factors including self-efficacy, trauma-related persistent dissociation[19], and social support.

Both DSM-5 and ICD-11 criteria were applied to assess PTSD in this study to explore comparability and discuss the robustness of findings. Applying both diagnostic systems allows for a more nuanced understanding of posttraumatic stress reactions and aligns the study with international research standards, facilitating cross-study comparisons.

Incident

On July 3rd, 2022, a mass shooting took place in Copenhagen in a large shopping mall, Field's, which resulted in the death of three persons. Seven people suffered shooting injuries and further 21 people suffered minor injuries during evacuation or while hiding in the mall[20].

Field's is typically heavily visited prior to events at the nearby Royal Arena, where pop artist Harry Styles was scheduled to perform approximately 90 minutes after the incident.

The perpetrator, a 22-year-old Danish man with a documented history of contact with the psychiatric healthcare system, discharged the first shot at 17:33 PM and was apprehended by police at 17:48. A case report from the incident notes that social media rumors regarding additional perpetrators contributed to a delay in declaring the mall safe[20].

Mass shootings are a rare occurrence in Denmark which, preceding this incident, has been limited to a university shooting in 1994[21] and one terrorist attack against a public meeting place and the Jewish Synagogue in Copenhagen in 2015. Due to the rarity of mass shootings in the country, these incidents received large media attention.

Method

Participants and procedure

The participants in this study were the visitors and staff in the shopping mall, Field's, during a shooting episode on July 3rd, 2022, in Copenhagen. The Metropolitan Police in Copenhagen distributed the questionnaire to the victims via an electronic link ("e-box") seven months after the episode together with a letter that described the study, expressed concern about the experiences and possible consequences, stressed the voluntary, and offered concerned or distressed participants a direct telephone line to the first author. Eighty-five participants answered either part of or the full questionnaire. The mean age of the participants was 31.9 (SD=12,9). The gender distribution was that 74.1 percent of the participants were women, and 17.6 percent were men; the remaining 8.2 percent did not report their gender.

By Danish law, the return of the questionnaire is considered informed consent. Data were handled in accordance with Danish data laws and the General Data Protection Regulation (GDPR). The study was registered and approved by the Danish Data Protection Agency/RIO (journal #11.683).

Demographics

The questionnaire contains questions about age, gender, children, marital status, employment status, health, height, weight, as well as alcohol and smoking habits. Further, participants were asked to indicate if they had experienced any significant life events, aside from the incident, within the six months prior to completing the questionnaire. Several questions assessed the participants' experiences during the incident, including their location when the shooting started, their sense of danger during the incident, any injuries sustained, and their ability to assist other injured victims. Additional questions covered sick days and sick leave, use of pharmaceuticals related to the incident, and a self-assessment of the participants' general health. Participants were asked to rate their sense of safety on a scale from 1 ("I feel completely safe that I will not be subject to a new violent incident") to 7 ("I am very afraid that I will be submitted to a new violent incident").

Post-traumatic stress symptoms

In this study, two different measures were used to assess PTSD symptoms: the Harvard Trauma Questionnaire (HTQ)[22] and the International Trauma Questionnaire (ITQ). The Harvard Trauma Questionnaire (HTQ) is a simple and reliable screening instrument for PTSD symptoms based on the DSM-IV criteria[23]. The scale includes 18 questions, with the first 17 assessing symptoms across three clusters: re-experiencing, avoidance, and hypervigilance. The final item evaluates the emotional response during the traumatic incident as outlined in criterion A2 of the DSM-IV PTSD diagnosis. Respondents were asked to indicate the extent to which these symptoms have affected

them over the past month, using a four-point Likert scale from 1 to 4. The Danish version of the HTQ has been validated by Bach[24].

The International Trauma Questionnaire (ITQ)[25] is a self-report measure that assesses PTSD symptoms according to ICD-11 diagnostic criteria. This questionnaire consists of seven questions evaluating the core symptoms of PTSD experienced in the past month, along with three questions addressing functional impairment caused by these symptoms. One question on reexperiencing was added (“being very upset when something reminded you af the shooting”). Responses are recorded on a five-point Likert scale ranging from 0 to 4. Previous research has demonstrated the ITQ's validity and reliability[26], and a validation of the Danish version of the ITQ was recently published[27]. The details of the diagnostic algorithms are presented in Appendix 1.

VAS

Visual Analogue Scales (VAS) are continuous response formats typically presented as a 10 cm horizontal line, anchored by verbal descriptors at each extreme (e.g., "not coping" and "coping very well")[28-29]. Respondents indicate their perceived status by placing a mark along the line, facilitating the precise measurement of subjective phenomena. VAS are often used in the medical sector for detecting small changes in conditions such as pain and fatigue. The advantage of using VAS is particularly evident for participants who find that fixed-interval scales do not adequately capture the nuances of their experiences. These scales reduce differences in how people understand the scale and allow for more precise distinctions between subjective states. In this study, the scales evaluated four items including the participants' perceptions of control, experiences of received support, levels of self-respect, and perceived efficacy of coping in response to the aftermath of the shooting incident.

Bech-19

Additionally, the Bech-19[30] is a self-report questionnaire adapted from the SCL-90 questionnaire. It includes 19 items divided into three unidimensional subscales that measure symptoms of anxiety, depression, and interpersonal sensitivity. Participants reported how much the symptoms have affected them in the past week, using a five-point Likert scale from 0 to 4. A total score between 12 and 18 on the depression subscale indicates moderate depression, while a score above 18 indicates severe depression. For the anxiety subscale, a total score of 14 suggests an anxiety diagnosis. The Bech-19 was validated in Denmark in 2014, in a large population of psychiatric outpatients.

TSC-dissociation

The Trauma Symptom Checklist 26 (TSC-26) is a self-report measure consisting of 26 items evaluated in relation to the past month[31]. Responses are rated on a 4-point Likert scale (1 = no, 2 = yes sometimes, 3 = yes often, 4 = yes very often). This study utilized the dissociation subscale, which includes five items assessing symptoms such as hearing voices in your head, problems with memory, feeling that things are "unreal," and feeling as though you are not in your body. Total scores on this subscale range from 5 to 24, with higher scores indicating greater levels of dissociative symptoms.

CSS

The Crisis Support Scale (CSS)[32] is a self-report measure which assess perceived social support after the mass shooting. CSS consists of seven items rated on a seven-point-Likert scale ranging from “never” (1) to “always” (7). Six items are summated for a crisis support score, with higher scores indicating higher level of support while the final item measures overall satisfaction. The scale evaluates various aspects of social support, including emotional and instrumental support and the availability of someone willing to listen. The CSS has demonstrated good reliability and validity in previous research[33].

Statistical analysis

The statistical analyses were conducted using IBM SPSS Statistics version 26. Descriptive statistics and percentage analyses were conducted to calculate the frequency, means, and standard deviations (SD) as well as proportion for all variables in the total sample. The associations between scales and subscales were examined by means of a correlation analysis with Spearman's rho. Initially the associations between a specific dichotomous variable and trauma symptoms were investigated unadjusted. If a significant association was found, it was allowed into multiple regression analyses conducted hierarchically in a stepwise manner. Estimates were considered significant, if $p < 0.05$.

Results

Experiences during the shooting (N=73)

The results showed that 54.8 percent felt that they were in life-threatening danger during the shooting, while 76.7 percent feared others were in life-threatening danger or injured during the shooting. Additionally, 9.6 percent of participants were injured, and 2.7 percent reported that friends or family were injured. Results showed that 12.3 percent were able to assist others during the shooting. The descriptive statistics are shown in Table 1.

Post-traumatic stress symptoms, dissociation and feeling in control (N = 65)

Results from the HTQ scale find that 20 percent of the participants (N = 13) met the criteria for a PTSD diagnosis according to the DSM-IV (Table 2). Additionally, 41.5 percent (N=27) of the participants met the criteria for two out of three symptom clusters, suggesting subclinical PTSD levels.

Similarly, results from the ITQ scale reveal that 29.2 percent of the participants (N = 19) met the criteria for a PTSD diagnosis according to the ICD-11. Furthermore, 20 percent (N=13) of the participants met the diagnostic criteria for two out of three symptom clusters, indicating subclinical PTSD.

There was a modest overlap between the participants who would get a possible PTSD diagnosis with the HTQ and the ITQ of 46% (30/65). Therefore, we examined the overlap in the three subscales that constitutes the PTSD diagnosis (Table 3). The table illustrates important differences between the two measures and the two diagnostic manuals behind them. For reexperiencing the difference is minimal due to the same low threshold of one symptom. For the two next subscales the differences are huge. The DSM-IV requirement of three symptoms versus the ICD-11 requirement of one symptom for avoidance means that the overlap is just 50%. When it comes to hypervigilance or threat, the overlap is better, 70%, but far from satisfying. The modest overlap gives reason for concerns and apprehension of possible similar problems between the DSM-5 and ICD-11.

The results from the dissociation scale indicated that the majority of participants, 93.5 percent (N=62), did not experience dissociative symptoms or only exhibited mild symptoms. Conversely, a minority of participants exhibited high levels of dissociation. Results from the VAS scale indicated that most participants reported feeling in control and resourceful.

Depression, anxiety and interpersonal sensitivity (N = 63)

Results found that 17.7 percent of the participants met the criteria for moderate or severe depression according to the Bech-19 scale. Among these participants, 10.6 percent showed moderate depression, while 7.1 percent showed severe depression. Only one participant (1.2 percent) met the criteria for an anxiety diagnosis. The average score for interpersonal sensitivity was 4.65, implying that, in general, the participants did not experience a high level of interpersonal problems.

Physical health and sick leave (N = 74)

The results indicated that 58.1 percent of participants (n = 43) reported taking at least one sick day related to the shooting incident, with an average of 12.98 sick days. Additionally, 39.2 percent (n =

29) had been on official sick leave due to the incident. Furthermore, 11.8 percent of participants (n = 9) reported being prescribed medication because of the shooting. A minority of the sample report drinking 1 or more glasses of alcohol per day on weekdays, and 26.2 percent of the participants report drinking 4 or more glasses of alcohol per day at the weekend.

Help seeking and authorities (N = see Table 4)

The results showed that 43.5 percent of participants had contact with the hospital following the shooting, and 28.2 percent met the acute crisis-therapeutic team at a hospital. Additionally, 49.4 percent were in contact with the police, while 22.4 percent contacted their own doctor, 24.7 percent consulted a psychologist under the National Health Scheme (with reduced payment), and 23.5 percent reached out to a psychologist through their own health insurance company. A minority of participants reached out to either a lawyer, the social services administration, or media outlets. The findings shows that over 50 percent of participants who had interacted with law enforcement, hospital services, crisis intervention teams, personal physicians, or health insurance psychologists reported being either “satisfied” or “very satisfied” with the assistance they received. The majority of the sample reported that they received moderate to high levels of support from friends and family after the shooting incident.

Discussion

Psychological sequalae

The present study assessed posttraumatic stress reactions among survivors of the Field’s mall shooting. Findings revealed a 50% higher prevalence rates of ICD-11 PTSD compared to the DSM-IV criteria (29.2% and20% respectively), and correlation analyses found a strong association between HTQ and ITQ symptom clusters (see Table 5), indicating high concordance between the

diagnostic systems. At first glance , this consistency supports the applicability of both instruments in trauma research related to mass shootings.

These results align with previous research, such as North et al.'s[8] follow-up study one year after a 1991 shooting at a Texas restaurant, which reported a PTSD-prevalence of 17.7% using DSM-III-R criteria. While the diagnostic criteria and timing of assessment differ, the similarity in prevalence rates underscores the persistent psychological impact of mass shootings across contexts.

Beyond PTSD, depressive symptoms were also prevalent; 17.7% of participants experienced moderate to severe depression, with 7.1% meeting criteria for severe depression. This is comparable to North et al.'s[8] reported 4.9% prevalence of Major Depression, which is lower than rates observed in the broader field of mass shootings[6]. Correlation analysis revealed strong associations between PTSD symptom clusters and depressive symptoms (see Table 5), highlighting comorbidity in exposed individuals. These findings underscore a need to consider a broader view of possible psychological outcomes following episodes of mass violence.

The results also revealed a notable proportion of participants with subclinical symptoms, meeting criteria for two out of three symptom clusters, reflecting structural differences between the instruments. HTQ includes a broader range of symptoms within clusters, potentially making it more sensitive to detecting subclinical cases. This suggests the HTQ is more suitable for early screening by identifying individuals who experience substantial distress and functional impairment without meeting PTSD criteria. As North et al.[9] note, subthreshold cases can progress to full PTSD years after the incident. Therefore, it is important to monitor symptoms of subclinical cases over time, since these may evolve into psychiatric conditions.

There are very few studies which compare DSM-IV and ICD-11 PTSD diagnoses[34]. A recent study of a train disaster[35] found that the HTQ identified 19% five months after the disaster compared to the ITQ (15.5%). After 13 months the difference was still there (HTQ (26%) and the ITQ (19.9%)[36].

This finding aligns very well with similar differences found in most studies of DSM-5 and the ICD-11, although a large Chinese study of two trauma exposed adolescent samples (earthquake and general exposure) did not find significant PTSD prevalence differences comparing the DSM-5 and the ICD-11[37]. One might speculate that the differences between the two diagnostic systems might be to some degree dependent on trauma type[38,39]. Anyhow, we do not the answer; we can just conclude that the diagnostic manuals result in considerable differences that eventually would result in survivors of disaster - and very likely also other trauma types –being underserved when it comes to mitigating interventions and compensation

Risk factors

The regression model identified gender, injury, sick leave, self-efficacy, and dissociation as predictors of PTSD-symptoms among survivors of the Field's mall shooting. Together, these factors explained high proportion of variance in PTSD scores (68.1% for ICD-11 and 72.8% for DSM-IV), indicating a strong predictive capacity.

As shown in Table 7, self-efficacy (β = .347) and dissociation (β = 345) proved to be the most influential psychological predictors. Demographic and situational factors of gender (β = -.217), injury (β = .301) and sick leave (β = .181) together accounted for nearly 40% of the variance of PTSD symptoms (adjusted R^2 = .398).

Demographic factors

Socioeconomic factors

VAS analysis indicated that unemployed participants (students and those on social benefits) reported significantly lower ratings of self-efficacy and self-respect post-incident compared to employed participants. This is notable, as socioeconomic factors are rarely included in mass shooting studies[13]. While we could not find any significant difference in PTSD between employed and unemployed participants – possibly due to a low sample size – these results are in line with

previous research. Higher prevalence rates of PTSD have previously been found among unemployed community members indirectly exposed to mass shootings, and higher PTSS has been identified among participants with lower education level of employees directly exposed to a mass shooting[5,10]. This relationship between socioeconomic factors and coping warrants further investigation as these variables may influence vulnerability to post-incident adversities.

Gender

Greater vulnerability to post-incident adversities following mass shootings in female gender is in support with most, but not all, previous research[4,6]. In this study, VAS analysis indicates that the male participants reported significantly higher in self-efficacy and feeling of control compared to the female participants. Both self-efficacy and feeling of control have been identified as predictors of post traumatic growth in studies not related to mass shootings[40,41]. Lower self-efficacy and perceived control among female survivors may contribute to the vulnerability to PTSD, a relationship which clinicians should explore. A proposed explanation is that women are more likely to employ a ruminative coping style, increasing severity and chronicity of their symptoms[42] while possibly inhibiting self-efficacy and perceived control.

Injury / Sick leave

Apart from psychological mechanisms, physical injury was the largest predictor of PTSD in this study, consistent with previous research of mass shootings in a general population[11]. While injury severity was not assessed, a study with young survivors of the terror attack on Utøya Island found no significant differences between those moderately and severely injured during the attack[43]. Injury can be considered a type of trauma exposure[16], yet it does not necessarily indicate exposure to the shooting. As a case report from the shooting in Field's outlines, many of the injuries happened during evacuation or while hiding in the mall[20]. Injuries can occur without necessarily seeing the gunman or gunfire but is still a major predictor of post-incident PTSD, possibly due to a

form of physical manifestation of the incident which serves as a persistent reminder of the traumatic event.

Sick leave also emerged as a predictor of PTSD. This association may reflect the immediate psychological impact of the event, as sick leave could indicate functional impairment related to posttraumatic symptoms.

Psychological mechanisms

Self-efficacy

Self-efficacy and dissociation emerged as the strongest predictors of ITQ-PTSD, with almost identical effect sizes. Coping self-efficacy has been described as a mechanism through which other protective factors work to influence post-traumatic recovery.

Previous research indicates that pre-event general self-efficacy and social support can reduce posttraumatic stress symptoms by boosting post-event coping self-efficacy[44]. Social support thus has an indirect effect on distress levels which appear to operate by increasing self-efficacy. In this study, self-efficacy correlated strongly with perceived support (r = .676), supporting the notion that social support may operate by bolstering coping self-efficacy after mass shootings[44]

Although self-efficacy has not been examined in a general population following a mass shooting, some evidence of low self-efficacy as a predictor of posttraumatic stress symptoms have been found[18], consistent with our findings.

Dissociation

Dissociation proved to be a strong predictor of PTSD after the shooting, which is consistent with previous research[15]. Similar results have been observed in mass shootings on college campuses. For example, among young women at NIU, peritraumatic dissociation and high dysregulation was

associated with being four times more likely to have elevated posttraumatic stress symptoms 8 months after the campus shooting[45,46].

Besides Classen et al.[15], which did not discriminate between persistent and peritraumatic dissociation, Miron, Orcutt & Kumpula[45] and Kumpula et al.[46] examine peritraumatic dissociation on a young female sample. The present study provides evidence of persistent dissociation being a substantial predictor of PTSD after mass shootings. For more details on the distinction between peritraumatic and persistent dissociation, see Briere, Scott & Weathers[47] and Werner & Griffin[48].

Social support

While social support did not significantly predict PTSD score, correlation analysis found higher CSS score to be associated with lower PTSD and depression and higher self-efficacy. This supports the stress-buffering hypothesis[49], suggesting survivors who received greater social support not only experienced fewer symptoms but also greater coping resources. The results are also consistent with previous mass shooting research indicating victims with low social support are more vulnerable to PTSD and depression compared to those receiving adequate social support[11].

After the terrorist attack on Utøya Island, Thoresen et al.[50] investigated social support barriers, such as thinking other people are tired of hearing about your problems or that they would be burdening their friends. They found that higher presence of perceived social support barriers was an important factor that negatively influenced mental health[50]. Similarly, Smith et al.[44] found that the indirect distress-reducing effects of social support were reduced to nonsignificance when social support barriers increased. While both these studies were conducted on a young sample, they underscore the perceived accessibility and quality of support. Survivors often rely primarily on “natural” support networks, i.e. friends and family, as their main source of resources of reassurance, rather than formal services[51]. This suggests that interventions should not solely focus on professional help but also strengthen and make use of informal networks, which may play a crucial protective factor after

mass shootings. Efforts may be considered focusing on diminishing social support barriers so survivors will be more likely to utilize social support. Furthermore, interventions aimed at bolstering survivors' coping self-efficacy – e.g. through perceived social support[43], narrative writing interventions[18], or other psychoeducational and skill-building interventions[16] – should be prioritized in post-incident care.

Limitations

A major limitation of this study concerns the challenge of recruiting participants present during the shooting in Field's mall. To gain adequate insight into the psychological sequalae of survivors of mass shootings, it is crucial to access the affected individuals. Naturally, the primary focus immediately after such an incident is to ensure safety and provide acute medical and psychological care for survivors.

During a mass shooting, many survivors immediately flee the scene and are therefore never registered by any authority. Sometimes it is possible to find victims through the acute emergency, acute psychological aid, or police registration of witnesses. This said, it is hard to tell if the selection is representative for all who witnesses and survived the shootings. In our case, recruitment was facilitated through the Metropolitan police, who took half a year to give us permission before distributing an email with a survey link through the national e-box system to ensure survivors' privacy. However, the police initially restricted the invitation to a very small subset of those registered at the mall. Even after the mistake was corrected, our final sample – consisting of 85 participants completing all or part of the survey – represents only a fraction of the several hundred or thousands of employees, concert guests, and regular visitors present during the shooting. As a reference, 15.000 to 40.000 people visit the mall on a regular day[20]. Furthermore, the predominantly female sample (74.1%) may also compromise the external validity of the study. Consequently, the representativeness of the sample is limited, and the risk and impact of selection bias is increased. It

is possible that individuals experiencing high levels of distress were less inclined to respond due to avoidance or, conversely, more inclined to respond due to ongoing symptoms. Both under- and overestimation of symptom levels are plausible as a result.

These recruitment barriers will likely persist in future research in disasters and mass shootings, albeit some measures may help mitigate them while simultaneously providing support to survivors of disasters. First, mass shootings are frequently mediatized events, and while exposure to intense media coverage may have negative effects on affected individuals, it is unlikely to prevent[4,6]. Therefore, media outlets should direct survivors to dedicated telephone lines that help them access professional care, while also offering a pathway for potential future research contact. Second, while the immediate care protocols after disasters in Denmark are sufficient, there is no established system providing support to affected individuals in the weeks and months after disasters. Implementing systemic post-disaster registration practices by law enforcement and emergency services could create a pathway for coordinated proactive outreach, allowing earlier identification and support of at-risk individuals and potentially reducing the severity or persistence of psychological sequalae. Establishing collaboration frameworks between relevant authorities and researchers would not only strengthen the provision of long-term psychosocial care but also improve the conditions of research efforts within the field.

Conclusions

The present study provides important insights into the psychological sequalae following a rare mass shooting incident in Denmark. The findings indicate that PTSD and depression are prevalent months after the shooting and that gender, injury, sick leave, self-efficacy, and dissociation explain a substantial proportion of symptom variance. Recruitment challenges limited the representativeness of the sample, underscoring the need for more systematic post-disaster registration and improved collaboration between local authorities and researchers. The findings contribute to a narrow

research field on psychological sequalae following a mass shooting, and underline the need for larger, longitudinal studies.

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Table 1 *Descriptive data for the participants*

	n	Mean (SD)
Age	78	31.9 (12.9)
		(16-76 yr.)
Gender	78	N/%
Female		63 (80.8%)
Male		15 (19.2%)
Children	62	32 (51.6%)
Civil status	62	
Cohabiting/Married		40 (64.5%)
Single		22 (35.5%)
Working status	62	
Employment		40 (64.5%)
Students		16 (25.8%)
Social benefits		6 (9.7%)
Recent life events	61	23 (37.7%)

Table 2 *Descriptives and reliability analysis for the scales*

		Interval	Mean	SD	n	Items	α
HTQ	Reexperiencing	5-20	11.1	3.97	65	5	0.89
	Avoidance	7-26	12.14	4.25	65	7	0.82
	Arousal	5-20	11.97	3.91	65	5	0.85
	Total	20-68	38.46	11.13	65	17	0.92
ITQ	Reexperiencing	0-7	1.63	2.0	65	2	0.76
	Avoidance	0-8	2.37	2.26	65	2	0.76
	Arousal	0-8	4.2	2.51	65	2	0.86
	Total	0-25	9.34	6.62	65	6	0.86
Bech19	Depression	0-24	6.05	6.16	63	6	0.94
	Anxiety	0-32	6.40	6.63	63	8	0.89
	Interpersonal sensitivity	0-20	4.65	5.09	62	5	0.92
VAS	Feeling of control	0-100	26.05	26.42	63	1	n/a
	Self-respect	0-100	21.67	25.75	63	1	n/a
	Coping	0-100	26.59	29.49	63	1	n/a
	Received support	0-100	24.97	30.62	63	1	n/a
TSC	Dissociation	0-12	1.94	2.30	62	5	0.78
Safety	Feeling of safety	2-6	3.85	1.10	54	1	n/a

Table 3 Concordance between participants who fulfill scale criteria in HTQ and ITQ			
Subscales	HTQ	ITQ	Concordance
Reexperiencing	≥1 24	≥1 23	96%
Avoidance	≥3 15	≥1 30	50%
Hypervigility	≥2 32	≥1 46	70%

Table 4

Descriptive data for contact with authorities (N=78)

	Contact	Satisfaction with help (1= very dissatisfied; 7 = very satisfied)		
	n	n	mean	SD
Hospital	37	9	5.78	2.11
Crisis-therapeutic team at hospital	24	14	5.29	1.64
Police	42	39	5.74	2.05
Own doctor	19	15	5.27	2.40
Health insurance psychologist	21	22	5.23	2.18
Insurance company	20	22	5.50	1.87
Lawyer	4	4	4.25	2.75
Social services administration	1	1	2.0	-
The media	7	9	4.67	2.60
Others	18	11	5.46	2.42

Table 5 *Correlations between scales*

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
HTQ														
1. Reexperiencing														
2. Avoidance	.601**													
3. Arousal	.608**	.732**												
ITQ														
4. Reexperiencing	.737**	.459**	.379**											
5. Avoidance	.708**	.768**	.630**	.567**										
6. Arousal	.707**	.576**	.760**	.519**	.633**									
Bech-19														
7. Depression	.542**	.742**	.788**	.371**	.572**	612**								
8. Anxiety	.653**	.722**	.702**	.616**	.717**	.730**	.762**							
9. Interpersonal sensitivity	.631**	.758**	.795**	.476**	.700**	.705**	.872**	.842**						
TSC														
10. Dissociation	.473**	.554**	.595**	.468**	531**	.568**	.668**	.709**	.694**					
VAS														
11. Feeling of control	.302*	.558**	.540**	.191	.401**	.453**	.636**	.624**	.640**	.424**				
12. Self-respect	.294*	.487**	.550**	.150	.314*	.433**	.716**	.504**	.598**	.576**	.617**			
13. Self-efficacy	.674**	.638**	.530**	.486**	.535**	.501**	.541**	.553**	.580**	.421**	.411**	.573**		
14. Perceived support	.467**	.486**	.534**	.393**	.362**	.551**	.479**	.460**	.497**	.354**	.370**	.434**	.676**	
15. CSS total	-.363**	-.445**	-.451**	-.301*	-.311*	-.342**	-.466**	-.455**	-.514**	-.322*	-.385	-.303*	-.486**	-.422**

Tabel 6 *Hierarchical regression analysis, HTQ-PTSD scores*

Steps	Variable	β	Std. E	t	Sig.	F (df)	Sig.	R^2	Adj. R^2
1.						20.386 (1,59)	<.001	.257	.244
	Gender	-.507	3.188	-4.515	<.001				
2.						8.040 (3,57)	<.001	.420	.390 .
	Gender	-.468	2.912	-4.566	<.001				
	Injured	.231	3.646	2.246	.029				
	Sick leave	.356	2.325	3.513	<.001				
3.						45.207 (5,55)	<.001	.679	.656
	Gender	-.333	2.258	-4.187	<.003				
	Injured	.179	2.750	2.303	.025				
	Sick leave	.231	1.796	2.956	.005				
	Self-efficacy	.545	.031	6.724	<.001				
4.						15.707 (6,54)	<.001	.751	.728
	Gender	-.289	2.034	-4.036	<.001				
	Injured	.164	2.451	2.369	.021				
	Sick leave	.171	1.636	2.406	.020				
	Self-efficacy	.440	.029	5.726	<.001				
	Dissociation	.306	1.900	3.963	<.001				

Tabel 7 *Hierarchical regression analysis, ITQ-PTSD scores*

Steps	*Variable*	β	Std. E	*t*	Sig.	F (df)	Sig.	R^2	Adj. R^2
1.						14.503 (1,59)	<.001	.197	.184
	Gender	-.444	1.949	-3.808	<.001				
2.						14.209 (3,57)	<.001	.428	.398
	Gender	-.382	1.702	-3.751	<.001				
	Injured	.363	2.131	3.550	<.001				
	Sick leave	.355	1.359	3.529	<.001				
3.						22.569 (4,56)	<.001	.617	.590
	Gender	-.266	1.452	-3.067	.003				
	Injured	.318	1.768	3.752	<.001				
	Sick leave	.249	1.154	2.909	.005				
	Self-efficacy	.466	.020	5.262	<.001				
4.						26.641 (5,55)	<.001	.708	.681
	Gender	-.217	1,295	-2.799	.007				
	Injured	.301	1.561	4.025	<.001				
	Sick leave	.181	1.041	2.350	.022				
	Self-efficacy	.347	.049	4.180	<.001				
	Dissociation	.345	1.210	4.129	<.001				

Appendix 1 Algorithms for scoring and criteria for scales and diagnoses				
Instrument	# items	# of answers	Criteria score for items	Scale criteria for diagnosis
HTQ	18	1-4	3-4	All 3 scales
Reexperiencing	5			1
Avoidance	7			3
Hypervigility	5			2
A2 horror	1			Not applied
ITQ	7	1-5	3-5	All 3 scales
Reexperiencing	2+1			1
Avoidance	2			1
Hypervigiliance	2			1
Bech-19	19	0-4		
Depression	6			12-18 moderate; ≥18 severe
Anxiety	8			≥ 14
Interpersonal sensitivity	5			No diagnosis
TSC	26	1-4	3-4	No diagnosis
Negative affectivity	10			
Somatisation	11			
Dissociation	5			